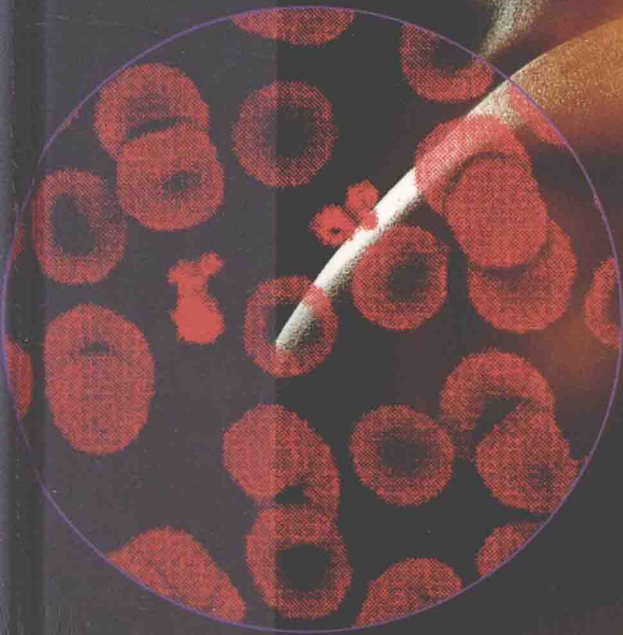
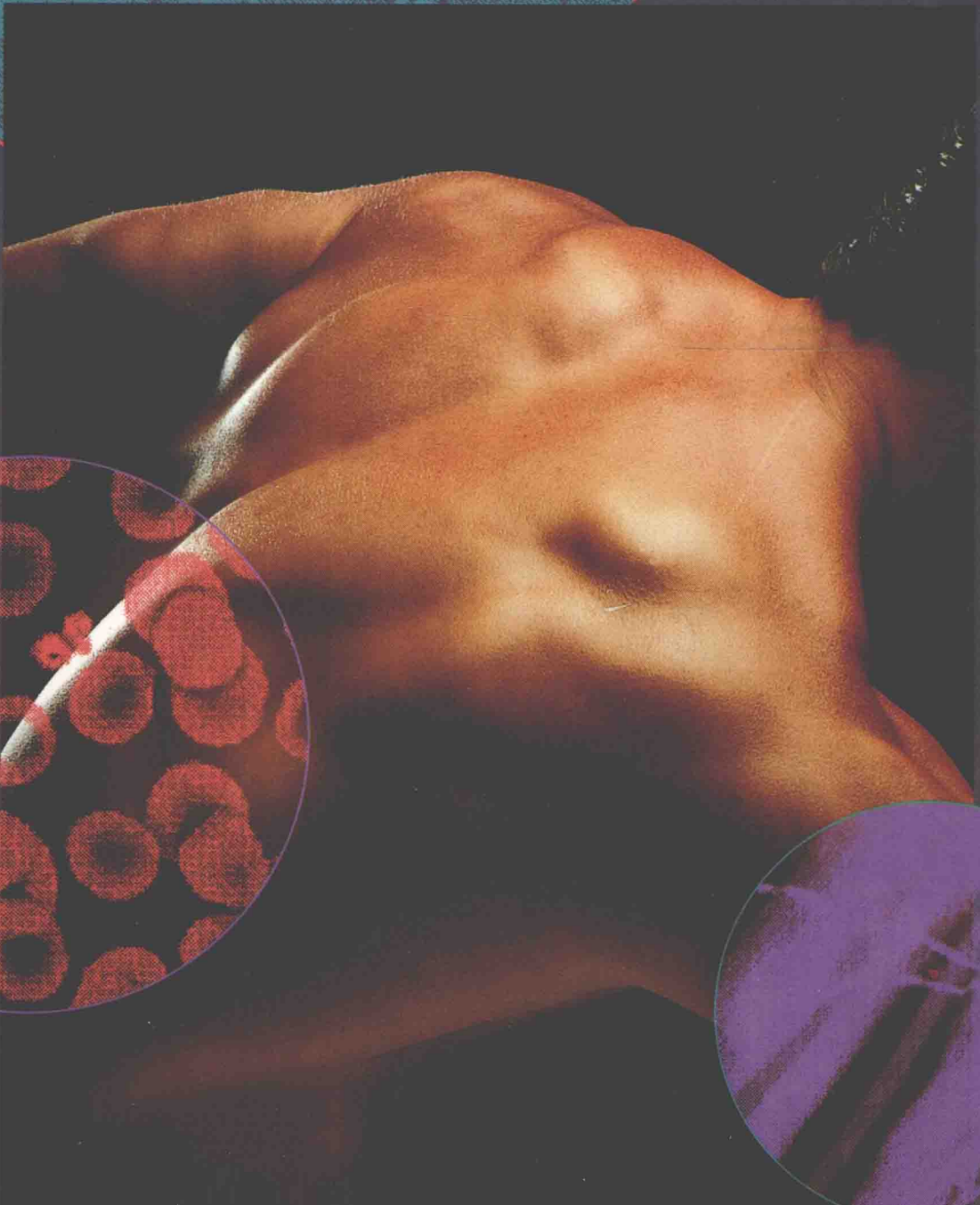


*Essentials of*  
**Human Anatomy  
& Physiology**

Fourth Edition

John W. Hole, Jr.



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**Human Anatomy  
Physiology**

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**Wm. C. Brown Publishers**

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# Preface

*Essentials of Human Anatomy and Physiology*, Fourth Edition, is designed to provide accurate information about the structure and function of the human body in an interesting and readable manner. It is especially planned for students of one-semester courses in anatomy and physiology who are pursuing careers in allied health fields and who have minimal backgrounds in physical and biological sciences.

## Organization

The text is organized in units or groups of related chapters. These chapters are arranged traditionally beginning with a discussion of the physical basis of life and proceeding through levels of increasing complexity.

*Unit 1* is concerned with the structure and function of cells and tissues; it introduces membranes as organs and the integumentary system as an organ system.

*Unit 2* deals with the skeletal and muscular systems, which support and protect body parts and make movements possible.

*Unit 3* concerns the nervous and endocrine systems, which integrate and coordinate body functions.

*Unit 4* discusses the digestive, respiratory, circulatory, lymphatic, and urinary systems. These systems obtain nutrients and oxygen from the external environment; transport these substances internally; utilize them as energy sources, structural materials,

and essential components in metabolic reactions; and excrete the resulting wastes.

*Unit 5* describes the male and female reproductive systems, their functions in producing offspring, and the early growth and development of this offspring.

## Biological Themes

In addition to being organized according to levels of increasing complexity, the narrative emphasizes the following: the complementary nature of structure and function, homeostasis and homeostatic-regulating mechanisms, interaction between humans and their environments, and metabolic processes.

## Changes in the Fourth Edition

The fourth edition of *Essentials of Human Anatomy and Physiology* has been reviewed throughout, and special attention has been given to suggestions received from users of the book. Major changes in the new edition include the following:

1. Many figures have been revised or replaced with new art, and many new micrographs and photographs have been included. See chapters 8 and 10 for examples.
2. Sections of the narrative that are new concern the cavities of the head, atomic weights, reticular fibers, homeostasis of bone, repair of fractures,

3. ratchet theory of muscle contraction, pain nerve pathways, and the pineal gland. Nineteen longer asides called "Current Topics" have been added. These include radioactive isotopes, cancer, mutations and mutagenic factors, elevated body temperature, use and disuse of muscles, factors affecting synaptic transmission, diabetes, dental caries, hepatitis, emphysema and lung cancer, leukemia, hypertension, atherosclerosis, autoimmunity, water balance disorders, sodium and potassium imbalances, acid-base imbalances, birth control, and teratogens.
4. Fourteen new boxed asides have been included covering the topics of anabolic steroids, hip fracture, pain and muscle contraction, corneal transplantation, cellular turnover, Valsalva maneuver, anorexia nervosa, lipid requirements, hyperoxia, atrial natriuretic factor, endothelium, cyclosporine, testicular cancer, and in vitro fertilization.
5. Certain sections of the narrative have been revised or expanded. Among these are the composition of cell membranes, cranial nerves, pineal gland, thyroxine, tonsils, lymphocytes, immune responses, and AIDS.

6. Seven new summary charts have been included. These concern protein synthesis, muscle contraction, nerve impulses, release of neurotransmitters, impulses to hearing receptors, gas exchanges, and birth control.
7. Some new items have been added to the clinical application of knowledge questions at the end of each chapter.

## Pedagogical Devices

The text includes an unusually large number of pedagogical devices intended to involve students in the learning process, to stimulate their interests in the subject matter, and to help them relate their classroom knowledge to their future vocational experiences. These include the following:

**Unit Introductions** Each unit opens with a brief description of the general content of the unit and a list of the chapters within the unit (see p. 3 for an example). This introduction provides an overview of the chapters that make up a unit and tells how the unit relates to other aspects of human anatomy and physiology.

**Chapter Introductions** Each chapter introduction previews the chapter's contents and relates that chapter to others within the unit (see p. 6).

**Chapter Objectives** Chapter objectives at the beginning of each chapter indicate what the reader should be able to do after mastering the information within the narrative (see p. 5). Review activities at the end of each chapter (see p. 22) are phrased like detailed objectives, and it is helpful for the reader to review them before beginning a study of the chapter. Both sets of objectives are guides that indicate important sections of the narrative.

**Key Terms** A list of terms and their phonetic pronunciations is given at the beginning of each chapter to help the reader build a scientific vocabulary. The words included in each list are used within the chapter and are likely to be found in subsequent chapters as well (see p. 5). There is an explanation of phonetic pronunciation on pages 5 and 535.

**Aids to Understanding Words** Aids to understanding words, at the beginning of each chapter, should help to build the reader's sci-

entific vocabulary. This section presents a list of word roots, stems, prefixes, and suffixes to help the reader discover and remember word meanings. Each root, stem, prefix, or suffix and an accompanying example in which it occurs are defined.

**Review Questions within the Narrative** Review questions occur at the ends of major sections within each chapter to test the reader's understanding of previous discussions (see p. 6). If the reader has difficulty answering a set of these questions, the previous section should be reread.

**Illustrations and Tables** In each chapter, numerous illustrations and tables are placed near their related textual discussion. They are designed to help the reader visualize structures and processes, clarify complex ideas, summarize sections of the narrative, or present pertinent data.

Sometimes the figure legends contain questions that will help the reader apply newly acquired knowledge to the object or process the figure illustrates (see fig. 1.9). The ability to apply information to new situations is of prime importance, and such questions concerning the illustrations will provide the practice needed to develop this skill.

**Boxed Information** Short paragraphs set off in colored boxes also occur throughout each chapter (see p. 8). These asides often contain information that will help the reader apply the ideas presented in the narrative to clinical situations. In some of the boxes, there are descriptions of changes that occur in body structure and function as a result of disease processes.

**Current Topics** Longer asides are entitled Current Topics. They discuss pathological disorders, physiological responses to environmental factors, and other topics of general interest (see page 37).

**Clinical Terms** At the end of certain chapters is a list of related terms, with their phonetic pronunciations and definitions, that are sometimes used in clinical situations (see p. 19). Although these lists are often brief, they will be a useful addition to the reader's understanding of medical terminology.

**Chapter Summaries** A summary in outline form occurs at the end of each chapter to help the reader review the major ideas presented in the narrative (see p. 20).

**Clinical Application of Knowledge** At the end of each chapter are questions (see p. 22) that help the reader gain experience in applying information to clinical situations. They may also serve as topics for discussion with other students or with the instructor. Suggested answers to these questions appear in the Instructor's Manual that accompanies the textbook.

**Review Activities** Review activities at the end of each chapter (see p. 22) will serve as a check on the reader's understanding of the major ideas presented in the narrative.

**Appendix** The appendix consists of lists of clinical laboratory tests commonly performed on human blood and urine. These lists give the tests' names, normal adult values, and brief descriptions of their clinical significance (see p. 531).

## Readability

Readability is an important asset of this text. The writing style is intentionally informal and easy to read. Technical vocabulary has been minimized, and illustrations, summary tables, and flow diagrams are carefully positioned near the discussions they complement. Other features provided to increase readability and aid student understanding include the following:

**Bold and Italic Type** identifying words and ideas of particular importance.

**Glossary of Terms** with phonetic pronunciations, supplying easy access to definitions.

**Index**, which is complete and comprehensive.

## Supplementary Materials

The following supplementary materials, designed to help the instructor plan class work and presentations and to aid students in their learning activities, are also available:

**Instructor's Resource Manual and Test Item File** by John W. Hole, Jr., and Karen A. Koos, which contains chapter overviews, instructional techniques, a suggested class schedule, discussions of chapter elements, lists of related films, and directories of suppliers of audiovisual and laboratory materials. It also provides test items for each chapter of the text, designed to help evaluate student understanding.



*WCB TestPak* is a computerized testing service offered free upon request to adopters of this textbook. It provides a call-in/mail-in test preparation service. A complete test item file is also available on computer diskette for use with IBM compatible, Apple IIe or IIc, or Macintosh computers.

*A Student Study Guide to Accompany Essentials of Human Anatomy and Physiology, Fourth Edition*, by Nancy Sickles Corbett, which contains overviews, chapter objectives, focus questions, mastery tests, study activities, and answer keys corresponding to the chapters of the text.

*A Set of 100 acetate transparencies*, designed to complement lectures or to be used for short quizzes.

*Visuals Testbank* is a set of 50 transparency masters that are available for use by instructors. These feature line art from the text with labels deleted for student quizzing or for student practice.

*Laboratory Manual* to accompany *Essentials of Human Anatomy and Physiology, Fourth Edition*, by John W. Hole, Jr., contains 45 exercises planned to stimulate interest in the subject matter, to involve students in the learning process, and to guide them through a variety of laboratory activities.

Also available from WCB. . . .

- Study Cards for Human Anatomy and Physiology by Van De Graaff/Rhees/Creek
- *The Coloring Review Guide to Human Anatomy* by McMurtrie/Rikel
- *Atlas of the Skeletal Muscles* by Robert and Judith Stone
- The WCB Anatomy and Physiology Video Series
- *Anatomy and Physiology of the Heart* videodisc
- *Computer Review of Human Anatomy and Physiology* software by Davis/Zimmerman/Van De Graaff
- *Knowledge Map of Human Anatomy Systems* software (Macintosh) by Craig Gundy of Weber State College

# Acknowledgments

Once again, I want to express my sincere gratitude to those who used or reviewed previous editions of *Essentials of Human Anatomy and Physiology* and provided suggestions for its improvement. I am especially indebted to those who read all or portions of the Fourth Edition manuscript while it was being prepared. They include:

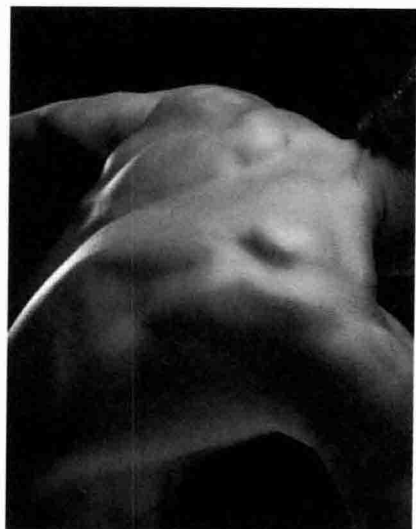
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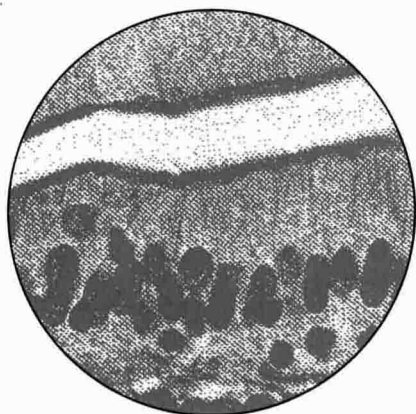
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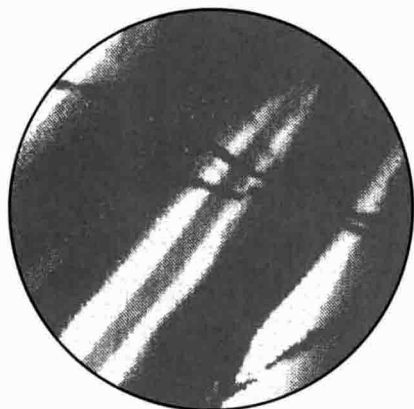
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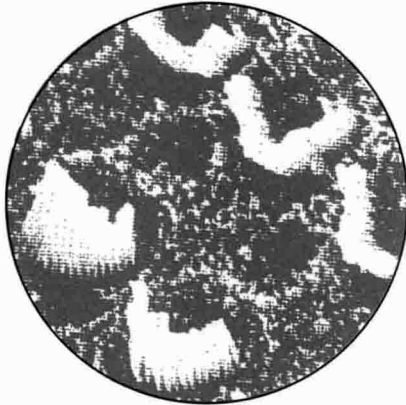
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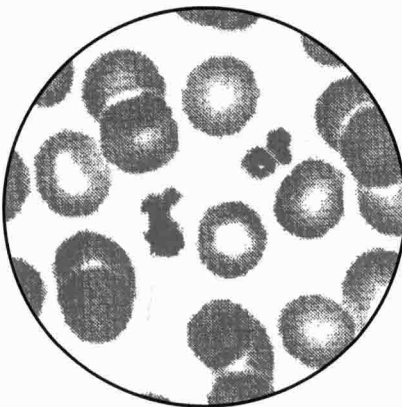
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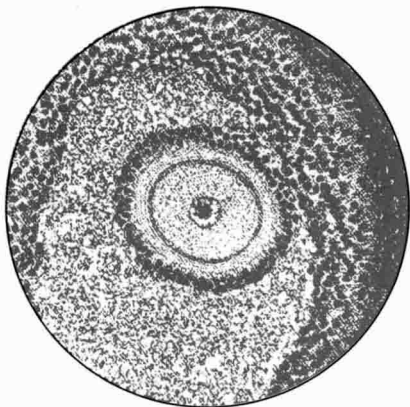
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