

Optical Systems Design With Zemax Opticstudio

A Practical Guide to Lens Design focuses on the very detailed practical process of lens design. Every step from setup specifications to finalizing the design for production is discussed in a straight forward, tangible way. Design examples of several widely used modern lenses are provided. Optics basics are introduced and basic functions of Zemax are described. Zemax will be used throughout the book. Serves as a reference for those working in the field or a text for courses in lens design. Explains how to create a wide range of lens systems via lens optimization programs, describing techniques for fashioning single element lenses, two element achromats, and air speed triplets. Covers 31 types of

There is no shortage of lens optimization software on the market to deal with today's complex optical systems for all sorts of custom and standardized applications. But all of these software packages share one critical flaw: you still have to design a starting solution. Continuing the bestselling tradition of the author's previous books, Lens Design, Fourth Edition is still the most complete and reliable guide for detailed design information and procedures for a wide range of optical systems. Milton Laikin draws on his varied and extensive experience, ranging from

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innovative cinematographic and special-effects optical systems to infrared and underwater lens systems, to cover a vast range of special-purpose optical systems and their detailed design and analysis. This edition has been updated to replace obsolete glass types and now includes several new designs and sections on stabilized systems, the human eye, spectrographic systems, and diffractive systems. A new CD-ROM accompanies this edition, offering extensive lens prescription data and executable ZEMAX files corresponding to figures in the text. Filled with sage advice and completely illustrated, *Lens Design, Fourth Edition* supplies hands-on guidance for the initial design and final optimization for a plethora of commercial, consumer, and specialized optical systems.

Micro-assembly is a key enabling technology for cost effective manufacture of new generations of complex micro products. It is also a critical technology for retaining industrial capabilities in high labour cost areas such as Europe since up to 80% of the production cost in some industries is attributed directly to assembly processes. With the continuous trend for product miniaturisation, the scientific and technological developments in micro-assembly are expected to have a significant long-term economic, demographic and social impact. A distinctive feature of the process is that surface forces are often dominant over gravity forces, which determines a

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number of specific technical challenges. Critical areas which are currently being addressed include development of assembly systems with high positional accuracy, micro gripping methods that take into account the adhesive surface forces, high precision micro-feeding techniques and micro-joining processes. Micro-assembly has developed rapidly over the last few years and all the predictions are that it will remain a critical technology for high value products in a number of key sectors such as healthcare, communications, defence and aerospace. The key challenge is to match the significant technological developments with a new generation of micro products that will establish firmly micro-assembly as a core manufacturing process.

A practical guide to optical system design and development *Optical Systems Engineering* emphasizes first-order, system-level estimates of optical performance. Building on the basic principles of optical design and engineering, the book uses numerous practical examples to illustrate the essential, real-world processes such as requirements analysis, feasibility and trade studies, subsystem interfaces, error budgets, requirements flow-down and allocation, component specifications, and vendor selection. Filled with detailed diagrams and photographs, this is an indispensable resource for anyone involved in developing optical, electro-optical, and infrared systems. *Optical Systems*

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Engineering covers: Systems engineering
Geometrical optics Aberrations and image quality
Radiometry Optical sources Detectors and focal
plane arrays Optomechanical design

This book gathers selected and expanded contributions presented at the 4th Symposium on Space Optical Instruments and Applications, which was held in Delft, the Netherlands, on October 16–18, 2017. This conference series is organized by the Sino-Holland Space Optical Instruments Laboratory, a cooperative platform between China and the Netherlands. The symposium focused on key technological problems regarding optical instruments and their applications in a space context. It covered the latest developments, experiments and results on the theory, instrumentation and applications of space optics. The book is split into five main sections: The first covers optical remote sensing system design, the second focuses on advanced optical system design, and the third addresses remote sensor calibration and measurement. Remote sensing data processing and information extraction are then presented, followed by a final section on remote sensing data applications.

This classic resource provides a clear, well-illustrated introduction to the essentials of optical design—from basic principles to cutting-edge design methods.

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A wide variety of detail regarding genuine and proprietary research from distinguished authors is presented, ranging from new means of evaluation of the local solar irradiance to the manufacturing technology of photovoltaic cells. Also included is the topic of biotechnology based on solar energy and electricity generation onboard space vehicles in an optimised manner with possible transfer to the Earth. The graphical material supports the presentation, transforming the reading into a pleasant and instructive labor for any interested specialist or student.

Leading experts present the latest technology and applications in adaptive optics for vision science. Featuring contributions from the foremost researchers in the field, *Adaptive Optics for Vision Science* is the first book devoted entirely to providing the fundamentals of adaptive optics along with its practical applications in vision science. The material for this book stems from collaborations fostered by the Center for Adaptive Optics, a consortium of more than thirty universities, government laboratories, and corporations. Although the book is written primarily for researchers in vision science and ophthalmology, the field of adaptive optics has strong roots in astronomy. Researchers in both fields share this technology and, for this reason, the book includes chapters by both astronomers and vision scientists. Following the introduction, chapters are divided into the following sections: * Wavefront Measurement and Correction * Retinal Imaging Applications * Vision Correction Applications * Design Examples. Readers will discover the remarkable proliferation of new applications of wavefront-related technologies developed for the human eye. For example, the

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book explores how wavefront sensors offer the promise of a new generation of vision correction methods that can deal with higher order aberrations beyond defocus and astigmatism, and how adaptive optics can produce images of the living retina with unprecedented resolution. An appendix includes the Optical Society of America's Standards for Reporting Optical Aberrations. A glossary of terms and a symbol table are also included. Adaptive Optics for Vision Science arms engineers, scientists, clinicians, and students with the basic concepts, engineering tools, and techniques needed to master adaptive optics applications in vision science and ophthalmology. Moreover, readers will discover the latest thinking and findings from the leading innovators in the field. The optimization of optical systems is a very old problem. As soon as lens designers discovered the possibility of designing optical systems, the desire to improve those systems by the means of optimization began. For a long time the optimization of optical systems was connected with well-known mathematical theories of optimization which gave good results, but required lens designers to have a strong knowledge about optimized optical systems. In recent years modern optimization methods have been developed that are not primarily based on the known mathematical theories of optimization, but rather on analogies with nature. While searching for successful optimization methods, scientists noticed that the method of organic evolution (well-known Darwinian theory of evolution) represented an optimal strategy of adaptation of living organisms to their changing environment. If the method of organic evolution was very successful in nature, the principles of the biological evolution could be applied to the problem of optimization of complex technical systems.

Unrivalled in its coverage and unique in its hands-on approach, this guide to the design and construction of

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scientific apparatus is essential reading for every scientist and student of engineering, and physical, chemical, and biological sciences. Covering the physical principles governing the operation of the mechanical, optical and electronic parts of an instrument, new sections on detectors, low-temperature measurements, high-pressure apparatus, and updated engineering specifications, as well as 400 figures and tables, have been added to this edition. Data on the properties of materials and components used by manufacturers are included. Mechanical, optical, and electronic construction techniques carried out in the lab, as well as those let out to specialized shops, are also described. Step-by-step instruction supported by many detailed figures, is given for laboratory skills such as soldering electrical components, glassblowing, brazing, and polishing.

Optomechanical Systems Engineering bridges the gap between mechanical engineering and optical engineering. Following an introduction to optical fundamentals, the author provides detailed information about optical fabrication, tolerancing, and alignment. Elements of structural design are examined from mechanical, optical, and vibrational viewpoints. Kasunic then explores the principles, materials properties, and selection related to thermal design, kinematic design, and system design.

This book constitutes the refereed post-conference proceedings of the 6th EAI International Conference on Green Energy and Networking, GreeNets 2019, held in Dalian, China, May 5, 2019. The 30 full papers were selected from 44 submissions and cover a wide spectrum of ideas to reduce the impact of the climate change, while maintaining social prosperity. In this context, growing global concern leads to the adoption of the new technological paradigms, especially for the operation of future smart cities.

Adaptive Optics for Biological Imaging brings together

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groundbreaking research on the use of adaptive optics for biological imaging. The book builds on prior work in astronomy and vision science. Featuring contributions by leaders in this emerging field, it takes an interdisciplinary approach that makes the subject accessible to nonspecialists who want to use adaptive optics techniques in their own work in biology and bioengineering. Organized into three parts, the book covers principles, methods, and applications of adaptive optics for biological imaging, providing the reader with the following benefits: Gives a general overview of applied optics, including definitions and vocabulary, to lay a foundation for clearer communication across disciplines Explains what kinds of optical aberrations arise in imaging through various biological tissues, and what technology can be used to correct for these aberrations Explores research done with a variety of biological samples and imaging instruments, including wide-field, confocal, and two-photon microscopes Discusses both indirect wavefront sensing, which uses an iterative approach, and direct wavefront sensing, which uses a parallel approach Since the sample is an integral part of the optical system in biological imaging, the field will benefit from participation by biologists and biomedical researchers with expertise in applied optics. This book helps lower the barriers to entry for these researchers. It also guides readers in selecting the approach that works best for their own applications.

A comprehensive and practical analysis and overview of the imaging chain through acquisition, processing and displayThe Handbook of Digital Imaging provides a coherent overview of the imaging science amalgam, focusing on the capture, storage and display of images. The volumes are arranged thematically to provide a seamless analysis of the imaging chain from source (image acquisition) to destination (image print/display). The coverage is planned to have a very

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practical orientation to provide a comprehensive source of information for practicing engineers designing and developing modern digital imaging systems. The content will be drawn from all aspects of digital imaging including optics, sensors, quality, control, colour encoding and decoding, compression, projection and display. • Contains approximately 50, highly illustrated articles (ranging from 20-40 pages), printed in full colour throughout

Comprehensive 3-volume set, also available on Wiley Online Library. • Over 50 Contributors, with contributors from Europe, US and Asia. Contributors are both and from academia and industry

The 3 volumes will be organized thematically for enhanced usability:

Volume 1: Image Capture and Storage • Image Capture and Storage

Volume 2: Image Display and Reproduction • Image Display and Projection • Hardcopy Technology • Halftoning and Physical Evaluation • Models for Halftone Reproduction

Volume 3: Imaging System Applications • Media Imaging • Remote Imaging • Medical and Forensic Imaging

Ideal for engineers and designers in the dynamic global imaging and display industries

Laser Beam Shaping: Theory and Techniques addresses the theory and practice of every important technique for lossless beam shaping. Complete with experimental results as well as guidance on when beam shaping is practical and when each technique is appropriate, the Second Edition is updated to reflect significant developments in the field. This authoritative text: Features new chapters on axicon light ring generation systems, laser-beam-splitting (fan-out) gratings, vortex beams, and microlens diffusers

Describes the latest advances in beam profile measurement technology and laser beam shaping using diffractive diffusers

Contains new material on wavelength dependence, channel integrators, geometrical optics, and optical software

Laser Beam Shaping: Theory and Techniques, Second Edition not only provides a

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working understanding of the fundamentals, but also offers insight into the potential application of laser-beam-profile shaping in laser system design.

The Global COE is setting out a zero-emission technology roadmap and is promoting socioeconomic studies of energy, studies of new technologies for renewable energies, and research for advanced nuclear energy. It has also established the Global COE Unit for Energy Science Education to support young researchers as they apply their skills and knowledge and a broad international perspective to respond to issues of energy and the environment in our societies. This book follows on the earlier volumes Zero-Carbon Energy Kyoto 2009, 2010, and 2011.

The proceedings present selected research papers from the CIAC2019, held in Jiangsu, China on September 20-22, 2019. It covers a wide range of topics including intelligent control, robotics, artificial intelligence, pattern recognition, unmanned systems, IoT and machine learning. It includes original research and the latest advances in the field of intelligent automation. Engineers and researchers from academia, industry, and government can gain valuable insights into solutions combining ideas from multiple disciplines in this field.

Due to the development of microscale fabrication methods, microlenses are being used more and more in many unique applications, such as artificial implementations of compound eyes, optical communications, and labs-on-chips. Liquid microlenses, in particular, represent an important and growing research area yet there are no books devoted to this topic that summarize the research to date. Rectifying this deficiency, *Microlenses: Properties, Fabrication and Liquid Lenses* examines the recent progress in the emerging field of liquid-based microlenses. After describing how certain problems in optics can be solved by liquid microlenses, the

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book introduces the physics and fabrication methods involved in microlenses. It also details the facility and equipment requirements for general fabrication methods. The authors then present examples of various microlenses with non-tunable and tunable focal lengths based on different mechanisms, including: Non-tunable microlenses: Ge/SiO₂ core/shell nanolenses, glass lenses made by isotropic etching, self-assembled lenses and lens arrays, lenses fabricated by direct photo-induced polymerization, lenses formed by thermally reflowing photoresist, lenses formed from inkjet printing, arrays fabricated through molding processes, and injection-molded plastic lenses Electrically tuned microlenses: liquid crystal-based lenses and liquid lenses driven by electrostatic forces, dielectrophoretic forces, electrowetting, and electrochemical reactions Mechanically tunable microlenses: thin-membrane lenses with varying apertures, pressures, and surface shapes; swellable hydrogel lenses; liquid–liquid interface lenses actuated by environmentally stimuli-responsive hydrogels; and oscillating lens arrays driven by sound waves Horizontal microlenses: two-dimensional polymer lenses, tunable and movable liquid droplets as lenses, hydrodynamically tuned cylindrical lenses, liquid core and liquid cladding lenses, air–liquid interface lenses, and tunable liquid gradient refractive index lenses The book concludes by summarizing the importance of microlenses, shedding light on future microlens work, and exploring related challenges, such as the packaging of systems, effects of gravity, evaporation of liquids, aberrations, and integration with other optical components.

Unique within the field for being written in a tutorial style, this textbook adopts a step-by-step approach to the background needed for understanding a wide range of full-field optical measurement techniques in solid mechanics. This method familiarizes readers with the essentials of imaging and full-

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field optical measurement techniques, helping them to identify the appropriate techniques and in assessing measurement systems. In addition, readers learn the appropriate rules of thumb as a guide to better experimental performance from the applied techniques. Rather than presenting an exhaustive overview on the subject, each chapter provides a concise introduction to the concepts and principles, integrates solved problems within the text, summarizes the essence at the end, and includes unsolved problems. With its coverage of topics also relevant for industry, this text is aimed at graduate students, researchers, and engineers involved in non-destructive testing for acoustics, mechanics, medicine, diagnosis on artwork and construction, and civil engineering. Optical System Design, Second Edition McGraw Hill Professional

The definitive work on iris recognition technology, this comprehensive handbook presents a broad overview of the state of the art in this exciting and rapidly evolving field. Revised and updated from the highly-successful original, this second edition has also been considerably expanded in scope and content, featuring four completely new chapters. Features: provides authoritative insights from an international selection of preeminent researchers from government, industry, and academia; reviews issues covering the full spectrum of the iris recognition process, from acquisition to encoding; presents surveys of topical areas, and discusses the frontiers of iris research, including cross-wavelength matching, iris template aging, and anti-spoofing; describes open source software for the iris recognition pipeline and datasets of iris images; includes new content on liveness detection, correcting off-angle iris images, subjects with eye conditions, and implementing software systems for iris recognition.

The application of intelligent imaging techniques to industrial

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vision problems is an evolving aspect of current machine vision research. Machine vision is a relatively new technology, more concerned with systems engineering than with computer science, and with much to offer the manufacturing industry in terms of improving efficiency, safety and product quality. Beginning with an introductory chapter on the basic concepts, the authors develop these ideas to describe intelligent imaging techniques for use in a new generation of industrial imaging systems. Sections cover the application of AI languages such as Prolog, the use of multi-media interfaces and multi-processor systems, external device control, and colour recognition. The text concludes with a discussion of several case studies that illustrate how intelligent machine vision techniques can be used in industrial applications.

The Asia Pacific region has become a manufacturing hub for optical components and optoelectronics. These optical devices are widely used in imaging optical systems, such as various consumer and scientific products, instruments and lighting systems, etc. Volume is indexed by Thomson Reuters CPCI-S (WoS). The papers cover most recent research results and are grouped as follows: Chapter 1: Design and System; Chapter 2: Fabrication; Chapter 3: Instrumentation; Chapter 4: Laser; Chapter 5: Measurement; Chapter 6: Optical Information Processing.

As the human population expands and natural resources become depleted, it becomes necessary to explore other sources for energy consumption and usage. Renewable and Alternative Energy: Concepts, Methodologies, Tools, and Applications provides a comprehensive overview of emerging perspectives and innovations for alternative energy sources. Highlighting relevant concepts on energy efficiency, current technologies, and ongoing industry trends, this is an ideal reference source for academics, practitioners, professionals,

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and upper-level students interested in the latest research on renewable energy.

"This book explores emerging technologies and best practices designed to effectively address concerns inherent in properly optimizing advanced systems, demonstrating applications in areas such as bio-engineering, space exploration, industrial informatics, information security, and nuclear and renewable energies"--Provided by publisher.

Reuse and integration are defined as synergistic concepts, where reuse addresses how to minimize redundancy in the creation of components; while, integration focuses on component composition. Integration supports reuse and vice versa. These related concepts support the design of software and systems for maximizing performance while minimizing cost. Knowledge, like data, is subject to reuse; and, each can be interpreted as the other. This means that inherent complexity, a measure of the potential utility of a system, is directly proportional to the extent to which it maximizes reuse and integration. Formal methods can provide an appropriate context for the rigorous handling of these synergistic concepts. Furthermore, formal languages allow for non ambiguous model specification; and, formal verification techniques provide support for insuring the validity of reuse and integration mechanisms. This edited book includes 12 high quality research papers written by experts in formal aspects of reuse and integration to cover the most recent advances in the field. These papers are extended versions of some of the best papers, which were presented at the IEEE International Conference on Information Reuse and Integration and the IEEE International Workshop on Formal Methods Integration - both of which were held in San Francisco in August 2014.

After nearly two decades, Paul Yoder's Opto-Mechanical Systems Design continues to be the reference of choice for

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professionals fusing optical and mechanical components into advanced, high-performance instruments. Yoder's authoritative systems-oriented coverage and down-to-earth approach fosters the deep-seated knowledge needed to continually push the field to new limits. Extensively revised and updated, this Third Edition reflects the massive growth and advancement achieved in the field over the past few years. It systematically examines the building blocks for new optical instruments and details new tools and techniques for designing, building, and testing optical systems hardware. The book includes revised, broad-based standards, equations for designing 26 types of prisms and lens, mirror, and prism mounts, state-of-the-art examples of designs for large mirrors and their mounts, and an expanded chapter that consolidates information on the design and mounting of metal mirrors. New sections include special protective coatings, manufacturing techniques, mounting lenses on flexures, and techniques for aligning lenses and lens systems in addition to two new chapters: one on designing and mounting small mirrors, gratings, and pellicles; the other, on analysis methods including damage and failure analysis. Whether you are designing a high-resolution projector or the most sensitive space telescope, *Opto-Mechanical Systems Design, Third Edition* supplies the tools you need in a single, concise reference.

In order to analyze the light of cosmic objects, particularly at extremely great distances, spectroscopy is the workhorse of astronomy. In the era of very large telescopes, long-term investigations are mainly performed with small professional instruments. Today they can be done using self-designed spectrographs and highly efficient CCD cameras, without the need for large financial investments. This book explains the basic principles of spectroscopy, including the fundamental optical constraints and all mathematical aspects needed to

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understand the working principles in detail. It covers the complete theoretical and practical design of standard and Echelle spectrographs. Readers are guided through all necessary calculations, enabling them to engage in spectrograph design. The book also examines data acquisition with CCD cameras and fiber optics, as well as the constraints of specific data reduction and possible sources of error. In closing it briefly highlights some main aspects of the research on massive stars and spectropolarimetry as an extension of spectroscopy. The book offers a comprehensive introduction to spectroscopy for students of physics and astronomy, as well as a valuable resource for amateur astronomers interested in learning the principles of spectroscopy and spectrograph design.

Publishes papers reporting on research and development in optical science and engineering and the practical applications of known optical science, engineering, and technology.

A concise introduction to lens design, including the fundamental theory, concepts, methods and tools used in the field. Covering all the essential concepts and providing suggestions for further reading at the end of each chapter, this book is an essential resource for graduate students working in optics and photonics.

The Art and Science of Optical Design is a comprehensive introduction to lens design, covering the fundamental physical principles and key engineering issues. Several practical examples of modern computer-aided lens design are worked out in detail from start to finish. The basic theory and results of optics are presented early on in the book, along with a discussion of optical materials. Aberrations, and their correction, and image analysis are then covered in great detail. Subsequent chapters deal with design optimisation and tolerance analysis. Several design examples are then given, beginning with basic lens design forms, and

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progressing to advanced systems, such as gradient index and diffractive optical components. In covering all aspects of optical design, including the use of modern lens design software, this book will be invaluable to students of optical engineering as well as to anyone engaged in optical design at any stage.

This book provides a unified treatment of the characteristics of telescopes of all types, both those whose performance is set by geometrical aberrations and the effect of the atmosphere, and those diffraction-limited telescopes designed for observations from above the atmosphere. The emphasis throughout is on basic principles, such as Fermat's principle, and their application to optical systems specifically designed to image distant celestial sources. The book also contains thorough discussions of the principles underlying all spectroscopic instrumentation, with special emphasis on grating instruments used with telescopes. An introduction to adaptive optics provides the needed background for further inquiry into this rapidly developing area.

Geometrical aberration theory based on Fermat's principle
Diffraction theory and transfer function approach to near-perfect telescopes
Thorough discussion of 2-mirror telescopes, including misalignments
Basic principles of spectrometry; grating and echelle instruments
Schmidt and other catadioptric telescopes
Principles of adaptive optics
Over 220 figures and nearly 90 summary tables

Learn advanced optical design techniques from the field's most respected guide
Honed for more than 20 years in an SPIE professional course taught by

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renowned optical systems designer Robert E. Fischer, *Optical System Design, Second Edition* brings you the latest cutting-edge design techniques and more than 400 detailed diagrams that clearly illustrate every major procedure in optical design. This thoroughly updated resource helps you work better and faster with computer-aided optical design techniques, diffractive optics, and the latest applications, including digital imaging, telecommunications, and machine vision. No need for complex, unnecessary mathematical derivations—instead, you get hundreds of examples that break the techniques down into understandable steps. For twenty-first century optical design without the mystery, the authoritative *Optical Systems Design, Second Edition* features:

- Computer-aided design use explained through sample problems
- Case studies of third-millennium applications in digital imaging, sensors, lasers, machine vision, and more
- New chapters on optomechanical design, systems analysis, and stray-light suppression
- New chapter on polarization including lots of really useful information
- New and expanded chapter on diffractive optics
- Techniques for getting rid of geometrical aberrations
- Testing, tolerancing, and manufacturing guidance
- Intelligent use of aspheric surfaces in optical design
- Pointers on using off-the-shelf optics
- Basic optical principles and solutions for common and advanced design problems

Thoroughly revised and expanded to reflect the substantial changes in the field since its publication in 1978. Strong emphasis on how to effectively use software design packages, indispensable to today's lens designer.

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Many new lens design problems and examples – ranging from simple lenses to complex zoom lenses and mirror systems – give insight for both the newcomer and specialist in the field. Rudolf Kingslake is regarded as the American father of lens design; his book, not revised since its publication in 1978, is viewed as a classic in the field. Naturally, the area has developed considerably since the book was published, the most obvious changes being the availability of powerful lens design software packages, theoretical advances, and new surface fabrication technologies. This book provides the skills and knowledge to move into the exciting world of contemporary lens design and develop practical lenses needed for the great variety of 21st-century applications. Continuing to focus on fundamental methods and procedures of lens design, this revision by R. Barry Johnson of a classic modernizes symbology and nomenclature, improves conceptual clarity, broadens the study of aberrations, enhances discussion of multi-mirror systems, adds tilted and decentered systems with eccentric pupils, explores use of aberrations in the optimization process, enlarges field flattener concepts, expands discussion of image analysis, includes many new exemplary examples to illustrate concepts, and much more. Optical engineers working in lens design will find this book an invaluable guide to lens design in traditional and emerging areas of application; it is also suited to advanced undergraduate or graduate course in lens design principles and as a self-learning tutorial and reference for the practitioner. Rudolf Kingslake (1903-2003) was a founding faculty member of the

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Institute of Optics at The University of Rochester (1929) and remained teaching until 1983. Concurrently, in 1937 he became head of the lens design department at Eastman Kodak until his retirement in 1969. Dr. Kingslake published numerous papers, books, and was awarded many patents. He was a Fellow of SPIE and OSA, and an OSA President (1947-48). He was awarded the Progress Medal from SMPTE (1978), the Frederic Ives Medal (1973), and the Gold Medal of SPIE (1980). R. Barry Johnson has been involved for over 40 years in lens design, optical systems design, and electro-optical systems engineering. He has been a faculty member at three academic institutions engaged in optics education and research, co-founder of the Center for Applied Optics at the University of Alabama in Huntsville, employed by a number of companies, and provided consulting services. Dr. Johnson is an SPIE Fellow and Life Member, OSA Fellow, and an SPIE President (1987). He published numerous papers and has been awarded many patents. Dr. Johnson was founder and Chairman of the SPIE Lens Design Working Group (1988-2002), is an active Program Committee member of the International Optical Design Conference, and perennial co-chair of the annual SPIE Current Developments in Lens Design and Optical Engineering Conference. Thoroughly revised and expanded to reflect the substantial changes in the field since its publication in 1978 Strong emphasis on how to effectively use software design packages, indispensable to today's lens designer Many new lens design problems and examples – ranging from simple lenses to complex zoom lenses

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and mirror systems – give insight for both the newcomer and specialist in the field

Advances in semi-automated high-throughput image data collection routines, coupled with a decline in storage costs and an increase in high-performance computing solutions have led to an exponential surge in data collected by biomedical scientists and medical practitioners. Interpreting this raw data is a challenging task, and nowhere is this more evident than in the field of ophthalmology. The sheer speed at which data on cataracts, diabetic retinopathy, glaucoma and other eye disorders are collected, makes it impossible for the human observer to directly monitor subtle, yet critical details. This book is a novel and well-timed endeavor to present, in an amalgamated format, computational image modeling methods as applied to various extrinsic scientific problems in ophthalmology. It is self-contained and presents a highly comprehensive array of image modeling algorithms and methodologies relevant to ophthalmologic problems. The book is the first of its kind, bringing eye imaging and multi-dimensional hyperspectral imaging and data fusion of the human eye, into focus. The editors are at the top of their fields and bring a strong multidisciplinary synergy to this visionary volume. Their "inverted-pyramid" approach in presenting the content, and focus on core applications, will appeal to students and practitioners in the field.

This book gathers selected and expanded contributions presented at the 5th Symposium on Space Optical Instruments and Applications, which was held in Beijing, China, on September 5–7, 2018. This conference series

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is organized by the Sino-Holland Space Optical Instruments Laboratory, a cooperative platform between China and the Netherlands. The symposium focused on key technological problems regarding optical instruments and their applications in a space context. It covered the latest developments, experiments and results on the theory, instrumentation and applications of space optics. The book is split into five main sections: The first covers optical remote sensing system design, the second focuses on advanced optical system design, and the third addresses remote sensor calibration and measurement. Remote sensing data processing and information extraction are then presented, followed by a final section on remote sensing data applications.

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