

Springer Series in

**Optical Sciences**

M. Young

# **Optics and Lasers**

*An Engineering Physics Approach*



# Optics And Lasers An Engineering Physics Approach

**Y.I. Ostrovsky, M.M. Butusov, G.V.  
Ostrovskaya**



## **Optics And Lasers An Engineering Physics Approach:**

**Optics and Lasers** Matt Young, 1977-01-01      Optics and Lasers M. Young, 2013-11-11 The field of optics has changed greatly in the past dozen years or so Partly because of the applied or engineering nature of much of modern optics there is need for a practical text that surveys the entire field Such a book should not be a classical optics text but rather it should be strong on principles applications and instrumentation on lasers holography and coherent light On the other hand it should concern itself relatively little with such admittedly interesting phenomena as the formation of the rainbow or the precise determination of the speed of light My purpose therefore has been to write an up to date textbook that surveys applied or engineering optics including lasers and certain other areas that might be called modern optics I have attempted to treat each topic in sufficient depth to give it considerable engineering value while keeping it as free of unnecessary mathematical detail as possible Because I have surveyed applied optics in a very general way including much more than I would attempt to incorporate into any single college course this book should be a useful handbook for the practicing physicist or engineer who works from time to time with optics Any of the material is appropriate to an introductory undergraduate course in optics the work as a whole will be useful to the graduate student or applied scientist with scant background in optics      **Optics and Lasers** Matt Young, Chris Cook, 1977      *Optical and Laser Remote Sensing* D.K. Killinger, A. Mooradian, 2013-06-29 The field of optical and laser remote sensing has grown rapidly in recent years This dynamic growth has been stimulated not only by technological advances in lasers detectors and optical system design but also by the potential application of remote sensing systems to a wide variety of atmospheric measurements Optical and laser remote sensing can allow single ended measurement capability not offered by conventional point detection techniques While many past measurements have been associated with laboratory research practical systems have recently been developed which are capable of remotely detecting measuring and tracking a wide range of molecular and atomic species in the atmosphere with concentrations of parts per billion and at ranges over 100 km This book is a compilation of papers which represent an overview of the present state of development of optical and laser remote sensing technology The subjects covered include both passive and active remote sensing techniques in the UV visible and IR spectral regions related laser and detector technology and atmospheric propagation and system analysis considerations While the papers do not constitute an exhaustive treatment of the excellent research being conducted in this field they are representative of the wide diversity of present efforts It is hoped that the reader will gain a general understanding of the current research in optical and laser remote sensing as well as an overview of current systems development      *The Monte Carlo Methods in Atmospheric Optics* G.I. Marchuk, G.A. Mikhailov, M.A. Nazareliev, R.A. Darbinjan, B.A. Kargin, B.S. Elepov, 2013-04-17 This monograph is devoted to urgent questions of the theory and applications of the Monte Carlo method for solving problems of atmospheric optics and hydrooptics The importance of these problems has grown because of the increasing need to interpret optical observations and to estimate radiative balance

precisely for weather forecasting Inhomogeneity and sphericity of the atmosphere absorption in atmospheric layers multiple scattering and polarization of light all create difficulties in solving these problems by traditional methods of computational mathematics Particular difficulty arises when one must solve nonstationary problems of the theory of transfer of narrow beams that are connected with the estimation of spatial location and time characteristics of the radiation field The most universal method for solving those problems is the Monte Carlo method which is a numerical simulation of the radiative transfer process This process can be regarded as a Markov chain of photon collisions in a medium which result in scattering or absorption The Monte Carlo technique consists in computational simulation of that chain and in constructing statistical estimates of the desired functionals The authors of this book have contributed to the development of mathematical methods of simulation and to the interpretation of optical observations A series of general methods using Monte Carlo techniques has been developed The present book includes theories and algorithms of simulation Numerical results corroborate the possibilities and give an impressive prospect of the applications of Monte Carlo methods NBS Technical Note, 1979

*Advances in Diagnostic Visual Optics* G. M. Breinin, I. M. Siegel, 2013-04-18 Opening Remarks of the President 2nd ISVO Professor G M Breinin M D The study of visual processes is surely unique as a clinical specialty in incorporating the disciplines of physics chemistry physiology and psychology Diagnosing and correcting disorders of the visual system in these last two decades of the 20th century has brought all of us into close proximity with computer sciences laser technology the marvels of electronic microcircuitry and the impressive developments in optical materials During the course of this meeting we shall be hearing about how these different technologies can interact with one another and we shall discover that such interaction may produce new diagnostic tools and new optical devices We shall also learn that the optical qualities of the eye change during life producing subtle and complex alterations in vision On behalf of the members and organizing committee of the American Committee on Optics and Visual Physiology and our co sponsoring organization the Optical Society of America I welcome you to this second symposium on visual optics The first symposium took place in Japan in 1978 and like the present one was a satellite meeting of the International Congress of Ophthalmology The third symposium in this series will take place in Italy in 1986 as part of the next session of the International Congress of Ophthalmology **Lasers in**

**Photomedicine and Photobiology** R. Pratesi, C. A. Sacchi, 2013-11-11 This Conference on biomedical applications of lasers has been organized by the Quantum Electronics Divisional Board of the European Physical Society E P S and held at the Villa of Poggio Imperiale in Florence September 3-6 1979 As known laser surgery especially microsurgery and endoscopic photocoagulation has recently made important progress and the field is expanding rapidly Very significant applications of lasers have also been achieved in Biology during recent years cell microsurgery cell counting and sorting cytofluorimeter devices etc and the potential of laser techniques in this field is now sufficiently well established A new class of applications of laser radiation in Medicine has recently been made possible by important results obtained with low intensity non coagulative

visible lasers such as photodynamic therapy of tumors At the same time important branches of Medicine where light effects are studied and optical techniques are presently used for a certain number of clinical applications such as dermatology and pediatry appear to be still in their infancy as far as the proper use of optical radiation and techniques and the understanding of fundamental photoinduced biological processes are concerned Moreover laser photobiology appears a very promising field for the investigation of fundamental processes at the biomolecular level Holography and Deformation Analysis W. Schumann, J.-P. Zürcher, D. Cuche, 2013-04-17 In this book series on Optical Sciences holography has been the subject of three previous volumes In particular Vol 16 written by one of us W S and Dr M Dubas treated holographic interferometry of opaque bodies from the standpoint of deformation analysis However the fundamental principles of holography are developed there only briefly in preparation for a discussion of interference fringe modifications This new volume in the series is intended to consider in detail many topics which were previously omitted such as the deformation or distortion of holographic images the theory of volume holograms composite or multiplex holography holographic interferometry of transparent media time dependent effects holographic contouring and applications of fringe modifications to the deformation of opaque bodies In addition these and other subjects will be treated with the same unifying concept developed in Vol 16 but with an additional emphasis on those features that have their origins in classical optics especially the small wavelength approach the coupled wave theory and the Seidel aberrations Since the field of holography and its various applications is growing rapidly it is impossible to be comprehensive in a single book Every effort has been made to avoid unnecessary duplication of Vol 16 For example displacement and fringe localization problems are only briefly discussed while some modification techniques e g sandwich holography are not included When needed however the reader is directly referred to complementary publications *The High-Power Iodine Laser* G. Brederlow, E. Fill, K. J. Witte, 2013-04-17 There have been two major review articles on the iodine laser in the last 11 seven years *The Photochemical Iodine Laser* by K Hohla and K Kompa *Handbook of Chemical Lasers* edited by R Gross and J Bott Wile y New York 1976 and a SANDIA report No 78 1071 1978 entitled *The Atomic Iodine Laser* Since then a large body of new material has been published and practical experience has been gained with large iodine laser systems in Germany ASTERIX II I and in the USSR These lasers have now become very reliable tools especially in fusion oriented plasma experiments which represent their main field of application They can deliver powers in excess of many terawatts per beam and are thus also suited for use in other areas such as X ray lasers incoherent X ray sources compression of matter and its behaviour at very high densities The physics of the iodine laser is now rather well understood and its technology has reached a standard adequate for the construction of large scale systems in the multi hundred kJ range In view of this new situation we thought it useful to document the present state of the art in a book Its contents and the literature cited therein have been chosen to cover those areas which are of main concern in the design and operation of pulsed high power iodine lasers *Scanning Electron Microscopy* Ludwig

Reimer, 2013-11-11 The aim of this book is to outline the physics of image formation electron specimen interactions imaging modes the interpretation of micrographs and the use of quantitative modes in scanning electron microscopy SEM It forms a counterpart to Transmission Electron Microscopy Vol 36 of this Springer Series in Optical Sciences The book evolved from lectures delivered at the University of Münster and from a German text entitled Raster Elektronenmikroskopie Springer Verlag published in collaboration with my colleague Gerhard Pfefferkorn In the introductory chapter the principles of the SEM and of electron specimen interactions are described the most important imaging modes and their associated contrast are summarized and general aspects of elemental analysis by x ray and Auger electron emission are discussed The electron gun and electron optics are discussed in Chap 2 in order to show how an electron probe of small diameter can be formed how the electron beam can be blanked at high frequencies for time resolving experiments and what problems have to be taken into account when focusing

*Fiber-Optic Rotation Sensors and Related Technologies* S. Ezekiel, H. J. Arditty, 2013-11-11 Currently there is considerable interest in the application of optical methods for the measurement of absolute rotation Active approaches so called ring laser gyros have been under serious development for at least 15 years More recently passive approaches using ring resonators or multi turn fiber interferometers have also demonstrated much promise The only previous conference devoted exclusively to optical rotation sensors held in 1978 in San Diego California was organized by the Society of Photo optical Instrumentation Engineers SPIE Although the main emphasis at that conference was on ring laser gyros a number of papers were also included that described the early development of fiber gyroscopes Since then the field of fiber optic rotation sensors has grown so rapidly that a conference devoted primarily to this subject was needed The First International Conference on Fiber Optic Rotation Sensors was held at the Massachusetts Institute of Technology Cambridge Massachusetts November 9-11 1981 The purpose of the conference was to bring together the many researchers and interested personnel from universities industry and government to discuss and exchange ideas on the many recent developments in fiber optic rotation sensors and related technologies The program consisted of tutorial papers as well as invited and contributed papers

*Photon Correlation Techniques in Fluid Mechanics* E.O. Schulz-Dubois, 2013-06-29 Photon correlation is a kind of spectroscopy designed to identify optical frequency shifts and line broadening effects in the range of many MHz down to a few Hz The optical intensity is measured in terms of single photon detection events which result in current pulses at the output of photomultiplier tubes This signal is processed in real time in a special purpose parallel processor known as a correlator The resulting photon correlation function a function in the time domain contains the desired spectral information which may be extracted by a suitable algorithm Due to the non intrusive nature and the sound theoretical basis of photon correlation the phenomena under study are not disturbed and the parameters in question can be precisely evaluated For these reasons photon correlation has become a valuable and in many instances indispensable technique in two distinct fields One of these is velocimetry in fluid flow This includes hydro and aerodynamic processes in liquids gases or flames

where the velocity field may be stationary time periodic or turbulent and may range from micrometers per second for motion inside biological cells to one kilometer per second for supersonic flow The other major field is stochastic particle propagation due to Brownian motion

Table of Laser Lines in Gases and Vapors R. Beck, W. Englisch, K. Gürs, 2013-06-05 Lasers and Applications W.O.N. Guimares, C.-T. Lin, A. Mooradian, 2013-06-29 The International Conference on Lasers and Applications was held in Rio de Janeiro Brazil from 29 June to 3 July 1980 This conference was held to commemorate the memory of Professor Sergio Porto who died suddenly about one year earlier while attending a laser conference in the Soviet Union The subject matter covered the active areas of laser devices photochemistry non linear optics high resolution spectroscopy photokinetics photobiology photomedicine optical communication optical bistability and Raman spectroscopy The conference was attended by over 150 people including scientists from Japan France England West Germany Norway Italy Brazil Chile Argentina India Canada and the United States A memorial session attended by members of the Porto family and ranking Brazilian government dignitaries preceded the start of the conference The location of the conference in Rio de Janeiro Brazil was chosen because it was in the homeland of Sergio Porto and provided an opportunity for his friends colleagues and countrymen to pay homage to him The setting on Copacabana Beach afforded access to the lovely beaches restaurants and nightlife of one of the most beautiful and exciting cities of the world There were tours of the city together with a banquet that featured a performance by one of the best Samba Schools in Rio Financial support from many sponsors in Brazil and the United States is gratefully acknowledged in making this working conference a fitting tribute to the memory of Professor S P S Porto

**Holographic Interferometry** W. Schumann, M. Dubas, 2013-06-29 This small book intends to build a bridge between the aspects of Optics and of Mechanics that are involved in the application of holographic interferometry to deformation analysis of opaque bodies As such it follows in some way the footsteps of the late Prof H Favre who already in 1927 proposed to use interferometry for deformation measurements refer to his thesis *Sur une nouvelle methode optique de determination des tensions interieures* Many a concept also originates from the research and lectures of Prof W Prager in continuum mechanics Profs D C Drucker and C Mylonas in experimental mechanics Prof C R Steele in shell theory and Prof W Lukosz in physical optics Further stimulation arose in discussions about holography with Profs R D Mindiker J Der Hovanesian and H Tiziani as well as with Drs B Ineichen and F M Mottier The contribution of Drs W W Thrich P Bohler and G Teichmann must also be acknowledged the latter more particularly for rendering valuable assistance on the delicate points of tensor calculus as well as in the drawing of the figures Full gratitude must also be expressed to those who made the publication of this book possible Dr D MacAdam who openheartedly accepted it in his series Dr H Lotsch and the collaborators of Springer Verlag Mr P Hagnauer who revised the original text and Mrs L Wehrli whose patience was tried in carefully typing the manuscript which Mr F Dufour read over again

**Matrix Theory of Photoelasticity** Pericles S. Theocaris, E.E. Gdoutos, 2013-06-29 Photoelasticity as an experimental method for analyzing stress fields in mechanics was

developed in the early thirties by the pioneering works of Mesnager in France and Coker and Filon in England Almost concurrently F ppl Mesmer and Oppel in Germany contributed significantly to what turned out to be an amazing development Indeed in the fifties and sixties a tremendous number of scientific papers and monographs appeared all over the world dealing with various aspects of the method and its applications in experimental stress analysis All of these contributions were based on the so called Neumann Maxwell stress optical law they were developed by means of the classical methods of vector analysis and analytic geometry using the conventional light vector concept This way of treating problems of mechanics by photoelasticity indicated many shortcomings and drawbacks of this classical method especially when three dimensional problems of elasticity had to be treated and when complicated load and geometry situations existed Meanwhile the idea of using the Poincare sphere for representing any polarization profile in photoelastic applications was introduced by Robert in France and Aben in the USSR in order to deal with problems of polarization of light passing through a series of optical elements retarders and/or rotators Although the Poincare sphere presentation of any polarization profile constitutes a powerful and elegant method it exhibits the difficulty of requiring manipulations in three dimensional space on the surface of the unit sphere However other graphical methods have been developed to bypass this difficulty

*Interferometry by Holography* Y.I. Ostrovsky, M.M. Butusov, G.V. Ostrovskaya, 2013-04-17 This book is an introduction to holographic interferometry a field of holography having a great number of important and practically useful applications It is intended for specialists working in the field of optics and holography and also for students of the relevant specialities At present a greater and greater number of mechanical engineers turbine designers testers of diverse equipment biologists crystallographers and so on have to do with holographic interferometry To allow these specialists who are comparatively far from optics to master the subject too the main content of the book is preceded by an introductory chapter treating the fundamental concepts of the interference of light optical interferometry holography and holographic interferometry The following chapters deal with the fundamentals of the theory of holographic interferometry and of experimental equipment The authors have set themselves the task of sharing their more than ten year of experience of work in the field of holographic interferometry with their readers In this connection the questions which they dealt with directly are considered in somewhat greater detail as a rule than those with which they have become acquainted only from publications on the subject A sufficiently detailed although far from complete bibliography gives any interested reader an opportunity to improve his knowledge of this field

*Color Theory and Its Application in Art and Design* George A. Agoston, 2013-11-11 My aim in this introductory text is to present a comprehensible discussion of certain technical topics and recent developments in color science that I believe are of real interest to artists and designers I treat a number of applications of this knowledge for example in selection and use of colorants pigments and dyes and light Early in the book I discuss what color is and what its characteristics are This is followed by a chapter on pertinent aspects of light as the stimulus that causes the perception



of color Then the subject of the colors of opaque and transparent nonfluorescent and fluorescent materials is taken up There are sections on color matching color mixture and color primaries Chapter 6 introduces the basic ideas that underlie the universal method CIE of color specification Later chapters show how these ideas have been extended to serve other purposes such as systematic color naming determining complementary colors mixing colored lights and demonstrating the limitations of color gamuts of colorants The Munsell and the Ostwald color systems and the Natural Colour System Sweden are explained and the new Uniform Color Scales Optical Society of America are described Color specification itself is a broad topic The information presented here is relevant in art and design for those who work with pigments and dyes or with products that contain them such as paints printing inks plastics glasses mosaic tesserae etc

**Laser Spectroscopy IV** H. Walther, K. W. Rothe, 2013-06-05 The Fourth International Conference on Laser Spectroscopy FICOLS was held in the Hotel Oberfahrt in Rottach Egern Tegernsee June 11 15 1979 Rottach Egern is a well known health resort situated on the southern end of Lake Tegernsee As with the previous laser spectroscopy conferences in Vail Megeve and Jackson the purpose of FICOLS was to provide an informal setting where an international group of scientists active in laser spectroscopy could discuss current problems and developments in the field The program consisted essentially of invited lectures with appropriate time provided for the latest postdeadline results The conference was attended by 340 scientists representing 25 countries Austria Australia Brazil Canada Peoples Republic of China Denmark Finland France Germany FRG Germany GDR Great Britain India Italy Japan Netherlands New Zealand Norway Pakistan Poland Spain Sweden Switzerland U S K U S S R and Yugoslavia Unfortunately five of our colleagues from Japan who planned to attend the meeting could not come due to an interruption of airline schedules Their absence was a distinct loss to the conference However their papers will be published in one of the forthcoming issues of the journal Applied Physics Numerous people have contributed to making the conference a success Especially we would like to thank the members of the steering committee for their advice concerning the program

## Unveiling the Magic of Words: A Report on "**Optics And Lasers An Engineering Physics Approach**"

In a global defined by information and interconnectivity, the enchanting power of words has acquired unparalleled significance. Their ability to kindle emotions, provoke contemplation, and ignite transformative change is really awe-inspiring. Enter the realm of "**Optics And Lasers An Engineering Physics Approach**," a mesmerizing literary masterpiece penned with a distinguished author, guiding readers on a profound journey to unravel the secrets and potential hidden within every word. In this critique, we shall delve to the book is central themes, examine its distinctive writing style, and assess its profound impact on the souls of its readers.

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