
FUNDAMENTALS
OF
INTERNAL
MEDICINE

EDITED BY

Donald Kaye • Louis F. Rose

FUNDAMENTALS OF INTERNAL MEDICINE

Edited by

DONALD KAYE, M.D.

Professor and Chairman, Department of Medicine,
The Medical College of Pennsylvania; Chief of Medicine,
The Hospital of The Medical College of Pennsylvania,
Philadelphia, Pennsylvania

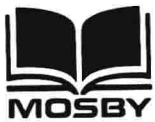
LOUIS F. ROSE, M.D.

Professor of Medicine and Surgery,
The Medical College of Pennsylvania,
Philadelphia, Pennsylvania

with **299** illustrations

The C. V. Mosby Company

ST. LOUIS • TORONTO • LONDON 1983



A TRADITION OF PUBLISHING EXCELLENCE

Editor: Samuel E. Harshberger
Manuscript editors: Judi Wolken, Patricia Tannian, Roger McWilliams
Book design: Susan Trail
Cover design: Suzanne Oberholtzer
Production: Sue Soehngen, Carolyn Biby, Mary Stueck

Copyright © 1983 by The C.V. Mosby Company

All rights reserved. No part of this publication may be reproduced, stored in a retrieval system, or transmitted, in any form or by any means, electronic, mechanical, photocopying, recording, or otherwise, without prior written permission from the publisher.

Printed in the United States of America

The C.V. Mosby Company
11830 Westline Industrial Drive, St. Louis, Missouri 63141

Library of Congress Cataloging in Publication Data

Main entry under title:

Fundamentals of internal medicine.

Bibliography: p.

Includes index.

1. Internal medicine. I. Kaye, Donald.

II. Rose, Louis, F. [DNLM: 1. Internal medicine.
WB 115 F981]

RC46.F947 616 82-3600

ISBN 0-8016-2622-6 AACR2

GW/VH/VH 9 8 7 6 5 4 3 2

05/D/641

SECTION EDITORS

DORIS G. BARTUSKA, M.D.

Professor of Medicine and Chief, Division of Endocrinology and Metabolism, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

ROSALIE A. BURNS, M.D.

Professor and Chairman, Department of Neurology, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

TOBY R. ENGEL, M.D.

Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

HARVEY M. FRIEDMAN, M.D.

Associate Professor of Medicine, University of Pennsylvania School of Medicine; Director, Diagnostic Virology Laboratory, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania

ROSALINE R. JOSEPH, M.D.

Professor of Medicine and Chief, Division of Hematology and Oncology, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

WARREN A. KATZ, M.D.

Clinical Professor of Medicine and Chief, Division of Rheumatology, The Medical College of Pennsylvania; Attending Physician, Moss Rehabilitation Hospital, Philadelphia, Pennsylvania

DONALD KAYE, M.D.

Professor and Chairman, Department of Medicine, The Medical College of Pennsylvania; Chief of Medicine, The Hospital of the Medical College of Pennsylvania, Philadelphia, Pennsylvania

BERNARD A. KIRSHBAUM, M.D.

Clinical Professor of Medicine and Chief, Division of Dermatology, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

SANDRA P. LEVISON, M.D.

Professor of Medicine and Chief, Division of Nephrology and Hypertension, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

WILLIAM L. MORRISSEY, M.D.

Associate Professor of Medicine and Chief, Division of Pulmonary Diseases, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

LOUIS F. ROSE, M.D.

Professor of Surgery, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

WALTER RUBIN, M.D.

Professor of Medicine and Anatomy and Chief, Division of Gastroenterology, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

CONTRIBUTORS

ELIAS ABRUTYN, M.D.

Associate Professor of Medicine, The Medical College of Pennsylvania; Chief, Infectious Diseases, and Assistant Chief of Medical Service, Philadelphia Veterans Administration Medical Center; Adjunct Associate Professor of Medicine, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

STANLEY L. ALTSCHULER, M.D.

Clinical Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

BRAJESH AGARWAL, M.D.

Professor of Medicine, Thomas Jefferson University Medical School, Philadelphia, Pennsylvania; Chief of Medical Services, Veterans Administration Medical and Regional Center, Wilmington, Delaware

PASHA AGARWAL, M.D.

Assistant Professor of Pathology, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

EZRA A. AMSTERDAM, M.D.

Professor of Medicine and Chief, Coronary Care Unit, University of California–Davis School of Medicine and Medical Center, Davis, California

JAMES T. AMSTERDAM, D.M.D., M.D.

Clinical Instructor, Department of Surgery, Division of Dental Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

KARL E. ANDERSON, M.D.

Associate Professor, The Rockefeller University Hospital, New York, New York

ALLAN M. ARBETER, M.D.

Assistant Professor, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

BALU H. ATHREYA, M.D.

Clinical Director, Children's Seashore House; Chief of Rheumatology, The Children's Hospital of Philadelphia; Associate Professor of Pediatrics, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

FRANK BARCH, M.D.

Clinical Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

MICHAEL J. BARRETT, M.D.

Associate Professor of Medicine and Director, Non-Invasive Laboratory, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

WILLIAM E. BARRY, M.D.

Professor of Medicine, Section of Hematology-Oncology, Temple University Health Sciences Center, Philadelphia, Pennsylvania

CHRISTINE P. BASTL, M.D.

Associate Professor of Medicine, Temple University Health Sciences Center, Philadelphia, Pennsylvania

HAROLD BAUMGARTEN, D.M.D.

Clinical Assistant Professor, Department of Form and Function of the Masticatory System, University of Pennsylvania School of Dental Medicine, Philadelphia, Pennsylvania

ANTHONY V. BENEDETTO, D.O.

Clinical Assistant Professor of Medicine (Dermatology), The Medical College of Pennsylvania, Philadelphia, Pennsylvania

JOHN E. BENNETT, M.D.

Head, Clinical Mycology Section, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland

EMMANUEL C. BESA, M.D.

Associate Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

IAIN F.S. BLACK, M.D.

Professor, Department of Pediatrics, Temple University School of Medicine; Chief, Section of Cardiology, St. Christopher's Hospital for Children, Philadelphia, Pennsylvania

RANDOLPH C. BLODGETT, Jr., M.D.

Director, Clinical Investigation—U.S., Clinical Research and Development, Smith Kline & French Laboratories; Clinical Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

GUENTHER BODEN, M.D.

Professor of Medicine and Chief, Division of Diabetes/Metabolism, Temple University School of Medicine, Philadelphia, Pennsylvania

JEROME A. BOSCIA, M.D.

Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

JEROME I. BRODY, M.D.

Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

SHIRLEY BROWN, D.M.D.

Assistant Professor of Surgery, Division of Dental Medicine, The Medical College of Pennsylvania; Clinical Assistant Professor of Oral Medicine, University of Pennsylvania, School of Dental Medicine, Philadelphia, Pennsylvania

R. MICHAEL BUCKLEY, Jr., M.D.

Clinical Assistant Professor of Medicine, University of Pennsylvania School of Medicine; Infectious Disease Section, Pennsylvania Hospital, Philadelphia, Pennsylvania

BERNADINE HEALY BULKLEY, M.D.

Associate Professor of Medicine, Assistant Professor of Pathology, and Assistant Dean, Postdoctoral Program and Faculty Development, Johns Hopkins University School of Medicine, Baltimore, Maryland

CHARLES A. BUSH, M.D.

Associate Professor of Medicine, Division of Cardiology, and Director, Cardiac Catheterization Laboratories, Ohio State University College of Medicine, Columbus, Ohio

†LEOPOLD CANALES, M.D.

Associate Professor of Neurology, The Medical College of Pennsylvania; Chief of Neurology, Philadelphia Veterans Administration Medical Center, Philadelphia, Pennsylvania

DAVID M. CAPUZZI, M.D., Ph.D.

Chairman of Research, The Lankenau Medical Research Center; Associate Professor of Medicine, The Medical College of Pennsylvania; Associate Professor of Medicine (Adjunct), University of Pennsylvania, Philadelphia, Pennsylvania

JAIME CARRIZOSA, M.D.

Formerly Associate Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

HUGH J. CARROLL, M.D.

Professor of Medicine and Director, Electrolyte and Hypertension Division, State University of New York, Downstate Medical Center, Brooklyn, New York

PATRICIA M. CATALANO, M.D.

Clinical Assistant Professor of Medicine, Thomas Jefferson University Medical School, Philadelphia, Pennsylvania

ANTHONY N. DeMARIA, M.D.

Professor of Medicine and Chief, Cardiology Division, University of Kentucky School of Medicine, Lexington, Kentucky

SANDEEP DHAND, M.D.

Clinical Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

VASANT DHOPESH, M.D.

Associate Professor, Department of Neurology, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

NIKOLAY V. DIMITROV, M.D.

Professor of Medicine, Department of Medicine, College of Human Medicine, Michigan State University, East Lansing, Michigan

GERALD R. DONOWITZ, M.D.

Assistant Professor of Medicine, University of Virginia School of Medicine, Charlottesville, Virginia

MARY B. DRATMAN, M.D.

Professor, Department of Medicine, The Medical College of Pennsylvania; Medical Investigator, Veterans Administration Medical Center, Philadelphia, Pennsylvania

W. BRUCE DUNKMAN, M.D.

Chief, Clinical Cardiology Service, Veterans Administration Medical Center; Assistant Professor of Medicine, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

DAVID DUNN, M.D.

Associate Professor of Neurology and Anatomic Pathology, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

ROGER DUVOISIN, M.D.

Professor and Chairman, Department of Neurology, University of Medicine and Dentistry of New Jersey, Rutgers Medical School; Director, Neurology Service, Middlesex General Hospital, New Brunswick, New Jersey

†Deceased.

NORMAN H. ERTEL, M.D.

Chief, Medical Service, Veterans Administration Medical Center, East Orange, New Jersey; Professor of Medicine, College of Medicine and Dentistry of New Jersey, New Jersey Medical School, Newark, New Jersey

GERALD H. ESCOVITZ, M.D.

Associate Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

CALVIN EZRIN, M.D.

Clinical Professor of Medicine, Cedars-Sinai Medical Center, University of California—Los Angeles, Los Angeles, California

ANTHONY S. FAUCI, M.D.

Chief, Laboratory of Immunoregulation, National Institute of Allergy and Infectious Diseases, National Institutes of Health, Bethesda, Maryland

PEDRO C. FERNANDEZ, M.D.

Director, Hemodialysis Unit, Philadelphia Veterans Administration Medical Center; Associate Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

JAMES O. FINNEGAN, M.D.

Associate Professor of Surgery and Chief, Division of Cardiothoracic Surgery, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

GARY R. FLEISHER, M.D.

Assistant Professor of Pediatrics, University of Pennsylvania School of Medicine; Division of Infectious Diseases, The Children's Hospital of Philadelphia, Philadelphia, Pennsylvania

JOSEPH A. FRANCIOSA, M.D.

Professor of Medicine and Chief, Cardiovascular Division, University of Arkansas for Medical Sciences, Little Rock, Arkansas

WILLIAM O. FRANK, M.D.

Assistant Professor of Medicine, The Medical College of Pennsylvania; Staff Physician, Philadelphia Veterans Administration Medical Center, Philadelphia, Pennsylvania

FRANK H. GARDNER, M.D.

Professor of Medicine and Director, Division of Hematology-Oncology, University of Texas Medical Branch, Galveston, Texas

ELAINE GERMAN, M.D.

Director of Medicine, United Hospitals of Newark; Clinical Professor of Medicine, New Jersey College of Medicine, Newark, New Jersey

LEONARD S. GIRSH, M.D.

Clinical Associate Professor of Medicine and Chief, Division of Allergy and Clinical Immunology, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

STEPHEN J. GLUCKMAN, M.D.

Chief, Infectious Disease Section, Pennsylvania Hospital; Clinical Assistant Professor of Medicine, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

ERNEST M. GOLD, M.D.

Executive Associate Dean and Professor of Internal Medicine, University of California—Davis School of Medicine, Davis, California

ROBERT H. GORDON, M.D.

Clinical Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

HARRY GOTTLIEB, M.D.

Clinical Professor of Medicine and Chief, Subsection of Diabetes and Metabolic Diseases, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

ROBERT A. GROSSMAN, M.D.

Associate Professor of Medicine, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

LINDA B. HINER, M.D.

Associate Professor of Pediatrics, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

ROBERT D. HOELDTKE, M.D., Ph.D.

Assistant Professor of Medicine, Division of Metabolism, Temple University School of Medicine, Philadelphia, Pennsylvania

BRUCE I. HOFFMAN, M.D.

Clinical Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

WILLIAM A. HORTON, M.D.

Associate Professor of Medicine and Pediatrics, University of Kansas School of Medicine, Kansas City, Kansas

LEONORE C. HUPPERT, M.D.

Assistant Professor of Obstetrics and Gynecology, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

GRAHAM H. JEFFRIES, M.B., Ch.B., D.Phil.

Professor and Chairman, Department of Medicine, The Pennsylvania State University College of Medicine, Hershey, Pennsylvania

SERGIO A. JIMENEZ, M.D.

Director, Collagen Research Laboratories, and Associate Professor of Medicine, Rheumatology Section, Department of Medicine, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

THOMAS C. JONES, M.D.

Professor of Medicine and Chief, Division of International Medicine, Cornell University Medical College, New York, New York

JAMES A. JOYE, M.D.

Assistant Professor of Internal Medicine, University of California–Davis School of Medicine, Davis, California

ATTALLAH KAPPAS, M.D.

Professor and Physician-in-Chief, The Rockefeller University Hospital, New York, New York

JOHN H. KARAM, M.D.

Associate Professor of Medicine and Chief, Clinical Endocrinology, Moffitt Hospital, University of California–San Francisco School of Medicine, San Francisco, California

JULIAN KATZ, M.D.

Clinical Professor of Medicine, Lecturer in Biochemistry and Physiology, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

LOIS ANNE KATZ, M.D.

Associate Chief, Nephrology, and Associate Chief of Staff for Ambulatory Care, New York Veterans Administration Medical Center; Associate Professor of Clinical Medicine, New York University School of Medicine, New York, New York

PAUL KATZ, M.D.

Assistant Professor of Medicine, Division of Clinical Immunology, University of Florida College of Medicine, Gainesville, Florida

JUNE F. KLINGHOFFER, M.D.

Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

OKSANA M. KORZENIOWSKI, M.D.

Assistant Professor of Medicine, The Medical College of Pennsylvania; Department of Medicine, Philadelphia Veterans Administration Medical Center, Philadelphia, Pennsylvania

PAUL J. KOVNAT, M.D.

Associate Clinical Professor of Medicine, The University of New Mexico School of Medicine, Albuquerque, New Mexico

SAMUEL T. KUNA, M.D.

Assistant Professor of Medicine, University of Texas Medical School at Galveston, Galveston, Texas

ELIZABETH D. LABOVITZ, M.D.

Associate Professor of Medicine, Division of Nephrology and Hypertension, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

SALLY D. LANE, M.D.

Clinical Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

ROBERT L. LAVINE, M.D.

Associate Professor of Medicine and Associate Director, Division of Endocrinology and Metabolism, Hahnemann Medical College and Hospital of Philadelphia, Philadelphia, Pennsylvania

GEOFFREY LEFFERTS, M.D.

Associate Professor of Medicine and Chief, Division of General Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

HARVEY B. LEFTON, M.D.

Clinical Associate Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

CARL V. LEIER, M.D.

Associate Professor of Medicine and Pharmacology, Division of Cardiology, Department of Medicine, Ohio State University College of Medicine, Columbus, Ohio

GREGORY S. LENCHNER, M.D.

Clinical Assistant Professor of Medicine, Hahnemann Medical College and Hospital, Philadelphia, Pennsylvania

SANFORD LEVINE, M.D.

Chief, Pulmonary Diseases Section, Veterans Administration Medical Center; Associate Professor of Medicine, The Medical College of Pennsylvania; Adjunct Associate Professor of Medicine, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

MATTHEW E. LEVISON, M.D.

Professor of Medicine and Chief, Division of Infectious Diseases, Department of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

DONALD H. LIEBERMAN, M.D.

Clinical Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

KAREN LIPINSKI, M.D.

Assistant Dermatologist to the Outpatient Clinic, Bryn Mawr Hospital, Bryn Mawr, Pennsylvania

SAL A. LOFARO, M.D.

Attending Physician, Delaware County Memorial Hospital, Drexel Hill, Pennsylvania

REGINALD I. LOW, M.D.

Assistant Professor of Medicine, Section of Cardiovascular Medicine, University of California–Davis School of Medicine, University of California–Davis Medical Center, Davis, California

ROBERT J. LUCHI, M.D.

Professor and Vice-Chairman, Department of Medicine, Baylor College of Medicine; Chief, Medical Service, Veterans Administration Medical Center, Houston, Texas

JERRY C. LUCK, M.D.

Assistant Professor of Medicine, Baylor College of Medicine, Houston, Texas

DAVID T. LUSH, M.D.

Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

MALCOLM W. MacNAB, M.D., Ph.D.

Instructor, Department of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

GERALD L. MANDELL, M.D.

Professor of Medicine and Head, Division of Infectious Disease, University of Virginia School of Medicine, Charlottesville, Virginia

CLARENCE MARTIN, M.D.

Instructor in Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

DEAN T. MASON, M.D.

Professor of Medicine and Physiology, University of California–Davis School of Medicine, University of California–Davis Medical Center; Editor-in-Chief, American Heart Journal, Davis, California

DEBORAH MAYER, C.R.N.P.

Head Nurse, Biological Response Modifiers Program, National Cancer Institute, Frederick, Maryland

MARIAN F. McNAMARA, M.D.

Associate Professor of Surgery and Head of the Division of Vascular Surgery, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

STEVEN G. MEISTER, M.D.

Professor of Medicine and Chief, Cardiology Division, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

HIROSHI MITSUMOTO, M.D.

Assistant Professor of Neurology and Neuropathology, Veterans Administration Medical Center and Case Western Reserve University School of Medicine, Cleveland, Ohio

THEODORE L. MUNSAT, M.D.

Professor and Chairman, Department of Neurology, and Neurologist-in-Chief, Tufts–New England Medical Center, Boston, Massachusetts

DAVID M.F. MURPHY, M.B., M.R.C.P. (U.K.)

Assistant Professor of Medicine and Director of the Pulmonary Function Laboratory, Hospital of the University of Pennsylvania, Philadelphia, Pennsylvania

RALPH M. MYERSON, M.D.

Clinical Professor of Medicine, The Medical College of Pennsylvania; Group Director, Smith Kline & French Laboratories, Philadelphia, Pennsylvania

ROBERT G. NARINS, M.D.

Professor of Medicine and Chief, Renal Section, Temple University Health Sciences Center, Philadelphia, Pennsylvania

THOMAS F. NIKOLAI, M.D.

Clinical Associate Professor of Medicine, University of Wisconsin Medical School; Staff Physician, Department of Internal Medicine, Section of Endocrinology, Marshfield Clinic, Marshfield, Wisconsin

STEVEN NUSSBAUM, M.D.

Clinical Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

MAN S. OH, M.D.

Associate Professor of Medicine and Co-Director, Electrolyte and Hypertension Division, State University of New York Downstate Medical Center, Brooklyn, New York

GEORGE A. OMURA, M.D.

Professor of Medicine, University of Alabama in Birmingham, Birmingham, Alabama

OLIVER OWEN, M.D.

Professor of Medicine, Temple University School of Medicine, Philadelphia, Pennsylvania

GEORGE PAULSON, M.D.

Clinical Professor of Neurology, Ohio State University College of Medicine; Program Director, Neurology, Riverside Methodist Hospital, Columbus, Ohio

STEVEN J. PEITZMAN, M.D.

Associate Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

LEWIS PERELMUTTER, Ph.D.

Chief, Immunology, Bureau of Medical Biochemistry, Laboratory Center for Disease Control; Senior Lecturer in Immunology, Department of Medicine, University of Ottawa, Ottawa, Ontario, Canada

GEORGE A. POPORAD, M.D.

Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

T.K.S. RAO, M.D.

Associate Professor of Medicine, State University of New York Downstate Medical Center, Brooklyn, New York

HOWARD RASMUSSEN, M.D., Ph.D.

Professor of Medicine, Physiology, and Cell Biology and Chief, Division of Endocrinology, Yale University School of Medicine, New Haven, Connecticut

MICHAEL F. REIN, M.D.

Associate Professor of Medicine, Division of Infectious Disease, University of Virginia School of Medicine, Charlottesville, Virginia

LESLIE I. ROSE, M.D.

Professor of Medicine and Director of the Section of Endocrinology-Metabolism, Hahnemann Medical College and Hospital, Philadelphia, Pennsylvania

MARC ROSENSHEIN, M.D.

Clinical Assistant Professor of Medicine, University of Washington School of Medicine, Seattle, Washington

MORTON RUBENSTEIN, M.D.

Clinical Assistant Professor of Medicine, Pennsylvania State University College of Medicine, Hershey, Pennsylvania; Associate Medical Director, Department of Respiratory Services, Harrisburg Hospital, Harrisburg, Pennsylvania

DONALD H. RUBIN, M.D.

Assistant Professor of Medicine, Departments of Medicine and Microbiology, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

MICHAEL R. RUDNICK, M.D.

Associate Professor of Medicine and Director of Hemodialysis, Temple University Health Sciences Center, Philadelphia, Pennsylvania

MERLE A. SANDE, M.D.

Professor and Vice Chairman, Department of Medicine, University of California-San Francisco; Chief of Medical Services, San Francisco General Hospital, San Francisco, California

JEROME SANTORO, M.D.

Clinical Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

SHIGERU SASSA, M.D., Ph.D.

Associate Professor, The Rockefeller University Hospital, New York, New York

W. MICHAEL SCHELD, M.D.

Assistant Professor of Internal Medicine, Infectious Diseases and Neurosurgery, University of Virginia School of Medicine, Charlottesville, Virginia

MARTIN SCHIMMEL, M.D.

Clinical Associate Professor of Medicine, Division of Endocrinology and Metabolism, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

PAUL L. SCHRAEDER, M.D.

Associate Professor of Neurology and Director, Epilepsy Treatment Program, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

I. ROBERT SCHWARTZ, M.D.

Director, Blood Bank, Albert Einstein Medical Center, Northern Division; Clinical Associate Professor of Medicine, Schools of Medicine and Dentistry, Temple University, Philadelphia, Pennsylvania

RICHARD K. SHADDUCK, M.D.

Professor of Medicine, University of Pittsburgh School of Medicine; Head, Hematology-Oncology Unit, Montefiore Hospital, Pittsburgh, Pennsylvania

CHARLES R. SHUMAN, M.D.

Professor of Medicine, Temple University School of Medicine, Philadelphia, Pennsylvania

PAUL D. SIEGEL, M.D.

Clinical Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

SURENDER SINGH, M.D.

Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

GREGORY W. SISKIND, M.D.

Professor of Medicine and Head of the Division of Allergy and Immunology, Department of Medicine, The New York Hospital-Cornell Medical Center, New York, New York

RICHARD V. SMALLEY, M.D.

Chief, Biologic Resources Branch, Biologic Response Modifiers Program, National Cancer Institute, Frederick, Maryland

RICHARD SNEPAR, M.D.

Formerly Instructor in Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

ROGER D. SOLOWAY, M.D.

Professor of Medicine, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

†MAURICE SONES, M.D.

Clinical Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

JOHN M. STANG, M.D.

Assistant Professor of Medicine, Division of Cardiology, and Director, Coronary Care, Ohio State University College of Medicine, Columbus, Ohio

STUART E. STARR, M.D.

Assistant Professor of Pediatrics, University of Pennsylvania School of Medicine, Philadelphia, Pennsylvania

MARY CATHERINE STOM, M.D.

Assistant Professor of Medicine, Renal Section, Temple University Health Sciences Center, Philadelphia, Pennsylvania

†Deceased.

JOSEPH U. TOGLIA, M.D.

Professor of Neurology and Director of Electrodiagnostic Laboratories, Temple University Hospital and School of Medicine, Philadelphia, Pennsylvania

KATHLEEN E. TOOMEY, M.D.

Assistant Professor, Child Health and Development, George Washington University, Children's Hospital National Medical Center, Washington, D.C.

WALLACE W. TOURTELLOTTE, M.D., Ph.D.

Chief of Neurology, Veterans Administration Medical Center-Wadsworth; Professor and Vice-Chairman, Department of Neurology, University of California-Los Angeles School of Medicine, Los Angeles, California

MICHAEL J. WALSH, M.B., B.Ch.

Assistant Professor, Department of Neurology, University of California-Los Angeles School of Medicine, Los Angeles, California

PAUL B. WEISBERG, M.D.

Clinical Assistant Professor of Medicine, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

ARNOLD WEISGOLD, D.D.S.

Professor and Chairman, Department of Form and Function of the Masticatory System, University of Pennsylvania, School of Dental Medicine, Philadelphia, Pennsylvania

GARY B. WEISS, M.D., Ph.D.

Assistant Professor of Medicine, Division of Hematology-Oncology, University of Texas Medical Branch, Galveston, Texas

WILLIAM WEISS, M.D.

Professor of Medicine and Director, Division of Occupational Medicine, Hahnemann Medical College and Hospital, Philadelphia, Pennsylvania

NELSON M. WOLF, M.D.

Associate Professor of Medicine and Director, Cardiac Catheterization Laboratory, The Medical College of Pennsylvania, Philadelphia, Pennsylvania

CLINTON W. YOUNG, M.D.

Assistant Professor of Medicine, University of California-San Francisco Medical School; Associate Director of Medical Education and Director, Medical Clinics, Presbyterian Hospital, San Francisco, California

JAMES B. YOUNG, M.D.

Associate Director of Cardiology, Ben Taub General Hospital; Assistant Professor of Medicine, Baylor College of Medicine, Houston, Texas

To my wife
Janet
my children
Kenneth, Karen, Kendra, and Keith
and my parents
with love
D.K.

To my wife
Claire
my children
David and Michael
and my parents and grandmother
with love
L.F.R.

PREFACE

This textbook describes the basic mechanisms involved in the various disease processes included in internal medicine, the symptoms they produce, and the manner in which they are diagnosed and managed. The information available in the field of internal medicine is enormous, and we believed that a complete yet concise textbook was needed. We therefore concentrated on including material that would be appropriate for medical students, residents, and practitioners of internal medicine.

Since we did not restrict the contributing authors by imposing rigid boundaries that might have limited their freedom to provide broad coverage of their subject, inevitably there is some overlap. However, we tried to minimize duplication by the use of cross-referencing and indexing, to exclude highly speculative material, and to avoid extensive bibliographies. The bibliographies at the end of the chapters are for the most part limited to reviews and monographs that contain comprehensive bibliographies. The text was kept current by rapid processing of the manuscript with review and modification just before publication. All the chapters were written by experts in their fields who have considerable clinical experience.

The textbook has been arranged by organ systems with a description of the disease entities affecting each system. To minimize repetition, it was necessary to arbitrarily classify a disease within a specific system. For example, gout is discussed in the section "Rheumatic and Granulomatous Diseases," but it could just as properly have been classified as a metabolic or renal disease. When such multi-system diseases are described primarily under one system, cross-references to the major description are included.

The following is a brief discussion of each section. "Approach to Evaluation of the Patient" is a description of how to take a comprehensive medical history and perform a physical examination. "Immunologic and Allergic Diseases" includes a review of immunologic principles and a discussion of diseases of allergy. "Rheumatic and Granulomatous Diseases" describes the arthritic diseases, as well as the connective tissue disorders and noninfectious granulomatous diseases that share a tendency toward multi-organ involvement, musculoskeletal manifestations, and a variety of immunologic phenomena. "Microbial Diseases" includes a general discussion of infectious diseases and a description of infections caused by viral, bacterial, fungal, protozoal, and helminthic agents. Infections are delineated by anatomic site, as well as by microbial organism. "He-

matologic Disorders" is divided into three major parts: red blood cell disorders and iron metabolism, white blood cell disorders (including plasma cell disorders and lymphomas), and hemostatic disorders. Although specific tumors are described with the organ systems in which they occur, the section "Neoplastic Diseases" is included to outline the principles of pathophysiology, diagnosis, and therapy. "Cardiovascular Diseases" presents the physiologic disorders (heart failure, hypertension, shock, and arrhythmias) and anatomic abnormalities (pulmonary embolism, thrombophlebitis, congenital and valvular heart disease, primary cardiac muscle diseases, pericarditis, and diseases of the coronary arteries and other blood vessels) of the cardiovascular system. "Genetics and Metabolism" describes genetic principles and the inherited and acquired disorders of metabolism. "Endocrinology" presents the endocrine disorders. "Disorders of the Digestive System" describes the normal structure and function of the gastrointestinal tract, signs and symptoms of diseases, and methods of diagnosis. The disorders are discussed systematically, starting with the esophagus and moving down the gastrointestinal tract. Nutritional disorders are also included in this section.

"Diseases of the Kidney and Disturbances in Electrolyte and Acid-Base Metabolism" describes the structure and function of the kidney in health and disease. Disturbances in fluid, electrolyte, and acid-base metabolism are considered in this section with the recognition that the kidneys exert the major control in regulating these processes. "Respiratory Diseases" discusses the normal structure and function of the lungs and the diseases affecting the lungs. "Environmental Injuries" includes some traumatic disorders (such as electrical shock) that are not ordinarily considered a part of internal medicine. However, in an emergency these conditions may be treated by an internist. "Neurologic Diseases" describes the neurologic disorders and diseases of muscle that are commonly seen and treated by internists. These include diseases affecting consciousness and cognition, seizure disorders, headache, vertigo, and degenerative, inflammatory, vascular, and neoplastic diseases of the nervous system. "Skin Diseases and Cutaneous Manifestations of Systemic Diseases" discusses many of the common primary skin diseases likely to be seen by an internist. In addition, this section describes the skin manifestations of systemic diseases, including endocrine, metabolic, gastrointestinal, hepatic, renal, hematologic, and connective tissue disorders. "Oral Diseases" is an

overview of dentistry, including common dental concepts, caries and periodontal disease, the manifestations of systemic conditions in the periodontal tissues, and the detection and treatment of oral cancer, diseases of the salivary glands, and lesions of the oral mucosa and tongue.

We would like to thank our wives, Janet Kaye and Claire Rose, and our children, Kenneth, Karen, Kendra, and Keith Kaye and David and Michael Rose, for their patience. Those who have never taken part in a project such as this cannot possibly appreciate the enormity of the task and the many hundreds of hours required that we might otherwise have spent with our families. Special thanks are

due the section editors who took much of the load off our shoulders and without whom we could never have completed this book. We also thank our office staff who were so helpful in the preparation of the book: Margaret Nyalka, Faith Shoemaker, Beverly Kravitz, and Janet Mintzer. Finally, we wish to thank the staff at The C.V. Mosby Company, whose expert and accurate editing, prompt processing, and encouragement allowed the rapid publication of this text.

Donald Kaye
Louis F. Rose

CONTENTS

Section One

APPROACH TO EVALUATION OF THE PATIENT

edited by **Donald Kaye**

Introduction

David T. Lush and **Geoffrey Lefferts**

1 History, 1

David T. Lush and **Geoffrey Lefferts**

Patient identification, 1
Source of information, 1
Chief complaint, 1
Present illness, 2
Past history, 2
Review of systems, 2
Social history, 3
Family history, 3

2 Physical examination, 3

David T. Lush and **Geoffrey Lefferts**

Methods, 3
Preliminaries, 3
Specific areas, 3

Section Two

IMMUNOLOGIC AND ALLERGIC DISEASES

edited by **Warren A. Katz** and **Donald Kaye**

3 Immunologic principles, 10

Donald Kaye and **Warren A. Katz**

Lymphocytic system, 10
Immunoglobulins, 11
Phagocytic system, 12
Complement system, 12
Types of immunologic reactions, 13
 Type I reactions, 13
 Type II reactions, 13
 Type III reactions, 14
 Type IV reactions, 14
Autoimmunity, 14
Immune-complex disease, 14
Graft-versus-host disease, 14

4 Atopic disease, 15

Gregory W. Siskind

Rhinitis, 15
Asthma of allergic etiology, 18

5 Urticaria and angioedema, 20

Leonard S. Girsh and **Lewis Perelmutter**

Urticaria pigmentosa (systemic mastocytosis), 21
Hereditary angioedema, 21

6 Serum sickness, 21

Leonard S. Girsh and **Lewis Perelmutter**

7 Contact dermatitis, 22

Leonard S. Girsh and **Lewis Perelmutter**

8 Drug allergy, 22

Leonard S. Girsh and **Lewis Perelmutter**

9 Immunodeficiency diseases, 24

Leonard S. Girsh and **Lewis Perelmutter**

Disorders of B lymphocytes, 25
Disorders of T lymphocytes, 25
Disorders of polymorphonuclear leukocytes, 25
Defects in the complement system, 25
Evaluation of immunity, 25
 B-cell function, 25
 T-cell function, 25
 Complement, 26
 Leukocytes, 26
Classification, 26
 Defects in B-cell function (antibody production), 26
 X-linked agammaglobulinemia (Bruton type), 26
 X-linked immunodeficiency with hyper-IgM, 26
 Selective deficiencies of immunoglobulin, 26
 IgA deficiency, 26
 Other isotype deficiencies, 26
 Common variable (unclassifiable) immunodeficiency (acquired agammaglobulinemia), 26
 Wiskott-Aldrich syndrome, 27
 Immunodeficiency with thymoma, 27
 Defects in T-cell function (cellular immunity), 27
 DiGeorge's syndrome, 27
 Ataxia-telangiectasia, 27
 Chronic mucocutaneous candidiasis, 27
 Defects in both B- and T-cell function, 27
 Combined systems disease, 27
 Management, 27

Section Three

RHEUMATIC AND GRANULOMATOUS DISEASESedited by **Warren A. Katz**

- 10 Rheumatoid arthritis, 29**
Warren A. Katz
Sjögren's syndrome, 31
- 11 Juvenile rheumatoid arthritis, 37**
Balu H. Athreya
- 12 Ankylosing spondylitis, 41**
Randolph C. Blodgett, Jr.
- 13 Psoriatic arthritis, 44**
Warren A. Katz
- 14 Reiter's syndrome, 46**
Warren A. Katz
- 15 Intermittent rheumatic diseases, 47**
Randolph C. Blodgett, Jr.
Intermittent hydrarthrosis, 47
Palindromic rheumatism, 47
Familial Mediterranean fever, 48
Behçet's syndrome, 48
- 16 Systemic lupus erythematosus, 49**
June F. Klinghoffer
Drug-induced connective tissue disease
(drug-induced lupus), 53
Chronic discoid lupus erythematosus, 53
- 17 Systemic sclerosis, 53**
Sergio Jimenez
Mixed connective tissue disease, 57
Eosinophilic fasciitis, 57
Scleredema, 57
Scleromyxedema, 58
Sclerodermatous changes, 58
- 18 Raynaud's phenomenon, 59**
Warren A. Katz
- 19 Polymyositis and dermatomyositis, 61**
Donald H. Lieberman
- 20 Vasculitis, 62**
Paul Katz and Anthony S. Fauci
Systemic necrotizing vasculitis, 63
Hypersensitivity vasculitis, 64
Wegener's granulomatosis, 65
Lymphomatoid granulomatosis, 65
Giant cell arteritides, 65
Other vasculitides, 66
Thromboangiitis obliterans, 66
Mucocutaneous lymph node syndrome, 66
- 21 Schönlein-Henoch purpura, 67**
Warren A. Katz
- 22 Wegener's granulomatosis and midline granuloma, 68**
Paul Katz and Anthony S. Fauci
Wegener's granulomatosis, 68
Midline granuloma, 70
- 23 Polymyalgia rheumatica and temporal arteritis, 72**
June F. Klinghoffer
- 24 Sarcoidosis, 73**
Warren A. Katz
- 25 Weber-Christian disease, 76**
Robert H. Gordon
- 26 Infectious arthritis, 77**
Bruce I. Hoffman
Pyogenic arthritis, 77
Gonococcal arthritis, 77
Nongonococcal septic arthritis, 78
Tuberculous and fungal arthritis, 79
Arthritis caused by *Mycobacterium tuberculosis*, 79
Arthritis caused by other mycobacteria, 79
Arthritis caused by fungi, 79
Arthritis caused by viruses, 80
- 27 Osteomyelitis, 80**
Bruce I. Hoffman
- 28 Osteoarthritis, 81**
Donald H. Lieberman
Primary osteoarthritis, 81
Variants of osteoarthritis, 83
Erosive osteoarthritis, 83
Neuropathic arthropathy, 83
Diffuse idiopathic skeletal hyperostosis, 83
- 29 Paget's disease (osteitis deformans), 84**
Donald H. Lieberman
- 30 Osteoporosis, 86**
Donald H. Lieberman
- 31 Gout and pseudogout, 88**
Warren A. Katz
Gout, 88
Pseudogout, 93
Other crystal deposition disease, 95

32 Nonarticular rheumatism, 95**Robert H. Gordon**

- Fibrositis, 96
- Regional and local nonarticular syndromes, 97
 - Myofascial syndromes, 97
 - Nerve entrapments, 97
 - Carpal tunnel syndrome, 97
 - Meralgia paresthetica, 98
 - Tarsal tunnel syndrome, 98
- Bursitis, 98
- Tendinitis, 99
 - Calcific tendinitis, 99
 - Bicipital tendinitis, 99
 - Flexor tenosynovitis, 99
 - DeQuervain's disease, 99
 - Lateral epicondylitis, 99
- Miscellaneous nonarticular syndromes, 99

33 Miscellaneous rheumatic disorders, 102**Warren A. Katz**

- Relapsing polychondritis, 102
- Hypertrophic osteoarthropathy, 103
- Fibrous dysplasia, 103
- Avascular necrosis, 104
- Hemarthrosis, 104

34 Fibrosing syndromes, 105**Jerome A. Boscia and Donald Kaye****Section Four****MICROBIAL DISEASES**edited by **Donald Kaye****35 Introduction to microbial diseases, 106****Donald Kaye**

- Fever and chills, 106
- Diagnosis of microbial diseases, 106
- Laboratory evaluation, 106
- Management, 107
- Fever of unknown origin, 107
 - Laboratory approach, 108

Unit A**VIRAL DISEASES, 109**edited by **Harvey M. Friedman****36 Introduction, classification, and laboratory diagnosis, 109****Harvey M. Friedman****37 Diseases caused by viruses, 113****Viral infections of the fetus and newborn, 113****Stuart E. Starr**

- Cytomegalovirus, 113
- Herpes simplex virus, 114
- Rubella virus (German measles), 114
- Hepatitis B virus, 114
- Coxsackievirus B, 114

Varicella-zoster virus (chickenpox), 114

Herpesviruses, 115**Gary R. Fleisher**

- Herpes simplex virus, 115
- Varicella-zoster virus, 117
- Cytomegalovirus, 118
- Epstein-Barr virus, 119

Viral infections of the central nervous system, 122**Stephen Gluckman**

- Herpes simplex, 123
- Enteroviruses (echoviruses, coxsackieviruses, polioviruses), 124
- Arboviruses, 125
 - California encephalitis group, 125
 - Eastern equine encephalitis, 125
 - Western equine encephalitis, 125
 - St. Louis encephalitis, 126
 - Venezuelan equine encephalitis, 126

Mumps, 126

Other childhood infections, 127

Measles, 127

Varicella-zoster, 127

Lymphocytic choriomeningitis virus, 127

Rabies, 127

Treatable causes of "aseptic meningoencephalitis," 128

Evaluation of the patient with aseptic meningitis
or viral encephalitis, 128**Mumps, 128****Donald Kaye****Viral respiratory infections, 129****Michael Buckley**

- Influenza, 129
- Respiratory syncytial virus, 130
- Parainfluenza viruses, 131
- Adenoviruses, 132
- Picomaviruses, 133
- Rhinoviruses, 133

Enteroviruses (polioviruses, coxsackieviruses, echoviruses), 133

Coronaviruses, 133

Exanthems of viral or presumed viral origin, 134**Allan M. Arbeter**

- Measles (rubeola), 134
- Rubella (German measles), 135
- Roseola (exanthema subitum), 136
- Erythema infectiosum (fifth disease), 136
- Kawasaki disease, 136

Adenovirus exanthems, 137

Enterovirus exanthems, 137

Variola (smallpox) and vaccinia, 138**Donald Kaye****Arthropod-borne viral fevers, 138**

Undifferentiated fevers, 138

Donald Kaye

Hemorrhagic fevers, 138

Allan M. Arbeter**Viral gastroenteritis, 139****Donald H. Rubin**

Rotaviruses, 140

27-nm Norwalk-like agents, 140