Clinical Optics

Last major revision 2013–2014
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Originally released June 2013; reviewed for currency September 2016; CME expiration date: June 1, 2018. AMA PRA Category 1 Credits™ may be claimed only once between June 1, 2013, and the expiration date.

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Printed in the United States of America.
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The authors and reviewers state the following financial relationships:*  
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Dr Beaver: Genzyme (L)  
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General Introduction

The Basic and Clinical Science Course (BCSC) is designed to meet the needs of residents and practitioners for a comprehensive yet concise curriculum of the field of ophthalmology. The BCSC has developed from its original brief outline format, which relied heavily on outside readings, to a more convenient and educationally useful self-contained text. The Academy updates and revises the course annually, with the goals of integrating the basic science and clinical practice of ophthalmology and of keeping ophthalmologists current with new developments in the various subspecialties.

The BCSC incorporates the effort and expertise of more than 90 ophthalmologists, organized into 13 Section faculties, working with Academy editorial staff. In addition, the course continues to benefit from many lasting contributions made by the faculties of previous editions. Members of the Academy Practicing Ophthalmologists Advisory Committee for Education, Committee on Aging, and Vision Rehabilitation Committee review every volume before major revisions. Members of the European Board of Ophthalmology, organized into Section faculties, also review each volume before major revisions, focusing primarily on differences between American and European ophthalmology practice.

Organization of the Course

The Basic and Clinical Science Course comprises 13 volumes, incorporating fundamental ophthalmic knowledge, subspecialty areas, and special topics:

1. Update on General Medicine
2. Fundamentals and Principles of Ophthalmology
3. Clinical Optics
4. Ophthalmic Pathology and Intraocular Tumors
5. Neuro-Ophthalmology
6. Pediatric Ophthalmology and Strabismus
7. Orbit, Eyelids, and Lacrimal System
8. External Disease and Cornea
9. Intraocular Inflammation and Uveitis
10. Glaucoma
11. Lens and Cataract
12. Retina and Vitreous
13. Refractive Surgery

In addition, a comprehensive Master Index allows the reader to easily locate subjects throughout the entire series.

References

Readers who wish to explore specific topics in greater detail may consult the references cited within each chapter and listed in the Basic Texts section at the back of the book.
These references are intended to be selective rather than exhaustive, chosen by the BCSC faculty as being important, current, and readily available to residents and practitioners.

**Study Questions and CME Credit**

Each volume of the BCSC is designed as an independent study activity for ophthalmology residents and practitioners. The learning objectives for this volume are given on page 1. The text, illustrations, and references provide the information necessary to achieve the objectives; the study questions allow readers to test their understanding of the material and their mastery of the objectives. Physicians who wish to claim CME credit for this educational activity may do so by following the instructions given at the end of the book.

**Conclusion**

The Basic and Clinical Science Course has expanded greatly over the years, with the addition of much new text, numerous illustrations, and video content. Recent editions have sought to place greater emphasis on clinical applicability while maintaining a solid foundation in basic science. As with any educational program, it reflects the experience of its authors. As its faculties change and medicine progresses, new viewpoints emerge on controversial subjects and techniques. Not all alternate approaches can be included in this series; as with any educational endeavor, the learner should seek additional sources, including Academy Preferred Practice Pattern Guidelines.

The BCSC faculty and staff continually strive to improve the educational usefulness of the course; you, the reader, can contribute to this ongoing process. If you have any suggestions or questions about the series, please do not hesitate to contact the faculty or the editors.

The authors, editors, and reviewers hope that your study of the BCSC will be of lasting value and that each Section will serve as a practical resource for quality patient care.
Objectives

Upon completion of BCSC Section 3, Clinical Optics, the reader should be able to

- explain the principles of light propagation and image formation and work through some of the fundamental equations that describe or measure such properties as refraction, reflection, magnification, and vergence
- explain how these principles can be applied diagnostically and therapeutically
- describe the clinical application of Snell’s law and the lensmaker’s equation
- identify optical models of the human eye and describe how to apply them
- define the various types of visual perception and function, including visual acuity, brightness sensitivity, color perception, and contrast sensitivity
- summarize the steps for performing streak retinoscopy
- identify the steps for performing a manifest refraction using a phoropter or trial lenses
- describe the use of the Jackson cross cylinder
- describe the indications for prescribing bifocal lenses and common difficulties encountered in their use
- identify the materials and fitting parameters of both soft and rigid contact lenses
- explain the optical principles underlying various modalities of refractive correction: spectacles, contact lenses, intraocular lenses, and refractive surgery
- discern the differences among these types of refractive correction and describe how to apply them most appropriately to individual patients
• discuss the basic methods of calculating intraocular lens (IOL) powers and the advantages and disadvantages of the different methods
• explain the conceptual basis of multifocal IOLs and how the correction of presbyopia differs between IOLs and spectacles
• appraise the visual needs of low vision patients and determine how to address these needs through use of optical and nonoptical devices and/or appropriate referrals
• describe the operating principles of various optical instruments in order to use them more effectively
• compare and contrast physical and geometric optics
• describe the clinical and technical relevance of such optical phenomena as interference, coherence, polarization, diffraction, and scattering
• explain the basic properties of laser light and how they affect laser–tissue interaction