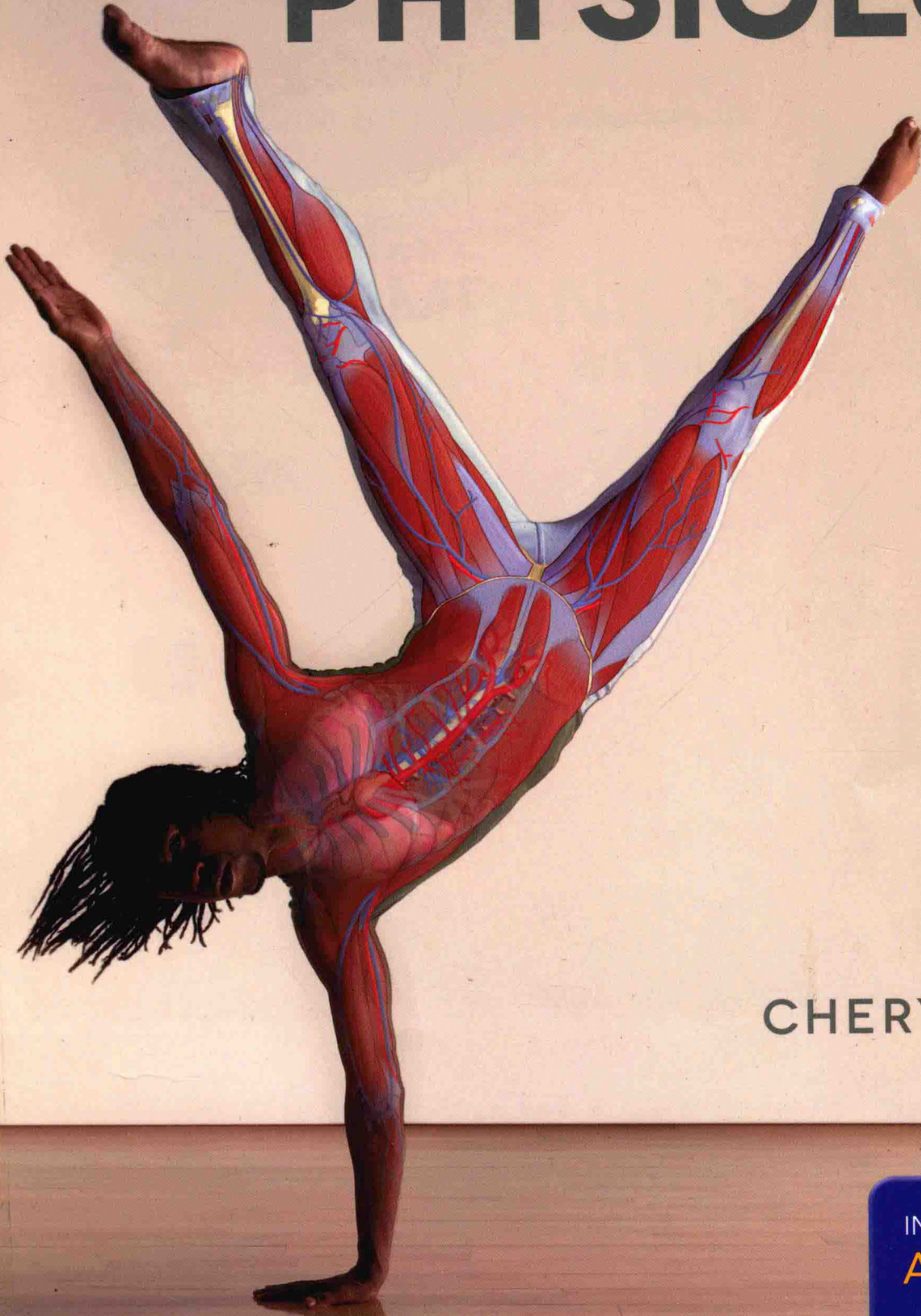


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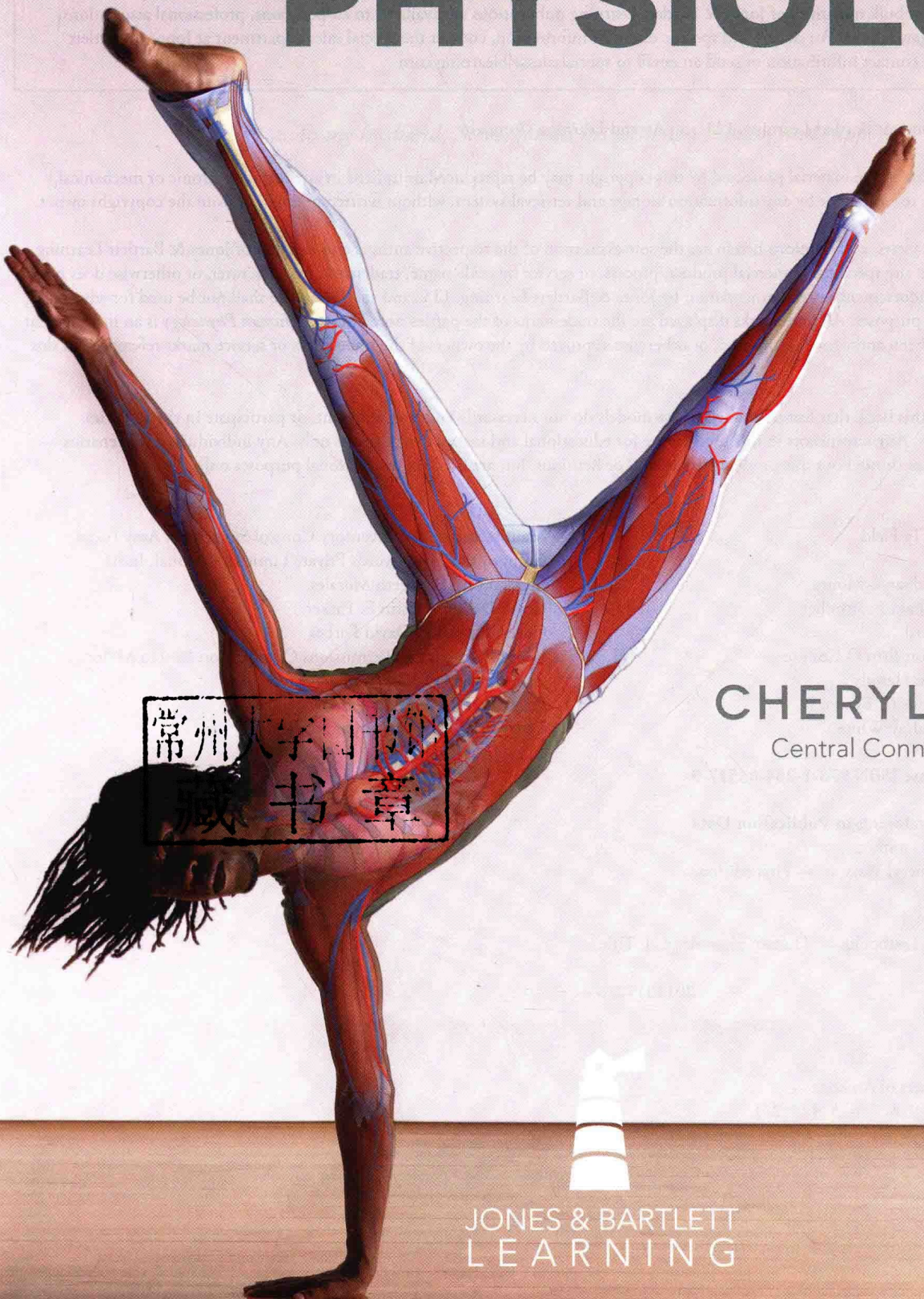


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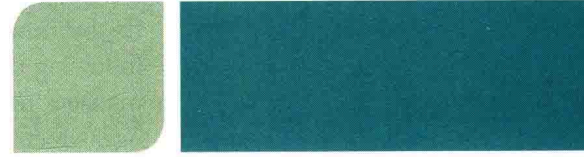
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To my husband, Steve, for all his patience, humor, and support.



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Preface

This book was written for human physiology students. During 18 years of teaching physiology I've discovered that students learn physiology most quickly and retain it the longest when it is presented as a series of concrete problems. This observation gave birth to my use of case studies and storytelling as tools for understanding human physiology. This text uses case studies involving healthy adults to introduce all the most important concepts in physiology and simultaneously help students to think as physiologists. To accomplish this, students must see the physiological consequences of any change in our physical state, such as exercise, dehydration, or hunger. These consequences involve multiple organ systems and a whole-body response. This text is designed to emphasize these interactions and encourage students to see physiology as a cascade of mechanisms.

Physiology is fascinating in its own right. We all want to know why we get a fever, why a cut finger stops bleeding, or why being frightened makes the heart beat faster. Physiology, however, is the foundation of medicine, pharmacology, and pathophysiology. A good working knowledge of physiology, therefore, is indispensable for those scientific disciplines or any health profession that utilizes them. To emphasize these connections, pharmacology case studies and clinical case studies are included at the end of each chapter.

Brevity

This text is designed to be used in its entirety during a single-semester, undergraduate, human physiology course, so it is shorter than many standard texts. No organ system need be eliminated due to a lack of time, and, therefore, students have the opportunity to learn about the interplay of all the organ systems. The text is not intended to be all-inclusive nor does it attempt to be a comprehensive resource for all of human physiology. It is constructed to give undergraduate students an integrated framework that will allow them to understand the fundamentals of human physiology from protein to organ system to whole body response. With this background, students will be well-prepared for studying advanced physiology, pathophysiology, or pharmacology.

Organization

There are several techniques in this book designed to help students grasp and use essential physiological concepts.

Chapter Sequence

The chapters are in a slightly different order than commonly found in other physiology textbooks. Systems that affect all other organ systems, such as the autonomic nervous system, are introduced early in the text. Because these controller systems are covered at the beginning, they can be applied to other systems later in the text. Thus, immediately following the chapter on cell physiology is the chapter on autonomic physiology, which manages most of our vegetative functions, followed by a chapter on endocrine physiology, which relies heavily on the receptors and signal transduction introduced in the first chapter to coordinate our activity in a long-term fashion. My intention is to continuously reuse concepts throughout the text. In this way, students will be able to integrate concepts introduced earlier, such as receptors, with organ system responses. This will help students see the human being as a coordinated physiological system. Throughout the book, the organismal consequences of protein function or hormonal processes will be introduced, so students can have a real-world example of molecular phenomena. I will always “close the loop,” so that relevant connections are illustrated and explained, not just implied. Too often, as instructors, we anticipate that students will make connections that they simply are not scientifically educated enough to make.

End-of-Chapter Pharmacology Case Studies

Pharmacology case studies appear at the end of each chapter. While each pharmacology case is system based, it often refers back to specific receptors or metabolic processes that have been studied in previous chapters. This helps students to see the cumulative nature of physiology and its application to pharmacology. To follow through with tissue receptor distribution and the possible effects when they are targeted by drugs, there are end-of-chapter pharmacology questions. For example, receptors and their signaling pathways, introduced in the first chapter, are utilized again in the final chapter. Because receptors are frequently drug targets, understanding that the same receptor type can exist in many tissues and cause different actions is important.

Case Studies: Normal Physiology and Clinical Case Studies

Case studies at the beginning of a chapter are referenced throughout the chapter, bridging the gulf between academic material and application. This is important because students sometimes compartmentalize what they know, separating academic concepts from the “real” world. The case studies are based on normal physiology, so they are events experienced by healthy young people, allowing students to see physiology at work within themselves. These case studies are frequently cumulative, so new systems are added to those previously considered. All of this is designed to promote thinking about human physiology in an integrated way.

Finally, there are clinical case studies at the end of each chapter. These cases are based on two prevalent diseases: diabetes and heart failure. These two diseases form a clinical thread throughout the text, illustrating both the commonality of cellular mechanisms between tissues and how organ systems interact with one another. Diabetes, for example, is introduced during the cell physiology chapter (1) through a discussion of glucose transport and insulin receptor signaling. It reappears in the endocrine chapter (3) in a section on glucose regulation; in the sensory-motor system chapter (5) regarding loss of sensory ability; in the digestive system chapter (6) in a section on nutrient distribution; in the cardiovascular system chapter (7) during a discussion of vascular inflammation; in the immune system chapter (4), also under inflammation; and finally in the renal system

chapter (9) in discussion of glucose uptake. The case studies of these two conditions reintroduced in most of the chapters illustrate the far-reaching consequences of apparently simple physiological malfunctions and help students understand the interdependencies of organ systems.

To the Student

Read each opening case study carefully as it is referenced throughout the chapter and will help you apply physiological principles to your daily life. You will notice quickly that this text does not emphasize memorization of facts but an understanding of process. This is a slightly different way of studying, so don't forget to sit back after your reading and ask "How do I move?" or "How does the sugar in the doughnut I just ate get into cells?" or "How do I distinguish between touch and pain?" and then try to answer your own question. Directed daydreaming is an important component of learning physiology!

To the Instructor

Stories are powerful teaching tools and an important part of human history. Stories help us understand and are easy to remember. In science, storytelling is accomplished through case studies. Normal physiology case studies are incorporated into this text as an application of principles. These will help you bring concepts to life. Additional case studies, both pharmacology cases and clinical cases are available at the end of the chapter and in the instructional materials on-line.

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For the Instructor

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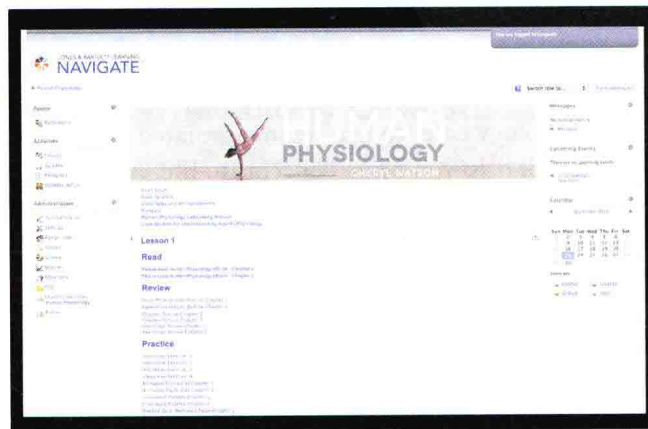
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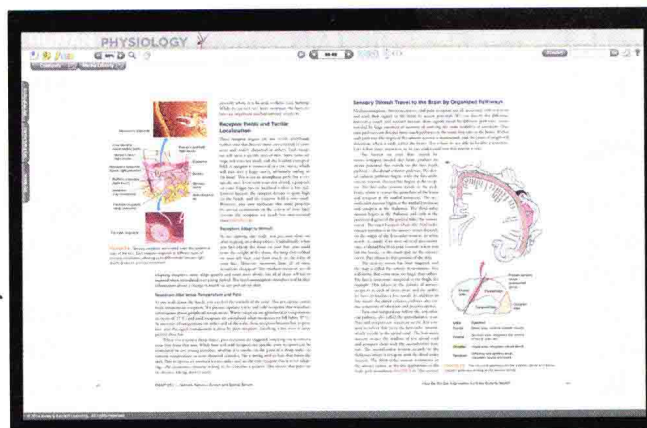
in the text, additional case studies on asthma and chronic obstructive pulmonary disease (COPD) have been developed and will be hosted exclusively on the companion site. Access to this site is free with every new print copy of the text and is available for purchase separately at go.jblearning.com/HumanPhysCWSAccess.

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Cheryl Watson



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