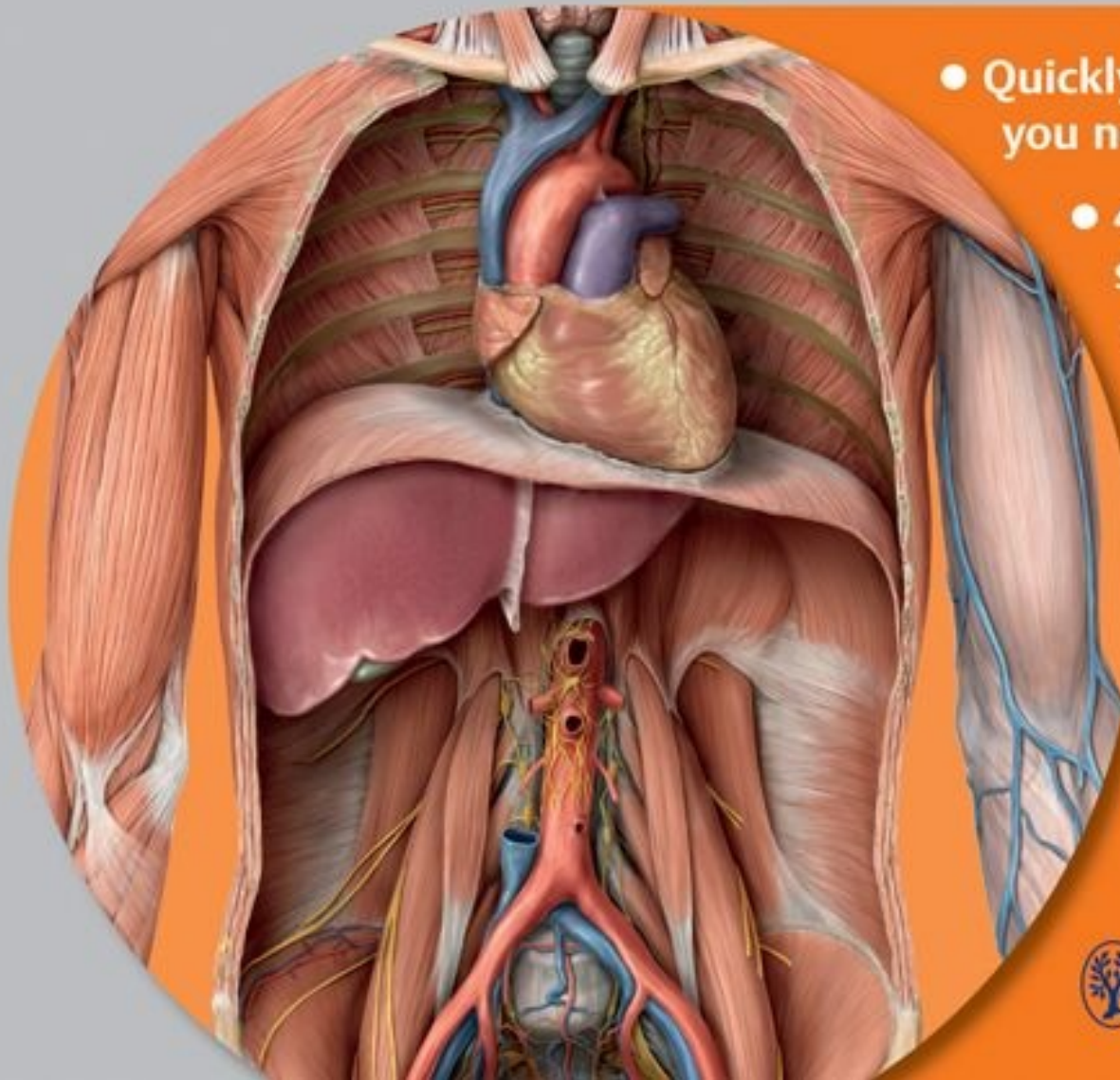


Anatomy

An Essential Textbook

Anne M. Gilroy

Illustrations by
Markus Voll
Karl Wesker



- Quickly learn what you need to know
- 400 USMLE-style review questions
- Simulate the exam with online Q&A

 Thieme

Anatomy

An Essential Textbook

Anne M. Gilroy, MA

Associate Professor
Departments of Cell Biology and of Surgery
University of Massachusetts Medical School
Worcester, Massachusetts

Illustrations by

Marcus Voll
Karl Wesker

Thieme
New York · Stuttgart

Thieme Medical Publishers, Inc.

333 Seventh Ave.
New York, NY 10001

Vice President and Editorial Director,
Educational Products: Anne T. Vinnicombe
Development editor: Marjorie Singer Anderson
Production Editor: Megan C. Conway
Editorial Assistant: Renee Kestenbaum
Senior Vice President, Editorial and
E-Product Development: Cornelia Schulze
Chief Financial Officer: Sarah Vanderbilt
President: Brian D. Scanlan
Compositor: Manila Typesetting Company
Printer: Everbest Printing Co. Ltd.

Illustrations: Markus Voll and Karl Wesker Library of Congress Cataloging-in-Publication Data Gilroy, Anne M.

Anatomy : an essential textbook / Anne M Gilroy.

p. ; cm.

Includes index.

ISBN 978-1-60406-207-6 (pbk.) — ISBN 978-1-60406-208-3 (e-ISBN) I. Title.

[DNLM: 1. Anatomy—Atlases. 2. Anatomy—Examination Questions. QS 18.2]

612.0076--dc23

2012049133

Copyright © 2013 by Thieme Medical Publishers, Inc. This book, including all parts thereof, is legally protected by copyright. Any use, exploitation, or commercialization outside the narrow limits set by copyright legislation without the publisher's consent is illegal and liable to prosecution. This applies in particular to photostat reproduction, copying, mimeographing or duplication of any kind, translating, preparation of microfilms, and electronic data processing and storage.

Important note: Medical knowledge is ever-changing. As new research and clinical experience broaden our knowledge, changes in treatment and drug therapy may be required. The authors and editors of the material herein have consulted sources believed to be reliable in their efforts to provide information that is complete and in accord with the standards accepted at the time of publication. However, in view of the possibility of human error by the authors, editors, or publisher of the work herein or changes in medical knowledge, neither the authors, editors, nor publisher, nor any other party who has been involved in the preparation of this work, warrants that the information contained herein is in every respect accurate or complete, and they are not responsible for any errors or omissions or for the results obtained from use of such information. Readers are encouraged to confirm the information contained herein with other sources. For example, readers are advised to check the product information sheet included in the package of each drug they plan to administer to be certain that the information contained in this publication is accurate and that changes have not been made in the recommended dose or in the contraindications for administration. This recommendation is of particular importance in connection with new or infrequently used drugs.

Some of the product names, patents, and registered designs referred to in this book are in fact registered trademarks or proprietary names even though specific reference to this fact is not always made in the text. Therefore, the appearance of a name without designation as proprietary is not to be construed as a representation by the publisher that it is in the public domain.

Printed in China 5 4 3 2 1

ISBN 978-1-60406-207-6

*To my mother, Mary Gilroy, a woman of courage and love;
To Colin and Bryan, my strength and sanity;
And once more, to my Dad.*

Contents

Preface

I Introduction

1 Introduction to Anatomic Systems and Terminology

Questions and Answers: Introduction

II Back

2 Back

Questions and Answers: Back

III Thorax

3 Overview of the Thorax

4 Thoracic Wall

5 Mediastinum

6 Pulmonary Cavities

Questions and Answers: Thorax

IV Abdomen

7 The Abdominal Wall and Inguinal Region

8 The Peritoneal Cavity and Neurovasculature of the Abdomen

9 Abdominal Viscera

Questions and Answers: Abdomen

V Pelvis and Perineum

10 Overview of the Pelvis and Perineum

11 Pelvic Viscera

12 The Perineum

Questions and Answers: Pelvis and Perineum

VI Upper Limb

13 Overview of the Upper Limb

14 Functional Anatomy of the Upper Limb

Questions and Answers: Upper Limb

VII Lower Limb

15 Overview of the Lower Limb

16 Functional Anatomy of the Lower Limb

Questions and Answers: Lower Limb

VIII Head and Neck

17 Overview of the Head and Neck

18 Meninges, Brain, and Cranial Nerves

19 Anterior and Lateral Regions of the Head

20 The Eye and Ear

21 The Neck

Questions and Answers: Head and Neck

Index

Acknowledgements

Special thanks to authors Michael Schuenke, Erik Schulte, and Udo Schumacher of the award-winning three-volume *Thieme Atlas of Anatomy* and illustrators Marcus Voll and Karl Wesker for their work over the course of many years

For their careful and thoughtful review of the manuscript, thanks to

Brian R. MacPherson, PhD
Department of Anatomy and Neurobiology
University of Kentucky School of Medicine
Lexington, KY

Carmen E. Rexach, PhD
Department of Biological Sciences
Mount San Antonio College
Walnut, CA

Lawrence M. Ross, MD, PhD
Department of Neurobiology and Anatomy
University of Texas Medical School
Houston, TX

For their contributions to the problems sets, thanks to

Frank J. Daly, PhD
Department of Biomedical Sciences
University of New England
School of Osteopathic Medicine
Biddeford, ME

Geoffrey Guttman, PhD
Department of Cell Biology and Anatomy
University of North Texas Health Science Center
Texas College of Osteopathic Medicine
Fort Worth, TX

Krista S. Johansen, MD
Department of Cell Biology
University of Massachusetts Medical School

Worcester, MA

Michelle Lazarus, PhD
Department of Neural and Behavioral Sciences
Pennsylvania State College of Medicine
Hershey, PA

Preface

Medical education continues to undergo innovative reform that challenges students, educators, and publishers. As curricula in the first two years of medical school have become increasingly multidisciplinary, the market for review-style textbooks has blossomed. Students are often presented with concepts in anatomy, physiology, histology, embryology, radiology, and even basic pathology and immunology in a single course. Despite the excitement that integrated courses generate, an unfortunate consequence is that students have even less time to devote to mastery of each subject by pouring over the large single-subject textbooks, which were the standard learning tools of the past. While these books are often the most relied upon references for practitioners and educators, students now gravitate towards concise texts that provide clinical context and allow for rapid review and self-testing. Such concise texts, together with dissection guides and atlases, are the go-to resources for today's anatomy students. Our challenge has been to provide adequate content in a format that fits this new learning style. Living up to that challenge has been our goal as we developed *Anatomy – An Essential Textbook*.

The introductory chapter provides clear explanations of anatomic terminology, concepts, and systems that will be especially useful for first-year students. The remainder of the book is organized into units by region (Back, Thorax, Abdomen, Pelvis/Perineum, Upper Limb, Lower Limb and Head and Neck). Each unit begins with an overview chapter that summarizes important regional concepts as well as the details of skeletal, vascular, and nervous system components of that region. Subsequent chapters focus on organ and functional anatomy, often by key subregions.

The book is generously populated with over 450 outstanding images and 95 tables (including many of the well-received muscle facts tables and schematics) from Thieme's award winning *Atlas of Anatomy*. In addition, over 165 clinical correlations are incorporated into the text. Each unit is followed by an extensive USMLE-style question set that tests basic knowledge of that region's anatomy and its clinical application, a total of over 400 for the book. We hope that this unique combination of regional and systemic approaches presented via prioritized bulleted explanations, supported by summary tables, carefully coordinated visuals, clinical correlations, and self-testing will appeal to students as they journey through the world of anatomy.

I am grateful to so many colleagues for their contributions and expertise in completing this project. Most importantly, my editor, Anne Vinnicombe has guided, encouraged, and supported me throughout the process, always knowing when to push hard and when to tread gently. Marjorie S. Anderson, my developmental editor, suffered patiently through many versions of the text, as did editorial assistants Debra Zharnest and Renee Kestenbaum. Megan Conway helped in the layout and production of this volume. Their tireless efforts organized my thoughts into a publishable product. Thank you to developmental editor Julie O'Meara, who did the research on the clinical boxes and my humble and heartfelt thanks go to my valued colleagues Brian MacPherson (University of Kentucky College of Medicine), Larry Ross (University of Texas Medical School at Houston), and Carmen E. Rexach (Mount San Antonio College), who reviewed the manuscript and found and corrected my mistakes and inconsistencies. I'm grateful to Frank Daly (University of New England, College of Osteopathic Medicine), Krista Johansen (University of Massachusetts Medical School), Geoffrey Guttman (University of North Texas Health Center, Texas College of Osteopathic Medicine), and Michelle Lazarus (Pennsylvania State College of Medicine) for their contributions to the extensive question set and to Cathrin Weinstein, who helped in the editing process. I offer special thanks to authors Michael Schuenke, Erik Schulte, and Udo Schumacher of the three-volume *Thieme Atlas of Anatomy* and illustrators Marcus Voll and Karl Wesker for their collaboration, the results of which enrich the pages of this book.

Anne Gilroy

Worcester, Massachusetts

January 2013

1 Introduction to Anatomic Systems and Terminology

1.1 Terms of Location and Direction, Cardinal Planes and Axes

- All locational and directional terms used in anatomy, and in medical practice, refer to the human body in the **anatomic position**, in which the body is upright, arms at the side, with the eyes, palms of the hands, and feet directed forward (**Fig. 1.1, Table 1.1**).

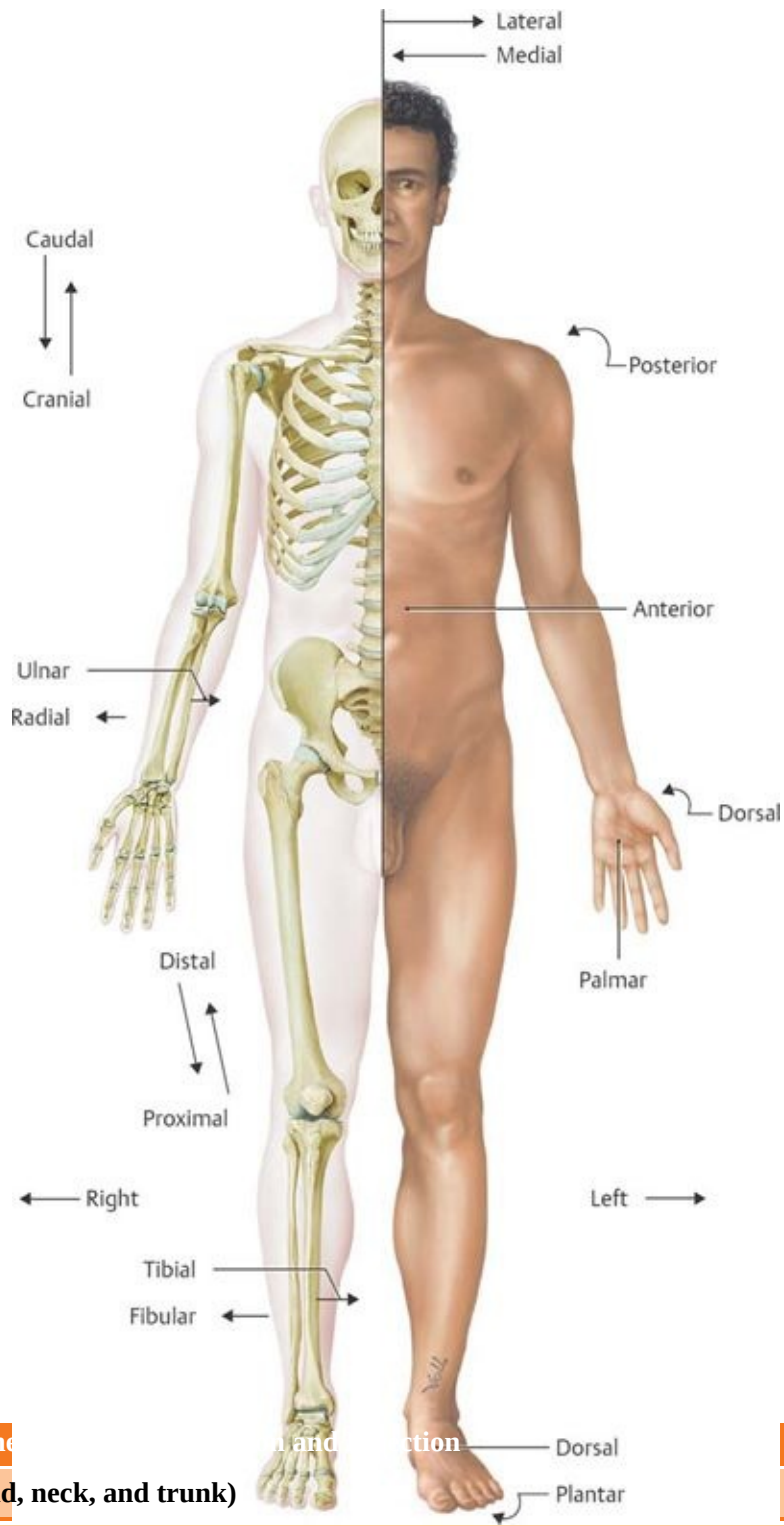


TABLE 1.1 ► General

Upper body (head, neck, and trunk)

Term Explanation

Fig. 1.1 ► **Anatomic position**
 Cranial Anterior view Pertaining to, or located toward, the head

Caudal	Pertaining to, or located toward, the tail
Anterior	Pertaining to, or located toward, the front Synonym: Ventral (used for all animals)
Posterior	Pertaining to, or located toward, the back Synonym: Dorsal (used for all animals)
Superior	Upper or above
Inferior	Lower or below
Axial	Pertaining to the axis of a structure
Transverse	Situated at right angles to the long axis of a structure
Longitudinal	Parallel to the long axis of a structure
Horizontal	Parallel to the plane of the horizon
Vertical	Perpendicular to the plane of the horizon
Medial	Toward the median plane
Lateral	Away from the median plane (toward the side)
Median	Situated in the median plane or midline
Peripheral	Situated away from the center
Superficial	Situated near the surface
Deep	Situated deep beneath the surface
External	Outer or lateral
Internal	Inner or medial
Apical	Pertaining to the top or apex
Basal	Pertaining to the bottom or base
Sagittal	Situated parallel to the sagittal suture
Coronal	Situated parallel to the coronal suture (pertaining to the crown of the head)
Limbs	
Term	Explanation
Proximal	Close to, or toward, the trunk, or toward the point of origin
Distal	Away from the trunk (toward the end of the limb), or away from the point of origin
Radial	Pertaining to the radius or the lateral side of the forearm
Ulnar	Pertaining to the ulna or the medial side of the forearm
Tibial	Pertaining to the tibia or the medial side of the leg
Fibular	Pertaining to the fibula or the lateral side of the leg
Palmar (volar)	Pertaining to the palm of the hand

Plantar	Pertaining to the sole of the foot
Dorsal	Pertaining to the back of the hand or top of the foot

- Three perpendicular cardinal planes and three axes based on the three spatial coordinates can be drawn through the body (**Fig. 1.2**).
 - The **sagittal plane** passes through the body from front to back, dividing it into right and left sides.
 - The **coronal plane** passes through the body from side to side, dividing it into front (anterior) and back (posterior) parts.
 - The **transverse** (axial, horizontal, cross-sectional) **plane** divides the body into upper and lower parts. A particular transverse section is often given the designation of the corresponding vertebral level, such as *T4*, which passes through the 4th thoracic vertebra.
 - The **longitudinal axis** passes along the height of the body in a craniocaudal direction.
 - The **sagittal axis** passes from the front to the back (or the back to the front) of the body in an anteroposterior direction.
 - The **transverse** (horizontal) **axis** passes through the body from side to side.

1.2 Landmarks and Reference Lines

- In surface anatomy, palpable structures or visible markings on the surface of the body are used to identify the location of underlying structures. **Reference lines** are vertical or transverse planes that connect palpable structures or markings (**Tables 1.2, 1.3, and 1.4**; see also **Fig. 1.4A and B**).

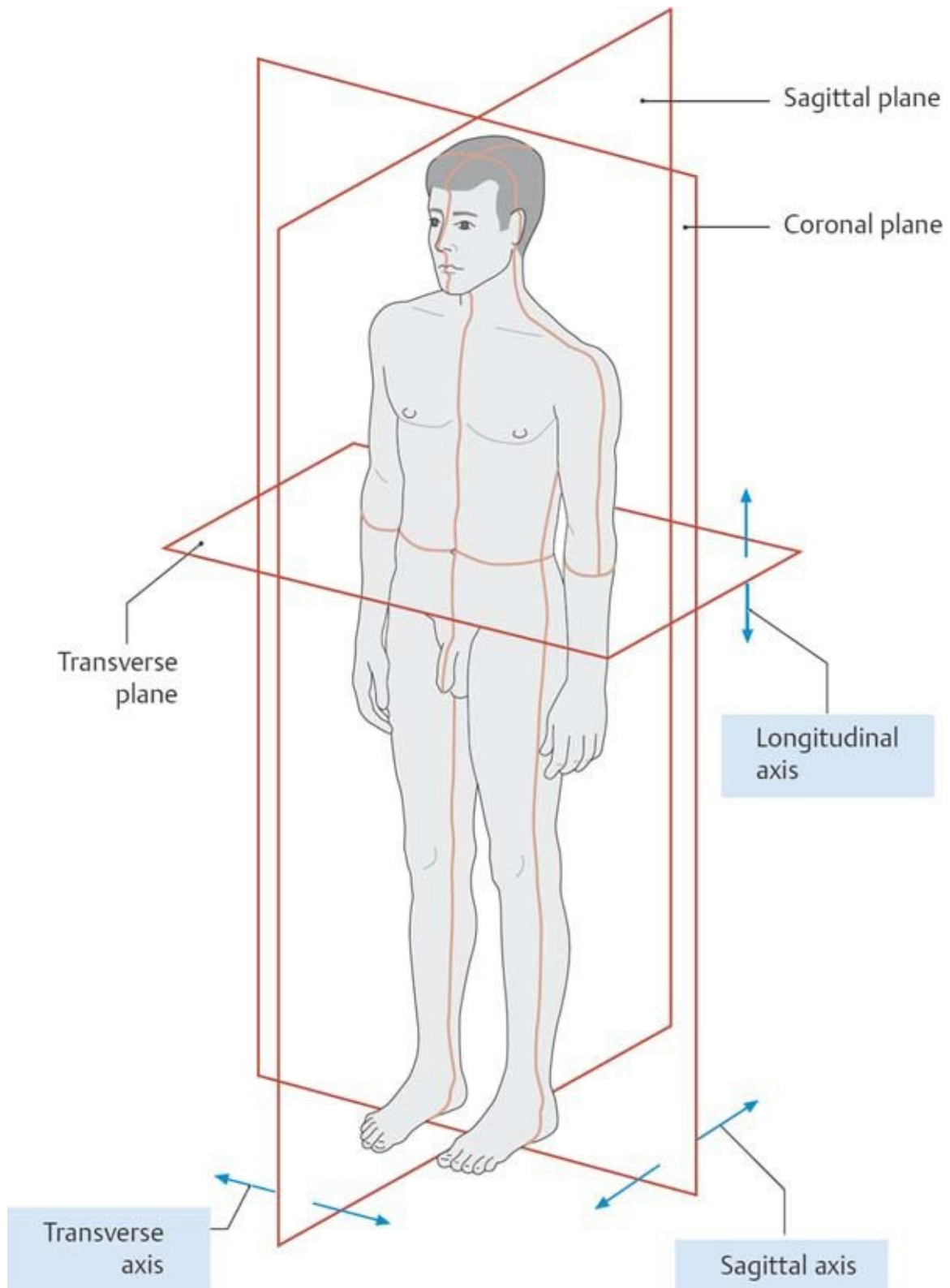
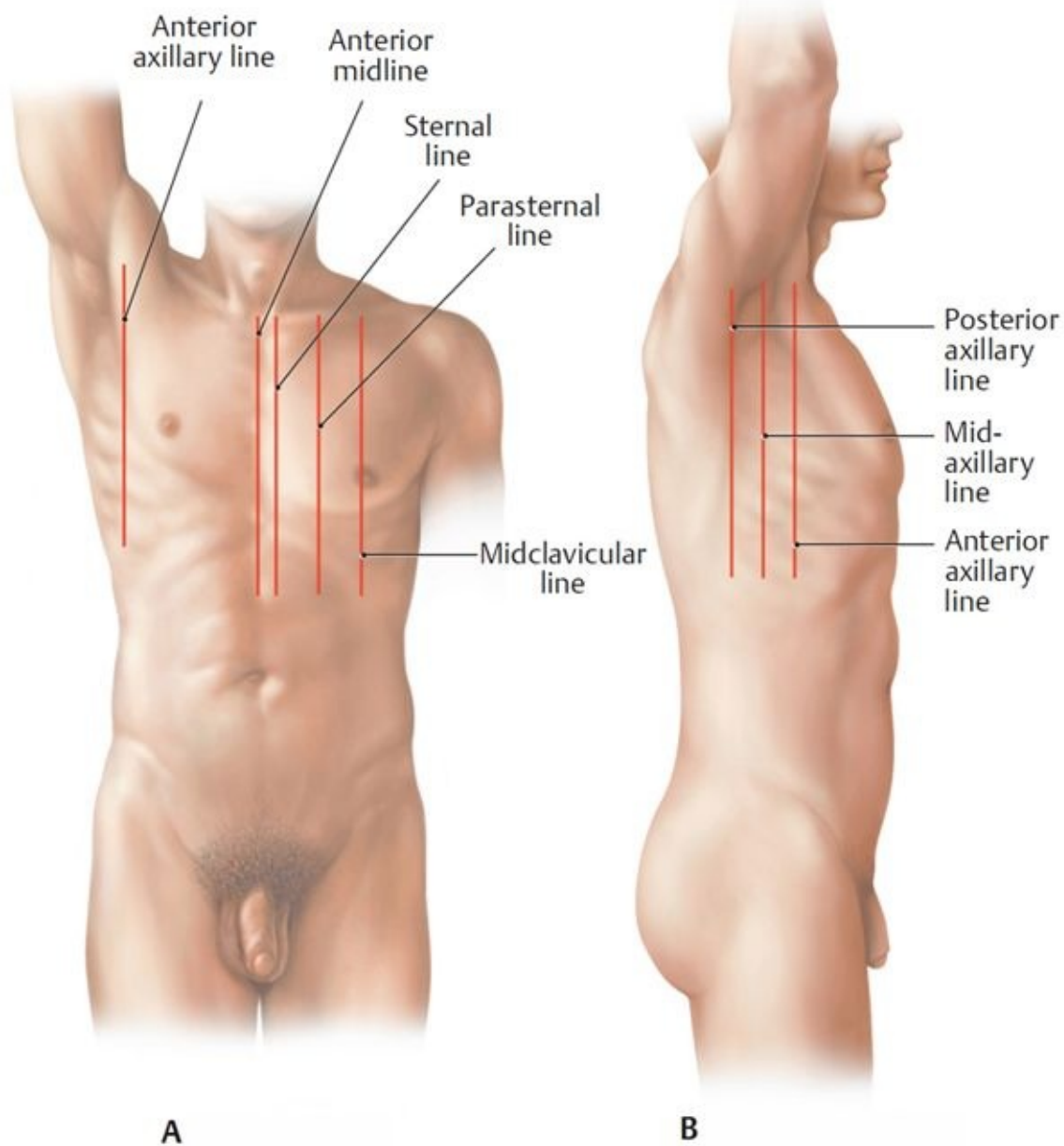


Fig. 1.2 ► **Cardinal planes and axes**
Neutral position, left anterolateral view.

TABLE 1.2 ► Anterior and Lateral Reference Lines on Trunk

Anterior midline	Passes through the center of the sternum
Sternal line	Passes along the lateral border of the sternum
Midclavicular line	Passes through the midpoint of the clavicle
Parasternal line	Passes through a point midway between the sternal and midclavicular lines
Anterior axillary line	Marks the anterior axillary fold formed by the pectoralis major muscle
Posterior axillary line	Marks the posterior axillary fold formed by the teres major muscle
Midaxillary line	Marks the midpoint between the anterior and posterior axillary lines



A Anterior view.
B Right lateral view.

TABLE 1.3 ► Landmarks and Transverse Planes on the Anterior Trunk	
Jugular notch	Marks the superior border of the manubrium
Sternal angle	Marks the junction of manubrium and body of the sternum
Transpyloric plane	Passes through the midpoint between the jugular notch and pubic symphysis
Subcostal plane	Marks the lowest level of the thoracic cage, the 10th costal cartilage

Supracrestal plane	Connects the top of the iliac crests
Intertubercular plane	Passes through the iliac tubercles
Interspinal plane	Connects the anterior superior iliac crests

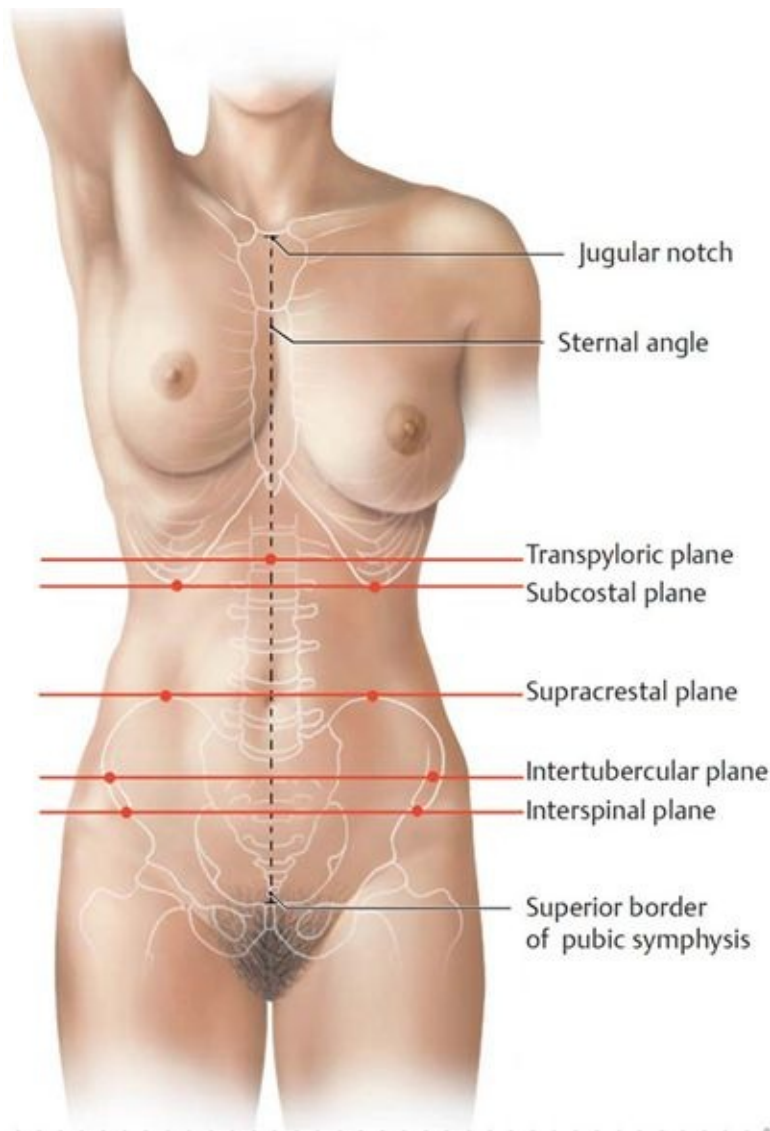


TABLE 1.4 ► Vertebral Spinous Processes and Posterior Landmarks

C7	The vertebra prominens
T3	Level of the medial edge of spines of the scapulae