
Rosenberg's Atlas of Clinical Neurology

Olaf Stüve · Sven Meuth
Editors

Rosenberg's Atlas of Clinical Neurology

Fifth Edition

 Springer

Editors

Olaf Stüve
Department of Neurology
University of Texas Southwestern Medical Center
Dallas, TX, USA

Peter O'Donnell Brain Institute
University of Texas Southwestern Medical Center
Dallas, TX, USA

Dallas VA Medical Center
Dallas, TX, USA

Sven Meuth
Department of Neurology
Heinrich Heine University Düsseldorf
Düsseldorf, Nordrhein-Westfalen, Germany

University Hospital Düsseldorf
Düsseldorf, Germany

ISBN 978-3-032-13039-6 ISBN 978-3-032-13040-2 (eBook)

<https://doi.org/10.1007/978-3-032-13040-2>

© The Editor(s) (if applicable) and The Author(s), under exclusive license to Springer
Nature Switzerland AG 2026

This work is subject to copyright. All rights are solely and exclusively licensed by the Publisher, whether the whole or part of the material is concerned, specifically the rights of translation, reprinting, reuse of illustrations, recitation, broadcasting, reproduction on microfilms or in any other physical way, and transmission or information storage and retrieval, electronic adaptation, computer software, or by similar or dissimilar methodology now known or hereafter developed.

The use of general descriptive names, registered names, trademarks, service marks, etc. in this publication does not imply, even in the absence of a specific statement, that such names are exempt from the relevant protective laws and regulations and therefore free for general use.

The publisher, the authors and the editors are safe to assume that the advice and information in this book are believed to be true and accurate at the date of publication. Neither the publisher nor the authors or the editors give a warranty, expressed or implied, with respect to the material contained herein or for any errors or omissions that may have been made. The publisher remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.

This Springer imprint is published by the registered company Springer Nature Switzerland AG
The registered company address is: Gewerbestrasse 11, 6330 Cham, Switzerland

If disposing of this product, please recycle the paper.

Preface

“Learning does not make one learned: there are those who have knowledge and those who have understanding. The first requires memory and the second philosophy.”

— Alexandre Dumas

This profound insight by Alexandre Dumas aptly captures the guiding principle of this new edition of the Clinical Atlas of Neurology. In neurology—as in medicine more broadly—knowledge alone is not sufficient. True understanding requires reflection, synthesis, and the philosophical mindset to see beyond isolated facts and to grasp the broader patterns and mechanisms of disease. With this edition, we aim to bridge the gap between knowledge and understanding through a visual and integrative approach to neurologic disorders.

The Clinical Atlas of Neurology, originally shaped by the vision of Dr. Roger N. Rosenberg, has long served as a trusted visual reference for clinicians, educators, and students. We are honored to continue this legacy and to present an extensively revised and updated edition that reflects the tremendous strides made in clinical neuroscience over the past decade.

Neurology remains a discipline in which visual observation is central to diagnosis and understanding. From neurologic examination findings to advanced imaging modalities—such as MRI, EEG, PET, and sonography—our specialty is uniquely dependent on visual tools to decode both normal brain function and the manifestations of disease.

This Atlas seeks to provide more than just a compendium of images; it offers a comprehensive and coherent visual framework for understanding the clinical presentation, pathophysiology, and molecular basis of neurologic disorders. The goal is to support clinicians not only in acquiring knowledge, but also in cultivating the understanding necessary to deliver thoughtful, high-quality patient care.

Major advances in molecular biology, genetics, immunology, and therapeutics have transformed our field. This edition includes detailed updates on topics such as thrombolytic and endovascular therapies for stroke, deep brain stimulation in Parkinson’s disease, novel antiepileptic medications, and immune-based treatments for demyelinating and autoimmune diseases. New insights into neurodegenerative diseases, including Alzheimer’s disease and movement disorders, are also presented—accompanied by high-resolution visual material that reflects the clinical-molecular correlations at the core of modern neurology.

As in prior editions, each chapter has been written by subject-matter experts and carefully curated to reflect contemporary clinical practice and scientific understanding. Richly illustrated with hundreds of images, algorithms, and explanatory diagrams, the Atlas is intended as a practical tool for daily clinical use, teaching, and lifelong learning.

We are deeply grateful to Dr. Roger N. Rosenberg for his enduring contributions to the conception and realization of this Atlas. Our thanks also go to Lee Klein at Springer for his invaluable editorial support.

In the spirit of Dumas' wisdom, we hope this edition empowers its readers not only to learn, but to understand—to go beyond the accumulation of facts and develop the deeper insight required to care for patients with neurologic disease.

Olaf Stüve
UT Southwestern Medical Center
Dallas, TX, USA

Sven Meuth
Professor of Neurology
Heinrich Heine University Düsseldorf
Düsseldorf, Nordrhein-Westfalen, Germany

Contents

Developmental Disorders	1
Suresh Kotagal, Alma R. Bicknese, Marthand Eswara, Glen A. Fenton, Thomas J. Geller, Dorothy K. Grange, Michael A. Nigro, Joseph Parisi, Thomas Pittman and Lily Wong-Kiesel	
Genetic Diseases of the Nervous System	43
Thomas D. Bird and Suman Jayadev	
Neuroendocrine Disorders	99
Earl A. Zimmerman and Afsaneh Shirani	
Critical Care Neurology	117
Rainer Dziewas, Volker Schulte, Sonja Kumpf, Yousef Hannawi, Jharna N. Shah, Shamir Haji and Marek A. Mirski	
Cerebrovascular Disease	185
Michael Gliem, John-Ih Lee, Julian Caspers, Robin Jansen and Sajjad Muhammad	
Dementias	241
Julia Czech, Charlotte Weyland, Manuela Neumann, Alexander Drzezga and Jörg B. Schulz	
Behavioral Neurology	329
Kaancan Deniz, HyungSub Shim and Daniel Tranel	
Neuro-Oncology	371
Vinay Puduvalli, Michael Youssef, Karen L. Fink and Elisabeth J. Rushing	
Movement Disorders	441
Meagen Salinas and Christian Hartmann	
The Epilepsies	487
Felix Rosenow and Catrin Mann	
Neuromuscular Junction Disorders and Inflammatory Myopathies	529
Tobias Ruck	
Infectious Diseases of the Nervous System	543
Marie Francisca Grill	
Neuroimmunology	595
Benjamin M. Greenberg and Michael R. Swenson	
Headache	613
Dagny Holle-Lee and Marc E. Lenaerts	
Subject Index	625

Contributors

Alma R. Bicknese Sutter Children's Services, Sutter Genetics Clinic, Sacramento, CA, USA

Thomas D. Bird Department of Neurology, University of Washington, Geriatric Research Education and Clinical Center, VA Puget Sound Health Care System, Seattle, WA, USA

Julian Caspers Department of Diagnostic and Interventional Radiology, Medical Faculty and University Hospital Düsseldorf, Heinrich Heine University Düsseldorf, Düsseldorf, Germany

Julia Czech Department of Neurology, University Hospital RWTH Aachen, Aachen, Germany

Kaancan Deniz Department of Neurology, Edward and Pearl Fein Memory and Aging Center, University of California San Francisco, San Francisco, CA, USA

Alexander Drzezga Department of Nuclear Medicine, University Hospital of Cologne, Cologne, Germany

Rainer Dziewas Department of Neurology and Neurolorehabilitation, Klinikum Osnabrück, Academic Teaching Hospital of the University of Münster, Osnabrück, Germany

Marthand Eswara Department of Neurology, Saint Louis University, St. Louis, MO, USA

Glen A. Fenton SSM Cardinal Glennon Children's Hospital, St. Louis, MO, USA

Karen L. Fink Baylor Scott and White Neuro-Oncology Associates, Dallas, USA

Thomas J. Geller Department of Pediatrics, Washington University in St. Louis School of Medicine, St. Louis, MO, USA

Michael Gliem Department of Neurology, Medical Faculty and University Hospital, Düsseldorf, Heinrich Heine University Düsseldorf, Düsseldorf, Germany

Dorothy K. Grange Michigan Institute for Neurological Disorders (MIND), Farmington Hills, MI, USA

Benjamin M. Greenberg Department of Neurology, UT Southwestern Medical Center, Dallas, TX, USA

Marie Francisca Grill Department of Neurology, Mayo Clinic, Scottsdale, AZ, USA

Shamir Haji Neuroscience Intensive Care Unit, Fort Sanders Regional Medical Center, Knoxville, TN, USA

Yousef Hannawi Neurological Institute, Wexner Medical Center, The Ohio State University, Columbus, OH, USA

Christian Hartmann Department of Neurology, University Hospital Düsseldorf, Heinrich-Heine University Düsseldorf, Düsseldorf, Germany

Dagny Holle-Lee Department of Neurology, University Hospital Essen (AöR), Essen, Germany

Robin Jansen Department of Neurology, Medical Faculty and University Hospital Düsseldorf, Heinrich Heine University Düsseldorf, Düsseldorf, Germany

Suman Jayadev Department of Neurology, University of Washington, Seattle, WA, USA

Suresh Kotagal Departments of Laboratory Medicine and Pathology, Mayo Clinic, Rochester, MN, USA

Sonja Kumpf Department of Neurology and Neurolorehabilitation, Klinikum Osnabrück, Academic Teaching Hospital of the University of Münster, Osnabrück, Germany

John-Ih Lee Department of Neurology, Medical Faculty and University Hospital, Düsseldorf, Heinrich Heine University Düsseldorf, Düsseldorf, Germany

Marc E. Lenaerts Department of Neurology, University of California, Sacramento, CA, USA

Catrin Mann Epilepsy Center Frankfurt Rhine-Main, Department of Neurology, Center of Neurology and Neurosurgery, University Medical Center, Goethe University Frankfurt, Frankfurt/Main, Germany

Marek A. Mirski Department of Anesthesiology & Critical Care Medicine, Johns Hopkins Medicine, Baltimore, MD, USA

Sajjad Muhammad Department of Neurosurgery, Medical Faculty and University Hospital, Düsseldorf, Heinrich Heine University Düsseldorf, Düsseldorf, Germany

Manuela Neumann Department of Neuropathology, University Hospital Tübingen, Molecular Neuropathology of Neurodegenerative Diseases, German Center for Neurodegenerative Diseases, Tübingen, Germany

Michael A. Nigro Departments of Laboratory Medicine and Pathology, Mayo Clinic, Rochester, MN, USA

Joseph Parisi Department of Neurosurgery and Pediatrics, University of Kentucky Hospital, Lexington, KY, USA

Thomas Pittman Department of Neurology, Division of Child Neurology, Division of Epilepsy, Mayo Clinic, Rochester, MN, USA

Vinay Puduvalli Department of Neuro-Oncology, UT MD Anderson Cancer Center, Houston, USA

Felix Rosenow Epilepsy Center Frankfurt Rhine-Main, Department of Neurology, Center of Neurology and Neurosurgery, University Medical Center, Goethe University Frankfurt, Frankfurt/Main, Germany

Tobias Ruck Department of Neurology, Ruhr-University Bochum, BG University Hospital Bergmannsheil Bochum, Bochum, Germany

Elisabeth J. Rushing Institute for Neuropathology, University Hospital Zurich, Zurich, Switzerland

Meagen Salinas Rocky Mountain Movement Disorders Center, CenExel Denver, Colorado, Englewood, CO, USA

Volker Schulte Department of Neurology and Neurolorehabilitation, Klinikum Osnabrück, Academic Teaching Hospital of the University of Münster, Osnabrück, Germany

- Jörg B. Schulz** Department of Neurology, University Hospital RWTH Aachen, Aachen, Germany
- Jharna N. Shah** Lysterly Neurosurgery: Cerebrovascular, Baptist Health Jacksonville, Jacksonville, FL, USA
- HyungSub Shim** Department of Neurology, Division of Behavioral Neurology, University of Iowa Hospitals and Clinics, Iowa City, IA, USA
- Afsaneh Shirani** Saint Luke's Marion Bloch Neuroscience Institute, Department of Neurology, University of Missouri-Kansas City, Kansas City, MO, USA
- Michael R. Swenson** Lander Medical Clinic, Lander, WY, USA
- Daniel Tranel** Department of Neurology, Division of Neuropsychology, University of Iowa Hospitals and Clinics, Iowa City, IA, USA
- Charlotte Weyland** Department of Diagnostic and Interventional Neuroradiology, University Hospital RWTH Aachen, Aachen, Germany
- Lily Wong-Kisiel** Department of Neurology, Division of Child Neurology, Division of Epilepsy, Mayo Clinic, Rochester, MN, USA
- Michael Youssef** Department of Neurology and Department of Hematology and Oncology, University of Texas Southwestern Medical Center (UTSW), Neuro-Oncology Clinic—UT Southwestern, Dallas, USA
- Earl A. Zimmerman** Department of Neurology, Albany Medical College, Albany, NY, USA