PREFACE

Our Unique Anatomy

Just as the faces of those we encounter daily reveal a stunning array of differences, our internal anatomy also shows remarkable diversity. It is impossible to fully capture the depth of this variation within the confines of this atlas and the limited hours of a human anatomy course. However, we aim to provide foundational content that empowers you with anatomical knowledge applicable to different individuals, whether you are studying anatomical gifts from donors and their families, visualizing living anatomy through clinical imaging, performing a physical exam, or observing a surgical procedure. Just as best practice clinical guidelines must be tailored to a patient's unique needs and circumstances, atlas anatomy serves as a framework and guide for understanding and applying anatomy knowledge. While this atlas primarily focuses on generalized anatomy, we have included Bonus Plates that illustrate a selection of clinically relevant variations, encouraging you to embrace the complexity and individuality inherent in human anatomy.

Clinical Perspective

When the first edition of the Netter *Atlas of Human Anatomy* was published in 1989, it stood out for depicting living people and their underlying anatomy as imagined during a physical examination or surgery rather than the more common illustrations of dissections found in other anatomy atlases at the time. As Dr. Netter was a surgeon, it made sense that his perspective on anatomy was focused on living patients. You will often find the faces of his family, friends, and himself in these illustrations.

Dr. Frank Netter was a surgeon, and Dr. Carlos Machado, the main contributing illustrator since Dr. Netter's passing, is a cardiologist. It is rare for an anatomy atlas to have the artistic insights of true physician-artists, which is a major reason why this atlas is so special. As imaging technology enables increasingly powerful views of human anatomy, it also shapes the content in the *Netter Atlas* and how artists work. In recent editions, radiological imaging and tables of Structures with High Clinical Significance have been added to aid in preparing future clinicians. Three new clinically oriented illustrations of particular note that were created for this Ninth Edition include the complex pathways of the maxillary nerve; a unique view of the cavernous sinus, its tributaries, and spatial relationships, which creates an informative and holistic visual narrative not found anywhere else; and a view of the hepatorenal recess (Morison's pouch) emulating the angle of an ultrasound probe. While the *Netter Atlas of Human Anatomy* takes a clinical perspective in its depictions of normal, healthy, generalized anatomy, it does *not* include clinical conditions. Examples of clinical illustrations are in *Netter's Clinical Anatomy, Netter's Essential Systems-Based Anatomy*, and other Netter publications.

Educational Utility

The *Netter Atlas of Human Anatomy* is available in two different sequences containing the same art and content: (1) a classic regional approach and (2) a systems approach. These two options align with the two most common methods for teaching anatomy. This copy of the *Atlas* follows the classic regional approach.

In both sequences, the order of plates has been deliberately selected to complement the curriculum in which they are used. The systems approach, which was only available in one previous edition, has been significantly reworked to better align with how students learn and dissect in systems-based courses.

The electronic supporting material that comes with the *printed paperback* is extensive and is focused on educational learning resources, including over 300 multiple-choice questions that have been fully reviewed and updated, a Study Guide, 3D models, and over 100 Bonus Plates. Each plate is also accompanied by a Plate Description (formerly known as "Plate Pearls") with concise, bulleted text. Educators can also request supplementary information through their Elsevier sales representative, Evolve.Elsevier.com, or *Evolve Instructor Resources,* including slide decks of the bulleted Plate Description text.

This Ninth Edition introduces more than 100 novel videos created to guide end-users through key structures for select Plates. Each guided tour video begins with an unlabeled atlas image, adding labels step-by-step as key anatomical relationships in the Plate are narrated. These concise videos support learners as they approach their study of complex and dense anatomical regions by narrating and labeling each image in a stepwise and sequential manner. Pairing this videographic approach with the impact of the Netter Atlas art provides a great opportunity to engage contemporary students in the Netter anatomy tradition.

The *hardback, professional edition* of *Netter Atlas of Human Anatomy: Classic Regional Approach* includes access to www.NetterReference.com with a downloadable image bank that includes customized label/line selections in addition to fully labeled and unlabeled Plates. This interactive image bank is also available for institutional licensing.

The Language of Anatomy

Just as we encourage you to embrace the rich diversity found in anatomy, we encourage you to appreciate the various terminologies that may be used throughout your studies and career to describe the same anatomical structure, depending upon the context.

Each edition of the *Netter Atlas* is available in as many as 18 or more languages. The English editions include two terminology options: English or Latin. The use of English versus Latin terminology at a school or by an individual

often reflects a regional preference. This copy uses English terminology.

The Ninth Edition, with either English or Latin terminology, incorporates terms of the *Terminologia Anatomica*, Second Edition (TA2), as published by the Federative International Programme on Anatomical Terminology in 2019 (https://fipat.library.dal.ca./ta2) and adopted by the International Federation of Associations of Anatomy in 2020 and the Universal Anatomical Organization in 2025. A fully searchable database of the updated TA2 can be accessed at TA2Viewer (https://ta2viewer.openanatomy.org). A description of the features of TA2Viewer was published in the journal *Clinical Anatomy* (https://doi.org/10.1002/ca.24162). In addition, TA2Viewer also includes many synonyms, eponyms, and related terms for each structure named in TA2.

Clinical specialties often have distinctive terminology and preferences regarding anatomical structures important to their work. While this adds complexity to anatomical vocabulary and may contribute to potential communication challenges, it can also open one's mind to other ways of thinking about a structure. As you learn about the posterior right subhepatic space, also known as the hepatorenal recess, subhepatic recess, or Morison's pouch, the varying terminology teaches you something slightly different about this anatomy. In the Ninth Edition of the *Netter Atlas,* in addition to TA2, you will see some common clinical eponyms and former or older terms selectively included in parentheses. Because of space constraints, however, synonym coverage is not all-inclusive.

To reduce the amount of text on the page while maximizing information, you will also see abbreviations used in many of the labels. The following abbreviations have been applied throughout:

Muscle/s = m./mm.
Artery/ies = a./aa.
Vein/s = v./vv.
Nerve/s = n./nn.

When vertebral or spinal levels are labeled, they are often shown in an abbreviated way. *Cervical, thoracic, lumbar, sacral,* and *coccygeal* are abbreviated as C, T, L, S, and Co, respectively. For example, the fifth cervical vertebra or spinal nerve may be labeled C5.

Use of Female and Male Terminology

The binary sex language used in the atlas refers to typical phenotypes of chromosomally female (XX) and chromosomally male (XY) individuals. As mentioned above, the atlas covers generalized anatomy and, as such, is a simplification. When possible, atlas plates have been named in relation to the structures depicted rather than in relation to binary sex language. For example, the Ninth Edition introduces a beautiful new plate on the inguinal canal and round ligament of the uterus near the similar inguinal canal and spermatic cord plate. However, the use of the terms *female* and *male* are still used to aid in the navigation of the content both in print and in electronic formats, with the understanding that the appearance of organs and other structures can vary widely within members of the same genetic sex. There has also been a conscious effort made to improve the ratio of representation of sexes in the atlas, which has historically been male-biased.

It is important for the student and clinician in training to know the difference between sex and gender and understand that one's gender identity exists on a nonbinary spectrum that may not necessarily align with sex assignment at birth or chromosomal sex. This understanding is vital when caring for patients.

Evolving Coverage and Context

In the Preface to the First Edition, Dr. Netter stated, "Anatomy of course does not change, but our understanding of anatomy and its clinical significance does change, as do anatomical terminology and nomenclature." With the publication of the Ninth Edition of the *Netter Atlas of Human Anatomy*, Dr. Netter's insights remain as relevant today as they were then. Ongoing feedback from clinicians, educators, researchers, and students worldwide has encouraged reflection and guided the updates included in this edition. Anatomy is a more dynamic field than one might initially expect. Technological advancements, particularly in imaging, evolving clinical practices, changing ethical standards, and a deeper understanding of social constructs and historical biases continue to shape our comprehension and depiction of anatomy. We encourage you to contribute your insights and suggestions to help us continue to evolve the *Netter Atlas* as a valuable resource for future generations. Contact Elsevier at https://tinyurl.com/NetterAtlas9.

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.

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ABOUT THE EDITORS

Carlos A.G. Machado, MD, was born and educated in Rio de Janeiro, Brazil. At the age of 6 years, he recalls having in his hands a copy of the CIBA *Collection of Medical Illustrations*, the first book illustrated by Dr. Netter, published in 1949.

Self-taught in art, Dr. Machado began studying, drawing and painting human anatomy at the age of 11. At 13, he became interested in the photorealism movement, and in middle school he acquired the habit of illustrating his notebooks, regardless of the subject—a practice he continued during medical school: drawing, for example, all the stages of the dissections he performed or took part in. In the second semester of medical school, he became a student teaching assistant in anatomy.

He graduated from the Faculdade de Medicina de Teresópolis in 1982 and completed his residencies in internal medicine, cardiology, and intensive care in 1987, followed by postgraduate specialization in cardiology in 1990 at Dr. Nelson Botelho's Department of Cardiology at Santa Casa da Misericórdia Hospital, Rio de Janeiro. In 1994, he was brought to the United States by Ciba-Geigy to be Dr. Netter's successor, at which point his career as a professional medical illustrator officially began. He meticulously updated a number of Dr. Netter's original plates and created new paintings of his own. He continues to be the main artist contributing to Netter publications, and for the last three decades, he has painted hundreds of new illustrations, including new plates for the best-selling *Netter Atlas of Human Anatomy*.

Although he considers dissection and correlated methods of studying anatomy (latex injection, corrosion cast, and others) fundamental for learning and teaching anatomy, Dr. Machado combines the information obtained from dissection and surgical procedures with that provided by "noninvasive" imaging methods, from conventional radiologic studies to CT (with or without cinematic rendering), MRI, angiogram with digital subtraction, ultrasound (one-, two, and three-dimensional), and so forth. Like surgeons who plan their procedures based on imaging tests, Dr. Machado also likes, whenever possible, to plan the dissections he performs using the same resources.

In 2016, Dr. Machado was presented with the Honored Member Award by the American Association of Clinical Anatomists, by the Society of Anatomy of Rio de Janeiro State in 2020, and by the Chilean Society of Anatomy in 2023. He was also honored with the Professor Trieste Smanio Service Award by the Brazilian Society of Anatomy in 2017, and in 2025 with the title of Distinguished Visitor by the University of Concepción, Chile.

Dr. Machado's photorealistic expertise and his keen insight into the physician-patient relationship inform his vivid and unforgettable visual style. His dedication to researching each topic and subject he paints places him among the premier medical illustrators at work today.

Martha Johnson Gdowski, PhD, earned her BS in Biology, cum laude, from Gannon University in 1990, and a PhD in Anatomy from the Pennsylvania State University College of Medicine in 1995. She completed postdoctoral fellowships at the Cleveland Clinic and Northwestern University School of Medicine before joining the faculty in the Department of Neuroscience at the University of Rochester School of Medicine and Dentistry in 2001. Dr. Gdowski established a neuroscience research laboratory focused on the basal ganglia and its role in sensorimotor integration. Her work has led to several published scientific articles and abstracts, contributing to the understanding of sensorimotor integration in normal and pathological aging. Throughout her career, she has mentored numerous graduate and undergraduate students in Neuroscience and Biomedical Engineering.

Dr. Gdowski is most passionate about her role as an educator. In recent years, her role evolved to include oversight of the training of undergraduate medical students, where she impacts the education of hundreds of students annually. As the leader of a team of eight anatomists, she is responsible for delivering the core anatomical sciences curriculum, including the hands-on anatomical dissection component, ensuring students receive a comprehensive and engaging learning experience. She has also developed novel undergraduate and graduate courses that provide anatomical instruction in the context of implanted medical devices, bridging the gap for biomedical engineers between human anatomy, biomaterials, and biomedical device design. These experiences have enabled her to work with students from diverse ages, races, ethnicities, and economic backgrounds. She has been honored with numerous awards for her teaching and mentoring of students, including the induction into the Rochester Chapter of the Alpha Omega Alpha Honor Medical Society. Outside of her professional endeavors, Martha enjoys gardening and swimming with her husband, Greg Gdowski, PhD, and their dogs, Sophie and Ivy.

Virginia T. Lyons, PhD, is a Professor of Medical Education and the Associate Dean for Pre-clerkship Education at the Geisel School of Medicine at Dartmouth. She received her BS in Biology from Rochester Institute of Technology and her PhD in Cell Biology and Anatomy from the University of North Carolina at Chapel Hill. Dr. Lyons has devoted her career to education in the anatomical sciences, teaching gross anatomy, histology, embryology, and neuroanatomy to medical students and other health professions students at three medical schools (Geisel, University of Virginia, and University of North Carolina). She has led courses and curricula in human gross anatomy and embryology for more than 25 years and is a strong advocate for incorporating engaged pedagogies into medical education. Dr. Lyons has been recognized with numerous awards for teaching

and mentoring students and was elected to the Dartmouth chapter of the Alpha Omega Alpha Honor Medical Society. She is the author of *Netter's Essential Systems-Based Anatomy* and co-author of the Dartmouth Human Anatomy Learning Modules website accessed by students worldwide. Dr. Lyons also served as the Discipline Editor for Anatomy on the Aquifer Sciences Curriculum Editorial Board, working to integrate anatomical concepts into virtual patient cases that are used in multiple settings including clerkships and residency training.

R. Shane Tubbs, MS, PA-C, PhD, is a native of Birmingham, Alabama, and a clinical anatomist. His research interests center on clinical and surgical problems identified and solved with anatomical studies. This investigative paradigm in anatomy has resulted in over 2,200 peer-reviewed publications, approximately 70,000 citations, and an h-index of 100. Dr. Tubbs' laboratory has made novel discoveries in human anatomy, including a new nerve plexus of the craniocervical junction, a new venous sinus of the skull base, a new classification for fractures of the dens, and a new nerve donor for sciatic nerve transfer procedures. Moreover, many anatomical feasibility studies from Dr. Tubbs' laboratory have gone on to be used by surgeons from around the world and have thus resulted in new surgical and clinical procedures such as treating hydrocephalus by shunting cerebrospinal fluid into various bones, restoration of upper limb function in paralyzed patients with neurotization procedures using the contralateral spinal accessory nerve, and harvesting of the clavicle for anterior cervical discectomy and fusion procedures in patients with cervical instability or degenerative spine disease. Specifically, up to 25% of his cadaveric feasibility studies have been used by neurosurgeons, with published results showing improved patient outcomes.

Dr. Tubbs sits on the editorial board of many anatomical journals and has reviewed for over 150 scientific journals. He has been a visiting professor at major institutions in the United States and worldwide. Dr. Tubbs has authored over 60 books and over 75 book chapters. His published books by Elsevier include *Gray's Anatomy Review,* First, Second, and Third Editions*; Gray's Clinical Photographic Dissector of the Human Body,* First, Second, and Third Editions; *Netter's Introduction to Clinical Procedures;* and *Nerves and Nerve Injuries, Volumes 1 and 2*. He was an editor for the 41st and 42nd Editions of the more than 150-year-old *Gray's Anatomy*, co-editor-in-chief for the 43rd Edition of *Gray's Anatomy*, and editor for the Fifth through Ninth Editions of *Netter Atlas of Human Anatomy*. Dr. Tubbs is the editor-in-chief of the journal *Clinical Anatomy* and immediate past-president of the American Association of Clinical Anatomists.

Peter J. Ward, PhD, grew up in Casper, Wyoming, graduated from Kelly Walsh High School and then attended Carnegie Mellon University in Pittsburgh, Pennsylvania. He began graduate school at Purdue University, where he first encountered gross anatomy, histology, embryology, and neuroanatomy. Having found a course of study that engrossed him, he helped teach those courses in the veterinary and medical programs at Purdue. Dr. Ward completed a PhD program in anatomy education and, in 2005, he joined the faculty at the West Virginia School of Osteopathic Medicine (WVSOM) in Lewisburg, West Virginia. There he has taught gross anatomy, neuroscience, embryology, histology, and the history of medicine. Dr. Ward has received numerous teaching awards, including the WVSOM Golden Key Award and the Basmajian Award from the American Association of Anatomists, and has been a three-time finalist in the West Virginia Merit Foundation's Professor of the Year selection. Dr. Ward has served as Council Member and Association Secretary for the American Association of Clinical Anatomists. In conjunction with Bone Clones, Inc., Dr. Ward has produced tactile models that mimic the feel of anatomical structures when intact and when ruptured during the physical examination. He created the YouTube channel Clinical Anatomy Explained! and continues to pursue interesting ways to present the anatomical sciences to the public. Dr. Ward was a Consulting Editor for the Eighth Edition of *Netter Atlas of Human Anatomy;* the Senior Associate Editor for the three volumes of *The Netter Collection of Medical Illustrations: Digestive System*, Third Edition; a contributor to *Gray's Anatomy*, 43rd Edition; and is author of *Netter's Integrated Musculoskeletal System: Clinical Anatomy Explained*.

Paul E. Neumann, MD, was clinically trained in anatomical pathology and neuropathology. Most of his research publications have been in mouse neurogenetics and molecular human genetics. In the past several years, he has concentrated on the anatomical sciences and has frequently written about anatomical terminology and anatomical ontology in the journal *Clinical Anatomy*. As an officer of the Federative International Programme for Anatomical Terminology (FIPAT), he participated in the production of *Terminologia Anatomica* (Second Edition), *Terminologia Embryologica* (Second Edition), and *Terminologia Neuroanatomica*. He has also chaired the Clinical Anatomy Terminology (CAT) Committee of the American Association of Clinical Anatomists (AACA) and was recently appointed the chair of the Anatomical Nomenclature Commission (ANC) by the Universal Anatomical Organization (UAO). In addition to serving as terminology and Latin Editor of the *Netter Atlas of Human Anatomy*, he was a contributor to the 33rd Edition of *Dorland's Illustrated Medical Dictionary*. As a member of the Open Anatomy Project, he participated in the development of TA2Viewer, a web-based human anatomy resource.

Jennifer K. Brueckner-Collins, PhD, is a proud Kentucky native. She pursued her undergraduate and graduate training at the University of Kentucky. During her second year of graduate school there, she realized that her professional

calling was not basic science research in skeletal muscle biology, but was instead helping medical students master the anatomical sciences. She discovered this during a required teaching assistantship in medical histology, where working with students at the 10-headed microscope changed her career path.

The next semester of graduate school, she assisted in teaching dissection-based gross anatomy, although she had taken anatomy when the lab component was prosection-based. After teaching in the first lab, she knew that she needed to learn anatomy more thoroughly through dissection on her own, so she dissected one to two labs ahead of the students that semester; that was when she really learned anatomy and was inspired to teach this discipline as a profession. All of this occurred in the early 1990s, when pursuing a teaching career was frowned upon by many; it was thought that you only pursued this track if you were unsuccessful in research. She taught anatomy part-time during the rest of her graduate training, on her own time, to gain requisite experience to ultimately secure a faculty position.

Dr. Brueckner-Collins spent 10 years at the University of Kentucky as a full-time faculty member teaching dissection-based gross anatomy to medical, dental, and allied health students. Then, after meeting the love of her life, she moved to the University of Louisville and has taught medical and dental students there for more than a decade. Over 20 years of teaching full time at two medical schools in the state, her teaching efforts have been recognized through receipt of the highest teaching honors at each medical school in the state, the 2010 Provost's Teaching Award at University of Kentucky, as well as the 2016 Distinguished Teaching Professorship and 2024 Trustee's Teaching Award at University of Louisville.

Brion Benninger, MD, MBChB, MSc, currently teaches surgical, imaging, and dynamic anatomy to medical students and residents in several countries (United States, New Zealand, China, Japan, Korea, Taiwan, The Caribbean, Mexico). He develops, invents, and assesses ultrasound probes, medical equipment, simulations, and software while identifying dynamic anatomy. He enjoys mixing educational techniques integrating macro imaging and surgical anatomy. Dr. Benninger developed the teaching theory of anatomy deconstruction/reconstruction and was the first to combine ultrasound with Google Glass during physical examination, coining the term "triple feedback examination." An early user of ultrasound, he continues to develop eFAST (Extended Focused Assessment With Sonography in Trauma) teaching and training techniques, has developed and shares a patent on a novel ultrasound finger probe, and is currently developing a new revolutionary ultrasound probe for breast screening. He is a reviewer for several ultrasound, clinical anatomy, surgical, and radiology journals and edits and writes medical textbooks. His research interests integrate clinical anatomy with conventional and emerging technologies to improve training techniques in situ and simulation. Dr. Benninger pioneered and coined the term "dynamic anatomy," developed a technique to deliver novel contrast medium to humans, and was the first to reveal vessels and nerves not previously seen using CT and MRI imaging. He has mentored more than 500 students on over 450 research projects presented at national and international conferences and has received numerous awards for projects related to emergency procedures, ultrasound, sports medicine, clinical anatomy, medical simulation, reverse translational research, medical education, and technology. He is proud to have received medical teaching awards from several countries and institutions, including being the first recipient in more than 30 years to receive the Commendation Medal Award from the Commission of Osteopathic Accreditation for innovative clinical anatomy teaching that he designed and facilitated in Lebanon, Oregon. Dr. Benninger has received sports medicine accolades from Sir Roger Bannister regarding his medical invention on shoulder proprioception. He is also Executive Director of the Medical Anatomy Center and collaborates with colleagues globally from surgical and nonsurgical specialties. He is also an invited course speaker for surgical anatomy in New Zealand. Dr. Benninger collects medical history books, loves mountains and sports, and is an anonymous restaurant critic. British mentors directly responsible for his training include Prof. Peter Bell (surgery); Prof. Sir Alec Jeffreys (genetic fingerprinting); Profs. David deBono and Tony Gershlick (cardiology); Prof. Roger Greenhalgh (vascular surgery); Profs. Chris Colton, John Webb, and Angus Wallace (orthopaedics); Prof. Harold Ellis CBE (surgery and clinical anatomy); and Prof. Susan Standring (Guys Hospital/Kings College).

ACKNOWLEDGMENTS

Carlos A.G. Machado, MD

With the completion of this Ninth Edition, I celebrate 31 years contributing to the Netter brand of educational products, 29 years of which have been dedicated to the update—eight editions—of this highly prestigious, from birth, *Atlas of Human Anatomy*. For these 29 years I have had the privilege and honor of working with some of the most knowledgeable anatomists, educators, and consulting editors—my treasured friends—from whom I have learned considerably.

For the last 20 years it has also been a great privilege to be part of the Elsevier team and be under the skillful and fundamental coordination and orientation of Marybeth Thiel, Elsevier's Senior Content Strategist, and Elyse O'Grady, Publisher. I thank both for their patience, friendship, support, sensibility, and very dedicated work.

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Martha Johnson Gdowski, PhD

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Virginia T. Lyons, PhD

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Peter J. Ward, PhD

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R. Shane Tubbs, MS, PA-C, PhD

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Paul E. Neumann, MD

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Jennifer K. Brueckner-Collins, PhD

Reba McEntire once said "To succeed in life, you need three things: a wishbone, a backbone, and a funny bone." My work with the *Netter Atlas* and the people associated with it over the past 15 years has played an instrumental role in helping me develop and sustain these three metaphorical bones in my professional and personal life.

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Finally, I dedicate my work on this edition with unconditional and infinite love to Kurt, Lincoln, my Mom and Dad in Heaven, as well as my dogs Bingo, Biscuit, and Bella.

Brion Benninger, MD, MBChB, MSc

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