Tenth Edition

THE OPHTHALMIC ASSISTANT

A TEXT FOR ALLIED AND ASSOCIATED OPHTHALMIC PERSONNEL

Harold A. Stein • Raymond M. Stein • Melvin I. Freeman

ELSEVIER

The Ophthalmic Assistant

A Text for Allied and Associated Ophthalmic Personnel

TENTH EDITION

Harold A. Stein, MD MSC(Ophth) FRCS(C) DOMS(London)

Professor of Ophthalmology, University of Toronto, Toronto, Ontario, Canada; Emeritus and Past Chairman, Department of Ophthalmology, Scarborough General Hospital, Scarborough, Ontario, Canada; Emeritus, Mount Sinai Hospital, Toronto, Ontario, Canada; Past Secretary General, International Contact Lens Society of Ophthalmologists, Denver, Colorado; Past President, Joint Commission on Allied Health Personnel in Ophthalmology, St Paul, Minnesota; Past President, Contact Lens Association of Ophthalmologists, New Orleans, Louisiana; Past President, Canadian Ophthalmological Society, Ottawa, Canada; Co-director, Bochner Eye Institute, Toronto, Ontario, Canada

Raymond M. Stein, MD FRCS(C)

Co-director, Bochner Eye Institute, Toronto, Ontario, Canada; Associate Professor of Ophthalmology, University of Toronto, Ontario, Canada; Board of Directors, Foundation Fighting Blindness, Toronto, Ontario, Canada; Attending Ophthalmologist, Scarborough Hospital, Scarborough, Ontario, Canada; Attending Ophthalmologist, Mount Sinai Hospital, Toronto, Ontario, Canada; Editor, Clinical and Surgical Ophthalmology, Medicopea, Montreal, Quebec, Canada; Editor, Eye Care Update, Digital Journal, Toronto, Ontario Past President, Canadian Society of Cataract

and Refractive Surgery, Montreal, Quebec, Canada; Past Commissioner, Joint Commission on Allied Health Personnel in Ophthalmology, St Paul, Minnesota, USA

Melvin I. Freeman, MD FACS

Clinical Professor of Ophthalmology, Emeritus, University of Washington School of Medicine, Seattle, Washington; Affiliate Clinical Investigator, Benaroya Research Institute at Virginia Mason, Seattle, Washington; Past Head, Section of Ophthalmology, Virginia Mason Clinic and Medical Center, Seattle, Washington; Medical Director, Emeritus, Department of Continuing Medical Education, Virginia Mason Medical Center, Seattle, Washington; Former Vice President, International Contact Lens Council, Osaka, Japan; Past President, Alliance for Continuing Medical Education, Birmingham, Alabama; Past President, Contact Lens Association of Ophthalmologists, New Orleans, Louisiana; Past President, Joint Commission on Allied Health Personnel in Ophthalmology, St Paul, Minnesota; Chair, Joint Commission on Allied Health Personnel in Ophthalmology Education and Research Foundation, St Paul, Minnesota, USA

ELSEVIER

Table of Contents

Chapter 17: Dry eyes

Chapter 18: Managing a contact lens practice

Section Four: Surgical Techniques

Section Eight: Expanded roles in eye care delivery

Section Nine: Role of assistants in eye care

Copyright

First edition 1968
Second edition 1971
Third edition 1976
Fourth edition 1983
Fifth edition 1988
Sixth edition 1994
Seventh edition 2000
Eighth edition 2006
Ninth edition 2013

Notices
Knowledge and best practice in this field are constantly changing. As new research and experience broaden our understanding, changes in research methods, professional practices, or medical treatment may become necessary.

Practitioners and researchers must always rely on their own experience and knowledge in evaluating and using any information, methods, compounds, or experiments described herein. In using such information or methods they should be mindful of their own safety and the safety of others, including parties for whom they have a professional responsibility.

With respect to any drug or pharmaceutical products identified, readers are

advised to check the most current information provided (i) on procedures featured or (ii) by the manufacturer of each product to be administered, to verify the recommended dose or formula, the method and duration of administration, and contraindications. It is the responsibility of practitioners, relying on their own experience and knowledge of their patients, to make diagnoses, to determine dosages and the best treatment for each individual patient, and to take all appropriate safety precautions.

To the fullest extent of the law, neither the Publisher nor the authors, contributors, or editors, assume any liability for any injury and/or damage to persons or property as a matter of products liability, negligence or otherwise, or from any use or operation of any methods, products, instructions, or ideas contained in the material herein.

ISBN: 978-0-323-39477-2
E-ISBN: 978-0-323-39478-9

Printed in China
Last digit is the print number: 9 8 7 6 5 4 3 2 1

Content Strategist: Russell Gabbedy
Content Development Specialist: Joanne Scott
Content Coordinator: John Leonard
Project Manager: Umarani Natarajan
Design: Miles Hitchen
Illustration Manager: Karen Giacomucci
Illustrator: Rob Flewell, CMI
Marketing Manager: Melissa Fogarty

The
Publisher's
policy is to use
paper manufactured
from sustainable forests

Foreword: An all purpose resource

The Ophthalmic Assistant, first published in 1968, has become the classic text for ophthalmic assistants and associated personnel over the past 50 years. The material presented is a mini-textbook of ophthalmology and eye care covering basic sciences, new testing procedures, new equipment, and the involvement of associated allied health personnel in the community.

In this tenth edition, Harold Stein and Raymond Stein of Toronto, Canada, are again joined by Melvin Freeman of Seattle, Washington and several new contributors in vision function and impairment and uveitis. The new chapters on the Dry Eye and an Atlas of Clinical Disorders is of particular importance. This text is well illustrated and written in a style that is easy to read and understand. Associated personnel can learn comfortably and easily. *The Ophthalmic Assistant* contains basic information on everything from testing vision and glaucoma to common surgical procedures, both minor and major, with an emphasis throughout on technical considerations. Refractive surgery is given special emphasis and the newer diagnostic modalities of ocular imaging are included. The authors' knowledge of the variety of information ophthalmic assistants need to know to perform their tasks comfortably, capably, and appropriately is obvious and impressive.

This text is of value to all ophthalmic personnel and associated health personnel who work with patients. By reviewing, discussing, and understanding the material in this book, they will be able to apply the valuable information contained in this text to their responsibilities in the best interest of patient care. Complete ophthalmologic care can best be provided when all team members are secure in their knowledge of ocular problems and clear in their roles and responsibilities. The delivery of care by teams is of increasing importance as the aging population is growing more rapidly than the capacity of existing ophthalmologists to provide care for it alone.

Previous editions of *The Ophthalmic Assistant* have been used as the standard text by ophthalmic assistants the world over, and this enhanced edition, with new and updated information and color illustrations and photographs, will continue this tradition.

Bruce E. Spivey, MD, *Immediate Past President, International Council of Ophthalmology; Founding CEO, American Academy of Ophthalmology; Chairman Emeritus of Ophthalmology, California Pacific Medical Center, CA, USA; Past President, American Ophthalmology Society; Past President, American Board of Medical Specialties; Past President, Council of Medical Specialty Societies*

Foreword: How paraoptometric assistants and optometry students can benefit from this textbook

The Ophthalmic Assistant was originally written in 1968. Over the past nine editions and 50 years it has expanded to cover all the newer areas of eye care delivery. This updated edition includes new tests, illustrations, and photographs, as well as a diversity of new information. There are excellent illustrations throughout the tenth edition, as well as both color and black-and-white photographs interspersed throughout each chapter. It is essentially a mini-textbook in eye care delivery. It can benefit both paraoptometric assistants and optometry students. It can also benefit optometrists who are interested in the latest information on refractive surgery, wavefront technology, glaucoma, and surgical techniques that are used in the current practice of ophthalmology. This volume includes chapters devoted to cross-linking and optical coherence tomography. The text is easy to read, with excellent artwork and information interspersed throughout all the chapters.

The authors, Dr. Harold Stein, Dr. Raymond Stein, and Dr. Melvin Freeman, are well known to their peers in the educational field. While the book is mainly written by these three authors, there are many chapters contributed by specialists in various fields of eye care. The text includes close to 1000 pages of high-quality illustrations, many of which are original. This is an excellent vehicle for dissemination of information.

The text is divided into nine sections: (1) basic sciences, (2) clinical practice, (3) Common Clinical Eye Problems, (4) surgical techniques, (5) ocular imaging, (6) special procedures, (7) community ocular programs, (8) expanded roles in eye care delivery, (9) role of assistants in eye care, and (10) a newly added color atlas of eye disease and disorders. In addition, there is an extensive appendix with some material and tables not found in other textbooks.

The basic sciences section includes anatomy, physiology, optics, pharmacology, and microbiology related to the eye. The pharmacology chapter gives a considerable amount of information on newer medications that are used today.

The clinical practice section includes chapters on history taking and office efficiency as well as preliminary ocular examination. It introduces refractive errors and how to correct them along with automated refractors and their use in clinical practice. There are chapters on the basic principles of spectacles. There are three chapters devoted to rigid and soft contact lenses and advanced

techniques in rigid and soft contact lens fittings. Visual fields, along with automated visual field testing, have been included, as well as chapters applied to clinical practice.

Section Three focuses on common clinical eye problems, such as ocular injuries, urgent cases, and common eye and retinal disorders and diseases. Glaucoma has a special chapter and there is a chapter on examination of children.

Section Four covers surgical technique, which includes management of the operative patient and highlights of major ocular surgery, management of laser surgery, ambulatory surgery, and refractive surgery. Those chapters related to ocular surgery and refractive surgery are of value to optometrists in comanagement situations of cataracts and refractive surgery, providing a basic text on understanding what problems may occur.

Section Five deals with ocular imaging, including ocular coherence tomography, computerized corneal topography, specular microscopy, and diagnostic ultrasound.

The special procedures described in Section Six include ocular motility and binocular vision, as well as an excellent chapter on ophthalmic photography and a chapter on low vision aids.

In Section Seven, there is a chapter on the latest techniques in cardiopulmonary resuscitation.

This textbook is a condensed version of all aspects of eye care and eye care delivery. The authors have provided both a reference book for those using the index to find some special disease or disorder and also a training book for those needing to identify areas of special concerns. In addition to individual educational benefits, the book serves as a valuable library purchase to have available on the latest in ophthalmic practice and diagnostic testing.

Desmond Fonn, DipOptom MOptom FAAO, *Distinguished Professor Emeritus, School of Optometry and Vision Science, University of Waterloo, Waterloo, ON, Canada*

Foreword: challenges for opticianry

Developments in ophthalmology continue apace, and the authors, Drs. Harold Stein and Raymond Stein of Canada and Dr. Melvin Freeman of the United States, are authorities in providing easy-to-read information and illustration for allied health personnel. The book is used in many teaching programs and has one of the largest worldwide text sales in ophthalmology.

Opticians are part of an allied health group that is allied to ophthalmology. They provide service in the eye care field by being end distributors of spectacles and contact lenses for the public. Part of their responsibility is the understanding, in general, of what is being achieved today in the field of ophthalmology.

The field of ophthalmology is truly amazing. Tremendous outcomes in patient care are being achieved on a daily basis in offices, clinics, and operating rooms throughout the world. The results have a very important and positive impact on the lives of the patients and their quality of life.

Members of the public often question opticians about eye care and what can be achieved today in the eye care field. Some are looking for recommendations and some are looking for positive answers to some of their symptoms and concerns. They often regard the optician as someone who can spend more time with them than their surgeon and be helpful in answering questions.

Some of these accomplishments in ophthalmology are in the area of refraction; some are in the area of medical treatment of such diseases as acanthamoeba, conjunctivitis and glaucoma. Some are in the new surgical techniques of cataract surgery, glaucoma and lasers. Sophisticated measurements such as A-scans, imaging, wavefront aberrometers, and topography are presented clearly. Other opticians may be interested in the areas of contact lenses and the problems that occur in their management.

This text is intended to fill a role for ophthalmic assistants, optometrists, and opticians in providing clinical, scientific information on the vast smorgasbord of concerns that occur in the eye care field. It is essentially a mini-textbook of ophthalmology in a single soft-cover volume. The book is well illustrated with original illustrations and color photographs of disease processes. There are sections devoted to common eye and retinal disorders that occur. Numerous surgical techniques are illustrated, covering strabismus and cataracts, as well as refractive surgery.

The impact of refractive surgery in this decade has been enormous. It is therefore important to understand how it works, including LASIK, PRK, LASEK, lensectomies, and the phakic intraocular contact lens. New bifocal implants that will correct presbyopia have become a new threshold of surgical

expertise. The chapters will reveal both complications and positive results that occur.

There are special chapters devoted to low-vision aids and managing the blind patient. There are excellent chapters on photography for those who are interested in this field. There is a chapter devoted to ethics that is applicable to all those who deal with the public.

Four chapters are devoted to rigid contact lenses, soft contact lenses, advanced contact lens fitting, and the management of a contact lens practice. These cover complications and managing the dry eye patient. Although this does not compare with *Fitting Guide for Hard and Soft Contact Lenses*, written by the same authors, it does provide a basis for management of a contact lens practice.

The appendix is outstanding, with materials gleaned from many areas of research which will serve the optician well.

The well-designed illustrations and photographs that are provided throughout the text are of great help in assimilation of the information and thus contribute greatly to the usefulness of the text.

Opticians who are knowledgeable about the expanding testing, imaging, and surgical outcomes of ophthalmology will be better able to understand the concerns of some members of the public encountered in day-to-day practice. They will understand complications of contact lenses as well as complications that may follow surgery. They will understand the expanding role of refractive surgery in today's environment and use of the sophisticated testing instrumentation required. This information will help in binding the optician to the public.

Mo Jalie, SMSA FBDO (Hons) Hon FCGI Hon FCOptom MCMI, *Visiting Professor in Optometry, School of Biomedical Sciences, Ulster University, Coleraine, Northern Ireland*

Foreword: How this textbook can be a valuable tool for physician assistants

Since the first program was established in 1965, physician assistants (PAs) have assumed an increasingly important role in the delivery of health care in the United States. According to the Physician Assistant History Society, there are currently 210 PA programs in the United States and more than 108,000 individuals who have earned certification through the National Commission on Certification of Physician Assistants (NCCPA).

PAs are employed in a wide variety of health care settings including primary care offices, emergency departments, hospitals, and in nearly every medical and surgical specialty. Although only a small number of PAs are working in ophthalmic practices, every PA who treats patients encounters refractive errors and ocular disorders.

The scope of practice for PAs varies from state to state; however, PAs are able to perform many functions traditionally performed by physicians. In ophthalmic practices, besides addressing patients' presurgical medical needs, PAs assist in surgery, administer intravitreal injections, provide pre-and postop surgical care, and manage many aspects of comprehensive ophthalmology.

Historically the curriculum in PA programs has given little attention to ocular disorders and treatments, with the main message being to refer to a specialist. However, awareness of the ocular implications of systemic diseases is vital to a holistic approach to patient care. For example, understanding the implications of a patient's 12-year history of diabetes on his or her retinal vasculature is imperative for the PA who is addressing the patient's overall health.

Since 1968 *The Ophthalmic Assistant* has been an excellent resource for those working in the field of eye care at all levels. Over the course of multiple editions, the textbook has been revised and expanded to remain relevant in a field that has seen exponential growth over the past several decades. Earlier editions of the textbook have included information on basic sciences, clinical practice, surgical techniques, ocular imaging, special procedures, community ocular programs, expanded roles in eye care delivery, and the role of assistants in eye care. There is a very detailed appendix that contains valuable reference materials. The tenth edition includes chapters with case studies of ophthalmic disorders and an atlas of common ocular conditions.

This text is laid out in a logical fashion and written in language that is understandable to those with limited knowledge about the eye. It has been the main textbook for nearly 20 years in our clinical ophthalmic assistant program. Students find it easy to understand and keep it well after graduation as the

foundation for their professional library. It will make an excellent addition to the reference library of the practicing PA.

Barbara T. Harris, PA MBA COT OSC, *Director, Ophthalmic Medical Assistant Program, Department Chair Health Sciences, Caldwell Community College and Technical Institute, Past President, Consortium of Ophthalmic Training Programs (COTP), Past Chair, PA Section North Carolina Medical Society (NCMS), Past Board Member Joint Commission on Allied Health Personnel in Ophthalmology (JCAHPO)*

Preface

Harold A. Stein

Raymond M. Stein

Melvin I. Freeman

Many ophthalmic assistants and technicians have no opportunity for formal training and learn their duties on the job. Experience and repetition alone may become excellent teachers. To paraphrase Sir William Osler, experience without knowledge is to sail an uncharted course, but knowledge without experience is never to go to sea at all. *The Ophthalmic Assistant* was written expressly for ancillary ophthalmic workers who assist eye doctors in the day-to-day care of eye patients. This book was designed to fill a vacuum in our community by providing a training basis for eye care personnel and meeting their needs for a reference source. The textbook has become a textbook of practical ophthalmology.

Originally published over 50 years ago in 1968, *The Ophthalmic Assistant* has grown in size by over 300%. It became necessary to continually expand the textbook to reflect the explosive growth of opthalmic knowledge and ophthalmic technology. Over the years we broadened the scope of the textbook to provide not only practical technical information but also background information on ophthalmic disease processes and surgical procedures. In this tenth edition, we attempted to keep pace with the ever-expanding new developments in the field of eye care by updating each chapter. At the same time, we have tried to retain the original concept: to provide a concise, up-to-date review of the field of eye care that is easily readable, interesting, and illustrated.

The Ophthalmic Assistant provides reliable and competent information on eye care before and after regular visits to offices, clinics, and hospitals. Ophthalmic assistants must be familiar with sterile procedures, types of emergencies, and many technical aspects of eye care. This knowledge can increase the ophthalmic assistant's efficiency, ensuring that all details of diagnostic work-up and regimen are understood and carried out. Although *The Ophthalmic Assistant* emphasizes the paramedical functions of the ophthalmic assistant and not the secretarial duties, we recognize that both positions in a small office may have to be carried out by the same individual.

We purposely avoided controversial subjects and highly specialized technical areas because of the varying degrees of training of eye assistants throughout the world. Rather, the emphasis is placed on illustrations and photographs that

illuminate and clarify ophthalmic technology and foster interest wherever possible.

While the main thrust of this book is toward the ophthalmic assistant, we hope the clarity, organization, and readability of the book will attract others in the ophthalmic community. To accommodate these readers, we included sections for the hospital ophthalmic assistant who aids in surgery, for the nurse who aids in the surgical and postoperative care of patients after surgery, and for the optometrist and their assistants who should have knowledge in recognizing diseases and disorders, particularly glaucoma and retinal disorders. We also include material of interest to those individuals working for optical and associated pharmaceutical companies. We have added and updated material for contact lens technicians, with a more detailed review to be found in our companion book, *Fitting Guide for Hard and Soft Contact Lenses,* fourth edition, published by Mosby. A companion book, *Ophthalmic Terminology,* third edition, published by Mosby, serves to expand the glossary and is designed for learning vocabulary and the origins of words. An additional publication, *Ophthalmic Dictionary and Vocabulary Builder for Eye Care Professionals*, fourth edition, authored by H.A. Stein, R.M. Stein, M.I. Freeman, and J.S. Massare and published by Jaypee-Highlights Medical Publishers, is also available for learning vocabulary and original words.

Refractive surgery and computerized corneal topography are two areas of eye care delivery that generate great clinical interest. The tenth edition expands on the chapter on refractive surgery with new emphasis on invasive surgery, as well as the section on computerized corneal topography. This edition also includes many color photographs as well as replacements in color of many black-and-white photographs.

We miss the influence and contributions of our previous coauthor, Dr. Bernard Slatt, whose premature passing away came shortly after the seventh edition was published. His memory gave us input, motivation, and direction in continuing this work.

The authors are indebted to Bruce E. Spivey, Desmond Fonn, Mo Jalie, and Barbara T. Harris for their forewords to ophthalmologists, optometrists, opticians, and physician assistants, respectively. We gratefully acknowledge new, invited chapters by Bernard R. Blais, Thellea K. Leveque and Russell N. van Gelder. Our appreciation is again extended to our invited ongoing chapter authors and coauthors for their continuing updates to their chapters: Lynn D. Anderson, Michael S. Berlin, Arielle R. Brickman, William H. Ehlers, Daniel Epstein, Peter Y. Evans, Eleanor E. Faye, Joseph D. Freeman, Michael L. Gilbert, Richard E. Hackel, Melissa A. Jones, Alex V. Levin, Shoshana (Sue) M. Levine. Efrem D. Mandelcorn, Csaba L. Mártonyi, Lynn D. Maund, Gerald E. Meltzer, Edyie G. Miller-Ellis, Richard P. Mills, Rod A. Morgan, Korosh Nikeghbal, Penny Pilliar, Phyllis L. Rakow, Hans-Walter Roth, A. Ghani Salim, Ernest R. Simpson, Rebecca L. Stein (the fourth generation of Bochner/Stein's to contribute to ophthalmic allied and associates health care education), Gwen K. Sterns, and Michael A. Ward.

New chapters have been added for the tenth edition on dry eyes, uveitis,

visual impairment and disabilities, and an atlas of common ocular conditions.

Acknowledgements

For aid and support for the tenth edition we thank Russell Gabbedy, Joanne Scott, John Leonard, Umarani Natarajan, and the contributors and reviewers.

Acknowledgments for aid as reviewers or contributors in previous editions:

Bud Appleton†
Richard Augustine
Howard S. Barneby
Joseph T. Barr
Tony Benson
Bernard R. Blais
Maxwell K. Bochner†
Albert Cheskes
Jordan Cheskes
John Crawford†
Norman Deer†
Katherine Delmer
William Ehlers
Saul Fainstein†
Zoraida Fiol-Silva
John Fowler
Therese Fredette
Ivan Gareau
Alice Gelinas
Paul Graczyk
Desmond Grant
Mark Grieve
Darrell Guthmiller
David L. Guyton
G. Peter Halberg†
Keith Harrison
William Hunter†
John Hymers
Anne Jackson
Jerome Kazdan
Edna Kelly
D'Arcy Kingsmill†
Jill Klintworth
Steven Kraft
Laurette LaRocque
Les Landecker
John Lloyd
Sze Kong Luke
Bernice Mandelcorn

Theodore Martens
Lynn D. Maund
Gerald E. Meltzer
Richard P. Mills
Donald Morin†
Korosh Nikeghbal
Sherrine Nunes
Kenneth Ogle†
Thomas D Padrick
John Parker
Thomas Pashby†
Charles J. Pavlin†
Scot M Peterson
Penny Cook Pilliar
Karen Quam
Paula Quigley
Robert Rosen
Barnet Sakler†
Abraham Schlossman†
Anne Skryzpnik
Laurie Stein
Kenneth Swanson†
Spencer Thornton
Alyssa Tipple
Len Waldbaum
Becky Walsh
E. Edward Wilson, Jr.
Sheffield Wo
Kenneth Woodward

† Deceased

List of Contributors

The editor(s) would like to acknowledge and offer grateful thanks for the input of all previous editions' contributors, without whom this new edition would not have been possible.

Lynn D. Anderson, PhD Chief Executive Officer, Joint Commission on Allied Health Personnel in Ophthalmology, St. Paul, MN, USA
(Chapters 53 and 54)

Michael S. Berlin, MD MS Director, Glaucoma Institute of Beverly Hills; Professor of Clinical Ophthalmology, Jules Stein Eye Institute, UCLA; President, Finnish American Chamber of Commerce on the Pacific Coast; Los Angeles, CA, USA
(Chapter 25)

Bernard R. Blais, MD Clinical Professor, Albany Medical College, Albany, New York, NY, USA
(Chapter 9)

Arielle R. Brickman York University, Toronto, ON, Canada
(Chapter 24)

William H. Ehlers, MD Associate Professor of Surgery, Division of Ophthalmology, UCONN Health, Farmington, CT, USA
(Chapter 53)

Daniel Epstein, MD PhD FARVO Professor, Department of Ophthalmology, Spitalgasse, Bern, Switzerland
(Chapter 38)

Peter Y. Evans, MD Professor Emeritus, Department of Ophthalmology, Georgetown University, Washington, DC, USA
(Chapter 56)

Eleanor E. Faye, MD Formerly Ophthalmic Surgeon, Manhattan Eye, Ear and Throat Hospital, New York; Ophthalmic Consultant, Lighthouse International Continuing Education, New York, NY, USA
(Chapters 45 and 46)

Tina Felfeli, BSc University of Toronto, Toronto, ON, Canada

(Chapter 24)

Joseph D. Freeman, MD FACEP Emergency Medicine Physician, Department of Emergency Medicine, Cottage Health System, Santa Barbara, CA, USA
(Chapter 49)

Michael L. Gilbert, MD *Past* Medical Editor, Eye Care Technology Magazine; Past President, Washington Academy of Eye Physicians Bellevue, WA, USA
(Chapter 50)

Richard E. Hackel, MA CRA FOPS Formerly Assistant Professor, Director of Ophthalmic Photography, WK Kellogg Eye Center, Department of Ophthalmology, University of Michigan, Ann Arbor, MI, USA
(Chapter 44)

Melissa A. Jones, MEd COE OCS Formerly Director, Department of Ophthalmology, Virginia Mason Medical Center, Seattle, WA, USA
(Chapter 6)

Thellea K. Leveque, MD MPH Clinical Associate Professor, Department of Ophthalmology, University of Washington Medicine, Seattle, WA, USA
(Chapter 26)

Alex V. Levin, MD MHSc FAAP FAAO FRCSC Chief, Pediatric Ophthalmology and Ocular Genetics, Wills Eye Institute; Professor, Departments of Ophthalmology and Pediatrics, Jefferson Medical College, Thomas Jefferson University, Philadelphia, PA, USA
(Chapters 27 and 52)

Shoshana (Sue) M. Levine, LDO ABO NCLE FNAO Visual Effects Supervisor Optical and Contact Lens Dispensary, Virginia Mason Medical Center, Seattle, WA, USA
(Chapter 13)

Efrem D. Mandelcorn, MD FRCSC DBO Assistant Professor, Department of Ophthalmology and Vision Sciences, University of Toronto, Toronto, ON, Canada
(Chapter 24)

Csaba L. Mártonyi, CRA FOPS Emeritus Associate Professor, Department of Ophthalmology and Visual Sciences, University of Michigan Medical School, Ann Arbor, MI, USA
(Chapter 44)

Lynn D. Maund, BA SC CLS Contact Lens Specialty, Manager, Laser Eye Surgery Division, Maxwell K. Bochner Eye Institute, Toronto, ON, Canada