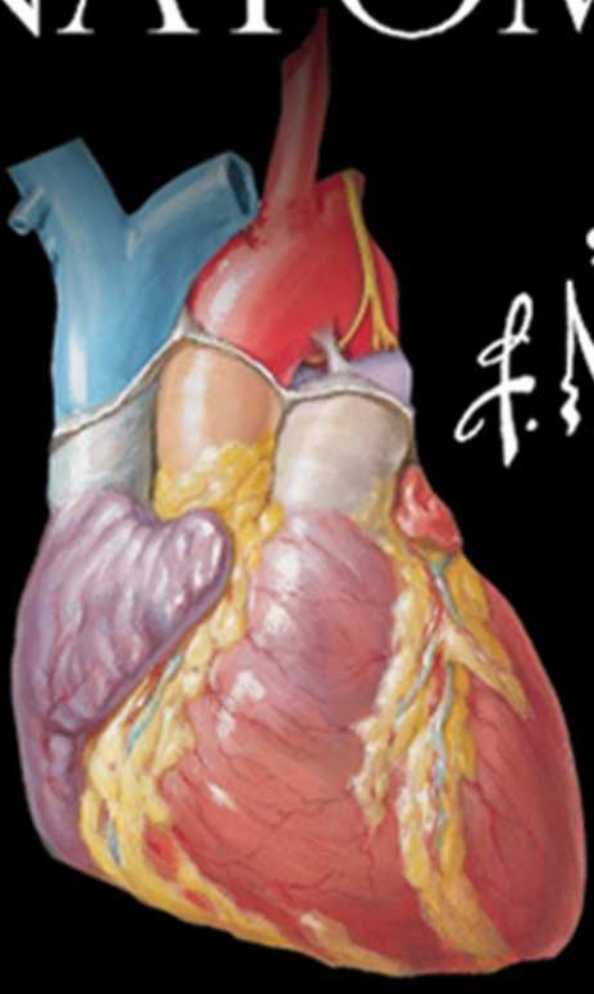
FRANK H. NETTER, MD

ATLAS OF HUMAN ANATOMY



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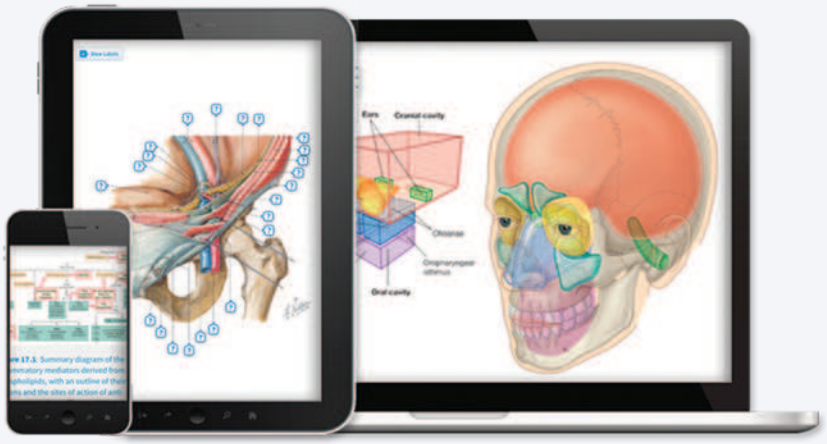

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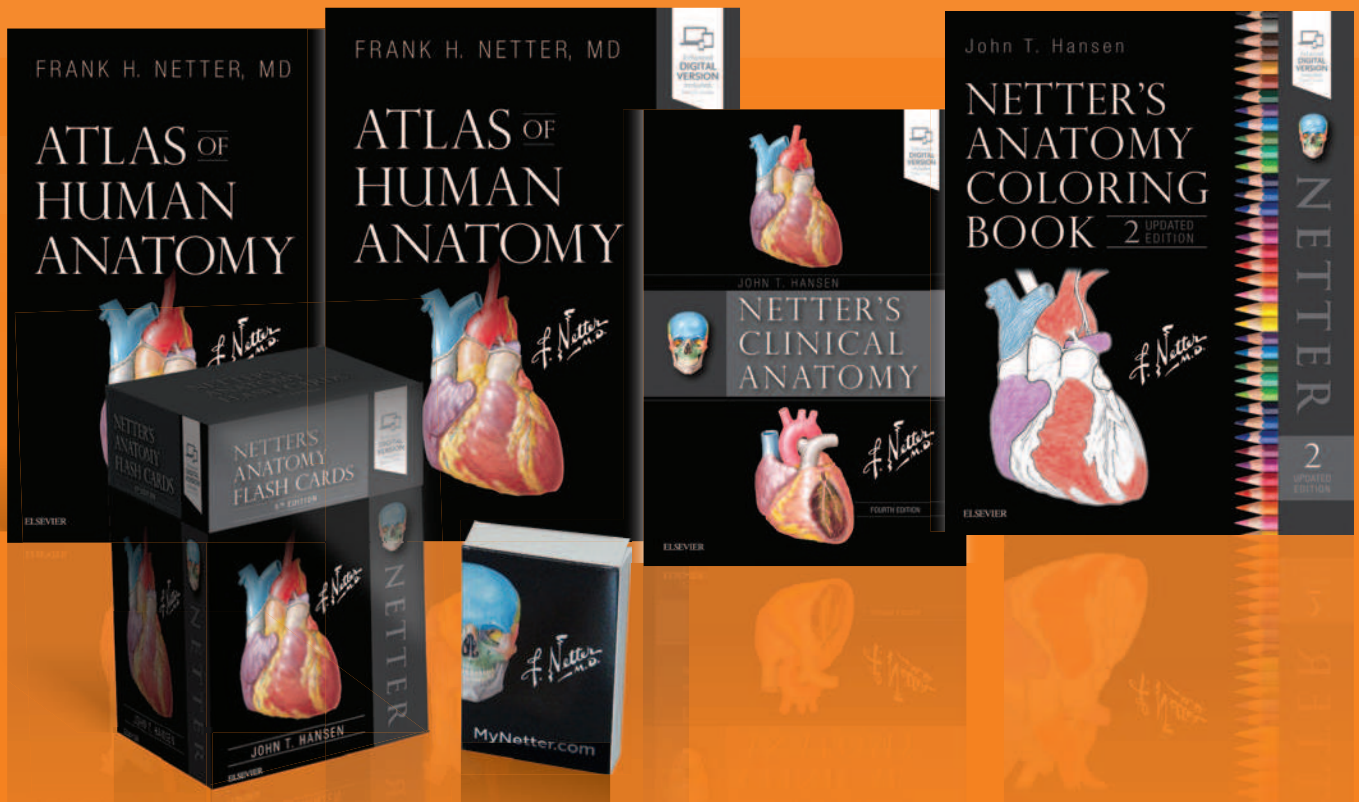

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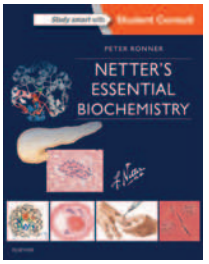

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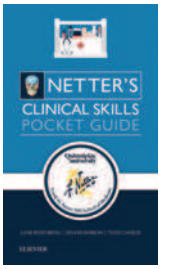

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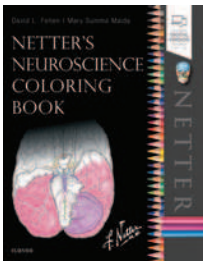

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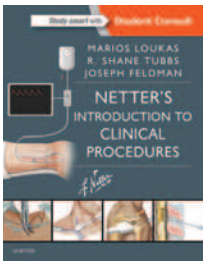

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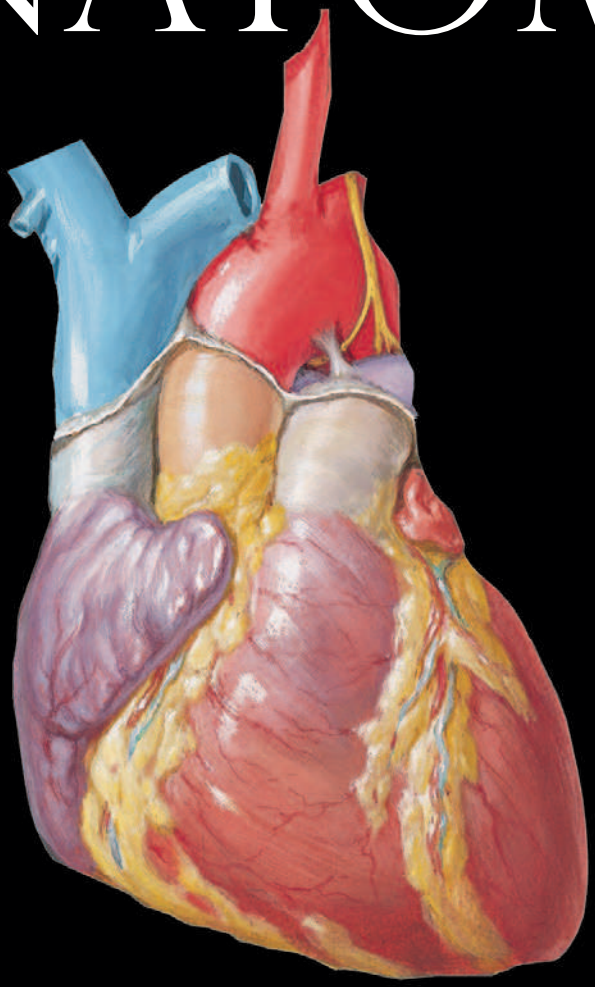

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NEW TO THIS EDITION

With your copy of the Frank H. Netter, MD, *Atlas of Human Anatomy*, you own a collection of some of the most well-known depictions of human anatomy in medicine and healthcare. In addition to the famous work of Dr. Netter, with your copy of this 7th edition, you also have access to nearly 100 painted pieces by Carlos A. G. Machado, MD, one of the foremost medical illustrators working today. Dr. Machado's contributions to the *Atlas* highlight important views of anatomy that have become more clinically relevant in recent years— anatomic views that have resulted from improved dissection techniques and modern imaging. In addition, you have access to more than 50 carefully selected radiologic images that help bridge the idealized illustrated anatomy with living anatomy viewed in the clinic.

While numerous updates have been made to the illustrated plates and tables to make them easier to learn from, the most significant changes to this edition include:

Introductory Section

To fulfill the requests from many students and fans of Netter's *Atlas*, we have added a new opening section containing several overview plates. These plates provide the very first head-to-toe views in the *Atlas of Human Anatomy!*

Clinical Tables

The *Atlas of Human Anatomy* is the only anatomy atlas illustrated by physicians. Dr. Netter was a surgeon and Dr. Machado is a cardiologist. The views of anatomy in this atlas have always reflected a clinical perspective. In line with this clinical focus, and in congruence with integrated curricula in health and medicine, tables at the end of each regional section highlight the most commonly injured structures, as well as other structures with high clinical significance and commonly covered in anatomy courses. The tables provide students with quick summaries, organized by body system, and note where to best view these key structures in the illustrated plates.

New Art Plates by Dr. Machado

For this edition alone, over 25 new illustrations have been painted by Dr. Machado. Suggestions for new plates of additional anatomic views and concepts are submitted by students, faculty, anatomists, physicians, and others. Sometimes suggestions are solicited at major anatomy conferences with a "What Should Carlos Paint Next?" idea box. Decisions around which new plates are prioritized and given space in a new edition come from discussions among consulting editors. The new plates for this edition are largely those that portray structures with clinical significance (Fascial Columns of the Neck, Deep Veins of the Leg, Hip Bursae, and Vasculature of the Prostate) or those that are difficult to visualize (Infratemporal Fossa)—and, of course, the new additions created for the introductory section.

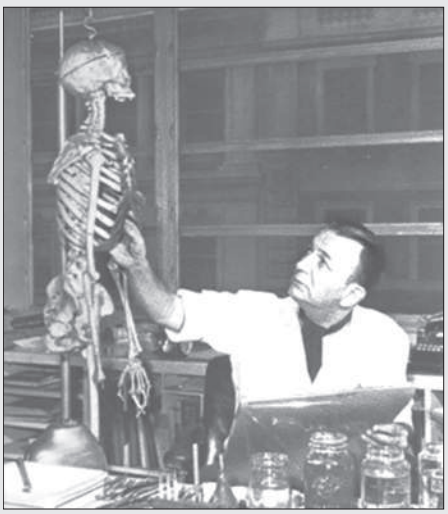
Terminology Updates

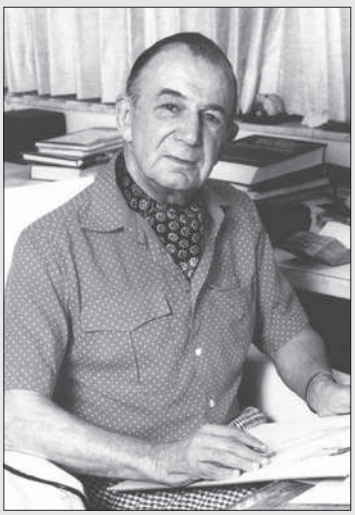
The *Atlas of Human Anatomy* uses terminology accepted (in Göttingen, Germany, on September 24, 2016) by the Federative International Programme on Anatomical Terminologies and published as updates to the 1998 *Terminologia Anatomica*. Numerous updates to terminology have been made, so in select cases, former terminology has been included within parentheses to assist with the transition.

New Radiologic Images

Over 50 radiologic images—some completely new views and others replacing existing views using newer imaging tools—are included in this edition. Images have been selected based on their utility to students studying gross anatomy.

Your *Atlas of Human Anatomy* content has been updated, created, and overseen by a team of dedicated and passionate consulting editors, with the help of a stellar international advisory board, and guided by the feedback of many students, educators, anatomists, and clinicians that love Netter's *Atlas*. Please feel free to comment on the Netter Images Facebook page or Twitter feeds or email us directly with your thoughts, suggestions, or questions at NetterAppFeedback@Elsevier.com.





To my dear wife, Vera

PREFACE TO THE FIRST EDITION

I have often said that my career as a medical artist for almost 50 years has been a sort of "command performance" in the sense that it has grown in response to the desires and requests of the medical profession. Over these many years, I have produced almost 4,000 illustrations, mostly for *The CIBA* (now *Netter*) *Collection of Medical Illustrations* but also for *Clinical Symposia*. These pictures have been concerned with the varied subdivisions of medical knowledge such as gross anatomy, histology, embryology, physiology, pathology, diagnostic modalities, surgical and therapeutic techniques, and clinical manifestations of a multitude of diseases. As the years went by, however, there were more and more requests from physicians and students for me to produce an atlas purely of gross anatomy. Thus, this atlas has come about, not through any inspiration on my part but rather, like most of my previous works, as a fulfillment of the desires of the medical profession.

It involved going back over all the illustrations I had made over so many years, selecting those pertinent to gross anatomy, classifying them and organizing them by system and region, adapting them to page size and space, and arranging them in logical sequence. Anatomy of course does not change, but our understanding of anatomy and its clinical significance does change, as do anatomical terminology and nomenclature. This therefore required much updating of many of the older pictures and even revision of a number of them in order to make them more pertinent to today's ever-expanding scope of medical and surgical practice. In addition, I found that there were gaps in the portrayal of medical knowledge as pictorialized in the illustrations I had previously done, and this necessitated my making a number of new pictures that are included in this volume.

In creating an atlas such as this, it is important to achieve a happy medium between complexity and simplification. If the pictures are too complex, they may be difficult and confusing to read; if oversimplified, they may not be adequately definitive or may even be misleading. I have therefore striven for a middle course of realism without the clutter of confusing minutiae. I hope that the students and members of the medical and allied professions will find the illustrations readily understandable, yet instructive and useful.

At one point, the publisher and I thought it might be nice to include a foreword by a truly outstanding and renowned anatomist, but there are so many in that category that we could not make a choice. We did think of men like Vesalius, Leonardo da Vinci, William Hunter, and Henry Gray, who of course are unfortunately unavailable, but I do wonder what their comments might have been about this atlas.

Frank H. Netter, MD
(1906–1991)

FRANK H. NETTER, MD

Frank H. Netter was born in New York City in 1906. He studied art at the Art Students League and the National Academy of Design before entering medical school at New York University, where he received his Doctor of Medicine degree in 1931. During his student years, Dr. Netter's notebook sketches attracted the attention of the medical faculty and other physicians, allowing him to augment his income by illustrating articles and textbooks. He continued illustrating as a sideline after establishing a surgical practice in 1933, but he ultimately opted to give up his practice in favor of a full-time commitment to art. After service in the United States Army during World War II, Dr. Netter began his long collaboration with the CIBA Pharmaceutical Company (now Novartis Pharmaceuticals). This 45-year partnership resulted in the production of the extraordinary collection of medical art so familiar to physicians and other medical professionals worldwide.

Icon Learning Systems acquired the Netter Collection in July 2000 and continued to update Dr. Netter's original paintings and to add newly commissioned paintings by artists trained in the style of Dr. Netter. In 2005, Elsevier Inc. purchased the Netter Collection and all publications from Icon Learning Systems. There are now over 50 publications featuring the art of Dr. Netter available through Elsevier Inc.

Dr. Netter's works are among the finest examples of the use of illustration in the teaching of medical concepts. The 13-book *Netter Collection of Medical Illustrations,* which includes the greater part of the more than 20,000 paintings created by Dr. Netter, became and remains one of the most famous medical works ever published. *The Netter Atlas of Human Anatomy,* first published in 1989, presents the anatomic paintings from the Netter Collection. Now translated into 16 languages, it is the anatomy atlas of choice among medical and health professions students the world over.

The Netter illustrations are appreciated not only for their aesthetic qualities, but, more importantly, for their intellectual content. As Dr. Netter wrote in 1949 "clarification of a subject is the aim and goal of illustration. No matter how beautifully painted, how delicately and subtly rendered a subject may be, it is of little value as a *medical illustration* if it does not serve to make clear some medical point." Dr. Netter's planning, conception, point of view, and approach are what inform his paintings and what make them so intellectually valuable.

Frank H. Netter, MD, physician and artist, died in 1991.

ACKNOWLEDGMENTS

Carlos A. G. Machado, MD

I struck luck when joining this golden team of consulting editors exceedingly knowledgeable in the fields of clinical anatomy and medical education. It has been a great honor to work with and be under their guidance, as well as under the highly competent coordination of Elyse O'Grady and Marybeth Thiel, Elsevier's Executive Content Strategist and Senior Content Development Specialist, respectively.

This unique book would not exist without the genius of its creator, Dr. Frank Netter, to whom I owe special thanks, also in the name of generations of students and health professionals who, like myself, have learned so much from his incommensurable body of work.

I dedicate my work and express my most sincere thanks to my beloved parents, Carlos and Neide, who provided me with the foundation of my education; to my patient wife, Adriana, and talented daughter, Beatriz, for their love and support; to the students, teachers, and health professionals who rely on my work to learn and teach; to all the body donors and living friends that have respectively been the subjects of my studies and models of most of the illustrations I have created for the *Atlas*; and to my teachers Eugênio Cavalcante, Mário Fortes, and Paulo Carneiro for taking my interest in human/clinical anatomy much further.

John T. Hansen, PhD

At Elsevier I would like to thank Marybeth Thiel, Senior Content Development Specialist, Elyse O'Grady, Executive Content Strategist, John Casey, Senior Project Manager, Patricia Tannian, Publishing Services Manager, Julia Dummitt, Design Manager, Karen Giacomucci, Illustration Buyer, and Madelene Hyde, Publishing Director, for their continuous support and meticulous attention to detail during the development of this seventh edition of the *Atlas of Human Anatomy*. They, along with the entire editorial, production, design, and marketing teams at Elsevier have been a delight to work with and to know. I also wish to thank my consulting editors for their insightful and constructive suggestions as we strive to make every new edition of the *Atlas* better. I am also indebted to Carlos Machado for his superb artistic skill in producing and updating a number of plates that appear in this latest edition of the *Atlas*. His renderings of human anatomy are the perfect complement to the Netter images. In addition to my fellow editors, I wish to express my thanks to my faculty colleagues at Rochester and to all my past and present students who have provided generous and constructive feedback and have enriched my life. Finally, I am indebted to my entire family for their continued support and especially to my wife, Paula. Their love and encouragement sustains me and is the source of all the happiness and joy I know.

Brion Benninger, MD, MSc

Every day I am thankful for my wife, Alison, and son, Jack, for the laughs we have as a family, often from my follies, which is such a tonic. I thank Elsevier, especially Marybeth Thiel, Elyse O'Grady, and Madelene Hyde for their professionalism and guidance, enabling John Hansen, Carlos Machado, and my fellow coeditors to work in a unique and dynamic environment. I thank those clinicians who trained me, especially my early gifted surgeon/anatomist/teacher mentors, Drs. Gerald Tressidor and Harold Ellis CBE (Cambridge & Guy's Hospital); Dr. S. Standring, who embodies professionalism and displays fortitude; Drs. P. Crone and J. Heatherington, and the University Board for their stellar support; my past and future students and patients; and clinical colleagues from all corners of the world who keep anatomy dynamic, fresh, and wanting more. Special thanks to Jim Diegel and Erik Szeto, friends, mentors and fellow visionaries who also see "outside the box," challenging status quo. A heartfelt tribute to my late mentors, friends, and sister, Jim McDaniel, Bill Bryan, and Gail Hendricks, all who represent what is good in teaching, caring, and healing. They made this world a wee bit better. Lastly, I thank my mother for her love of education and equality and my father for his inquisitive and creative mind.

Jennifer Brueckner-Collins, PhD

Many thanks to the Elsevier team, particularly Marybeth Thiel and Elyse O'Grady, for their guidance and expertise during our preparation of the seventh edition. It is always an honor to work with Carlos Machado, whose passion for and mastery of the art of clinical anatomy and medicine never cease to amaze me. I am forever indebted to Brian MacPherson, who has served as a teacher, mentor, and friend to me for more than 20 years….you showed me what it means to be a true educator and I have been so fortunate to have the opportunity to build a career based on those principles. To Kurt and Lincoln, you are my inspiration….my world…my life and I love you to the snow moon and back.

Todd M. Hoagland, PhD
It is a privilege to teach clinical human anatomy and I am eternally grateful to all the body donors and their families for enabling healthcare professionals to train in the dissection laboratory. It is my honor to work with outstanding medical students and colleagues at the Medical College of Wisconsin. I am grateful to John Hansen and the professionals of the Elsevier team for the opportunity to be a steward of the incomparable Netter's *Atlas*. Marybeth Thiel and Elyse O'Grady were especially helpful and a pleasure to work with. It was an honor to collaborate with the brilliant Carlos Machado and all the consulting editors. I thank Bill Swartz and Mark Moss for being outstanding mentors, and I thank all of the graduate students I've worked with, especially Rebecca Lufler. I am deeply appreciative of Stan Hillman and Jack O'Malley for inspiring me with masterful teaching and rigorous expectations. I am indebted to Gary Kolesari and Richard Hoyt Jr. for helping me become a competent clinical anatomist, and to Rob Bouchie for his camaraderie. I am most grateful to my brother, Bill, for his unwavering optimism and gregarious nature. I thank my mother, Liz, for her dedication and love and for instilling a strong work ethic. Finally, I am humbled by my two awesome children, Ella and Caleb, for helping me redefine love, wonder, and joy.

R. Shane Tubbs, MS, PA-C, PhD
Elsevier and the Netter team have once again been a joy to work with. I thank Elyse O'Grady, Marybeth Thiel, and John Casey for their tremendous work on this edition. In addition, Carlos Machado has again added his expertise to bringing his anatomical images to life. As always, my work is inspired by my beautiful wife, Susan, and son, Isaiah. Lastly, I am indebted to my parents, Richard and Karon Tubbs, who supported me in my career to better understand the human body.

CONTENTS

SECTION 1 INTRODUCTION • Plates 1-7

Introduction • Plates 1-7

1 Body Planes and Terms of Relationship
2 Surface Anatomy: Regions (Anterior View of Female)
3 Surface Anatomy: Regions (Posterior View of Male)
4 Major Arteries and Pulse Points
5 Major Systemic Veins of the Cardiovascular System
6 General Organization of the Nervous System
7 Overview of the Lymphatic System

Electronic Bonus Plates • Plates BP1-BP16

BP 1 Cross Section of Skin
BP 2 Pilosebaceous Unit
BP 3 Major Body Cavities
BP 4 Skeletal System: Axial and Appendicular Skeletons
BP 5 Types of Synovial Joints
BP 6 Joints: Connective Tissues and Articular Cartilage
BP 7 Architecture of Bone
BP 8 Muscular System
BP 9 Overview of the Gastrointestinal System
BP 10 Overview of the Endocrine System
BP 11 Neurons and Synapses
BP 12 Features of a Typical Peripheral Nerve
BP 13 Sites of Visceral Referred Pain
BP 14 General Organization of the Cardiovascular System
BP 15 Cardiovascular System: Composition of Blood
BP 16 Arterial Wall

SECTION 2 HEAD AND NECK • Plates 8-160

Surface Anatomy • Plate 8

8 Head and Neck: Surface Anatomy

Superficial Head and Neck • Plates 9-10

9 Cutaneous Nerves of Head and Neck
10 Superficial Arteries and Veins of Face and Scalp

Bones and Ligaments • Plates 11-30

11 Skull: Anterior View
12 Skull: Radiographs
13 Skull: Lateral View
14 Skull: Lateral Radiograph
15 Skull: Midsagittal Section
16 Calvaria
17 Cranial Base: Inferior View
18 Cranial Base: Superior View
19 Foramina and Canals of Cranial Base: Inferior View
20 Foramina and Canals of Cranial Base: Superior View
21 Skull of Newborn
22 Bony Framework of Head and Neck
23 Pterygoid Fossae
24 Mandible
25 Temporomandibular Joint
26 Cervical Vertebrae: Atlas and Axis
27 Cervical Vertebrae (continued)
28 Cervical Vertebrae: Uncovertebral Joints
29 External Craniocervical Ligaments
30 Internal Craniocervical Ligaments

Neck • Plates 31-41

31 Muscles of Facial Expression: Lateral View
32 Muscles of Neck: Anterior View
33 Fascial Layers of Neck
34 Cervical Fasciae
35 Infrahyoid and Suprahyoid Muscles
36 Muscles of Neck: Lateral View
37 Anterior and Lateral Cervical Muscles
38 Superficial Veins and Cutaneous Nerves of Neck
39 Nerves and Vessels of Neck
40 Nerves and Vessels of Neck (continued)
41 Carotid Arteries

Nasal Region • Plates 42-64

42 Nose
43 Lateral Wall of Nasal Cavity
44 Lateral Wall of Nasal Cavity (continued)
45 Medial Wall of Nasal Cavity (Nasal Septum)
46 Nerves of Nasal Cavity
47 Arteries of Nasal Cavity: Bony Nasal Septum Turned Up
48 Nerves of Nasal Cavity: Bony Nasal Septum Turned Up
49 Nose and Maxillary Sinus: Transverse Section
50 Paranasal Sinuses: Coronal and Transverse Sections
51 Paranasal Sinuses: Parasagittal Views
52 Paranasal Sinuses: Changes with Age

53 Salivary Glands
54 Facial Nerve Branches and Parotid Gland
55 Muscles Involved in Mastication
56 Muscles Involved in Mastication (continued)
57 Maxillary Artery
58 Proximal Maxillary and Superficial Temporal Arteries
59 Mandibular Nerve (CN V_3)
60 Superior View of Infratemporal Fossa
61 Ophthalmic (CN V_1) and Maxillary (CN V_2) Nerves
62 Autonomic Innervation of Nasal Cavity
63 Nerves and Arteries of the Deep Face
64 Orientation of Nerves and Vessels of the Cranial Base

Oral Region • Plates 65-74

65 Inspection of Oral Cavity
66 Afferent Innervation of Oral Cavity and Tongue
67 Roof of Oral Cavity
68 Tongue and Salivary Glands: Sections
69 Floor of Oral Cavity
70 Tongue
71 Tongue (continued)
72 Fauces
73 Teeth
74 Teeth (continued)

Pharynx • Plates 75-86

75 Muscles of Pharynx: Partially Opened Posterior View
76 Posterior View of Pharynx: Nerves and Vessels
77 Pharynx: Medial View
78 Muscles of Pharynx: Medial View
79 Pharynx: Opened Posterior View
80 Pharyngoesophageal Junction
81 Muscles of Pharynx: Lateral View
82 Nerves of Oral, Head, and Neck Regions
83 Arteries of Oral and Pharyngeal Regions
84 Veins of Face and Neck Regions
85 Lymph Vessels and Nodes of Head and Neck
86 Lymph Vessels and Nodes of Pharynx and Tongue

Thyroid Gland and Larynx • Plates 87-93

87 Thyroid Gland: Anterior View
88 Thyroid Gland and Pharynx: Posterior View
89 Parathyroid Glands
90 Cartilages of Larynx
91 Intrinsic Muscles of Larynx
92 Nerves and Coronal Section of Larynx
93 Action of Intrinsic Muscles of Larynx

Orbit and Contents • Plates 94-104

94 Eyelids
95 Lacrimal Apparatus
96 Extrinsic Eye Muscles
97 Nerves of Orbit
98 Superior and Anterior Views of Orbit
99 Arteries and Veins of Orbit and Eyelids
100 Eyeball: Transverse Section
101 Anterior and Posterior Chambers of Eyeball
102 Lens and Supporting Structures
103 Intrinsic Arteries and Veins of Eye
104 Vascular Supply of Eye

Ear • Plates 105-110

105 Ear and Course of Sound in Cochlea
106 External Ear and Tympanic Cavity
107 Tympanic Cavity
108 Bony and Membranous Labyrinths
109 Bony and Membranous Labyrinths (continued)
110 Orientation of Labyrinths in Skull

Meninges and Brain • Plates 111-126

111 Meninges and Diploic Veins
112 Meningeal Arteries
113 Meninges and Superficial Cerebral Veins
114 Dural Venous Sinuses: Sagittal Section
115 Dural Venous Sinuses (continued)
116 Brain: Lateral Views
117 Brain: Medial Views
118 Brain: Inferior View
119 Ventricles of Brain
120 Circulation of Cerebrospinal Fluid
121 Basal Nuclei (Ganglia)
122 Thalamus and Related Structures
123 Hippocampus and Fornix
124 Brain Stem
125 Ventricles and Cerebellum
126 Cerebellum

Cranial and Cervical Nerves • Plates 127-146

127 Cranial Nerve Nuclei in Brain Stem: Schema
128 Cranial Nerve Nuclei in Brain Stem: Schema (continued)
129 Cranial Nerves (Motor and Sensory Distribution): Schema
130 Olfactory Nerve (CN I): Schema
131 Optic Nerve (CN II) (Visual Pathway): Schema

132 Oculomotor (CN III), Trochlear (CN IV), and Abducens (CN VI) Nerves: Schema
133 Trigeminal Nerve (CN V): Schema
134 Facial Nerve (CN VII): Schema
135 Vestibulocochlear Nerve (CN VIII): Schema
136 Glossopharyngeal Nerve (CN IX): Schema
137 Vagus Nerve (CN X): Schema
138 Accessory Nerve (CN XI): Schema
139 Hypoglossal Nerve (CN XII): Schema
140 Cervical Plexus: Schema
141 Autonomic Nerves in Neck
142 Autonomic Nerves in Head
143 Ciliary Ganglion: Schema
144 Pterygopalatine and Submandibular Ganglia: Schema
145 Otic Ganglion: Schema
146 Taste Pathways: Schema

Cerebral Vasculature • Plates 147-158

147 Arteries to Brain and Meninges
148 Internal Carotid Artery in Petrous Part of Temporal Bone
149 Arteries to Brain: Schema
150 Arteries of Brain: Inferior Views
151 Cerebral Arterial Circle (of Willis)
152 Arteries of Brain: Frontal View and Section
153 Arteries of Brain: Lateral and Medial Views
154 Arteries of Posterior Cranial Fossa
155 Veins of Posterior Cranial Fossa
156 Deep Veins of Brain
157 Subependymal Veins of Brain
158 Hypothalamus and Hypophysis

Regional Imaging • Plates 159-160

159 Cranial Imaging (MRA and MRV)
160 Cranial Imaging (MRI)

Structures with High Clinical Significance • Tables 2.1-2.3

Muscle Tables • Tables 2.4-2.9

Electronic Bonus Plates • Plates BP17-BP32

BP17 3D Skull Reconstruction CTs
BP18 Degenerative Changes in Cervical Vertebrae
BP19 Atlantooccipital Junction
BP20 Muscles of Facial Expression: Anterior View
BP21 Musculature of Face
BP22 Paranasal Sinuses

BP23 Subclavian Artery
BP24 Opening of the Mandible
BP25 Afferent Innervation of Oral Cavity and Pharynx
BP26 Fasciae of Orbit and Eyeball
BP27 Tympanic Cavity
BP28 Anatomy of the Pediatric Ear
BP29 Auditory Tube (Eustachian)
BP30 Arteries and Veins of Hypothalamus and Hypophysis
BP31 Cranial Imaging (MRV and MRA)
BP32 Axial and Coronal MRIs of Brain

SECTION 3 BACK AND SPINAL CORD • Plates 161-186

Surface Anatomy • Plate 161

161 Back: Surface Anatomy

Bones and Ligaments • Plates 162-168

162 Vertebral Column
163 Thoracic Vertebrae
164 Lumbar Vertebrae
165 Vertebrae: Radiograph and MRI
166 Sacrum and Coccyx
167 Vertebral Ligaments: Lumbosacral Region
168 Vertebral Ligaments: Lumbar Region

Spinal Cord • Plates 169-179

169 Spinal Cord and Anterior Rami
170 Relation of Spinal Nerve Roots to Vertebrae
171 Dermatomes
172 Sympathetic Nervous System: Schema
173 Parasympathetic Nervous System: Schema
174 Spinal Meninges and Nerve Roots
175 Spinal Nerve Origin: Cross Sections
176 Arteries of Spinal Cord: Schema
177 Arteries of Spinal Cord: Intrinsic Distribution
178 Veins of Spinal Cord and Vertebral Column
179 Veins of Vertebral Column: Vertebral Veins

Muscles and Nerves • Plates 180-184

180 Muscles of Back: Superficial Layer
181 Muscles of Back: Intermediate Layer
182 Muscles of Back: Deep Layer
183 Nerves of Back
184 Suboccipital Triangle

Cross-Sectional Anatomy • Plates 185-186

185 Lumbar Region of Back: Cross Section
186 Typical Thoracic Spinal Nerve: Cross Section

Structures with High Clinical Significance • Table 3.1

Muscle Tables • Tables 3.2-3.3

Electronic Bonus Plates • Plates BP33-BP43

BP33 Vertebral Ligaments
BP34 Cervical Spine: Radiographs
BP35 Cervical Spine: MRI and Radiograph
BP36 Thoracolumbar Spine: Lateral Radiograph
BP37 Lumbar Vertebrae: Radiographs
BP38 Lumbar Spine: MRIs
BP39 Sympathetic Nervous System: General Topography
BP40 Parasympathetic Nervous System: General Topography
BP41 Cholinergic and Adrenergic Synapses: Schema
BP42 Vertebral Veins: Detail Showing Venous Communications
BP43 Spinal Cord Cross Sections: Fiber Tracts

SECTION 4 THORAX • Plates 187-248

Surface Anatomy • Plate 187

187 Thorax: Surface Anatomy

Mammary Gland • Plates 188-191

188 Mammary Gland
189 Arteries of Mammary Gland
190 Lymph Vessels and Nodes of Mammary Gland
191 Lymphatic Drainage of Breast

Body Wall • Plates 192-201

192 Bony Framework of Thorax
193 Ribs and Associated Joints
194 Anterior Thoracic Wall
195 Anterior Thoracic Wall (continued)
196 Anterior Thoracic Wall: Internal View
197 Intercostal Nerves and Arteries
198 Veins of Internal Thoracic Wall
199 Phrenic Nerve
200 Respiratory Diaphragm: Thoracic Surface
201 Respiratory Diaphragm: Abdominal Surface

Lungs • Plates 202-214

202 Topography of Lungs: Anterior View
203 Topography of Lungs: Posterior View
204 Lungs in Situ: Anterior View
205 Lungs: Medial Views
206 Bronchopulmonary Segments
207 Bronchopulmonary Segments (continued)
208 Trachea and Major Bronchi
209 Bronchi and Intrapulmonary Airways
210 Great Vessels of Superior Mediastinum
211 Bronchial Arteries and Veins
212 Lymph Vessels and Nodes of Lung
213 Autonomic Nerves of Thorax
214 Innervation of Tracheobronchial Tree: Schema

Heart • Plates 215-233

215 Heart in Situ
216 Heart: Anterior Exposure
217 Heart: Radiographs and CT Angiogram; Auscultation of Heart
218 Heart: Base and Diaphragmatic Surface
219 Pericardial Sac
220 Mediastinum: Cross Section
221 Thorax: Coronal Section of Heart and Ascending Aorta
222 Coronary Arteries and Cardiac Veins
223 Coronary Arteries: Imaging
224 Right Atrium and Ventricle
225 Left Atrium and Ventricle
226 Valves and Fibrous Skeleton of Heart
227 Valves and Fibrous Skeleton of Heart (continued)
228 Atria, Ventricles, and Interventricular Septum
229 Conducting System of Heart
230 Nerves of Thorax
231 Innervation of Heart: Schema
232 Innervation of Blood Vessels: Schema
233 Prenatal and Postnatal Circulation

Mediastinum • Plates 234-243

234 Mediastinum: Right Lateral View
235 Mediastinum: Left Lateral View
236 Esophagus in Situ
237 Topography and Constrictions of Esophagus
238 Musculature of Esophagus
239 Esophagogastric Junction
240 Arteries of Esophagus
241 Veins of Esophagus
242 Lymph Vessels and Nodes of Esophagus
243 Nerves of Esophagus

Regional Scans • Plate 244

244 Chest Scans: Axial CT Images

Cross-Sectional Anatomy • Plates 245-248

245 Cross Section of Thorax at T3 Level
246 Cross Section of Thorax at T3-4 Disc Level
247 Cross Section of Thorax at T4-5 Disc Level
248 Cross Section of Thorax at T7 Level

Structures with High Clinical Significance • Tables 4.1-4.2

Muscle Table • Table 4.3

Electronic Bonus Plates • Plates BP44-BP57

BP44 Respiratory System
BP45 Cervical Ribs and Related Anomalies
BP46 Muscle Attachments of Ribs
BP47 Muscles of Respiration
BP48 Intrapulmonary Airways: Schema
BP49 Intrapulmonary Blood Circulation: Schema
BP50 Gas Exchange
BP51 Anterior Aspect of Heart
BP52 Coronary Arteries: Right Anterior Oblique Views with Arteriograms
BP53 Coronary Arteries and Cardiac Veins: Variations
BP54 Intrinsic Nerves and Variations in Nerves of Esophagus
BP55 Arteries of Esophagus: Variations
BP56 Thorax: Coronal Section (Midaxillary Line, Tracheal Bifurcation, Left Atrium)
BP57 Thorax: Coronal CTs

SECTION 5 ABDOMEN • Plates 249-332

Surface Anatomy • Plate 249

249 Abdomen: Surface Anatomy

Body Wall • Plates 250-269

250 Bony Framework of Abdomen
251 Regions and Planes of Abdomen
252 Anterior Abdominal Wall: Superficial Dissection
253 Anterior Abdominal Wall: Intermediate Dissection
254 Anterior Abdominal Wall: Deep Dissection
255 Rectus Sheath: Cross Section
256 Anterior Abdominal Wall: Internal View

257 Posterolateral Abdominal Wall
258 Arteries of Anterior Abdominal Wall
259 Veins of Anterior Abdominal Wall
260 Nerves of Anterior Abdominal Wall
261 Thoracoabdominal Nerves
262 Inguinal Region: Dissections
263 Inguinal Canal and Spermatic Cord
264 Femoral Sheath and Inguinal Canal
265 Posterior Abdominal Wall: Internal View
266 Arteries of Posterior Abdominal Wall
267 Veins of Posterior Abdominal Wall
268 Lymph Vessels and Nodes of Posterior Abdominal Wall
269 Nerves of Posterior Abdominal Wall

Peritoneal Cavity • Plates 270-275

270 Greater Omentum and Abdominal Viscera
271 Mesenteric Relations of Intestines
272 Mesenteric Relations of Intestines (continued)
273 Omental Bursa: Stomach Reflected
274 Omental Bursa: Cross Section
275 Peritoneum of Posterior Abdominal Wall

Viscera (Gut) • Plates 276-283

276 Stomach in Situ
277 Mucosa of Stomach
278 Duodenum in Situ
279 Mucosa and Musculature of Small Intestine
280 Ileocecal Region
281 Ileocecal Region (continued)
282 (Vermiform) Appendix
283 Mucosa and Musculature of Large Intestine

Viscera (Accessory Organs) • Plates 284-289

284 Surfaces and Bed of Liver
285 Liver in Situ: Vascular and Duct Systems
286 Liver Structure: Schema
287 Gallbladder, Extrahepatic Bile Ducts, and Pancreatic Duct
288 Pancreas in Situ
289 Spleen

Visceral Vasculature • Plates 290-299

290 Arteries of Stomach, Liver, and Spleen
291 Arteries of Liver, Pancreas, Duodenum, and Spleen
292 Celiac Arteriogram and CT Angiogram
293 Arteries of Duodenum and Head of Pancreas
294 Arteries of Small Intestine
295 Arteries of Large Intestine

296 Veins of Stomach, Duodenum, Pancreas, and Spleen
297 Veins of Small Intestine
298 Veins of Large Intestine
299 Hepatic Portal Vein Tributaries: Portacaval Anastomoses

Innervation • Plates 300-310

300 Autonomic Nerves and Ganglia
301 Autonomic Innervation of Stomach and Duodenum
302 Autonomic Innervation of Stomach and Duodenum (continued)
303 Autonomic Innervation of Esophagus, Stomach, and Duodenum: Schema
304 Autonomic Innervation of Small Intestine
305 Autonomic Innervation of Large Intestine
306 Autonomic Innervation of Intestines: Schema
307 Autonomic Reflex Pathways: Schema
308 Enteric Plexuses of Intestine
309 Autonomic Innervation of Liver: Schema
310 Autonomic Innervation of Pancreas: Schema

Kidneys and Suprarenal Glands • Plates 311-324

311 Kidneys in Situ: Anterior Views
312 Kidneys in Situ: Posterior Views
313 Renal Artery and Vein in Situ
314 Gross Structure of Kidney
315 Intrarenal Arteries and Renal Segments
316 Ureters in Abdomen and Pelvis
317 Arteries of Ureters and Urinary Bladder
318 Renal Fasciae
319 Lymph Vessels and Nodes of Kidneys and Urinary Bladder
320 Autonomic Nerves of Kidneys, Ureters, and Urinary Bladder
321 Autonomic Innervation of Kidneys and Upper Ureters: Schema
322 Autonomic Nerves of Suprarenal Glands: Dissection and Schema
323 Arteries and Veins of Suprarenal Glands in Situ
324 Abdominal Wall and Viscera: Paramedian (Parasagittal) Section

Lymphatics • Plate 325

325 Abdominal and Pelvic Lymphatics: Schema

Regional Scans • Plates 326-327

326 Abdominal Scans: Axial CT Images
327 Abdominal Scans: Axial CT Images (continued)

Cross-Sectional Anatomy • Plates 328-332

328 Cross Section at T10, Esophagogastric Junction
329 Cross Section at T12, Inferior to Xiphoid
330 Cross Section at T12–L1, Intervertebral Disc
331 Cross Section at L1–2, Intervertebral Disc
332 Cross Section at L3–4

Structures with High Clinical Significance • Tables 5.1-5.2

Muscle Table • Table 5.3

Electronic Bonus Plates • Plates BP58-BP87

BP58 Inguinal and Femoral Regions
BP59 Indirect Inguinal Hernia
BP60 Variations in Position and Contour of Stomach in Relation to Body Habitus
BP61 Layers of Duodenal Wall
BP62 CT and MRCP Showing Appendix, Gallbladder, and Ducts; Nerve Branches of Hepatic Artery
BP63 Topography of Liver
BP64 Variations in Form of Liver
BP65 Sigmoid Colon: Variations in Position
BP66 Variations in Arterial Supply to Cecum and Posterior Peritoneal Attachment of Cecum
BP67 Variations in Pancreatic Duct
BP68 Variations in Cystic, Hepatic, and Pancreatic Ducts
BP69 Variations in Cystic Arteries
BP70 Variations in Hepatic Arteries
BP71 Variations and Anomalies of Hepatic Portal Vein
BP72 Variations in Celiac Trunk
BP73 Variations in Colic Arteries
BP74 Variations in Colic Arteries (continued)
BP75 Variations in Renal Artery and Vein
BP76 Histology of Renal Corpuscle
BP77 Nephron and Collecting Tubule: Schema
BP78 Blood Vessels in Parenchyma of Kidney: Schema
BP79 Lymph Vessels and Nodes of Stomach
BP80 Lymph Vessels and Nodes of Pancreas
BP81 Lymph Vessels and Nodes of Small Intestine
BP82 Lymph Vessels and Nodes of Large Intestine
BP83 Lymph Vessels and Nodes of Liver
BP84 Schematic Cross Section of Abdomen at Middle T12
BP85 Transverse Section of Abdomen: Level of L5, Near Transtubercular Plane
BP86 Transverse Section of Abdomen: Level of S1, Anterior Superior Iliac Spine
BP87 Axial CT Image of Upper Abdomen

SECTION 6 PELVIS AND PERINEUM • Plates 333-401

Surface Anatomy • Plate 333

333 Pelvis and Perineum: Surface Anatomy

Bones and Ligaments • Plates 334-338

334 Bony Framework of Pelvis
335 Male and Female Pelvis: Radiographs
336 Sex Differences of Pelvis: Measurements
337 Bones and Ligaments of Pelvis
338 Bones and Ligaments of Pelvis (continued)

Pelvic Floor and Contents • Plates 339-349

339 Pelvic Diaphragm: Female
340 Pelvic Diaphragm: Female (continued)
341 Pelvic Diaphragm: Female (continued)
342 Pelvic Diaphragm: Male
343 Pelvic Diaphragm: Male (continued)
344 Pelvic Contents: Female
345 Pelvic Viscera and Perineum: Female
346 Pelvic Viscera: Female
347 Endopelvic Fascia and Potential Spaces
348 Pelvic Contents: Male
349 Pelvic Viscera and Perineum: Male

Urinary Bladder • Plates 350-352

350 Urinary Bladder: Orientation and Supports
351 Female Sphincters
352 Urinary Bladder: Female and Male

Uterus, Vagina, and Supporting Structures • Plates 353-357

353 Uterus, Vagina, and Supporting Structures
354 Uterus: Fascial Ligaments
355 Uterus and Adnexa
356 Female Pelvic Relationships
357 Pelvic Ligaments

Perineum and External Genitalia: Female • Plates 358-361

358 Female Perineum and External Genitalia (Pudendum or Vulva)
359 Female Perineum (Superficial Dissection)
360 Female Perineum and Deep Perineum
361 Female Perineal Spaces

Perineum and External Genitalia: Male • Plates 362-369

362 Male Perineum and External Genitalia (Superficial Dissection)
363 Male Perineum and External Genitalia (Deeper Dissection)
364 Penis
365 Male Perineal Spaces
366 Prostate Gland and Seminal Vesicles
367 Urethra
368 Descent of Testis
369 Scrotum and Contents

Homologues of Genitalia • Plates 370-371

370 Homologues of External Genitalia
371 Homologues of Internal Genitalia

Testis, Epididymis, and Ductus Deferens • Plate 372

372 Testis, Epididymis, and Ductus Deferens

Rectum • Plates 373-378

373 Rectum in Situ: Female and Male
374 Ischioanal Fossae
375 Rectum and Anal Canal
376 Anorectal Musculature
377 External Anal Sphincter Muscle: Perineal Views
378 Actual and Potential Perineopelvic Spaces

Regional Scan • Plate 379

379 Pelvic Scans: Sagittal T2-Weighted MRIs

Vasculature • Plates 380-390

380 Arteries of Rectum and Anal Canal: Male Posterior View
381 Veins of Rectum and Anal Canal: Female Anterior View
382 Arteries and Veins of Pelvic Organs: Female Anterior View
383 Arteries and Veins of Testis: Anterior View
384 Arteries of Pelvis: Female
385 Arteries and Veins of Pelvis: Male
386 Arteries and Veins of Perineum and Uterus
387 Arteries and Veins of Perineum: Male
388 Lymph Vessels and Nodes of Pelvis and Genitalia: Female
389 Lymph Vessels and Nodes of Perineum: Female
390 Lymph Vessels and Nodes of Pelvis and Genitalia: Male

Innervation • Plates 391-399

391 Nerves of External Genitalia: Male
392 Nerves of Pelvic Viscera: Male
393 Nerves of Perineum: Male

394 Nerves of Pelvic Viscera: Female
395 Nerves of Perineum and External Genitalia: Female
396 Neuropathways in Parturition
397 Innervation of Female Reproductive Organs: Schema
398 Innervation of Male Reproductive Organs: Schema
399 Innervation of Urinary Bladder and Lower Ureter: Schema

Cross-Sectional Anatomy • Plates 400-401

400 Male Pelvis: Cross Section of Bladder–Prostate Gland Junction
401 Female Pelvis: Cross Section of Vagina and Urethra

Structures with High Clinical Significance • Tables 6.1-6.2

Muscle Tables • Tables 6.3-6.4

Electronic Bonus Plates • Plates BP88-BP98

BP88 Fasciae of Male and Female Pelvis and Perineum
BP89 Male and Female Cystourethrograms
BP90 Female Urethra
BP91 Genetics of Reproduction
BP92 Menstrual Cycle
BP93 Testes
BP94 Uterine Development
BP95 Ovary, Ova, and Follicles
BP96 Variations in Hymen
BP97 Cross Section Through Prostate
BP98 Arteries and Veins of Pelvis: Male

SECTION 7 UPPER LIMB • Plates 402-470

Surface Anatomy • Plate 402

402 Upper Limb: Surface Anatomy

Cutaneous Anatomy • Plates 403-407

403 Dermatomes of Upper Limb and Segmental Nerve Function
404 Cutaneous Innervation of Upper Limb
405 Cutaneous Nerves and Superficial Veins of Proximal Upper Limb
406 Cutaneous Nerves and Superficial Veins of Forearm and Hand
407 Lymph Vessels and Nodes of Upper Limb

Shoulder and Axilla • Plate 408-420

408 Clavicle and Sternoclavicular Joint
409 Humerus and Scapula: Anterior Views
410 Humerus and Scapula: Posterior Views
411 Shoulder: Anteroposterior Radiograph
412 Shoulder with Details of Glenohumeral Joint
413 Muscles of Shoulder
414 Axilla: Posterior Wall
415 Muscles of Rotator (Compressor) Cuff
416 Pectoral, Clavipectoral, and Axillary Fasciae
417 Scapulothoracic and Shoulder Dissection
418 Axillary Artery and Anastomoses Around Scapula
419 Axilla: Anterior View
420 Brachial Plexus: Schema

Arm • Plates 421-425

421 Muscles of Arm: Anterior Views
422 Muscles of Arm: Posterior Views
423 Brachial Artery in Situ
424 Arteries of Arm and Proximal Forearm
425 Arm: Serial Cross Sections

Elbow and Forearm • Plates 426-441

426 Bones of Elbow
427 Elbow: Radiographs
428 Ligaments of Elbow
429 Bones of Forearm
430 Individual Muscles of Forearm: Rotators of Radius
431 Individual Muscles of Forearm: Extensors of Wrist and Digits
432 Individual Muscles of Forearm: Flexors of Wrist
433 Individual Muscles of Forearm: Flexors of Digits
434 Muscles of Forearm (Superficial Layer): Posterior View
435 Muscles of Forearm (Deeper Layer): Posterior View
436 Muscles of Forearm (Superficial Layer): Anterior View
437 Muscles of Forearm (Intermediate Layer): Anterior View
438 Muscles of Forearm (Deep Layer): Anterior View
439 Attachments of Muscles of Forearm: Anterior View
440 Attachments of Muscles of Forearm: Posterior View
441 Forearm: Serial Cross Sections, Anterior View

Wrist and Hand • Plates 442-461

442 Carpal Bones
443 Movements of Wrist
444 Ligaments of Wrist
445 Ligaments of Wrist (continued)
446 Bones of Wrist and Hand