NEW! **Ready-to-Go Teaching Modules** help instructors find the best assets to use before, during, and after class to teach the toughest topics in A&P. Created by teachers for teachers, these curated sets of teaching tools save you time by highlighting the most effective and engaging animations, videos, quizzing, coaching and active learning activities from MasteringA&P.
Help Students Use Art More Effectively

NEW! Modules 1.1–1.5 emphasize the importance of studying the art in the book and then guide students through how to study the figures in the text most effectively.

Module 1.2
Comprehending the art is essential to understanding A&P

Think back to your first childhood book. You most likely began with a "picture book." Then, as you learned the alphabet and developed speech, you progressed to "word books." The next step was "chapter books." Somewhere along the way, you quit looking at pictures (art) and focused solely on the words (text). Maybe the shift to text-based reading without looking at the pictures happened in high school. You began reading words—paragraph after paragraph, page after page of words. Most of your books may have been informative and filled with pictures, but you quickly realized that most were didactic and that the real information was to be found in the words. To succeed in a college science course, you need to break this pattern, shift your focus, and integrate information presented in the art as well as the words.

3 In college, you are faced with new raw concepts, abstract ideas, and unfamiliar images. Each plot, diagram in a college textbook is intended to illustrate important or essential concepts in the text. To understand the discussions or experiments in these texts, you must relate the text to the art. This process means that you must think about the text and the art simultaneously. If you can correlate ideas or even see a word in the text that relates to a figure in the art, your comprehension will increase and your understanding will improve.

3 To understand, you must look at the text and the art simultaneously. This is essential for comprehension and effective problem solving. The best way to do this is to look at the text and art together when studying a concept. If you find yourself reading without looking at a figure, you are not using the text and art together. If you can look at the text and a figure at the same time, you will have a better understanding of the concept.

3 Although reading text and seeing an image side by side may sound like common sense, most students do not do that. Whenever the text refers to a figure, you should reread the text and then look at the figure. If you do not reread the text, you will not understand the figure. The best way to learn the text and the associated art is at the same time and in the same pages. Without the page-turning required by a traditional text-book format, in this book, the text and art go hand in hand. Please continue looking at your text and the art together. Using this technique will enhance your learning.

6 Chapter 1: An Introduction to Anatomy and Physiology
NEW! **SmartArt Videos** help students better navigate key, complex pieces of art. Author Kevin Petti narrates fifteen new videos, walking students through the piece and providing additional background and detail. The videos can be accessed via QR codes in the book and offer accompanying assignments through MasteringA&P.

**Motor Units and Recruitment**

A typical skeletal muscle contains thousands of muscle fibers. Although some motor neurons control just a few muscle fibers, most control hundreds of them. The amount of tension produced is controlled at the subconscious level through variations in the number of muscle fibers stimulated.

A motor unit is a motor neuron and all the muscle fibers that it controls. The size of a motor unit indicates how fine or precise a movement can be. In the muscles of the eye, where precise control is extremely important, a motor neuron may control 6–8 muscle fibers. We have much less precise control over our leg muscles, where a single motor neuron may control 1000–2000 muscle fibers.

The muscle fibers of each motor unit are interwoven with those of other motor units. As a result, the direction of pull exerted on the tendon does not change when the number of activated motor units changes. When you decide to perform a specific movement, the contraction begins with the activation of the smallest motor units in the stimulated muscle. As the movement continues, larger motor units containing faster and more powerful muscle fibers are activated, and tension rises steeply. The smooth but steady increase in muscular tension produced by increasing the number of active motor units is called recruitment.

**What Is Muscle Tone?**

A variable number of motor units is always active, even when the entire muscle is not contracting. Their contractions do not produce enough tension to cause movement, but they do tense and firm the muscle. This resting tension in a skeletal muscle is called muscle tone, and it is regulated at the subconscious level. The activity level of each motor neuron changes constantly, and individual muscle fibers can relax while a constant tension is maintained in the attached tendon. Activated muscle fibers use energy, so the greater the muscle tone, the higher the “resting” rate of metabolism. Elevated muscle tone increases resting energy consumption by a small amount, but the effects are cumulative, and they continue 24 hours per day.

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**Learning Outcome**

Discuss the factors that affect peak tension production during the contraction of an entire skeletal muscle, and explain the significance of the motor unit in this process.
Focus on
Critical Reflection, Media Integration,

Module 19.5
Pressure, resistance, and venous return affect cardiac output

You are now familiar with the factors that regulate cardiac output (see Module 18.16). Both cardiac output and the distribution of blood within the pulmonary and systemic circuits must constantly be adjusted to meet the demands of active tissues. The sites and mechanisms for such adjustments are reviewed here.

**Cardiac Output**
To maintain cardiac output, the heart must generate enough pressure to force blood through thousands of miles of peripheral capillaries, most no larger in diameter than a single red blood cell.

**Arterial Pressure**
Arterial pressure is the force exerted by blood against the walls of systemic arteries. Arterial pressure is much higher than venous pressure because it must push blood a greater distance and through smaller and smaller arteries and then through innumerable capillary networks.

**Blood Flow Regulation**
Auto regulation acts locally. Central regulation involves neural and endocrine mechanisms to make coordinated adjustments in heart rate, stroke volume, peripheral resistance, and venous pressure so that cardiac output is sufficient to meet the needs of peripheral tissues.

**Peripheral Resistance**
Resistance is a force that opposes movement. The peripheral resistance is the resistance of the arterial system as a whole. Resistance increases as the arterial branches become smaller and thinner.

**Venous Pressure**
Venous pressure is the force exerted by blood within the venous system. As blood moves toward the heart, the veins become larger, resistance drops, and blood flow velocity increases. Muscular compression and the respiratory pump are two factors that assist in propelling blood toward the heart at low venous pressure.

**Venous Return**
Venous pressure, although low, determines venous return—the amount of blood arriving at the right atrium each minute. Venous return has a direct impact on cardiac output.

NEW!
MasteringA&P references within the chapter direct students to specific digital resources, such as tutorials, animations, and videos, that will help further their understanding of key concepts in the course.

NEW!
Integrated Figure Questions encourage students to answer thought-provoking questions as part of viewing the figure.
Clinical Modules throughout the book help students connect what they learn in class to the real-world. They may encounter similar examples in their future career.

Chapter Integration • Applying what you have learned

A helmet-to-helmet collision causes a "stinger"

Dominic is a defensiveman on his high school's varsity lacrosse team. He plays an aggressive style of defense and initiates extensive physical contact. As the final seconds of a recent game counted down, an opposing player was about to take a shot on goal that would have tied the game. Dominic ran full speed into the shooter. Their helmets collided dead-on, and Dominic's head snapped hard to the left. As his opponent fell backward onto the ground, Dominic felt an intense pain from the right side of his neck that radiated down his entire right upper limb to the tips of his fingers. The referee blew the whistle, indicating the end of the game. As the winning players and coaches congegrated, the team’s athletic trainer asked Dominic how he was feeling after delivering such a significant hit. Dominic replied that upon impact he felt a severe pain on the right side of his neck and entire right upper limb that was both numb and burning, but that it lasted only a few moments. The trainer informed him that he likely experienced a “stinger” and that although the pain was quite intense, he would not likely have a lasting injury.

From what you have just learned about spinal nerves, answer the following questions.

1. Why did Dominic’s pain radiate down only the right upper limb and not both upper limbs? Why was the pain also in his neck?
2. Which spinal nerves would you suspect to be involved?
3. Why do you think he experienced the numbness, burning pain, and why do you think the pain extended all the way to his fingertips?

Chapter Integration sections ask students to aggregate what they have learned so far in the context of real world situations. These scenarios are presented in a friendly, story format followed by critical thinking questions.
Continuous Learning
Before, During, and After Class

Dynamic Study Modules enable students to study more effectively on their own. With the Dynamic Study Modules mobile app, students can quickly access and learn the concepts they need to be more successful on quizzes and exams.

NEW! Instructors can now select which questions to assign to students.

NEW! SmartArt Videos help students navigate some of the complex figures in the text. They are accessible via QR code in the book and are assignable in MasteringA&P.
with MasteringA&P™

Learning Catalytics is a “bring your own device” (laptop, smartphone, or tablet) engagement, assessment, and classroom intelligence system. Students use their device to respond to open-ended questions and then discuss answers in groups based on their responses.

“My students are so busy and engaged answering Learning Catalytics questions during lecture that they don’t have time for Facebook.”

Declan De Paor, Old Dominion University
NEW! Interactive Physiology 2.0 helps students advance beyond memorization to a genuine understanding of complex physiological processes. Fun, interactive tutorials, games, and quizzes give students additional explanations to help them grasp difficult concepts. IP 2.0 features brand-new graphics, quicker navigation, and more robust interactivity.

NEW IP 2.0 modules include:
- Resting Membrane Potential
- Electrical Activity of the Heart
- Cardiac Output
- Factors Affecting Blood Pressure
- Generation of an Action Potential
- Cardiac Cycle

Coming soon:
- Glomerular Filtration
- Neuromuscular Junction
- Tubular Reabsorption and Secretion
- Excitation Contraction Coupling
More Practice, More Learning

Additional assignable MasteringA&P activities include:

- Tough Topic Coaching Activities
- Bone & Dissection Video Coaching Activities
- Clinical Case Studies
- And More!

NEW! Beginning Fall 2017, all of the assignments from Sarikas’s Visual A&P Lab Manual, 2e can be accessed in your Visual A&P Mastering course! Only one MasteringA&P code is needed to access these assignments.

A&P Flix Coaching Activities bring interactivity to these popular 3D movie-quality animations by asking students to answer questions related to the video.
PhysioEx 9.1 is an easy-to-use lab simulation program that allows students to conduct experiments that are difficult in a wet lab environment because of time, cost, or safety concerns. Students are able to repeat labs as often as they like, perform experiments without animals, and are asked to frequently stop and predict within the labs.

Practice Anatomy Lab (PAL™ 3.0) is a virtual anatomy study and practice tool that gives students 24/7 access to the most widely used lab specimens, including the human cadaver, anatomical models, histology, cat, and fetal pig. PAL 3.0 is easy to use and includes built-in audio pronunciations, rotatable bones, and simulated fill-in-the-blank lab practical exams.
Access the Complete Textbook
On or Offline with eText 2.0

NEW! The eText 2.0 mobile app offers offline access and can be downloaded for most iOS and Android phones and tablets from the iTunes or Google Play stores.

NEW! The Third Edition is available in Pearson's fully-accessible eText 2.0 platform.*

Powerful interactive and customization functions include instructor and student note-taking, highlighting, bookmarking, search, and links to glossary terms.

*The eText 2.0 edition will be live for Fall 2017 classes.
NEW! The Art of Teaching A&P: Six Easy Lessons to Improve Student Learning by Lori K. Garrett
978-0-134-46951-5 / 0-134-46951-8

Author Lori Garrett (Get Ready for A&P) explores some of the most common challenges she’s encountered in her classroom when using art to teach anatomy and physiology. From describing the challenge to researching why it occurs and proposing solutions to address it, Lori provides insight into how students look at images. She presents ideas for how educators can best use figures and illustrations to teach complex concepts without overwhelming or discouraging their students.

NEW! The Learning Outcomes Correlation Guide

This guide ties each A&P topic and learning outcome established by HAPS (Human Anatomy & Physiology Society) to its corresponding module in the third edition of Martini’s *Visual Anatomy & Physiology*.

A complete package of instructor resources includes:
- Customizable PowerPoint slides (with NEW! Annotions on how to present complex art during lecture)
- All figures from the book in JPEG format
- A&P Flix 3D movie-quality animations on tough topics
- Test Bank
- And more!

978-0-134-48649-9 / 0-134-48649-8

This booklet contains all of the Section Review pages from the book for students who would prefer to mark their answers on separate pages rather than in the book itself.
**Martini’s Atlas of the Human Body by Frederic H. Martini**
The Atlas offers an abundant collection of anatomy photographs, radiology scans, and embryology summaries, helping students visualize structures and become familiar with the types of images seen in a clinical setting. Free when packaged with the textbook.

**A&P Applications Manual by Frederic H. Martini and Kathleen Welch**
978-0-321-94973-8 / 0-321-94973-0
This manual contains extensive discussions on clinical topics and disorders to help students apply the concepts of anatomy and physiology to daily life and their future health professions. Free when packaged with the textbook.

**Get Ready for A&P by Lori K. Garrett**
978-032181336-7 / 0-321-81336-7
This book and online component were created to help students be better prepared for their A&P course. Features include pre-tests, guided explanations followed by interactive quizzes and exercises, and end-of-chapter cumulative tests. Also available in the Study Area of MasteringA&P. Free when packaged with the textbook.

**Study Card for Martini: Body Systems Overview**
0-321-92930-6 / 978-0-321-92930-3
A six-panel laminated card showing all body systems and their organs and functions. Free when packaged with the textbook.