# *A.D.A.M. Student Atlas of Anatomy*

This is the second edition of a volume renowned for its innovative approach to understanding the human body. It features full-color art throughout, using a three-dimensional approach to anatomic structure. The *A.D.A.M. Student Atlas of Anatomy* is an invaluable learning and review tool developed for medical, allied health, and human biology undergraduate and graduate students.

This new edition emphasizes surface anatomy and features unique additional views (posterior, medial, lateral) of important structures. It has extensive coverage of those areas, such as the perineum, head, and neck, that are often difficult for students to understand and appreciate.

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2nd Edition

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***To my mother and father***
for the greatest of all contributions
to my existence, optimism, and ability to dream
***and to my teachers, colleagues, and students***
for their encouragement and contributions
to the realization of this dream.

***Todd R. Olson***

***To my father, Dr. Kazimierz Pawlina,***
who was my first anatomy teacher and
my inspiration to pursue an academic career.

***Wojciech Pawlina***

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The second edition of the *A.D.A.M. Student Atlas of Anatomy* is truly the product of a major collaborative effort. The authors wish to extend our appreciation to all individuals who worked on this project and, in particular, to six people whose contribution to this edition were most noteworthy. At Cambridge University Press, **Marc Strauss,** who had the determination and skill to assemble the talent needed to undertake the production of a second edition of this work, and **Nat Russo,** who had the conviction to push for its publication. At A.D.A.M., **Meredith Nienkamp** for her work in championing the second edition and **Lisa Higginbotham,** who worked tirelessly to produce the new artwork for this edition. **Robert A. Chase** at Stanford University School of Medicine for allowing us to include photographs from the David L. Bassett anatomical collection. And **Matthew Byrd** and his superb team at Aptara, Inc., for their excellent work in laying out and producing this book. The dedication to every detail of Matt's team elevated the content and quality of this edition well beyond what was originally perceived by the authors. Thank you!

The talent, dedication, and professionalism of all those at A.D.A.M. who were responsible for the artwork—both in this work and in the A.D.A.M. Interactive Anatomy products—are clearly visible on every page of this atlas. Their efforts and commitment to making this book a learning resource will benefit students everywhere.

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Todd R. Olson
Wojciech Pawlina
A.D.A.M., Inc.

# PREFACE

Although our knowledge of human anatomy has changed relatively little in the past hundred years, the teaching of anatomy in all health science professions has changed profoundly. During most of the 20th century, gross human anatomy was the principle course in the first year of medical school. Today, one hundred years later, the importance of anatomy within the curriculum has been reduced in pedagogic and temporal significance to the degree that first-year medical students spend two to three times more time studying cellular, subcellular, molecular, and biochemical processes than they do the gross structure of the human body. The major reason for this de-emphasis has been the spectacular development of bioscience technology and the resultant explosion in clinically relevant knowledge that has been incorporated into basic medical education.

Anatomists successfully responded to the challenges created by this reduction in curricular importance and time in three ways. First, and most significantly, we have largely reduced the body of knowledge covered in our courses to those aspects of anatomy that are clinically relevant and therefore of greatest potential value to the student's future clinical practice. Second, we have sifted the body of anatomical knowledge to winnow out the specialist details that must now be taught in postgraduate programs, leaving the anatomical essentials that are fundamental to the basic clinical education of every health sciences and medical student. And third, we have expanded our teaching into the later years of the medical curriculum, introduced specialty and subspecialty focused elective courses for students prior to graduation, and greatly expanded our participation in graduate and continuing education courses. The vertical expansion of anatomical education into these new venues, beyond the traditional first-year course, has allowed a more effective and focused delivery of appropriate anatomical detail to students and graduated physicians who have a direct and specific need to know this information.

All three of these new pedagogic frontiers are critical components in the anatomical education of our future healthcare professionals. The purpose of this work is to focus on the initial phase of this educational process in which it is increasingly necessary to distill the voluminous details present in gross anatomy to their fundamental essentials. While there are an ever-growing number of gross anatomy textbooks that have adopted an "essentials" perspective, we have long thought it remarkable that no one has successfully incorporated this perspective into an anatomy atlas for beginning students. This all changed ten years ago when the first edition of the *A.D.A.M. Student Atlas of Anatomy* was published. From its inception in 1994, we have viewed the *A.D.A.M. Student Atlas* as, first and foremost, a visual guide and interactive learning resource to be used along with a clinical anatomy textbook. In the organization and content of the *A.D.A.M. Student Atlas*, our goal has been and remains to emphasize those parts of the body and structures that are fundamental to the clinical education of every medical and health sciences student.

To accomplish our goal, we decided to include more images of fewer structures and, in particular, more images of those parts of the body that present the beginning student with the greatest difficulties to comprehend and appreciate. We expect and fully hope that most students who use this book will soon become aware of both this distinctive emphasis and limited scope, as well as their own need to consult a more comprehensive atlas as their study of human anatomy matures. *Our primary design concept in support of our goal was neither to duplicate the efforts seen in existing comprehensive atlases, which fully display every named feature in the human body, nor to create an atlas to accompany and guide dissection.*

Nowhere in the *A.D.A.M. Student Atlas* is the emphasis on essentials of the most difficult regions of the body more evident than in Chapter 4 ("Pelvis and Perineum"), which is substantially longer than normally found in traditional atlases. There were two reasons why this chapter was created in this expanded form: First, there is a clear need to know the basic anatomy of the pelvis and perineum in the major clerkship of obstetrics and gynecology, and it is only slightly less important in urology; second, experience indicates that this region is possibly the most difficult for first time students to understand. The pelvis and perineum present unique problems of spatial and surface relationships, which are compounded by the fact that dissection of the pelvis only partially reveals its contents *in situ* and the perineum dissection is difficult and time-consuming, even for an experienced dissector working on an ideal specimen. In contrast to Chapter 4, the preceding chapter on the abdominal contents and their peritoneal relationships is relatively short because the beginning student generally finds them easier to dissect and identify their important anatomical structures and relationships.

All of the atlas's chapters, except the cranial nerves, are topographically/regionally arranged and organized to begin with surface anatomy and to end with the traditional sequences of superficial-to-deep images that the student will see when dissecting. Another innovation that we have included in the *A.D.A.M. Student*

*Atlas* is the lengthy systemic sections found at the beginning of the chapters on the trunk, limbs, and head and neck. Systemic descriptions were not included in Chapters 2 and 3, the thoracic and abdominal contents, respectively, because the systemic anatomy of the body walls of these regions is covered extensively in Chapter 1 on the trunk, and the distribution and pattern of deeper neurovasculature structures can be clearly appreciated in the sequence of dissection images within each of these two chapters.

While it is ultimately the objective in teaching patient-oriented anatomy to provide the student with an understanding of the composite anatomy of all or selected regions of the body, experience has convinced us that many, or even most, students initially find it easier to organize information by systems. The addition of these extensive systemic sections should not only make the *A.D.A.M. Student Atlas* a more useful book for beginning students but also make it a valuable resource for allied health students whose courses are usually systemically taught but who have never had access to a regional atlas that also emphasized this arrangement.

Another distinctive innovation of the *A.D.A.M. Student Atlas* is the placement of photographs of dissected or osteological specimens adjacent to newly rendered A.D.A.M. images. The rationale for this arrangement and the way we have chosen to label them is based upon the experience we have had with many first year medical students who purchase an expensive photographic atlas that is then used for a short period of time prior to laboratory practical exams. These atlases are helpful because students can test their knowledge on the pictures, which more closely approximate what they will see on the practical exam.

In structuring the *A.D.A.M. Student Atlas*, we have selected and arranged the cadaveric photographs to provide beginning students with an overview of the more important dissections that she/he will see in the lab. Also, by placing them adjacent to similar A.D.A.M. images, the student gains the benefit of seeing a detailed artistic image (as opposed to a highly simplified schematic drawing) that enhances and highlights what is most important in this view.

While an appreciation of both cross-sectional and radiographic anatomy is important in many areas of basic clinical work, it was impossible, within the scope of this atlas, to incorporate more than a limited number into each chapter. The cross-sections and radiographs that do appear have been included because they either best display the distribution of prominent structures, e.g., peritoneum, or provide another means of visualizing the relationships within a region. The limited use of these important visual methods and modalities reflects the physical restrictions of the book and does not imply that they are unimportant or should not be part of a course in clinical anatomy.

***TRO & WP***

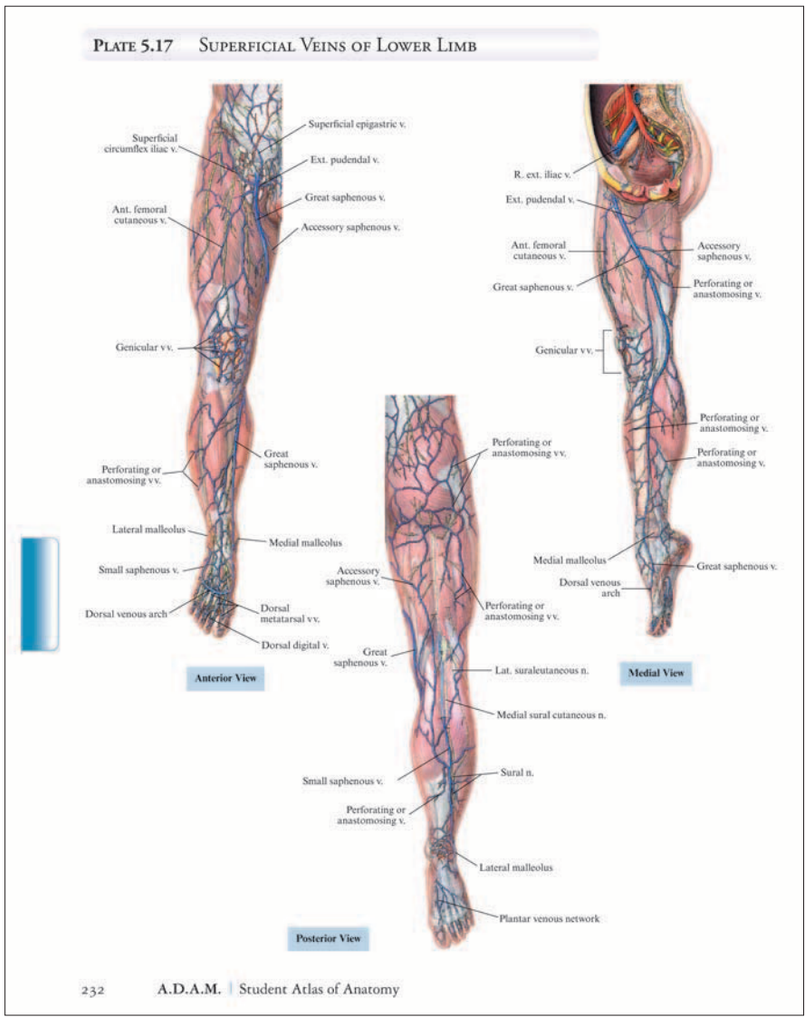
# Contents

# User's Guide

The *A.D.A.M. Student Atlas of Anatomy* was designed to be an interactive pictorial guide for the beginning student to master human anatomic methodology and basic terminology as well as the three-dimensional relationships of the body's constituent parts. The next few pages explain how to use the illustrations and special features of the atlas to their fullest advantage.

**Three-Dimensional Anatomy**

Among the problems faced by the beginning anatomy student, none is more universally perplexing than acquiring an appreciation of the three-dimensional relationships within the human body. Recent anatomy books have addressed this problem largely through the inclusion of cross-sections, CT, and MRI scans. Typically, anatomical atlases and textbooks illustrate an area or region from only one of the four traditional vertical perspectives (i.e., anterior, posterior, medial, or lateral), and students are left to extrapolate the anatomy of the third dimensional from a two-dimensional picture.

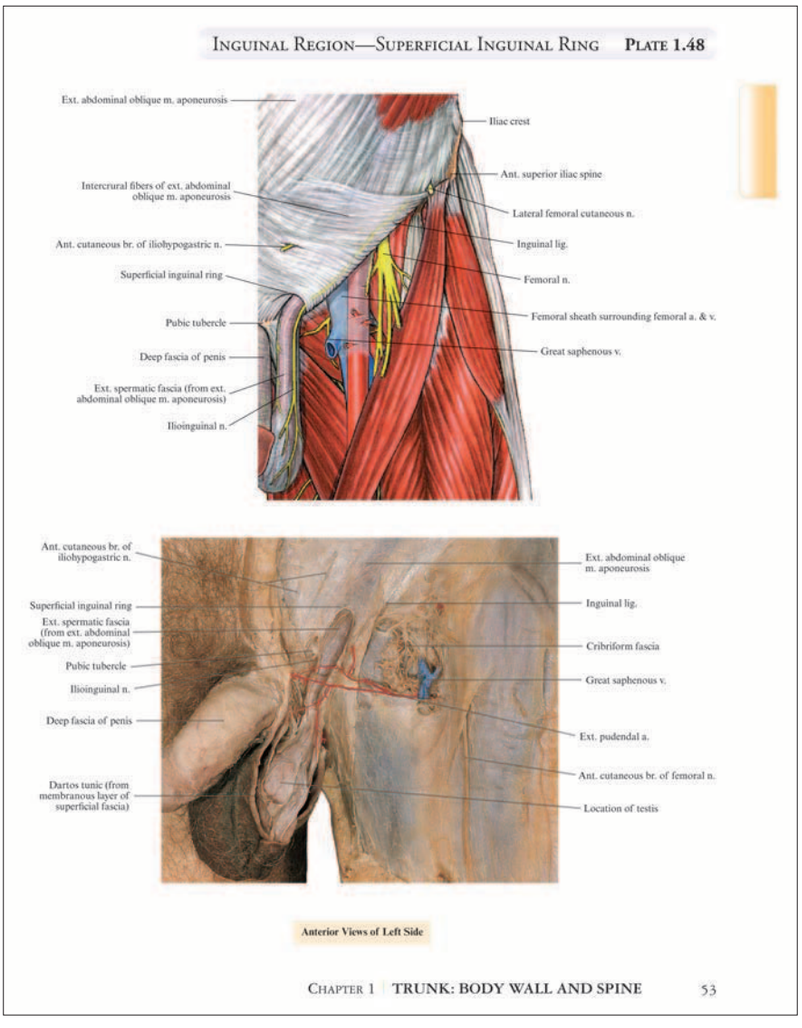



One of the most effective ways of overcoming this problem is to illustrate the region from an orientation that is at right angles to the view in question. Using A.D.A.M. Interactive Anatomy's distinctive ability to view the body from any one of the four vertical perspectives, figures on many plates depict at least two, and sometime more, orientations. For example, the anterior, medial, and posterior views of the leg in Plate 5.17 make visualizing the location, distribution, and relationships of the superficial veins, especially the clinically important

saphenous vein, and cutaneous nerves of the lower limb much easier. The extensive use of these multiple views is one of the most striking and valuable characteristics of the *A.D.A.M. Student Atlas of Anatomy*.

**Illustrations and Cadaver Photographs**

The two figures here in Plate 1.48 illustrate how A.D.A.M. illustrations have been paired with photographs taken from Stanford University's Bassett Collection and intended use in the atlas.

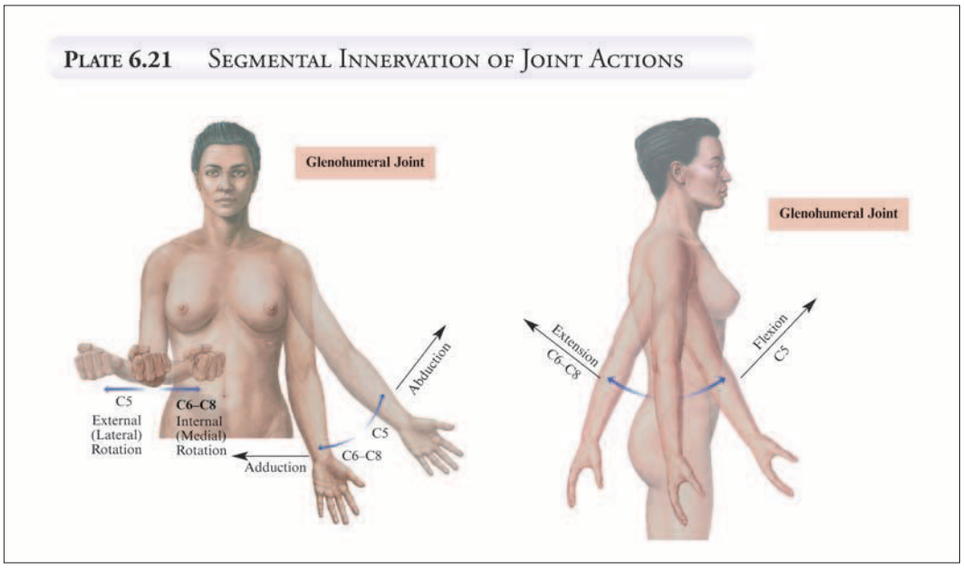



In structuring the *A.D.A.M. Student Atlas*, we have selected and arranged the cadaveric photographs to provide an overview of the more important dissections. By associating these photographs with adjacent A.D.A.M. images that depict similar but not identical anatomy, the student gains the benefit of seeing a detailed artistic image (as opposed to a highly simplified schematic drawing) to enhance and highlight what is most important to be seen in the photograph of the dissected specimen.

**Joint Motion and Segmentary Nerve Supply**

Motions in a single plane at each joint are typically initiated by motor neurons found in four successive spinal cord segments and their spinal nerves. The cranial pair of neurons innervate the muscles that produce movement in one direction and the caudal two innervate the muscles that produce the opposite motion. An appreciation of the actions, especially in the limbs, and their innervation is basic clinical knowledge that has practical value to a wide variety of health care professionals. The atlas includes tables that list the muscles

and the nerve(s) that innervate them. The segmentary origin of each nerve is also listed. In those cases where a specific segmentary level is primarily associated with the supply of the muscle, the level is printed in **BOLD**. In addition, information about segmentary innervation is provided in illustrations showing how different spinal levels control antagonistic movements in the upper and lower limb.




**Anatomical Terminology**

The anglicized and classical terminology used in the *A.D.A.M Student Atlas* follows the recent edition of the Terminologica *Anatomica*. In some case, the use of square **[ ]** and parentheses **( )** has formal meaning in the internationally recognized code of anatomical nomenclature.

**[Square] brackets** signify:

1. An officially recognized alternative name or synonym.
   Fibularis [Peroneus] longus m.
   L. vagus n. [CN X], where CN refers to a cranial nerve
   L. gastro-omental [gastroepiploic] v.

2. An equivalent anatomical name for this structure.
   Subcostal n. [T12], where T12 = 12th thoracic spinal n.
   C1 [Atlas]

**(Round) brackets** identify:

1. An official name of *inconsistent* structures.
   (Accessory parotid gland)
   (Frontal suture)

2. Eponyms and alternative names that are not officially recognized as appropriate in contemporary usage.
   Omental foramen (f. of Winslow)
   L. colic (splenic) flexure
   Costoaxillary (ext. mammary) v.
   Hepatopancreatic ampulla (of Vater)

3. Additional components of a name that are usually omitted that have been added for clarification or that are supplemental to the name.
   Greater tuberosity (of humerus)
   Acromion (process of scapula)
   Posterior basal bronchopulmonary segment (S10)
4. Motor and sensory segmental and spinal nerve levels of a peripheral nerve.
   Femoral n. (L2-L4)
   Lat. femoral cutaneous n. (L2,L3)
   Middle cluneal nn. (dorsal rami of S1-S3)
   For TWO adjacent spinal nn., they are separated by a comma; however, when more than two spinal nn. are involved, only the cranial and caudal-most are listed, separated by a hyphen.

5. Conditions specific or unique to the image or dissection.
   L. rectus abdominis m. (reflected medially)
   R. primary bronchus (pulled to L.)

**Hyphenated names.** Hyphens appear in a name to:
1. More specifically identify a constituent part of a larger complex structure.
   Triceps brachii m. - long head
   Pectoralis major m. - sternal head

2. Separate the parts of compound name where the same vowel is found at the end of the first name and beginning of the second.
   Gastro-omental [gastroepiploic] v.
   Atlanto-occipital joint

**Abbreviations**
The following abbreviations are used in the atlas. **Bold** entries are abbreviated everywhere they appear, other entries are sometimes abbreviated in order to save space.

| | | | | | |
|---|---|---|---|---|---|
| **&** | **= and** | inf. | = inferior | nn. | = nerves |
| **a.** | **= artery** | int. | = internal | port. | = portion |
| **aa.** | **= arteries** | **L.** | **= Left** | post. | = posterior |
| ant. | = anterior | lat. | = lateral | proc. | = process |
| asc. | = ascending | **lig.** | **= ligament** | pt. | = part |
| **br.** | **= branch** | **ligg.** | **= ligaments** | **R.** | **= Right** |
| **brr.** | **= branches** | **m.** | **= muscle** | sup. | = superior |
| **comm.** | **= communicating** | **mm.** | **= muscles** | trib. | = tributary |
| desc. | = descending | med. | = medial | **v.** | **= vein** |
| ext. | = external | **n.** | **= nerve** | **vv.** | **= veins** |

Another system of abbreviation is typically used when segmental structures (i.e., vertebrae, spinal or intercostal nerves, ribs) are superimposed on or immediately adjacent to the structure. Thus, **C6** on or next to a vertebra identifies the sixth cervical vertebrae; the "C" distinguishes the vertebral type and the number its segmental location. Abbreviations used in this way are:

C = Cervical
Cc = Coccygeal
L = Lumbar
R = Rib
S = Sacral
T = Thoracic