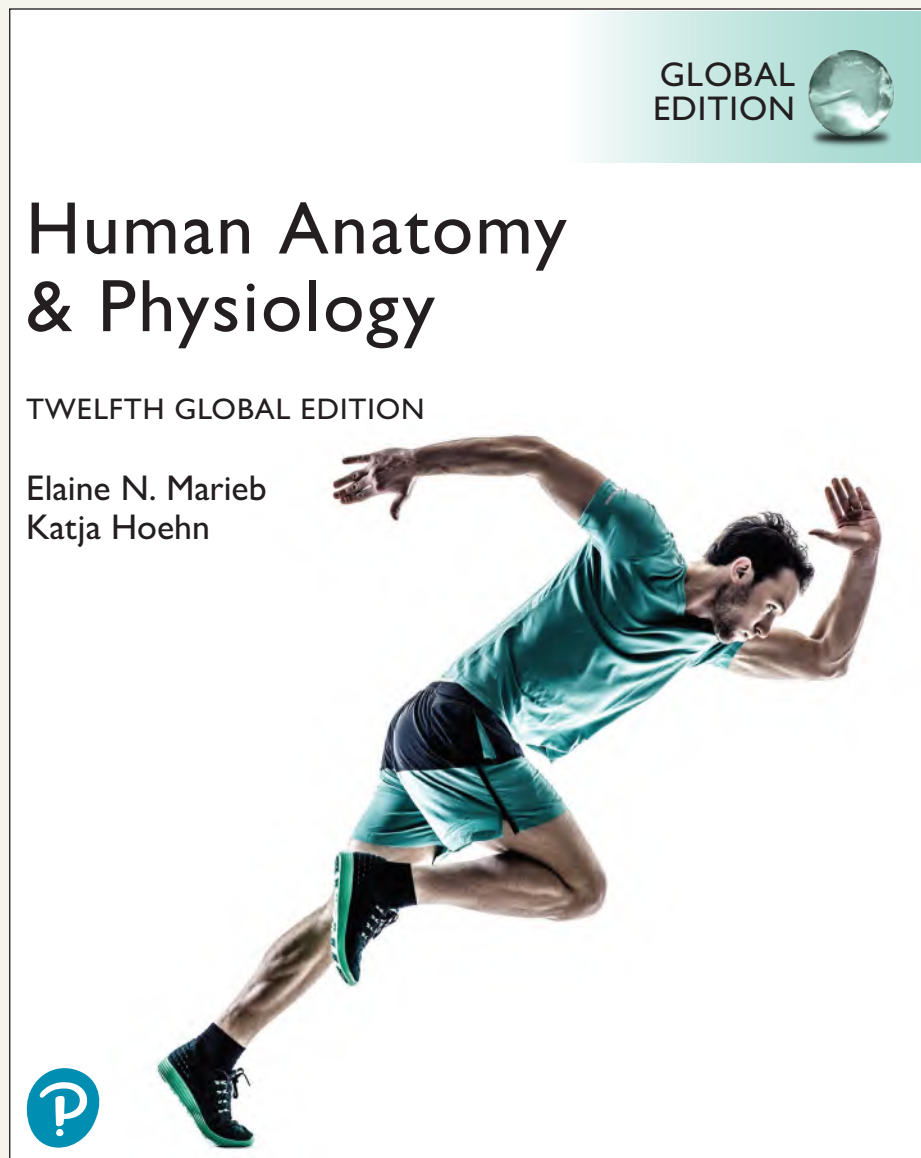


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The **12th Edition** of Elaine Marieb and Katja Hoehn's best-selling A&P text and media program motivates and supports both novice learners and expert students, more than ever before. Each carefully-paced chapter guides you in advancing from mastering terminology to applying knowledge in clinical scenarios, to practicing the critical thinking and problem-solving skills that are required for entry to nursing, allied health, and exercise science programs.



Identify “Big Picture” Concepts Before Exploring Details

Before you look up details and information within a chapter, read the **Chapter-Opening Roadmap**, which visually groups and organizes “big picture” concepts and shows how they are related. To focus your studying, review the numbered **Key Concept Headings**, **Learning Outcomes**, and summaries.

UNIQUE! Chapter Roadmaps provide a visual overview of the key concepts in the chapter and show how they relate to each other. Each key concept “brick” in the roadmap corresponds to a numbered section within the chapter.

Each numbered section within the chapter begins with a **Key Concept Heading** that helps you quickly grasp the “big idea” of the discussion that follows.

8

Joints

In this chapter, you will learn that

Joints determine how bones move relative to each other

by first asking

8.1 How are joints classified?

then exploring

8.2 Fibrous joints

8.3 Cartilaginous joints

8.4 Synovial joints

looking closer at

Movement of synovial joints

focusing on

8.5 Selected synovial joints

then asking


8.6 What happens when things go wrong?

and finally, exploring

Developmental Aspects of Joints

The graceful movements of ballet dancers and the rough-and-tumble grapplings of football players demonstrate the great variety of motion allowed by **joints**, or **articulations**—the sites where two or more bones meet. Our joints have two fundamental functions: They give our skeleton mobility, and they hold it together, sometimes playing a protective role in the process.

CAREER CONNECTION



Watch a video to learn how the chapter content is used in a real health care setting. Go to **Mastering A&P®** > Study Area > Animations and Videos or use quick access URL <https://bit.ly/3P8hiZa>

8.1

Joints are classified into three structural and three functional categories

Learning Outcomes

- ✓ Define joint or articulation.
- ✓ Classify joints by structure and by function.

Joints are classified by structure and by function. The *structural classification* focuses on the material binding the bones together and whether or not a joint cavity is present. Structurally, there are *fibrous*, *cartilaginous*, and *synovial joints* (Table 8.1 on p. 285). Only synovial joints have a joint cavity.

The *functional classification* is based on the amount of movement allowed at the joint. On this basis, there are **synarthroses** (sin'ar-thro'sēz; *syn* = together, *arthro* = joint), which are immovable joints; **amphiarthroses** (am'fē-ar-thro'sēz; *amphi* = on both sides), slightly movable joints; and **diarthroses** (di'ar-thro'sēz; *dia* = through, apart), or freely movable joints. Freely movable joints predominate in the appendicular skeleton (limbs). Immovable and slightly movable joints are largely restricted to the axial skeleton. This localization of functional joint types makes sense because the less movable the joint, the more stable it is likely to be.

In general, fibrous joints are immovable, and synovial joints are freely movable. However, cartilaginous joints have both rigid

Career Connection Videos

feature a health care professional who describes how the chapter content relates to their everyday work. You can access all of the Career Connections videos through an open access web page at <https://bit.ly/3P8hiZa>.

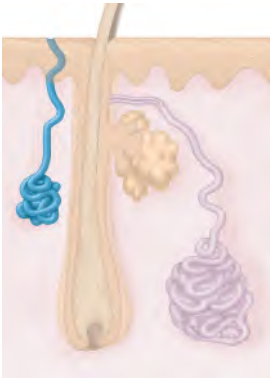


See p. 281

Learning Outcomes are presented at the beginning of each chapter section to give you a preview of essential information to study.

Pace Yourself: Learn & Review the Basics

Summary Tables present key information and serve as “one-stop shopping” study tools.

Table 5.1 Summary of Cutaneous Glands

	ECCRINE SWEAT GLANDS	APOCRINE SWEAT GLANDS	SEBACEOUS GLANDS
			
Functions	<ul style="list-style-type: none"> • Temperature control • Some antibacterial properties 	May act as sexual scent glands	<ul style="list-style-type: none"> • Lubricate skin and hair • Help prevent water loss • Antibacterial properties
Type of Secretion	Hypotonic filtrate of blood plasma	Filtrate of blood plasma with added proteins and fatty substances	Sebum (an oily secretion)
Method of Secretion	Merocrine (exocytosis)	Merocrine (exocytosis)	Holocrine
Secretion Exits Duct At	Skin surface	Usually upper part of hair follicle; rarely, skin surface	Usually upper part of hair follicle; sometimes, skin surface
Body Location	Everywhere, but especially palms, soles, forehead	Mostly axillary and anogenital regions	Everywhere except palms and soles

See p. 192

Sebaceous Glands

The **sebaceous glands** (se-ba'shus; “greasy”), or *oil glands* (Figure 5.9a), are simple branched alveolar glands that are found all over the body except in the thick skin of the palms and soles. They are small on the body trunk and limbs, but quite large on the face, neck, and upper chest. These glands secrete an oily substance called **sebum** (se'bum). The central cells of the alveoli accumulate oily lipids until they become so engorged that they burst, so functionally these glands are *holocrine glands* (◀ p. 156). The accumulated lipids and cell fragments constitute sebum.

Text Recall icons guide you to review specific pages where a concept was first introduced.

See p. 193

Building Vocabulary Coaching Activities in Mastering A&P® are a fun way to learn word roots and A&P terminology while building and practicing important language skills.

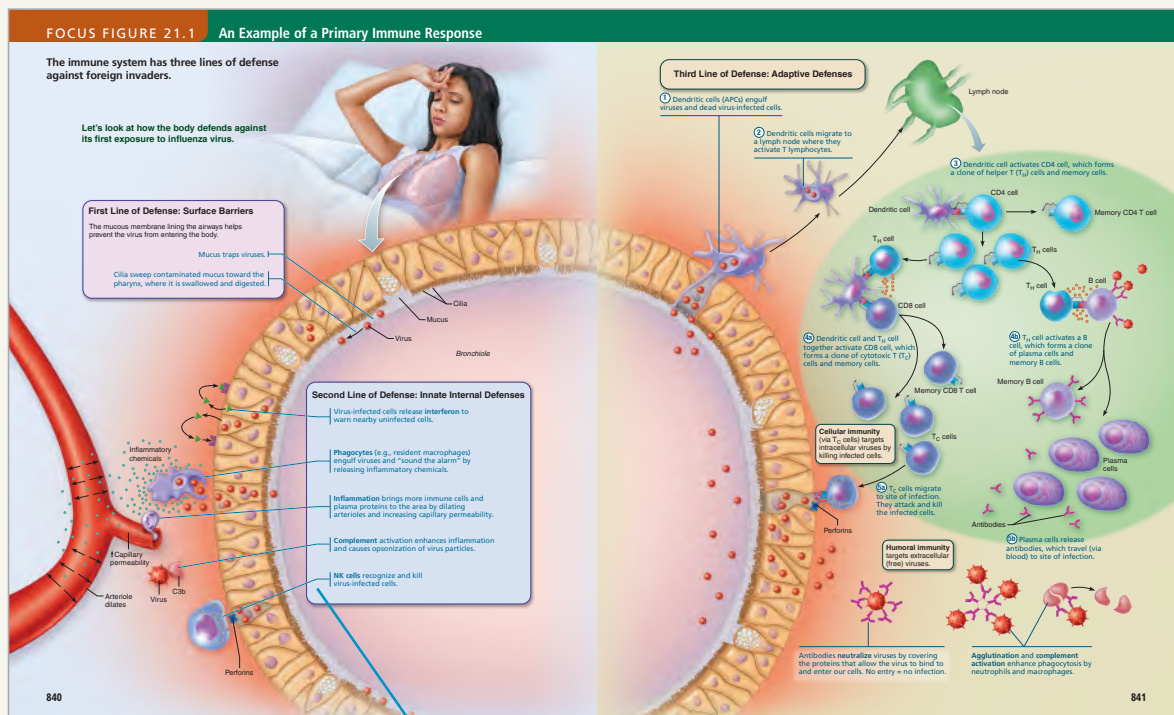
Study the Figures as You Read the Text

Anatomy and Physiology is a visual science. To succeed, you need to practice and develop visual literacy skills for understanding and interpreting information. To help you achieve this goal, the text and associated figures are tightly integrated so that you do not have to flip pages back and forth to connect visuals with words.

26 Focus Figures walk you through complex processes using exceptionally clear, easy-to-follow illustrations with integrated text explanations.

See pp. 840–841

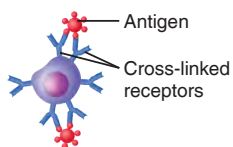
Focus Figure “Mini-Animation” Coaching Activities bring some of the Focus Figures to life using short video segments.



Blue text represents the voice of an A&P instructor, highlighting important points to remember.

Activation and Differentiation of B Cells

An immunocompetent but naive B lymphocyte is *activated* when matching antigens bind to its surface receptors and cross-link adjacent receptors together. Antigen binding is quickly followed by receptor-mediated endocytosis of the cross-linked antigen-receptor complexes. As we described previously, this is called *clonal selection* and is fol-



31 unique In-Line Figures are strategically placed within the text to visually reinforce the text discussion.

See p. 828

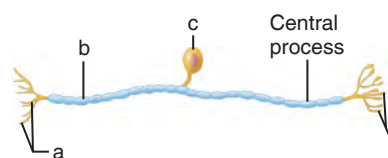
Apply Your Knowledge to a Range & Variety of Questions

As you build your knowledge and confidence in A&P, practice responding to the more challenging questions—you are likely to encounter similar questions on a test or licensing exam. Your extra effort will pay off at exam time!

A greater **variety and range of self-assessment questions** have been added to the **Check Your Understanding** sections within each chapter and include **Apply, Predict, What If?, Draw, and Make Connections**. Dozens of new **visual questions** ask you to label structures or interpret visual information.

Check Your Understanding

- How does a nucleus within the brain differ from a nucleus within a neuron?
- How is a myelin sheath formed in the CNS, and what is its function?
- What is the structural classification of the neuron shown below? What is its usual functional classification? Name the parts labeled a–d.
- APPLY** Which structural and functional type of neuron is involved in sensing the smell of your perfume? Which type is needed to transfer the impulses to the brain for integration?



- MAKE CONNECTIONS** Which part of the neuron is its fiber? How do nerve fibers differ from the fibers of connective tissue (see Chapter 4) and the fibers in muscle (see Chapter 9)?

For answers, see Answers Appendix.

See p. 431

“Draw” questions ask you to create visuals that reinforce important concepts by drawing a structure, annotating a figure, or creating a summary table.

- DRAW** Create a summary table to help you study the pharynx by comparing and contrasting its three parts. For each part, identify what it conducts (air, food, or both), the type of epithelium found there, and the associated tonsils.

	Conducts	Epithelium	Tonsils
Nasopharynx	Air	Pseudostratified ciliated columnar	Pharyngeal Tubal
Oropharynx	Air and food	Stratified squamous	Palatine Lingual
Laryngopharynx	Air and food	Stratified squamous	— (none)

See p. 858 and Answers Appendix

All of the **End-of-Chapter Review questions** are now organized into 3 levels of difficulty based on **Bloom's Taxonomy categories**:

- Level 1: Remember/Understand
- Level 2: Apply/Analyze
- Level 3: Evaluate/Synthesize

Prepare for Your Future Career & Practice Solving Real-World Problems

The authors of this text, Elaine Marieb and Katja Hoehn, share insights from their own clinical experience to help you prepare for your future career in health care. All clinical examples and applications are signaled with an easy-to-find “Clinical” label.

Homeostatic Imbalance discussions alert you to the consequences of body systems not functioning optimally. Relevant photos have been added to selected discussions for visual reinforcement.

NEW! Discussions have been added on Marfan syndrome, brittle bone disease, tetanus, and anxiety disorders.



HOMEOSTATIC IMBALANCE 4.2

CLINICAL

Marfan syndrome is an inherited disorder that causes a change in the types of proteins that comprise elastic fibers. As a result of this change, the elasticity in tissues is reduced, leading to the overgrowth (aortic enlargement and long arms, legs, and fingers) and instability (lung collapse and eye problems) of tissues. Although people suffering from Marfan syndrome are born with the condition, not all of them show symptoms at birth or during childhood; some only develop symptoms as adults.

See p. 158

Clinical Case Studies are provided at the end of Chapters 5–29 and challenge you to apply your knowledge to realistic clinical scenarios.

CLINICAL CASE STUDY

One-Year-Old Girl with Retarded Growth

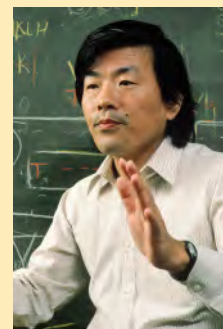
Miriam gave birth to a twin boy and girl a year ago. She is concerned about Theresa, her daughter, since her growth and development is much slower than that of her brother. Miriam visits a pediatric outpatient clinic, where she informs the physician that, apart from having retarded growth, Theresa has a poor appetite, suffers from constipation, and is lethargic. The physician orders blood tests to check Theresa’s growth hormone



See p. 673

NEW! Boxes on scientists feature details about the lives and works of eminent scientists. These will show you the human side of science.

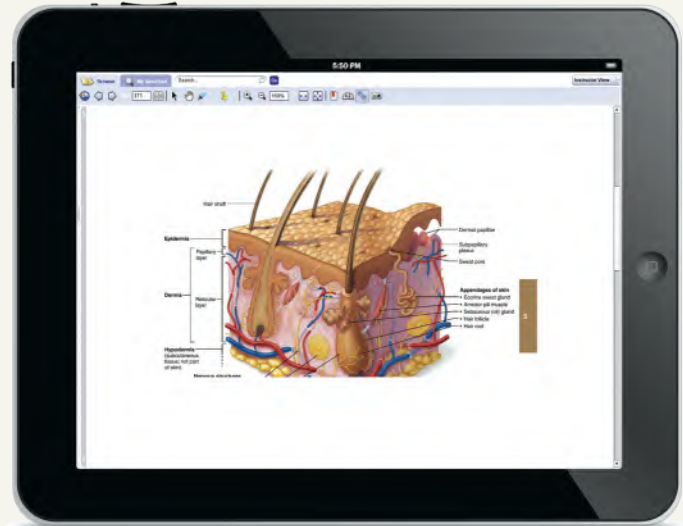
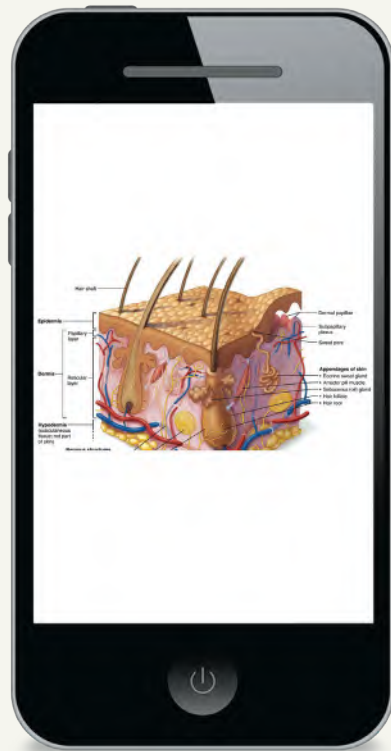
Susumu Tonegawa (b. 1939) is a Japanese scientist who won the Nobel Prize in Physiology or Medicine in 1987 for elucidating the genetic mechanisms underlying adaptive immunity. A problem in adaptive immunity was that, although the presence of millions of different antibody proteins was known, there weren’t enough genes in the human genome to account for these. So how were all these different antibodies produced? By comparing the DNA of mature and immature B cells, Tonegawa discovered that the regions of DNA that produce antibodies become greatly rearranged as the B cell matures, which is how a small number of antibody-producing genes generate the huge variety of antibodies seen.



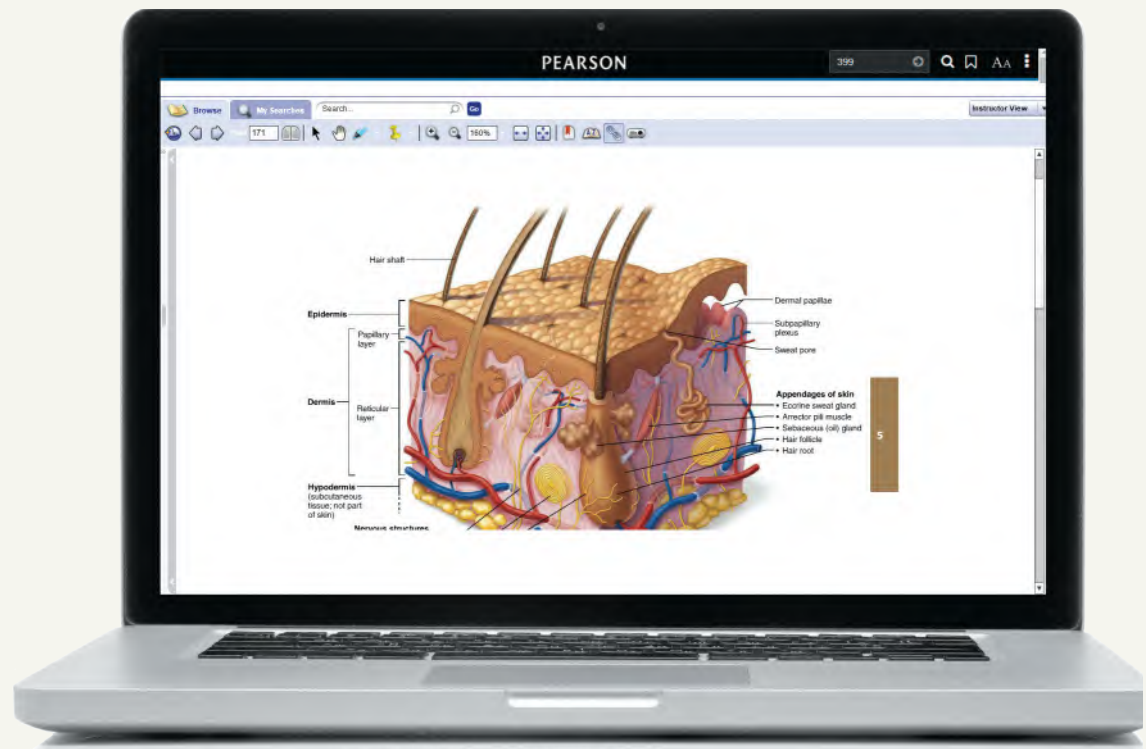
See p. 830

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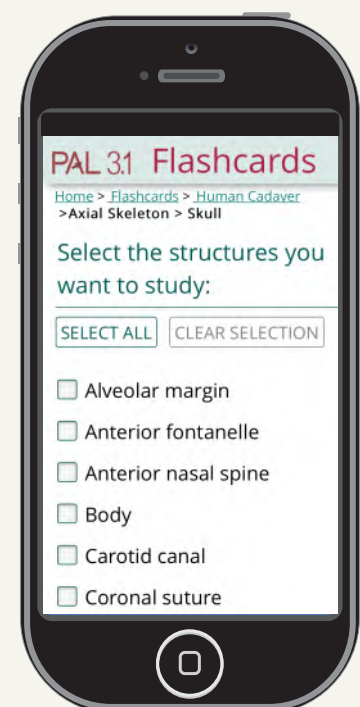
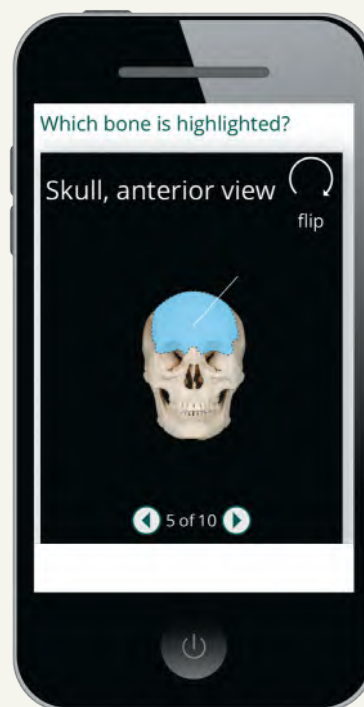
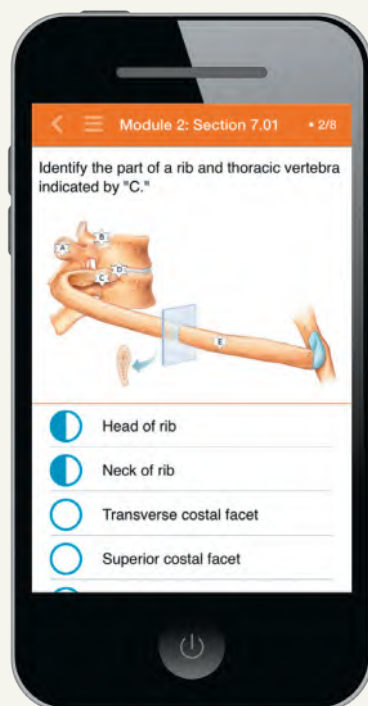
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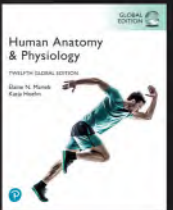

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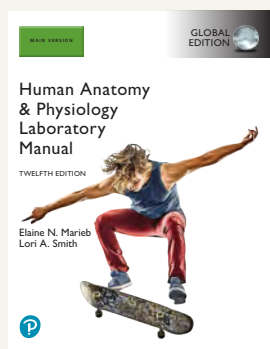
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- **Focus Figure “Mini-Animation” Coaching Activities** bring some of the Focus Figures to life and include assessment questions.
- **Concept Map Coaching Activities** support the concept maps in the text without requiring students to submit their own concept map for grading.
- **NCLEX-Style Questions** give students practice with the kinds of questions that will eventually appear on a licensing exam.

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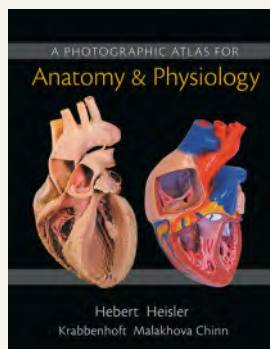
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Human Anatomy & Physiology

TWELFTH GLOBAL EDITION

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Mount Royal University



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