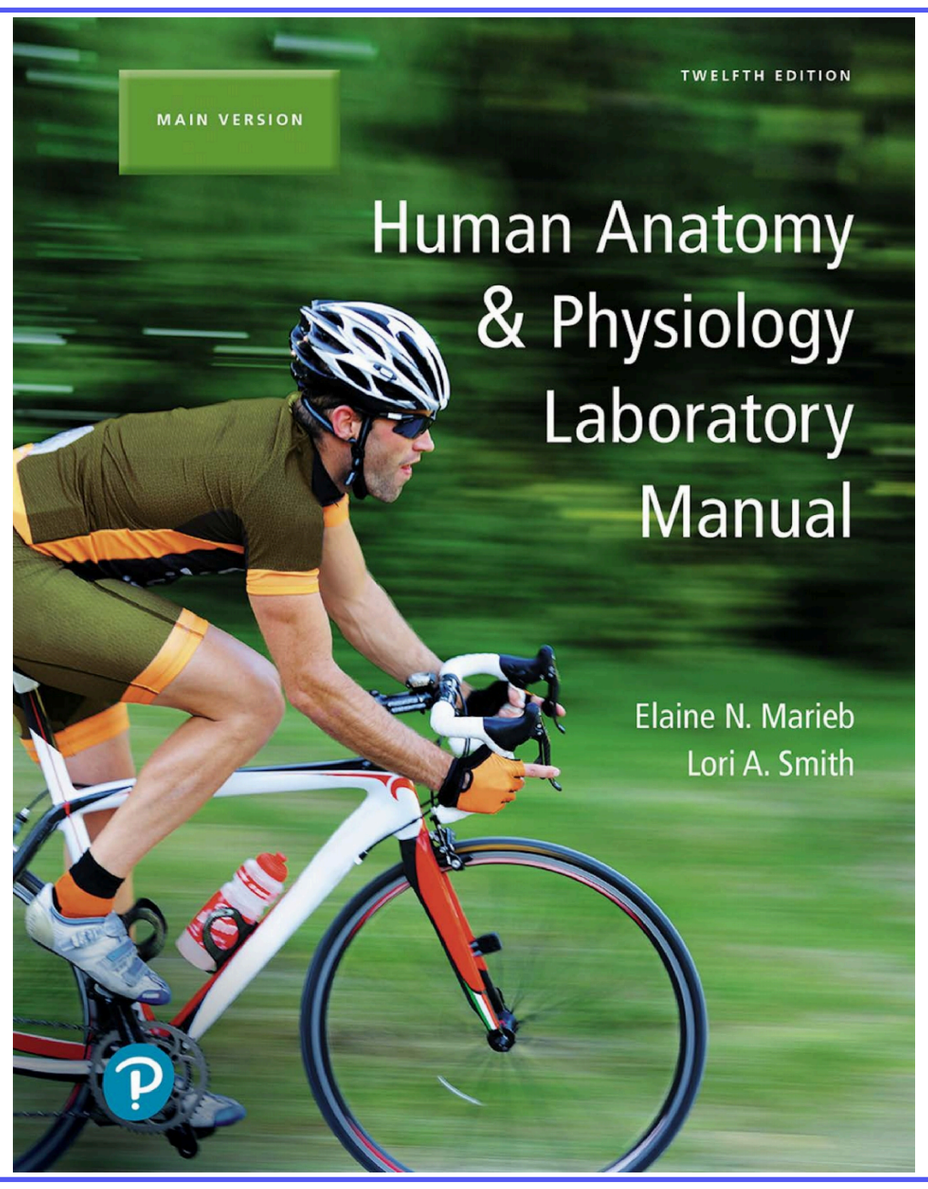
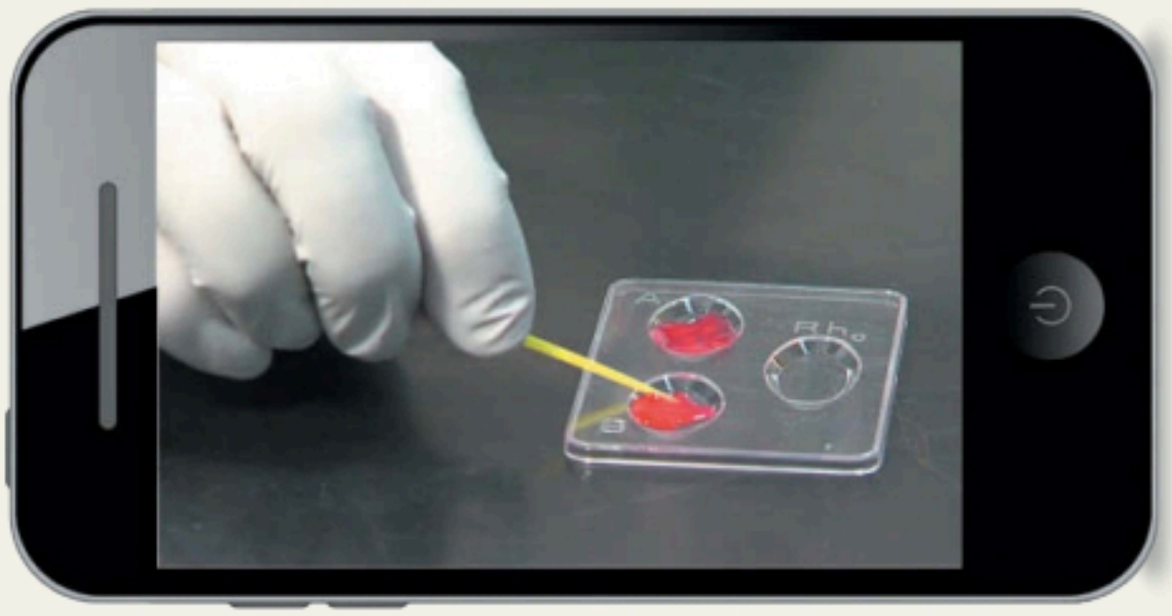


ebookbig.com

or scan the QR code to access the digital study portal.

Get 24/7 videos, coaching, and practice with Mastering A&P.

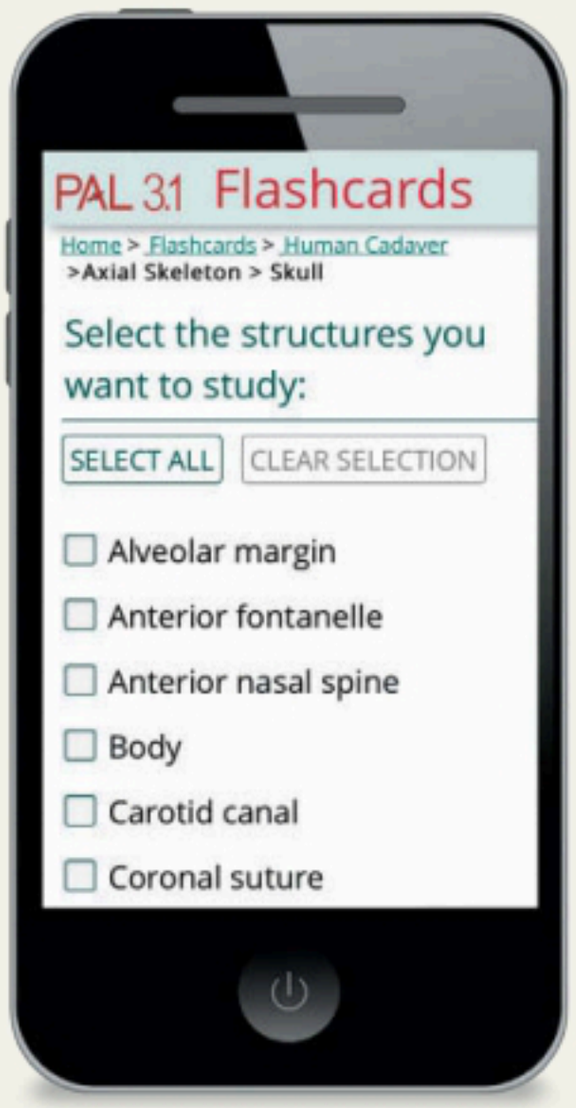
EXPANDED! 8 new Pre-Lab Video Coaching Activities in Mastering A&P (for a total of 18) focus on key concepts in the lab activity and walk you through important procedures. New pre-lab video topics include Preparing and Observing a Wet Mount, Examining a Long Bone, Initiating Pupillary Reflexes, Palpating Superficial Pulse Points, Auscultating Heart Sounds, and more.



NEW! Cat and Fetal Pig Dissection Video Coaching Activities help you prepare for dissection by previewing key anatomical structures. Each video includes one to two comparisons to human structures.



NEW! Customizable Practice Anatomy Lab (PAL) Flashcards allow you to create a personalized, mobile-friendly deck of flashcards and quizzes using images from PAL 3.1. You can generate flashcards using only the structures that your instructor has emphasized in lecture or lab.





IMPROVED! The Pearson eText mobile app allows you to access the complete lab manual online or offline, along with all of the videos described above.

Additional Support for Students & Instructors

Mastering A&P offers thousands of tutorials, activities, and questions that can be assigned for homework and practice. Highlights of popular assignment options include the following:

PhysioEx™ 9.1 is an easy-to-use lab simulation program that consists of 12 exercises containing 63 physiology lab activities that can be used to supplement or substitute for wet labs.

IMPROVED! Practice Anatomy Lab 3.1 is now accessible on all mobile devices to give students 24/7 access to the most widely used lab specimens, including human cadaver, anatomical models, histology slides, cat, and fetal pig.

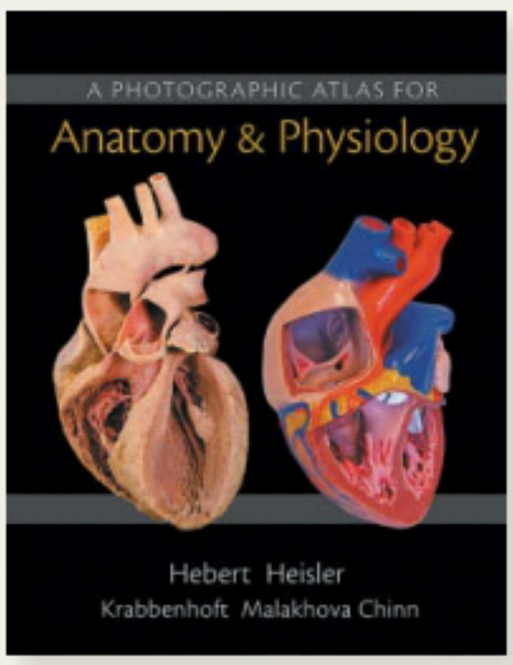
Dynamic Study Modules are manageable, mobile-friendly sets of questions with extensive feedback for students to test, learn, and retest until they master basic concepts.

- **NEW!** Instructors can select or deselect specific questions to customize assignments.
- **EXPANDED!** The Lab Manual Mastering A&P course now offers over 3,000 Dynamic Study Module questions, shared with the Marieb/Hoehn texbook ***Human Anatomy & Physiology*** **11th Edition**.

The Mastering A&P Instructor Resources Area includes the following downloadable tools:

- **Customizable PowerPoint® lecture outlines** include customizable images and provide a springboard for lab prep.
- **All of the figures, photos, and tables from the manual** are available in JPEG and PowerPoint® formats, in labeled and unlabeled versions, and with customizable labels and leader lines.
- **Test bank** provides thousands of customizable questions across Bloom's taxonomy levels and includes all lab practical and quiz questions from Practice Anatomy Lab 3.1. Each question is tagged to chapter learning outcomes that can also be tracked within Mastering A&P assessments. Available in Microsoft® Word and TestGen® formats.
- **Animations and videos** bring A&P concepts to life and include pre-lab videos, bone videos, and dissection videos.
- **A comprehensive Instructor's Guide**, co-authored by Elaine Marieb and Lori Smith, includes prep instructions for each exercise, along with answer keys for all of the Exercise Review Sheets.

A Photographic Atlas for Anatomy & Physiology
By Nora Hebert, Ruth E. Heisler, et al.
ISBN 9780321869258



Instructor Resource DVD with PowerPoint Lecture Outlines
ISBN 9780134777092

Instructor's Guide for Human Anatomy & Physiology Lab Manual 13/e
ISBN 9780134778839

MAIN VERSION

TWELFTH EDITION

Human Anatomy & Physiology Laboratory Manual

Elaine N. Marieb, R.N., Ph.D.
Holyoke Community College

Lori A. Smith, Ph.D.
American River College

PhysioEx™ Version 9.1
authored by

Peter Z. Zao
North Idaho College

Timothy Stabler, Ph.D.
Indiana University Northwest

Lori A. Smith, Ph.D.
American River College

Andrew Lokuta, Ph.D.
University of Wisconsin–Madison

Edwin Griff, Ph.D.
University of Cincinnati

Editor-in-Chief: Serina Beauparlant
Senior Courseware Portfolio Manager: Lauren Harp
Managing Producer: Nancy Tabor
Content & Design Manager: Michele Mangelli, Mangelli Productions, LLC
Courseware Editorial Assistant: Dapinder Dosanjh
Rich Media Content Producer: Kimberly Twardochleb
Mastering Content Developer: Cheryl Chi
Production Supervisor: Janet Vail
Copyeditor: Sally Peyrefitte
Proofreader: Betsy Dietrich

Compositor: iEnergizer Aptara®, Ltd.
Art Coordinator: David Novak
Interior & Cover Designer: Hespenheide Design
Illustrator: Imagineering STA Media Services, Inc.
Rights & Permissions Management: Ben Ferrini
Rights & Permissions Project Manager: Cenveo © Publishing Services, Matt Perry
Photo Researcher: Kristin Piljay
Manufacturing Buyer: Stacey Weinberger
Director of Product Marketing: Allison Rona
Senior Anatomy & Physiology Specialist: Derek Perrigo

Cover Photo Credit: technotr/Getty Images

Acknowledgments of third-party content appear on page C-1, which constitutes an extension of this copyright page.

Copyright © 2019, 2016, 2014 Pearson Education, Inc. All Rights Reserved. Printed in the United States of America. This publication is protected by copyright, and permission should be obtained from the publisher prior to any prohibited reproduction, storage in a retrieval system, or transmission in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise. For information regarding permissions, request forms and the appropriate contacts within the Pearson Education Global Rights & Permissions department, please visit www.pearsoned.com/permissions/.

PEARSON, ALWAYS LEARNING, Mastering™ A&P, and PhysioEx™ are exclusive trademarks in the U.S. and/or other countries owned by Pearson Education, Inc. or its affiliates.

Unless otherwise indicated herein, any third-party trademarks that may appear in this work are the property of their respective owners and any references to third-party trademarks, logos or other trade dress are for demonstrative or descriptive purposes only. Such references are not intended to imply any sponsorship, endorsement, authorization, or promotion of Pearson's products by the owners of such marks, or any relationship between the owner and Pearson Education, Inc. or its affiliates, authors, licensees or distributors.

Albustix®, Clinistix®, Clinitest®, Hemastix®, Ictotest®, Ketostix®, and Multistix® are registered trademarks of Bayer.
Chemstrip® is a registered trademark of Roche Diagnostics.
Parafilm® is a registered trademark of Pechiney Incorporated.
Porelon® is a registered trademark of IDG, LLC.
Sedi-stain™ is a registered trademark of Becton, Dickinson and Company.
VELCRO® is a registered trademark of VELCRO Industries B.V.

Microsoft and/or its respective suppliers make no representations about the suitability of the information contained in the documents and related graphics published as part of the services for any purpose. All such documents and related graphics are provided "as is" without warranty of any kind. Microsoft and/or its respective suppliers hereby disclaim all warranties and conditions with regard to this information, including all warranties and conditions of merchantability, whether express, implied or statutory, fitness for a particular purpose, title and non-infringement. In no event shall Microsoft and/or its respective suppliers be liable for any special, indirect or consequential damages or any damages whatsoever resulting from loss of use, data or profits, whether in an action of contract, negligence or other tortious action, arising out of or in connection with the use or performance of information available from the services. The documents and related graphics contained herein could include technical inaccuracies or typographical errors. Changes are periodically added to the information herein. Microsoft and/or its respective suppliers may make improvements and/or changes in the product(s) and/or the program(s) described herein at any time. Partial screen shots may be viewed in full within the software version specified.

Microsoft® Windows®, and Microsoft Office® are registered trademarks of the Microsoft corporation in the U.S.A. and other countries. This book is not sponsored or endorsed by or affiliated with the Microsoft corporation.

1 17

Pearson www.pearson.com

ISBN 10: 0-13-480635-2 (Student edition)
ISBN 13: 978-0-13-480635-8 (Student edition)
ISBN 10: 0-13-481459-2 (Instructor's Review Copy)
ISBN 13: 978-0-13-481459-9 (Instructor's Review Copy)

About the Authors



Elaine N. Marieb

After receiving her Ph.D. in zoology from the University of Massachusetts at Amherst, Elaine N. Marieb joined the faculty of the Biological Science Division of Holyoke Community College. While teaching at Holyoke Community College, where many of her students were pursuing nursing degrees, she developed a desire to better understand the relationship between the scientific study of the human body and the clinical aspects of the nursing practice. To that end, while continuing to teach full time, Dr. Marieb pursued her nursing education, which culminated in a Master of Science degree with a clinical specialization in gerontology from the University of Massachusetts. It is this experience that has informed the development of the unique perspective and accessibility for which her publications are known.

Dr. Marieb has given generously to provide opportunities for students to further their education. She funds the E. N. Marieb Science Research Awards at Mount Holyoke College, which promotes research by undergraduate science majors, and has underwritten renovation of the biology labs in Clapp Laboratory at that college. Dr. Marieb also contributes to the University of Massachusetts at Amherst, where she provided funding for reconstruction and instrumentation of a cutting-edge cytology research laboratory. Recognizing the severe national shortage of nursing faculty, she underwrites the Nursing Scholars of the Future Grant Program at the university.

In 2012 and 2017, Dr. Marieb gave generous philanthropic support to Florida Gulf Coast University as a long-term investment in education, research, and training for healthcare and human services professionals in the local community. In honor of her contributions, the university is now home to the Elaine Nicpon Marieb College of Health and Human Services.



Lori A. Smith

Lori A. Smith received her Ph.D. in biochemistry from the University of California at Davis. Before discovering her passion for teaching, she worked as a research scientist and project leader in the medical diagnostics industry. In 1999, she joined the faculty at American River College in the Biology Department, where she teaches anatomy and physiology and microbiology to students preparing for nursing or other allied health careers. Since 2005, she has coauthored Pearson's PhysioEx™: Laboratory Simulations in Physiology and has continued to coauthor several Pearson lab manuals. Dr. Smith has been named Instructor of the Year by the American River College Associated Student Body, and she is a member of the Human Anatomy and Physiology Society (HAPS) and California Academy of Sciences. When not teaching or writing, she enjoys spending time with her family: hiking, cycling, and kayaking.

Preface to the Instructor

The philosophy behind the revision of this manual mirrors that of all earlier editions. It reflects a still developing sensibility for the way teachers teach and students learn, informed by years of teaching the subject and by collecting suggestions from other instructors as well as from students enrolled in multifaceted healthcare programs. *Human Anatomy & Physiology Laboratory Manual* was originally developed to facilitate and enrich the laboratory experience for both teachers and students. This edition retains those same goals.

This manual, intended for students in introductory human anatomy and physiology courses, presents a wide range of laboratory experiences for students concentrating in nursing, physical therapy, pharmacology, respiratory therapy, and exercise science, as well as biology and premedical programs. The manual's coverage is intentionally broad, allowing it to serve both one- and two-semester courses, and it is available in versions that contain detailed guidelines for dissecting a cat or fetal pig laboratory specimen.

Basic Approach and Features

The generous variety of experiments in this manual provides flexibility that enables instructors to gear their laboratory approach to specific academic programs or to their own teaching preferences. The manual remains independent of any textbook, so it contains the background discussions and terminology necessary to perform all experiments. Such a self-contained learning aid eliminates the need for students to bring a textbook into the laboratory.

Each of the 46 exercises leads students toward a coherent understanding of the structure and function of the human body. The manual begins with anatomical terminology and an orientation to the body, which together provide the necessary tools for studying the various body systems. The exercises that follow reflect the dual focus of the manual—both anatomical and physiological aspects receive considerable attention. As the various organ systems of the body are introduced, the initial exercises focus on organization, from the cellular to the organ system level. As indicated by the table of contents, the anatomical exercises are usually followed by physiological experiments that familiarize students with various aspects of body functioning and promote the critical understanding that function follows structure. The numerous physiological experiments for each organ system range from simple experiments that can be performed without specialized tools to more complex experiments using laboratory equipment, computers, and instrumentation techniques.

Features

The dissection scissors icon appears at the beginning of activities that entail the dissection of isolated animal organs. In addition to the figures, isolated animal organs, such as the sheep heart and pig kidney, are employed to study anatomy because of their exceptional similarity to human organs.

Homeostasis is continually emphasized as a requirement for optimal health. Pathological conditions are viewed as a loss of homeostasis; these discussions can be recognized by the homeostatic imbalance logo within the descriptive material of each exercise. This holistic approach encourages an integrated understanding of the human body. The homeostatic imbalance icon directs the student's attention to conditions representing a loss of homeostasis.

A safety icon notifies students that specific safety precautions must be observed when using certain equipment or conducting particular lab procedures. For example, when working with ether, students are to use a hood; and when handling body fluids such as blood, urine, or saliva, students are to wear gloves. All exercises involving body fluids (blood, urine, saliva) incorporate current Centers for Disease Control and Prevention (CDC) guidelines for handling human body fluids. Because it is important that nursing students in particular learn how to safely handle bloodstained articles, the manual has retained the option to use human blood in the laboratory. However, the decision to allow testing of human (student) blood or to use animal blood in the laboratory is left to the discretion of the instructor in accordance with institutional guidelines. The CDC guidelines for handling body fluids are reinforced by the laboratory safety procedures described on the inside front cover of this text, in Exercise 29: Blood, and in the *Instructor's Guide*. You can photocopy the inside front cover and post it in the lab to help students become well versed in laboratory safety.

Group Challenge activities are designed to enhance collaborative group learning and to challenge students to think critically, identify relationships between anatomical structures and physiological functions, and achieve a deeper understanding of anatomy and physiology concepts.

The BIOPAC® icon in a relevant exercise materials list signals the use of the BIOPAC® Student Lab System and alerts you to the equipment needed. BIOPAC® is used in Exercises 14, 18, 20, 21, 31, 33, 34, and 37. The instructions in the lab manual are for use with the BIOPAC® MP36/35 and MP45 data acquisition unit. Note that some exercises are not compatible with the MP45 data acquisition unit. For those exercises, the MP45 will not be listed in the Materials section. In this edition, the lab manual instructions are for use with BSL software 4.0.1 and above for Windows 10/8.x/7 or Mac OS X10.9–10.12. Refer to the Materials section in each exercise for the applicable software version. The Instructor Resources area of Mastering A&P provides the following additional support for alternative data acquisitions systems, including exercises that can be distributed to students:

- *BIOPAC® Instructions for the MP36 (or MP35/30) data acquisition unit* using BSL software versions earlier than 4.0.1 (for Windows and Mac) for Exercises 14, 18, 20, 21, 31, and 34
- *Powerlab®* Instructions for Exercises 14, 21, 31, 33, 34, and 37
- *iWorx®* Instructions for Exercises 14, 18, 21, 31, 33, 34, and 37
- *Intelitool®* Instructions for Exercises 14i, 21i, 31i, and 37i

- **Exercise Review Sheets** follow each laboratory exercise and provide space for recording and interpreting experimental results and require students to label diagrams and answer matching and short-answer questions. Selected questions can be assigned and automatically graded in Mastering A&P.
- **PhysioEx™ 9.1 Exercises**, located in the back of the lab manual and accessible through a subscription to Mastering A&P, are easy-to-use computer simulations that supplement or take the place of traditional wet labs safely and cost-effectively. These 12 exercises contain a total of 63 physiology laboratory activities that allow learners to change variables and test out various hypotheses for the experiments. PhysioEx™ allows students to repeat labs as often as they like, perform experiments without harming live animals, and conduct experiments that are difficult to perform because of time, cost, or safety concerns.

Updated Content in This Edition of the Lab Manual

Throughout the manual, the narrative text has been streamlined and updated to make the language more understandable and to better meet the needs of today's students. Additional highlights include the following:

- **Dozens of new full-color figures and photos** replace black-and-white line drawings in the Exercise Review Sheets. Selected labeling questions in the manual can be assigned in Mastering A&P.
- **New Clinical Application questions** have been added to the Exercise Review Sheets and challenge students to apply lab concepts and critical-thinking skills to real-world clinical scenarios.
- **Updated BIOPAC® procedures** are included in the manual for eight lab exercises for the BIOPAC® 4.0 software upgrade. Procedures for Intelitool®, PowerLab®, and iWorx® remain available in the Instructor Resources area of Mastering A&P.
- **New Mastering A&P visual previews** appear on the first page of each lab exercise, highlighting a recommended pre-lab video, a related image from Practice Anatomy Lab 3.1 (PAL 3.1), or a helpful animation.
- **New Mastering A&P assignment recommendations** are signaled at appropriate points throughout the manual to help instructors assign related auto-graded activities and assessments.
- **Extensive updates and improvements** have been made to each of the 46 laboratory exercises in the manual to increase clarity and reduce ambiguity for students. Art within the exercises, the narrative, as well as the questions and figures within the Review Sheets have been updated. For a complete list of content updates, please refer to the *Instructor's Guide for Human Anatomy & Physiology Laboratory Manual* 13/e (ISBN 9780134778839 or in the Instructor Resources area of Mastering A&P).

Highlights of Updated Content in Mastering A&P

Mastering A&P, the leading online homework, tutorial, and assessment system is designed to engage students and improve results by helping them stay on track in the course and quickly master challenging anatomy and physiology concepts. Mastering A&P assignments support interactive features in the lab manual, including pre-lab video coaching activities; bone, muscle, and dissection videos; Dynamic Study Modules; *Get Ready for A&P*; plus a variety of Art Labeling questions, Clinical Application questions, and more. Highlights for this edition include the following:

- **8 new Pre-Lab Video Coaching Activities in Mastering A&P** (for a total of 18) focus on key concepts in the lab activity and walk students through important procedures. New pre-lab video titles include Preparing and Observing a Wet Mount, Examining a Long Bone, Initiating Pupillary Reflexes, Palpating Superficial Pulse Points, Auscultating Heart Sounds, and more.
- **New Cat and Fetal Pig Dissection Video Coaching Activities** help students prepare for dissection by previewing key anatomical structures. Each video includes one to two comparisons to human structures.
- **IMPROVED! Practice Anatomy Lab™ (PAL™ 3.1) is now fully accessible on all mobile devices**, including smartphones, tablets, and laptops. PAL is an indispensable virtual anatomy study and practice tool that gives students 24/7 access to the most widely used lab specimens, including human cadaver; anatomical models from leading manufacturers such as 3B Scientific, SOMSO, Denoyer-Geppert, Frey Scientific/Nystrom, Altay Scientific, and Ward's; histology; cat; and fetal pig. PAL 3.1 is easy to use and includes built-in audio pronunciations, rotatable bones, and simulated fill-in-the-blank lab practical exams.
- **New Customizable Practice Anatomy Lab (PAL) Flashcards** enable students to create a personalized, mobile-friendly deck of flashcards and quizzes using images from PAL 3.1. Students can generate flashcards using only the structures that their instructor emphasizes in lecture or lab.
- **New Building Vocabulary Coaching Activities** are a fun way for students to learn word roots and A&P terminology while building and practicing important language skills.
- **Expanded Dynamic Study Modules** help students study effectively on their own by continuously assessing their activity and performance in real time. Students complete a set of questions and indicate their level of confidence in their answer. Questions repeat until the student can answer them all correctly and confidently. These are available as graded assignments prior to class and are accessible on smartphones, tablets, and computers.
  - The Lab Manual Mastering A&P course now offers over 3000 Dynamic Study Module questions, shared with Marieb/Hoehn *Human Anatomy & Physiology*, 11th Edition.
  - Instructors can now remove questions from Dynamic Study Modules to better fit their course.
- **Expanded Drag-and-Drop Art Labeling Questions** allow students to assess their knowledge of terms and structures in the lab manual. Selected Exercise Review Sheet labeling activities in the manual are now assignable.

Please refer to the preceding pages for additional information about Mastering A&P and other resources for instructors and students.

Acknowledgments

Continued thanks to our colleagues and friends at Pearson who collaborated with us on this edition, especially Editor-in-Chief Serina Beauparlant, Acquisitions Editor Lauren Harp, Editorial Assistant Dapinder Dosanjh, and Rich Content Media Producers Kimberly Twardochleb and Lauren Chen. We also thank the Pearson Sales and Marketing team for their work in supporting instructors and students, especially Senior A&P Specialist Derek Perrigo and Director of Product Marketing Allison Rona.

Special thanks go out to Amanda Kaufmann for her leadership and expertise in producing the 18 pre-lab videos that support this edition, and to Mike Mullins of BIOPAC®, who helped us update the instructions for consistency with the upgraded software.

We're also grateful to Michele Mangelli and her superb production team, who continue to cross every hurdle with uncommon grace and skill, including Janet Vail, production coordinator; David Novak, art and photo coordinator; Kristin Piljay, photo researcher; Gary Hespenheide, interior and cover designer; and Sally Peyrefitte, copyeditor.

Last but not least, we wish to extend our sincere thanks to the many A&P students who have circulated through our lab classrooms and have used this lab manual over the years—you continue to inspire us every day! As always, we welcome your feedback and suggestions for future editions.

Elaine N. Marieb & Lori A. Smith

TWELFTH EDITION REVIEWERS

We wish to thank the following reviewers, who provided thoughtful feedback and helped us make informed decisions for this edition of both the lab manual and Mastering A&P resources:

Matthew Abbott, *Des Moines Area Community College*
Lynne Anderson, *Meridian Community College*
Penny Antley, *University of Louisiana, Lafayette*
Marianne Baricevic, *Raritan Valley Community College*
Christopher W. Brooks, *Central Piedmont Community College*
Jocelyn Cash, *Central Piedmont Community College*
Christopher D'Arcy, *Cayuga Community College*
Mary E. Dawson, *Kingsborough Community College*
Karen Eastman, *Chattanooga State Community College*
Jamal Fakhoury, *College of Central Florida*
Lisa Flick, *Monroe Community College*
Michele Finn, *Monroe Community College*
Juanita Forrester, *Chattahoochee Technical College*
Larry Frolich, *Miami Dade College*
Michelle Gaston, *Northern Virginia Community College, Alexandria*
Tejendra Gill, *University of Houston*
Abigail M. Goosie, *Walters State Community College*
Karen Gordon, *Rowan Cabarrus Community College*
Jennifer Hatchel, *College of Coastal Georgia*
Clare Hays, *Metropolitan State University*
Nathanael Heyman, *California Baptist University*
Samuel Hirt, *Auburn University*
Alexander Ibe, *Weatherford College*
Shahdi Jalilvand, *Tarrant County College–Southeast*
Marian Leal, *Sacred Heart University*
Geoffrey Lee, *Milwaukee Area Technical College*
Tara Leszczewiz, *College of Dupage*
Mary Katherine Lockwood, *University of New Hampshire*
Francisco J. Martinez, *Hunter College of CUNY*
Bruce Maring, *Daytona State College*
Geri Mayer, *Florida Atlantic University*
Tiffany B. McFalls-Smith, *Elizabethtown Community & Technical College*
Melinda A. Miller, *Pearl River Community College*
Todd Miller, *Hunter College of CUNY*
Susan Mitchell, *Onondaga Community College*
Erin Morrey, *Georgia Perimeter College*
Jill O'Malley, *Erie Community College*
Suzanne Oppenheimer, *College of Western Idaho*
Lori Paul, *University of Missouri - St. Louis*
Stacy Pugh-Towe, *Crowder College*
Suzanne Pundt, *The University of Texas at Tyler*
Jackie Reynolds, *Richland College*
Anthony Rizzo, *Polk State College*
Jo Rogers, *University of Cincinnati*
James Royston, *Pearl River Community College*
Connie E. Rye, *East Mississippi Community College*
Mark Schmidt, *Clark State Community College*
Jennifer Showalter, *Waubonsee Community College*
Teresa Stegall-Faulk, *Middle Tennessee State University*
Melissa Ann Storm, *University of South Carolina–Upstate*
Bonnie J. Tarricone, *Ivy Tech Community College*
Raymond Thompson, *University of South Carolina*
Anna Tiffany Tindall-McKee, *East Mississippi Community College*
Allen Tratt, *Cayuga Community College*
Khursheed Wankadiya, *Central Piedmont Community College*
Diane L. Wood, *Southeast Missouri State University*

Contents

A Pre-Lab video is available in Mastering A&P™ for selected activities.

THE HUMAN BODY: AN ORIENTATION

1 The Language of Anatomy 1

1 Locating Body Regions 3
2 Practicing Using Correct Anatomical Terminology 4
3 Observing Sectioned Specimens 6
4 Identifying Organs in the Abdominopelvic Cavity 9
5 Locating Abdominopelvic Surface Regions 10
Review Sheet 11

2 Organ Systems Overview 15

1 Observing External Structures 17
2 Examining the Oral Cavity 17
3 Opening the Ventral Body Cavity 17
4 Examining the Ventral Body Cavity 18
5 Examining the Human Torso Model 22
Review Sheet 23

THE MICROSCOPE AND ITS USES

3 The Microscope 25

1 Identifying the Parts of a Microscope 26
2 Viewing Objects Through the Microscope 27
3 Estimating the Diameter of the Microscope Field 30
4 Perceiving Depth 31
5 Preparing and Observing a Wet Mount 31
Review Sheet 33

THE CELL

4 The Cell: Anatomy and Division 37

1 Identifying Parts of a Cell 38
2 Identifying Components of a Plasma Membrane 39
3 Locating Organelles 40
4 Examining the Cell Model 40
5 Observing Various Cell Structures 41
6 Identifying the Mitotic Stages 43
7 "Chenille Stick" Mitosis 43
Review Sheet 47

5 The Cell: Transport Mechanisms and Cell Permeability 51

1 Observing Diffusion of Dye Through Agar Gel 53
2 Observing Diffusion of Dye Through Water 54
3 Investigating Diffusion and Osmosis Through Nonliving Membranes 54
4 Observing Osmometer Results 56
5 Investigating Diffusion and Osmosis Through Living Membranes 56
6 Observing the Process of Filtration 59
7 Observing Phagocytosis 60
Review Sheet 61

HISTOLOGY: BASIC TISSUES OF THE BODY

6 Classification of Tissues 65

1 Examining Epithelial Tissue Under the Microscope 67
2 Examining Connective Tissue Under the Microscope 73
3 Examining Nervous Tissue Under the Microscope 79
4 Examining Muscle Tissue Under the Microscope 80
Review Sheet 83

THE INTEGUMENTARY SYSTEM

7 The Integumentary System 89

1 Locating Structures on a Skin Model 90
2 Identifying Nail Structures 93
3 Comparing Hairy and Relatively Hair-Free Skin Microscopically 94
4 Differentiating Sebaceous and Sweat Glands Microscopically 96
5 Plotting the Distribution of Sweat Glands 96
6 Taking and Identifying Inked Fingerprints 97
Review Sheet 99