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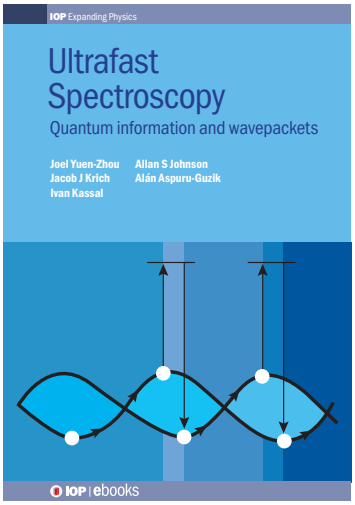


Subject
Atomic and molecular physics

Published

130pp

ISBN 978-0-750-31062-8 (electronic)

ISBN 978-0-750-31063-5 (print)

Readership
Graduate students and researchers in chemical physics, physics and chemistry

Key features
Practical introduction. Includes worked examples and problems. Accompanied by MATLAB® code

Ultrafast Spectroscopy

Quantum information and wavepackets

Joel Yuen-Zhou, Jacob J Krich, Ivan Kassal, Allan S Johnson and Alán Aspuru-Guzik

- Massachusetts Institute of Technology, Cambridge, Massachusetts, USA
- University of Ottawa, Canada
- The University of Queensland, Australia
- Imperial College London, UK
- Harvard University, Cambridge, Massachusetts, USA

About the book

The applications of nonlinear ultrafast spectroscopy are numerous and widespread, and it is an indispensable technique in modern research. Unfortunately, it is also a topic that can be daunting to those meeting it for the first time. Making use of many worked examples and accompanied by MATLAB® codes for numerical simulations of spectra, the authors deliver a practical and intuitive approach to the subject. Assuming just an understanding of quantum mechanics and statistical mechanics, the book delivers an introduction to the subject for advanced students and researchers. It will also be useful for practitioners, who are already familiar with the subject, but who want to develop a more conceptual understanding. Once a reader has assimilated the material in this text, they will be fully equipped with the tools to devise well reasoned spectroscopic experiments.

About the authors

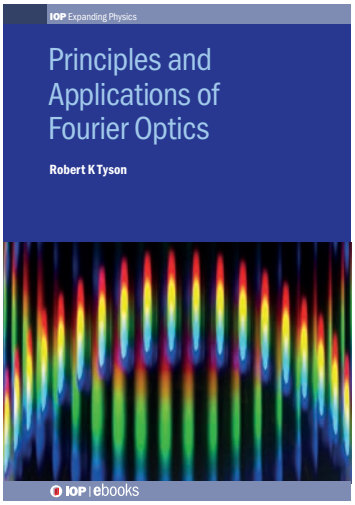
Joel Yuen-Zhou is a research fellow at Massachusetts Institute of Technology, USA.

Jacob J Krich is an assistant professor of physics at the University of Ottawa, Canada.

Ivan Kassal is a researcher at The University of Queensland, Australia.

Allan S Johnson is a Marie-Curie Early Stage Researcher and NSERC PGS award holder in the Quantum Optics and Laser Science division at Imperial College London, UK.

Alán Aspuru-Guzik is a professor of chemistry and chemical biology at Harvard University, USA.



Subject
Optics and photonics

Published

116pp

ISBN 978-0-750-31056-7 (electronic)

ISBN 978-0-750-31057-4 (print)

Readership
Advanced students and working professional optical scientists and electro-optical engineers

Key features
1. Principles are emphasized
2. Applications are mentioned with guidance for adopting analysis techniques
3. Path from basic optical propagation theory to Fourier techniques and problem solving is given

Principles and Applications of Fourier Optics

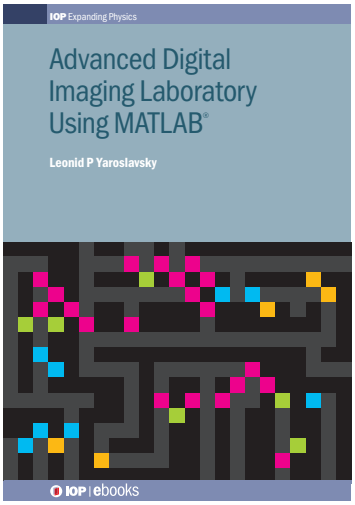
Robert K Tyson
The University of North Carolina at Charlotte,
Charlotte, North Carolina, USA

About the book

In this text, Robert Tyson presents the fundamentals of Fourier optics with sufficient detail to educate the reader, typically an advanced student or working scientist or engineer, to the level of applying the knowledge to a specific set of design or analysis problems. Instead of presenting complex multipage proofs of the underlying theory, the key results are presented with an explanation of the physical meaning and accompanied by appropriate literature references. The last half of the book explores some of the many and varied modern applications, including in imaging, interferometry, tomography, optical testing methods, pattern recognition, holography, data processing, encoding and encryption.

About the author

Robert K Tyson is a Fellow of SPIE and professor emeritus at the Department of Physics and Optical Sciences, The University of North Carolina at Charlotte. Before joining the faculty of UNC, Robert worked in the aerospace industry (United Technologies Corporation and Schafer Corporation) for more than 20 years. Working in the field of atmospheric propagation and adaptive optics, he has authored seven books in adaptive optics at various levels as well as graduated a number of master's and PhD students whose research was in physical (or Fourier) optics.



Subject
Applied and industrial physics

Published

Webinar

124pp

ISBN 978-0-750-31050-5 (electronic)

ISBN 978-0-750-31051-2 (print)

Readership
Graduate students and practitioners in imaging engineering

Webinar
iopscience.org/books/author-webinars

Advanced Digital Imaging Laboratory Using MATLAB®

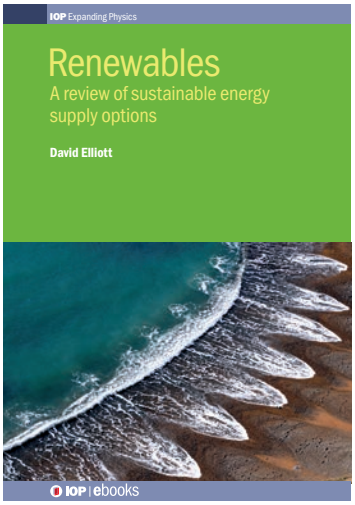
Leonid P Yaroslavsky
Tel Aviv University, Israel

About the book

In this book, Prof. Yaroslavsky delivers a complete applied course in digital imaging aimed at advanced students and practitioners. Covering all areas of digital imaging, the text provides an outline of underlying principles of each topic before offering more than 80 MATLAB® based exercises. Subjects addressed embrace image digitization (discretization, quantization, compression), digital image formation and computational imaging, image resampling and building continuous image models, image and noise statistical characterization and diagnostics, statistical image models and pattern formation, image correlators for localization of objects, methods of image perfecting (denoising, deblurring), and methods of image enhancement.

About the author

Leonid P Yaroslavsky is a professor emeritus at Tel Aviv University. A fellow of the Optical Society of America, he has authored more than 100 papers on digital image processing and digital holography.



Renewables

A review of sustainable energy supply options

David Elliott
The Open University, UK

Subject
Environmental physics and green energy

Published

Webinar

190pp

ISBN 978-0-750-31040-6 (electronic)

ISBN 978-0-750-31041-3 (print)

Readership
Students, scientists, engineers and professionals involved with the technology, policy and implementation of green and renewable energy, and the environmental aspects of modern energy demands

Webinar
iopscience.org/books/author-webinars

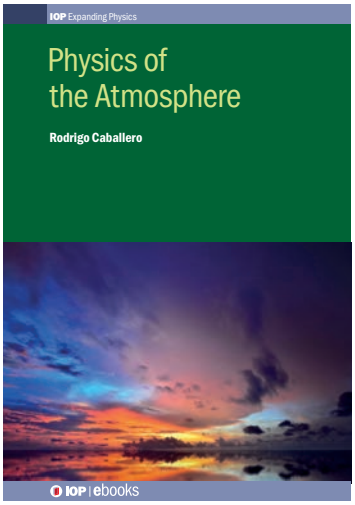
About the book

Renewable energy is a fast-expanding field, welcomed by many as part of the answer to climate change and energy security concerns; but can renewables deliver? This book reviews the basic technological options and global implementation, so as to convey the sense of excitement that abounds in this new area of technological development, but it also looks at the problems, including technological, policy issues, local environmental impacts and the need to deal with the variability of some renewable energy sources.

About the author

David Elliott worked initially with the UK Atomic Energy Authority at Harwell and the Central Electricity Generating Board, before moving to The Open University, where he is now an Emeritus Professor. While at The Open University, he was the co-director of the Energy and Environment Research Unit and Professor of Technology Policy in the Faculty of Mathematics, Computing and Technology. During his time at The Open University he created several courses in design and innovation, with special emphasis on how the innovation development process can be directed towards sustainable technologies.

Prof. Elliott has published numerous books, reports and papers, especially in the area of the development of sustainable and renewable energy technologies and systems. Still very active in research and policy, he also writes the popular blog *Renew Your Energy* on **environmentalresearchweb.org**.



Physics of the Atmosphere

Rodrigo Caballero
Stockholm University, Sweden

About the book

With the increasing interest in climate change, there is an ever-growing importance in atmospheric physics and an understanding of how the atmosphere functions and interacts with oceans, ice and the biosphere. This self-contained text, written for graduate students in physics or meteorology, assumes no prior knowledge apart from basic mechanics and calculus, and delivers material for a complete course. Augmented with worked examples, the text considers all aspects of atmospheric physics excluding dynamics, and covers topics such as thermodynamics, cloud microphysics, remote sensing and atmospheric radiation, and will be an invaluable resource for students and researchers.

About the author

Rodrigo Caballero is a researcher in the Department of Meteorology at Stockholm University where his research focuses on the role of the atmosphere within the climate system, with an emphasis on understanding the fundamental underlying mechanisms of this complex system, including interactions between atmosphere, ocean, ice and the biosphere.

Subject
Geophysics and planetary science

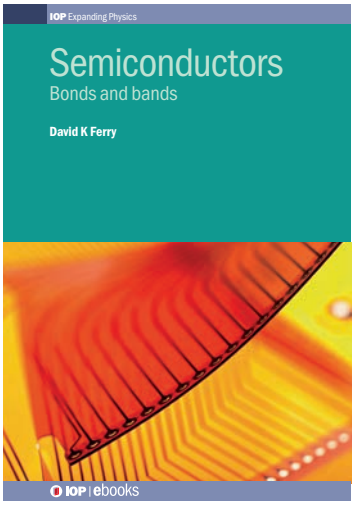
Published

132pp

ISBN 978-0-7503-1052-9 (electronic)

ISBN 978-0-7503-1053-6 (print)

Readership
Graduate students



Subject
Electronic materials and devices

Published

182pp

ISBN 978-0-750-31044-4 (electronic)

ISBN 978-0-750-31045-1 (print)

Readership
Graduate students and researchers in semiconductor physics and devices

Key features
Self-contained class-tested introductory text on the physics of semiconductors

Semiconductors

Bonds and bands

David K Ferry
Arizona State University, Arizona, USA

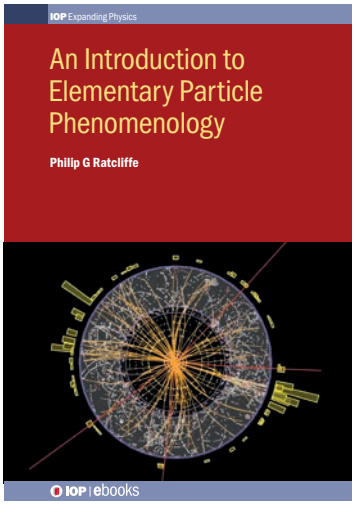
About the book

As we settle into this second decade of the 21st century it is evident that the advances in microelectronics have truly revolutionized our day-to-day lifestyle. The growth of microelectronics itself has been driven, and in turn is calibrated by, the growth in density of transistors on a single integrated circuit, a growth that has come to be known as Moore's Law. Considering that the first transistor appeared only at the middle of the last century, it is remarkable that billions of transistors can now appear on a single chip. The technology is built upon semiconductors, materials in which the band gap has been engineered for special values suitable to the particular application.

This book, written specifically for a one-semester course for graduate students, provides a thorough understanding of the key solid-state physics of semiconductors and prepares readers for further advanced study, research and development work in semiconductor materials and applications. The book describes how quantum mechanics gives semiconductors unique properties that enabled the microelectronics revolution, and sustain the ever-growing importance of this revolution. Including chapters on electronic structure, lattice dynamics, electron–phonon interactions and carrier transport it also discusses theoretical methods for computation of band structure, phonon spectra, the electron–phonon interaction and transport of carriers.

About the author

David K Ferry is Regents' Professor in the School of Electrical, Computer and Energy Engineering, at Arizona State University. He received his doctoral degree from the University of Texas, Austin, and was the recipient of the 1999 Cledo Brunetti Award from the Institute of Electrical and Electronics Engineers for his contributions to nanoelectronics. He is the author, or co-author, of numerous scientific articles and more than a dozen books.



An Introduction to Elementary Particle Phenomenology

Philip G Ratcliffe
University of Insubria, Como, Italy

About the book

This book deals with the development of particle physics, in particular an area that has now become known as phenomenology. The author presents a solid and clear motivation for the developments witnessed by the particle physics community at both high and low energies over the past 50 or 60 years. Including exercises and references to original experimental and theoretical papers, as well as other useful sources, it will be essential reading for all students and researchers in modern particle physics.

About the author

Philip G Ratcliffe gained his first degree at Trinity College, Cambridge in 1976, where he was also awarded a senior scholarship. In 1983 he obtained his doctoral degree with a thesis entitled "The Role of Spin Physics in Hadronic Interactions at Short Distances" at the International School for Advanced Studies (Scuola Internazionale Superiore di Studi Avanzati, SISSA), Trieste, Italy. He has been Research Associate at the Cavendish Laboratory, Cambridge; Queen Mary and Westfield College, London, and with the Italian National Institute for Nuclear Physics (INFN) in Milan and Turin. He is currently Associate Professor of Nuclear and Subnuclear Physics at the University of Insubria in Como, Italy.

Subject
High energy and particle physics

Published

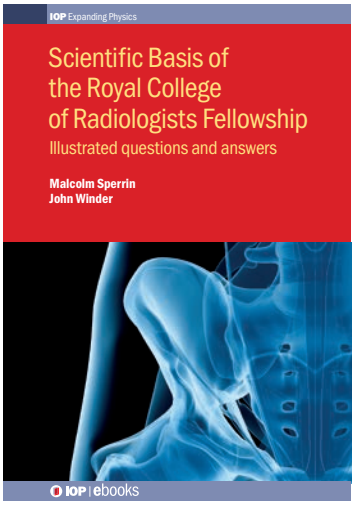
222pp

ISBN 978-0-7503-1072-7 (electronic)

ISBN 978-0-7503-1073-4 (print)

Readership
Advanced students and researchers in the fields of experimental, phenomenological and theoretical particle physics

Key features
Exercises; extensive references; high- and low-energy particle physics, the standard model and beyond



Scientific Basis of the Royal College of Radiologists Fellowship

Illustrated questions and answers

Malcolm Sperrin and John Winder

- Royal Berkshire Hospital, Reading, UK
- University of Ulster, N. Ireland

Subject
Medical physics and biomedical engineering

Published

Webinar

258pp

ISBN 978-0-7503-1058-1 (electronic)

ISBN 978-0-7503-1059-8 (print)

Readership
Graduate students in medical physics and clinicians and technologists preparing for the Royal College of Radiologists Fellowship examinations

Key features
Questions and answers authored by Royal College examiners

Webinar
iopscience.org/books/author-webinars

About the book

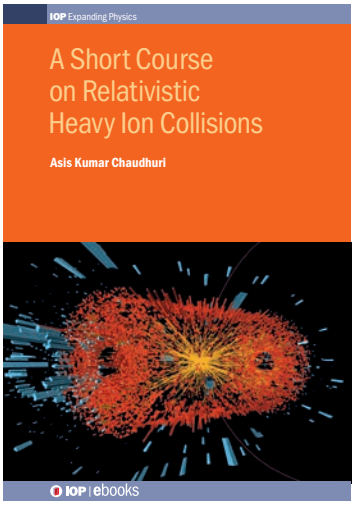
This book provides support for those sitting higher-level professional exams such as the various Royal College Fellowships but also includes other professional bodies such as IPEM, Society of Radiographers as well as numerous overseas boards.

A comprehensive and practical revision tool and study aid, the authors include background information on each topic but the book's key feature is the number of sample examination questions, complete with full detailed solutions, explanations and references.

About the authors

Malcolm Sperrin is the Director of the Department of Medical Physics, Royal Berkshire Hospital, Reading, UK.

John Winder is Reader in Healthcare Science at the Institute of Nursing and Health Research, University of Ulster, N. Ireland, and a clinical scientist specialising in medical physics and medical imaging.



Subject
Nuclear physics

Published

302pp

ISBN 978-0-750-31060-4 (electronic)

ISBN 978-0-750-31061-1 (print)

Readership
Graduate students and researchers in theoretical and experimental high-energy nuclear physics

A Short Course on Relativistic Heavy Ion Collisions

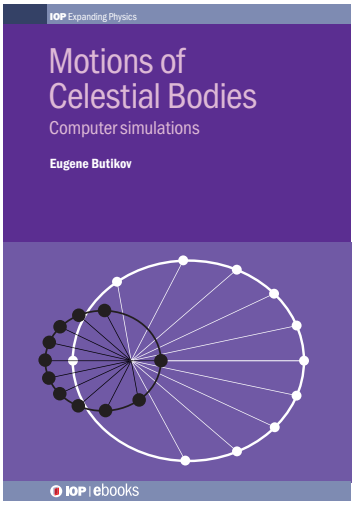
Asis Kumar Chaudhuri
Variable Energy Cyclotron Centre, Kolkata, India

About the book

By colliding heavy ions at nearly the speed of light, scientists are exploring both our physical world and conditions at the beginning of the universe. With applications in nuclear physics, particle physics, astrophysics, cosmology and condensed-matter physics, this text will provide the foundation for a range of graduate students and young researchers in both experimental and particle physics. This text introduces the subject of relativistic high-energy, heavy ion collisions and, in particular, the subject of the quark–gluon plasma (QGP). Starting with a conceptual basis for QGP formation in heavy ion collisions, the author then proceeds to provide a more rigorous foundation by introducing gauge theory, QCD and lattice QCD. These topics are introduced briefly but with sufficient coverage that the reader can comprehend their applications in heavy ion collisions. Two-particle correlation (Hanbury-Brown-Twiss) method and recent advances in hydrodynamical modelling, including event-by-event hydrodynamics are also discussed, bringing the coverage up to the leading areas of current research.

About the author

Asis Kumar Chaudhuri is head of the Theoretical Physics Division, Variable Energy Cyclotron Centre, Kolkata and a professor at the Homi Bhabha National Institute, Kolkata, India.



Motions of Celestial Bodies

Computer simulations

Eugene Butikov
St Petersburg State University, Russia

Subject
Astronomy and astrophysics

Published

240pp

ISBN 978-0-750-31100-7 (electronic)

ISBN 978-0-750-31101-4 (print)

Readership
University students studying physics, mathematics and astronomy, their lecturers and instructors. Advanced college students, scientists and engineers in spaceflight and astrodynamics

Key features

1. The textbook is written for a wide range of students learning various courses in physics and astronomy
2. The textbook is accompanied by a highly interactive educational software package developed by the author
3. Contemporary interactive media offers students a means to visualize and to explore numerous orbital motions
4. The structure of the textbook and programs allows students to study the subject at different levels of difficulty
5. Using the textbook and the simulation programs, students can perform mini-research projects in physics and astronomy

About the book

This book is written for a wide range of graduate and undergraduate students studying various courses in physics and astronomy. It is accompanied by the award-winning educational software package “Planets and Satellites” developed by the author. This text, together with the interactive software, is intended to help students learn and understand the fundamental concepts and the laws of physics as they apply to the fascinating world of the motions of natural and artificial celestial bodies. The primary aim of the book is the understanding of the foundations of classical and modern physics, while their application to celestial mechanics is used to illustrate these concepts. The simulation programs create vivid and lasting impressions of the investigated phenomena, and provide students and their instructors with a powerful tool that enables them to explore basic concepts that are difficult to study and teach in an abstract conventional manner. Students can work with the text and software at a pace that they can enjoy, varying parameters of the simulated systems. Each section of the textbook is supplied with questions, exercises, and problems. Using some of the suggested simulation programs, students have an opportunity to perform interesting mini-research projects in physics and astronomy.

About the author

Eugene Butikov is a professor of physics at St Petersburg State University in Russia, where he teaches general physics, optics, quantum theory of solids and theory of oscillations. His research work is associated with solid-state physics (quantum theory of electronic paramagnetic resonance, theory of Josephson effects in weak superconductivity) and theory of nonlinear oscillations. He has written several textbooks and handbooks on physics that are widely used in Russia, and is a co-author of the *Concise Handbook of Mathematics and Physics*, CRC Press, 1997. He devotes a lot of time and effort to developing interactive educational software for university-level physics students to investigate mathematical models of physical systems.

IOP Concise Physics™

IOP Concise Physics Collection

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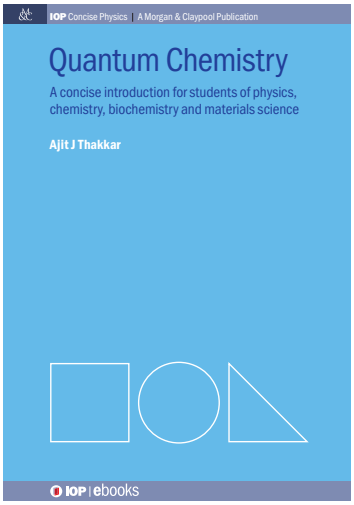
M&C were one of the early pioneers of e-first book publishing and have successfully combined an innovative editorial approach with an e-first model to become a leader in high-quality ebook publishing. This exciting new venture will bring the M&C "synthesis" model to physics.



Subject
Atomic and molecular physics

Published

124pp

ISBN 978-1-627-05416-4 (electronic)

ISBN 978-1-627-05417-1 (print)

Readership
Non-specialist users of spectroscopic measurements. Second- or third-year undergraduates

Quantum Chemistry

A concise introduction for students of physics, chemistry, biochemistry and materials science

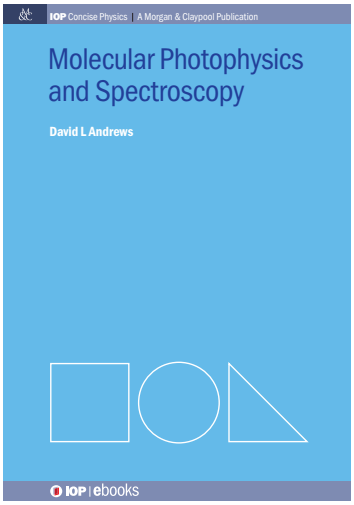
Ajit J Thakkar
University of New Brunswick, Fredericton, Canada

About the book

This book is designed to help the non-specialist user of spectroscopic measurements and electronic structure computations to achieve a basic understanding of the underlying concepts of quantum chemistry. The book can be used to teach introductory quantum chemistry to second- or third-year undergraduates either as a stand-alone one-semester course or as part of a physical chemistry or materials science course. Researchers in related fields can use the book as a quick introduction or refresher.

About the author

Ajit J Thakkar is a Professor in the Department of Chemistry at the University of New Brunswick. He obtained his PhD in theoretical chemistry from Queen's University at Kingston. His research program in the theoretical and computational prediction of molecular properties and interactions has led to more than 250 research papers. His research was recognized by the awards of a prestigious Alfred P Sloan Research Fellowship in 1984, the Canadian Society for Chemistry's Noranda Award (now called the Laidler Award) for distinguished contributions to physical chemistry in 1991 [Noranda award photos], and the European Society for Computational Methods in Sciences and Engineering ICCMSE prize in 2004 [ICCMSE prize photos].



Molecular Photophysics and Spectroscopy

David L Andrews
University of East Anglia, Norwich, UK

About the book

This book provides a fresh, photon-based description of modern molecular spectroscopy and photophysics, with applications drawn from chemistry, biology, physics and materials science. The concise and detailed approach includes some of the most recent developments, dispensing with old-fashioned treatments of theory and instrumentation.

Instead, the focus is on how light absorption and scattering occurs in molecules, and what happens to the energy that the molecules can acquire. The author draws upon his extensive experience of teaching these subjects at university level. Departing from the entrenched pattern of most textbooks, this book provides a modern and amenable treatment, directly meeting the needs of today's scientist. The text is fresh and lively, interspersed with vivid original figures, and there are numerous worked examples, illustrating the principles with real-world examples.

About the author

David L Andrews has more than 300 research papers and 10 books to his name, including the widely adopted textbook, *Lasers in Chemistry*; he is also on the Editorial Boards of four international journals. The current focus of his research is on novel mechanisms for optical nanomanipulation and switching, and light harvesting in nanostructured molecular systems. His group enjoys strong international links, particularly with groups in Canada, Lithuania, New Zealand and the US. Prof. Andrews was recently Chair of the SPIE Nanotechnology Technical Group and he is currently Chair of the Royal Society of Chemistry Molecular Spectroscopy Group.

Subject
Atomic and molecular physics

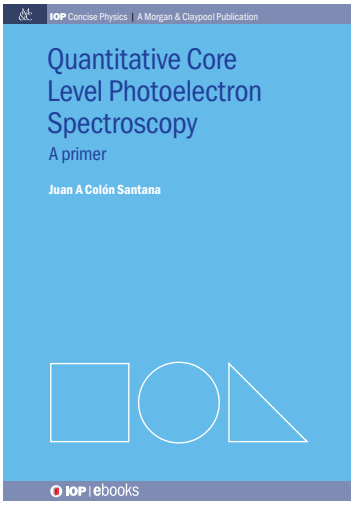
Published

95pp

ISBN 978-1-627-05288-7 (electronic)

ISBN 978-1-627-05287-0 (print)

Readership
Students in physics, chemistry and biology



Quantitative Core Level Photoelectron Spectroscopy

A primer

Juan A Colón Santana
Northern Illinois University, USA

Subject
Atomic and molecular physics

Published

110pp

ISBN 978-1-627-05415-7 (electronic)

ISBN 978-1-627-05414-0 (print)

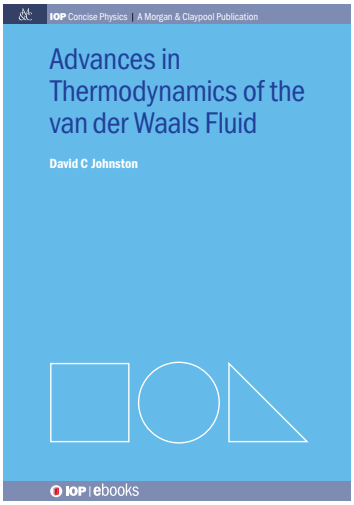
About the book

Photoemission (also known as photoelectron) spectroscopy refers to the process in which an electron is removed from a specimen after the atomic absorption of a photon. The first evidence of this phenomenon dates back to 1887 but it was not until 1905 that Einstein offered an explanation of this effect, which is now referred to as "the photoelectric effect".

Quantitative Core Level Photoelectron Spectroscopy: A primer tackles the pragmatic aspects of the photoemission process with the aim of introducing the reader to the concepts and instrumentation that emerge from an experimental approach. The basic elements implemented for the technique are discussed and the geometry of the instrumentation is explained. The book covers each of the features that have been observed in the X-ray photoemission spectra and provides the tools necessary for their understanding and correct identification. Charging effects are covered in the penultimate chapter with the final chapter bringing closure to the basic uses of the X-ray photoemission process, as well as guiding the reader through some of the most popular applications used in current research.

About the author

Juan A Colón Santana, obtained his PhD in Electrical Engineering from the University of Nebraska-Lincoln in 2012. He has contributed to the fields of magnetism and radiation with a total of 24 publications and one patent. Juan was nationally recognized for his work on oxides by winning prestigious awards such as the Leo Falicov Student Award. He is currently a Research Associate in the Department of Physics at Northern Illinois University where he is involved in research, teaching and outreach activities.



Subject
Atomic and molecular physics

Published

119pp

ISBN 978-1-627-05532-1 (electronic)

ISBN 978-1-627-05531-4 (print)

Advances in Thermodynamics of the van der Waals Fluid

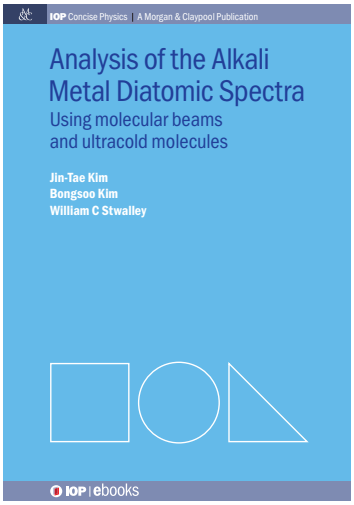
David C Johnston
Department of Physics and Astronomy and Ames Laboratory, Iowa State University, Ames, Iowa, USA

About the book

This book is a comprehensive exposition of the thermodynamic properties of the van der Waals fluid, which evolved out of a course on thermodynamics and statistical mechanics at Iowa State University in the US. The main goal of the book is to provide a graphical overview of the many interesting and diverse thermodynamic properties of the van der Waals fluid through plots of these properties versus various independent parameters. The data for these plots are obtained from formulas derived herein, some of which have previously appeared in the literature. Many results not amenable to graphical illustration are also included. This book will be useful to instructors as a teaching resource and to students as a text supplement of thermodynamics and statistical mechanics courses, as well as to others who are interested in the thermodynamics of the seminal van der Waals fluid.

About the author

David C Johnston is a Distinguished Professor in the Department of Physics and Astronomy of Iowa State University in Ames, Iowa, USA. He received his BA and PhD degrees in physics from the University of California at Santa Barbara and the University of California at San Diego, respectively. Prior to joining Iowa State University in 1987, he carried out research at the Corporate Research Laboratories of Exxon Research and Engineering Company in Annandale, NJ. His research area is experimental solid-state physics, with an emphasis on the measurement and theoretical modeling of the electronic, magnetic, thermal and superconducting properties of solids. He is a Fellow of the American Physical Society and a former Divisional Associate Editor of the journal *Physical Review Letters*.



Analysis of the Alkali Metal Diatomic Spectra

Using molecular beams and ultracold molecules

Jin-Tae Kim, Bongsoo Kim and William C Stwalley

- Chosun University, Korea
- KAIST, Korea
- University of Connecticut, USA

About the book

This book illustrates the complementarity of molecular beam (MB) spectra and ultracold molecule (UM) spectra in unraveling the complex electronic spectra of diatomic alkali metal molecules, using KRb as the prime example. Also, a new type of comparison spectrum is discussed that can provide powerful insight into the possibility of the production of a quantum degenerate gas of either Boson molecules (Bose–Einstein condensation) or Fermion molecules.

About the authors

Jin-Tae Kim is a Professor of the Department of Photonic Engineering at Chosun University, Gwangju, Korea. He has served as the chair of the division of atomic and molecular physics in the Korean Physical Society since 2014.

Bongsoo Kim is Professor of Chemistry at KAIST in Korea. His primary interest has been laser spectroscopy in molecular beams. Recently he expanded into nanoscience and synthesized gold nanowires and nanoplates, utilizing them for surface enhanced Raman scattering. In 2015 he serves as Chairman of the Physical Chemistry Section of the Korean Chemical Society for a year. Awards include the Grand Research Prize in 2011 from the Korean Chemical Society.

William C Stwalley is Board of Trustees Distinguished Professor of Physics at the University of Connecticut at Storrs as well as Affiliate Professor of Chemistry and member of the Institute of Materials Science. His primary interest has been atomic and molecular interactions, which he has studied theoretically and experimentally, emphasizing the determination of potential energy curves out to long range and the use of laser spectroscopy. Major awards received include the Meggers Award for spectroscopy of the Optical Society of America and the Connecticut Medal of Science.

Subject
Atomic and molecular physics

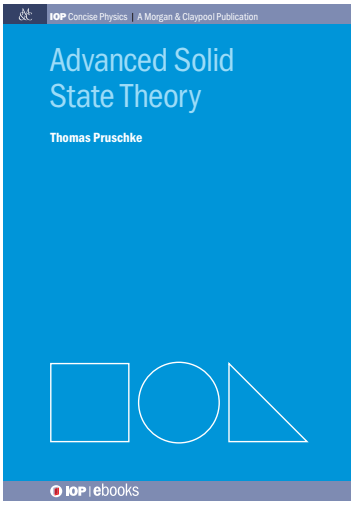
Published

67pp

ISBN 978-1-627-05678-6 (electronic)

ISBN 978-1-627-05677-9 (print)

Readership
Non-specialist users of spectroscopic measurements. Second- or third-year undergraduates. Graduate/specific interest groups – molecular spectroscopy; molecular beams; ultracold molecules



Advanced Solid State Theory

Thomas Pruschke
University of Göttingen, Germany

About the book

This book introduces advanced concepts and topics of solid-state theory to graduate-level students interested in advanced topics of condensed matter physics. It is self-contained in the sense that it provides the theoretical tools to calculate properties of interacting quantum systems (elements of many-particle physics), which are then applied to a selection of subjects of interest in condensed matter physics: dielectric theory of the solid, transport theory and superconductivity. Basic knowledge in the concepts of condensed matter theory as well as solid background in quantum mechanics is assumed.

About the author

Thomas Pruschke studied physics at the Technical University of Darmstadt, Germany, where he received his PhD degree in 1989. He then spent from 1990 until 1991 as postdoc at the Tokyo Institute of Technology in Tokyo, Japan, and six months in 1992 as visiting scholar at the Ohio State University in Columbus, Ohio. After 10 years as research assistant in Regensburg and Augsburg, he was appointed as professor for computational physics at the Georg-August-Universität Göttingen. His research field is the numerical simulation of strongly interacting electrons in condensed matter physics, with particular emphasis on transport, magnetism and superconductivity. In addition to his faculty position in Göttingen, he is also Adjoint Professor at the Louisiana State University in Baton Rouge, USA, and at the Tata Institute for Fundamental Research in Mumbai, India.

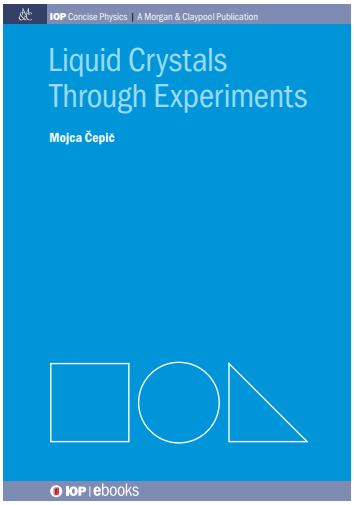
Subject
Condensed matter physics

Published

124pp

ISBN 978-1-627-05328-0 (electronic)

ISBN 978-1-627-05327-3 (print)



Subject
Condensed matter physics

Published

133pp

ISBN 978-1-627-05300-6 (electronic)

ISBN 978-1-627-05299-3 (print)

Readership
Undergraduate courses of general physics and chemistry; physics education research groups; high schools

Liquid Crystals Through Experiments

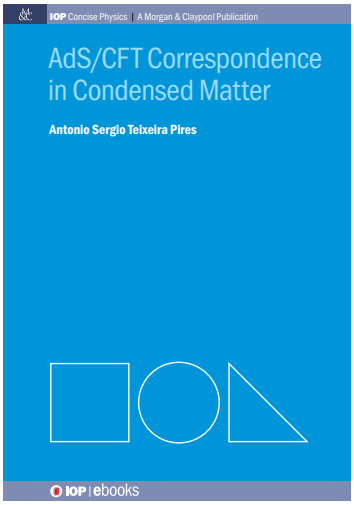
Mojca Čepič
University of Ljubljana, Slovenia

About the book

This book is a hands-on guide to experiments with liquid crystals, with clear instructions given throughout. It contains a set of questions and tasks for students as well as further project suggestions. Included are a set of experiments that do not use liquid crystals, but materials with similar properties, to allow for the study of phenomena characteristic for liquid crystal with simpler means. Finally, the book also includes an example of a module developed and tested for non-specialist undergraduate students. *Liquid Crystals Through Experiments* will prove itself as an indispensable text for lecturers who want to bring the physics of "everyday" into the classroom.

About the author

Mojca Čepič started her career as a high-school teacher of physics. She later went on to graduate in theoretical studies of soft matter physics, more precisely, by development of a phenomenological theoretical model describing phases in antiferroelectric liquid crystals at the Faculty of Mathematics and Physics, University of Ljubljana, Slovenia. Today she is the lecturer of physics, physics education and science education within university programs for future teachers of physics, teachers of science and for primary-school teachers. She is still actively involved in theoretical soft matter physics, mainly in liquid crystals and has published more than 70 articles in this field.



AdS/CFT Correspondence in Condensed Matter

Antonio Sergio Teixeira Pires
Universidade Federal de Minas Gerais, Belo Horizonte, Brazil

About the book

This book introduces, in an elementary way, the idea of the anti-de Sitter/Conformal Field Theory (AdS/CFT) correspondence to condensed matter physicists. This theory relates a gravity theory in a (d+1)-dimensional anti-de Sitter space time to a strongly coupled d-dimensional quantum field theory living on its boundary. The AdS/CFT correspondence can be used to study finite temperature real time processes, such as response functions and dynamics far from equilibrium in quantum critical points in condensed matter systems. Computation of these quantities is reduced to solving classical gravitational equations in one higher dimension than the original theory.

About the author

Antonio Sergio Teixeira Pires is a Professor of Physics in the Department of Physics at the Universidade Federal de Minas Gerais, Belo Horizonte, Brazil. He received his PhD in Physics from the University of California in Santa Barbara in 1976. He works in techniques of quantum field theory applied to condensed matter. He is a member of the Brazilian Academy of Science, was an Editor of the *Brazilian Journal of Physics* and currently is a member of the Advisory Board of the *Journal of Condensed Matter Physics*.

Subject
Condensed matter physics

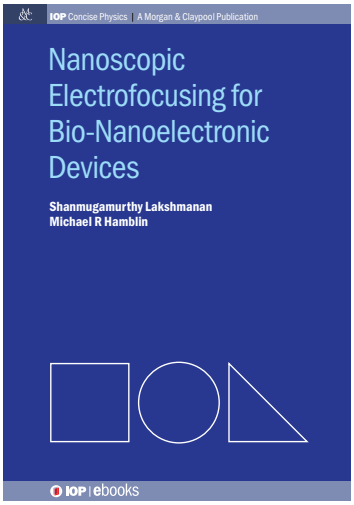
Published

96pp

ISBN 978-1-627-05309-9 (electronic)

ISBN 978-1-627-05308-2 (print)

Readership
Researchers in condensed matter physics



Nanoscopic Electrofocusing for Bio-Nanoelectronic Devices

Shanmugamurty Lakshmanan and Michael R Hamblin
Wellman Center for Photomedicine,
Massachusetts General Hospital, Boston, MA, USA

About the book

This cutting-edge book moves from the current ability to position nanoparticles on surfaces, to a new dimension of spatial control. The authors report that a new technique called "nanoscopic lens" is able to produce a variety of 3D nano-structures in a controlled manner. Particle trajectory calculations can efficiently predict the whole process of 3D assembly. The nanoscopic lens technique serves as the foundation of a multifaceted technology for device development including creating a wide range of bio-nanoelectronic devices.

Subject
Optics and photonics

Published

49pp

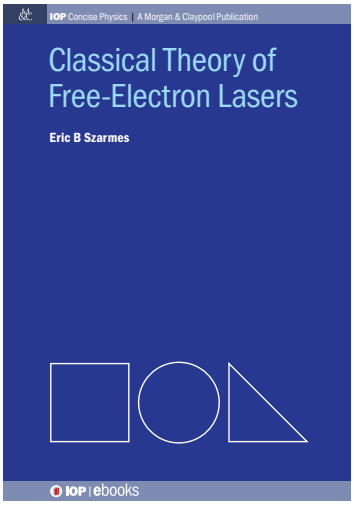
ISBN 978-1-627-05429-4 (electronic)

ISBN 978-1-627-05428-7 (print)

About the authors

Shanmugamurthy Lakshmanan is a Research Scientist at Wellman Center for Photomedicine, Harvard Medical School, Massachusetts. His research focus is on connecting nanotechnology with ancient Indian medical technologies namely Siddha and Ayurveda. He is a distinguished Scientific Advisor, Vice-president for International Research and the Direct and Head of Indian Division of Sciences for the World Institute for Scientific Exploration. He is also the founder and Editor-in-Chief of two peer-reviewed international journals, *Ancient Science* and *Ayurveda*, which have been established by Vedic Research International Inc. He is also the Chair and Research Director representing the Research and Development division of the Association of the Ayurvedic Physicians of North America.

Michael R Hamblin, PhD, is a Principal Investigator at the Wellman Center for Photomedicine, Massachusetts General Hospital, an Associate Professor of Dermatology, Harvard Medical School and the affiliated faculty of Harvard-MIT Division of Health Science and Technology. He directs a laboratory of around 12 scientists who work in photodynamic therapy and low-level light therapy. He has published 274 peer-reviewed articles, is Associate Editor for eight journals and serves on NIH Study-Sections. He has edited 10 proceedings volumes together with four other major textbooks on PDT and photomedicine. In 2011, Dr Hamblin was honored by election as a Fellow of SPIE.



Classical Theory of Free-Electron Lasers

Eric B Szarmes
Department of Physics and Astronomy,
University of Hawaii at Mãnoa, Honolulu

Subject
Optics and photonics

Published

146pp

ISBN 978-1-627-05573-4 (electronic)

ISBN 978-1-627-05572-7 (print)

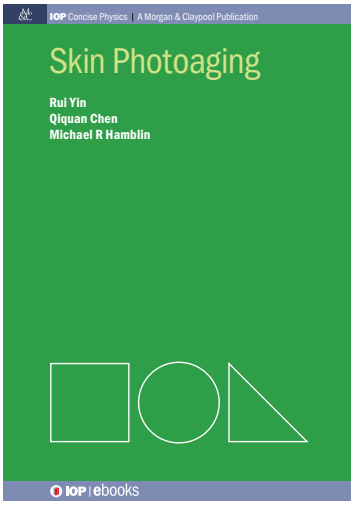
Readership
Advanced undergraduate and graduate students, researchers

About the book

Since their invention in the early 1970s, free-electron lasers (FELs) have been established as important sources of tunable, high-power, and high-quality laser radiation. This book develops the classical theory of FELs in sufficient depth to provide both a solid understanding of FEL physics and a solid background for contemporary research in the field. Topics of interest include detailed analyses of small-signal gain, laser saturation, harmonic lasing, mode-locked laser theory, and covers the entire range of FEL operation from spontaneous radiation through to saturation. The text is written at a level appropriate for advanced undergraduate and graduate students, and numerous examples are included throughout to illustrate the application of analytical results. The organization of the text, and the good analytical detail, should be especially helpful to students and researchers who wish to learn about FELs or pursue further study of the fascinating subject of electron beam-based light sources.

About the author

Eric B Szarmes received his Bachelor of Applied Science in Engineering Physics from the University of British Columbia in 1985, and his PhD in Applied Physics from Stanford University in 1992, where he did his doctoral research in high-resolution free-electron laser spectroscopy under Professor John Madey. He was a postdoctoral research scientist at the Duke Free-Electron Laser Laboratory from 1992 to 1998, where he made fundamental contributions to the development of the phase-locked and chirped-pulse free-electron laser. In 1998, he joined the faculty of the University of Hawaii where he is currently an associate professor of physics. His current research interests include the theory and design of novel optical resonators for high-resolution free-electron laser spectroscopy, X-ray generation and high-field physics. His greatest passion is teaching.



Skin Photoaging

Rui Yin, Qiquan Chen and Michael R Hamblin

- Department of Dermatology, Southwest Hospital, Third Military Medical University, Chongqing, China
- Wellman Center for Photomedicine, Massachusetts General Hospital, Boston MA, USA

About the book

This book focuses on skin photoaging, the premature aging of skin due to environmental effects such as exposure to UV radiation from the Sun. Slowing the aging process and rejuvenation have been one of the major goals of medicine and are in high demand as consumers seek agents or treatments that can prevent or reverse age-associated changes in the skin. *Skin Photoaging* reviews the compounds and modalities that have been shown (or have potential) to improve the appearance of prematurely aged skin.

About the authors

Rui Yin, MD PhD, is an Associate Professor of Dermatology, Southwest Hospital, Third Military Medical University, and a visiting associate professor of Wellman Center for Photomedicine at Massachusetts General Hospital. Her research interests lie in the areas of photodynamic therapy and laser therapy for photoaging and skin aging. She has published 20 peer-reviewed articles in English, over 40 peer-reviewed articles in Chinese, over 30 conference proceedings and two book chapters. She is a reviewer for seven journals and serves on the National Natural Science Foundation of China as a grant reviewer. She is also a committee member of China Dermatologist Association and China Medical Association. In 2011, Dr Yin was honored as one of Top 10 National Outstanding Young Dermatologist by China Dermatologist Association.

Qiquan Chen, MD, is a resident doctor in Department of Dermatology, Southwest Hospital, Third Military Medical University, Chongqing, China. His interests currently focus on the immunological mechanisms of phototherapy treatment in cancer therapy.

Michael R Hamblin, PhD, is a Principal Investigator at the Wellman Center for Photomedicine, Massachusetts General Hospital, an Associate Professor of Dermatology, Harvard Medical School and the affiliated faculty of Harvard-MIT Division of Health Science and Technology. He directs a laboratory of around 12 scientists who work in photodynamic therapy and low-level light therapy. He has published 274 peer-reviewed articles, is Associate Editor for eight journals and serves on NIH Study-Sections. He has edited 10 proceedings volumes together with four other major textbooks on PDT and photomedicine. In 2011, Dr Hamblin was honored by election as a Fellow of SPIE.

Subject
Biophysics

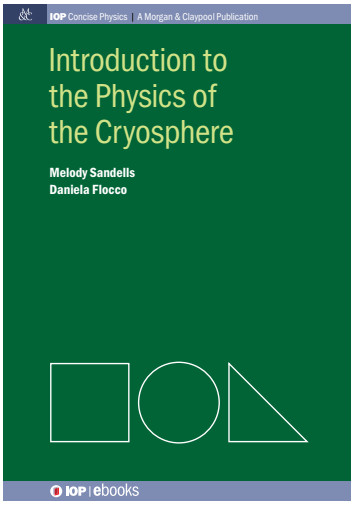
Published

56pp

ISBN 978-1-627-05455-3 (electronic)

ISBN 978-1-627-05454-6 (print)

Readership
Dermatologists, photomedicine and practitioners



Subject
Geophysics and planetary science

Published

89pp

ISBN 978-1-627-05303-7 (electronic)

ISBN 978-1-627-05302-0 (print)

Readership
Graduate students and researchers in environmental physics

Introduction to the Physics of the Cryosphere

Melody Sandells and Daniela Flocco
University of Reading, UK

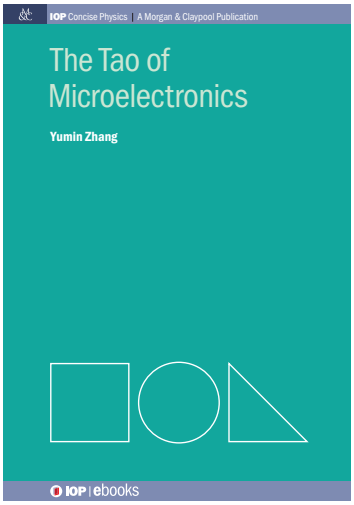
About the book

Introduction to the Physics of the Cryosphere is intended for graduates with a numerical sciences background, particularly those who are heading towards postgraduate study or are generally interested in environmental physics. Conservation equations underpin the physics encompassed in this book, although the interesting part comes in how the necessary variables and boundary conditions are defined to be able to simulate changes in the cryosphere. Phase changes between ice, liquid water and water vapour also come into play.

About the authors

Melody Sandells is a Research Fellow at the Environmental Systems Science Centre, University of Reading. Research interests include earth observation of snow and soil moisture, snow physics, snow vegetation radiative interactions, and microwave remote sensing and hydrology. Current research includes the development of a data assimilation system to improve snow mass retrievals, coupling of snow and soil systems, modelling and remote sensing of snow grain size evolution, the role of snow in the accumulation of water on ice shelves and improvement of snow microwave emission models. Fieldwork experience in North America, sub-Arctic and Arctic regions.

Daniela Flocco earned a degree in Environmental Sciences, majoring in oceanography at the Università Parthenope in Naples. She submitted her PhD thesis on the geophysics of Antarctic coastal polynyas and their impact on dense water production based on her studies at SPRI and DAMTP at the University of Cambridge. She is now working with Daniel Feltham as a PDRA on the inclusion of the physics of melt ponds in the CICE model.



The Tao of Microelectronics

Yumin Zhang
Southeast Missouri State University, USA

About the book

Microelectronics covers various circuits with different kinds of electronic devices, and hundreds of equations are involved for these circuits. It is often considered a "black art" instead of an engineering field. The author believes that in order to understand microelectronics, one needs to pay more attention to the ideas or Tao behind various intricate circuits. This book is not intended to replace those classic textbooks on microelectronics, but it can play a supplementary role by highlighting the key ideas and techniques.

About the author

Yumin Zhang is an associate professor in the Department of Physics and Engineering Physics, Southeast Missouri State University. His academic career started in China; in 1989 he obtained a master's degree in physics from Zhejiang University and then was employed as technical staff in the Institute of Semiconductors, Chinese Academy of Sciences. After receiving his PhD degree on electrical engineering from the University of Minnesota in 2000, he started to work as a faculty member in the University of Wisconsin-Platteville and then in Oklahoma State University-Stillwater. His research fields include semiconductor devices and electronic circuits. Since joining Southeast Missouri State University in 2007, he also investigated the field of engineering education. In addition, he is very interested in teaching Chinese to non-native speakers and wrote a book on this topic: *Roots and Branches: A Systematic Way of Learning Chinese Characters*.

Subject
Electronic materials and devices

Published

118pp

ISBN 978-1-627-05453-9 (electronic)

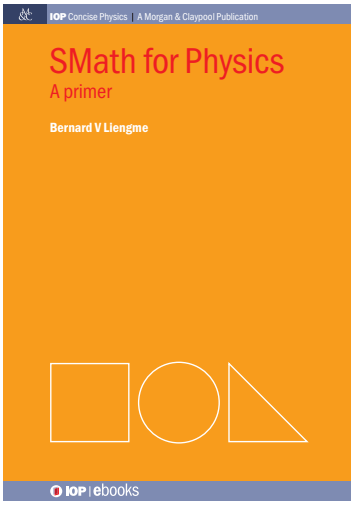
ISBN 978-1-627-05452-2 (print)

Readership

1. Undergraduate: physics, engineering physics, electrical engineering, biomedical engineering
2. Graduate: electrical engineering, computer engineering, biomedical engineering
3. Professional: electrical engineering, biomedical engineering

Courses

1. Undergraduate: analog electronic circuits, microelectronic devices and circuits
2. Graduate: analog IC design, integrated microelectronic circuits



Subject
Classical physics

Published

127pp

ISBN 978-1-627-05924-4 (electronic)

ISBN 978-1-627-05925-1 (print)

Readership
Instructors and students in introductory physics (and engineering) courses. Engineers and scientists who may not have access to expensive software suites like Mathcad

SMath for Physics

A primer

Bernard V Liengme
St Francis Xavier University, Nova Scotia, Canada

About the book

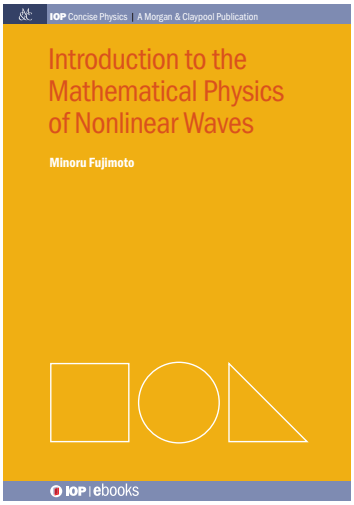
SMath is a free mathematical notebook program similar to Mathcad that provides many options for studying and solving complex mathematical equations. This book is a primer providing a concise but thorough introduction that keeps physics at a fairly low level so readers can concentrate on understanding the SMath features.

A wide range of topics are discussed in *SMath for Physics* including: using SMath as a simple scratch pad; getting familiar with the functions (polyroots, roots, and solve) to find the roots of the equations; making use of SMath's built-in ability to perform symbolic and numerical differentiation and numerical integration; using the vector and matrix features; and performing linear and non-linear regression analysis.

The student who learns how to use SMath can expect to get more accurate results compared to a paper and calculator method, since input errors are more easily spotted on the SMath "page". The skills acquired learning SMath will help the reader in future work – even if they end up working for a company that uses Mathcad, since the interface and features are very similar.

About the author

Bernard V Liengme is a Retired Professor of Chemistry and Lecturer in Information Systems of St Francis Xavier University in Nova Scotia, Canada, where he taught for more than 36 years. He is the author of *A Guide to Microsoft Excel® for Business and Management* (two editions), and *A Guide to Microsoft Excel® for Scientists and Engineers* (six editions). The later has been adopted by various engineering schools worldwide. Both books have been translated into a number of languages. More recently, he has published *Modelling Physics with Microsoft Excel®*. Bernard has been awarded the Microsoft Most Valued Professional award in Excel in each of the last eight years.



Introduction to the Mathematical Physics of Nonlinear Waves

Minoru Fujimoto
University of Guelph, Ontario, Canada

Subject
Mathematical and computational physics

Published

156pp

ISBN 978-1-627-05276-4 (electronic)

ISBN 978-1-627-05275-7 (print)

Readership
Physicists, physics students, applied mathematics

Key features

1. Nonlinear dynamics is discussed as restricted by practical surroundings, reviewing representative cases for physical reality, then proceeding via general theory to its applications
2. Although primarily mathematical, the author discusses the theory for nonlinear phenomena in practical environment to be understood with knowledge at upper undergraduate level

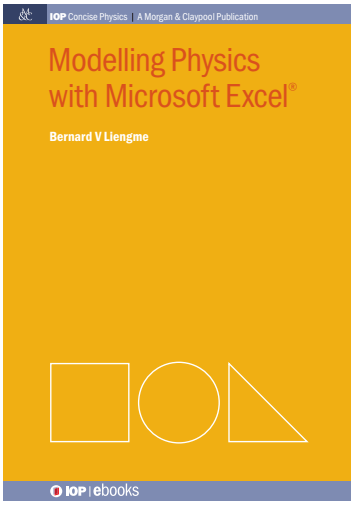
About the book

Nonlinear physics is a well established discipline of physics, for which this book offers a comprehensive account of the basic soliton theory and its applications. Although primarily mathematical, the author discusses the theory for nonlinear phenomena in the practical environment to be understood with knowledge at upper-undergraduate level, paying particular attention to the presence of media where nonlinearity takes place. In this book, nonlinear dynamics is discussed as being restricted by practical surroundings, reviewing representative cases for physical reality, then proceeding via general theory to its applications. This book addresses the mathematical theory with respect to the past development, however it implies possible theoretical innovations on many issues, providing a stimulating reference for students and researchers.

This book was written for students at upper-undergraduate and graduate levels, as a textbook for upgraded physics courses of nonlinear physics. Nevertheless, nonlinear mathematics is dominated by hyperbolic and elliptic functions, which are relatively unfamiliar topics in the traditional physics curriculum. From the pedagogical viewpoint, included is a short account of elliptic functions as a prerequisite to this book.

About the author

Minoru Fujimoto is a retired professor of physics at the University of Guelph, Ontario, Canada. Engaged in experimental work on magnetic resonance on structural phase transitions, he has published *Physics of Classical Electromagnetism* and *Thermodynamics of Crystalline States*, both from Springer.



Modelling Physics with Microsoft Excel®

Bernard V Liengme
St Francis Xavier University, Nova Scotia, Canada

About the book

This book demonstrates some of the ways in which Microsoft Excel® may be used to solve numerical problems in the field of physics. But why use Excel in the first place? Certainly, Excel is never going to out-perform the wonderful symbolic algebra tools that we have today – Mathematica, Mathcad, Maple, MATLAB, etc. However, from a pedagogical stance, Excel has the advantage of not being a "black box" approach to problem solving. The user must do a lot more work than just call up a function. The intermediate steps in a calculation are displayed on the worksheet. Another advantage is the somewhat less steep learning curve. This book shows Excel in action in various areas within physics. Some Visual Basic for Applications (VBA) has been introduced, the purpose here is to show how the power of Excel can be greatly extended and hopefully to whet the appetite of a few readers to get familiar with the power of VBA. Those with programming experience in any other language should be able to follow the code.

About the author

Bernard V Liengme is a Retired Professor of Chemistry and Lecturer in Information Systems of St Francis Xavier University in Nova Scotia, Canada, where he taught for more than 36 years. He is the author of *A Guide to Microsoft Excel® for Business and Management* (two editions), and *A Guide to Microsoft Excel® for Scientists and Engineers* (six editions). The later has been adopted by various engineering schools worldwide. Both books have been translated into a number of languages. More recently, he has published *Modelling Physics with Microsoft Excel®*. Bernard has been awarded the Microsoft Most Valued Professional award in Excel in each of the last eight years.

Subject
Mathematical and computational physics

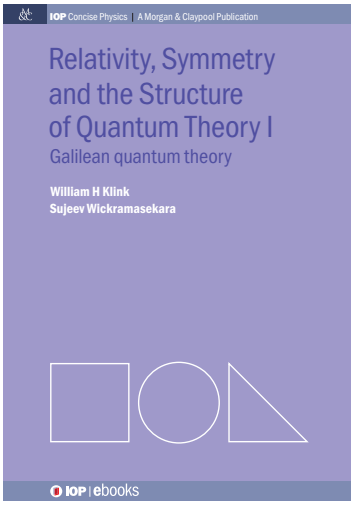
Published

95pp

ISBN 978-1-627-05419-5 (electronic)

ISBN 978-1-627-05418-8 (print)

Readership
Instructors and students in introductory physics (and engineering) courses. Engineers and students who may not have access to expensive software suites like Mathcad



Relativity, Symmetry and the Structure of Quantum Theory I

Galilean quantum theory

William H Klink and Sujeev Wickramasekara
University of Iowa, Grinnell College, USA

Subject
Quantum physics

Published

95pp

ISBN 978-1-627-05623-6 (electronic)

ISBN 978-1-627-05624-3 (print)

Readership
Quantum theory researchers and scientists, graduate-level students

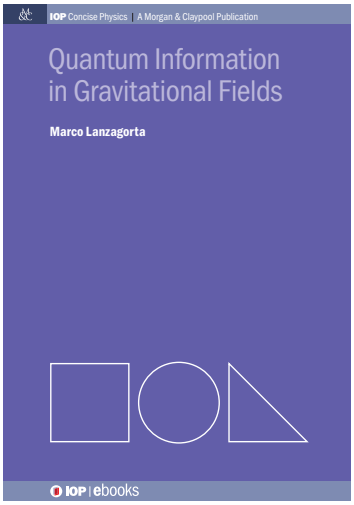
About the book

The history of how quantum mechanics was developed is a fascinating one and underlies the focus of this book; namely, given the rules that the founders of quantum mechanics developed, is it possible to find principles that lead to the structure of quantum mechanics as it was historically formulated? This is the first book in a series of works considering what particular relativity is applicable to a given dynamical theory. The series considers Newton, Einstein, and de Sitter relativities, while this book examines the unitary irreducible representations of the Galilei group and see how they provide the framework for Galilean quantum theory.

About the authors

William H Klink is a retired Professor of Physics and Astronomy and Adjunct Professor of Mathematics at the University of Iowa. His research dealt with the application of symmetry to quantum theory and quantum mechanical systems. Applications included using symmetry to develop a relativistic quantum theory for systems within finite and infinite degrees of freedom. His recent work has been using symmetry to show why quantum theory has the structure that it does, leading to work dealing with the interpretation of quantum theory, as well as work in the field of science and religion.

Sujeev Wickramasekara is an Assistant Professor in the Department of Physics at Grinnell College in Iowa and a Research Scientist at the Department of Physics and Astronomy at the University of Iowa. He received his PhD from the University of Texas at Austin. His research interests include quantum field theory; relativistic resonances; phenomenology of the Z-boson; foundations of quantum physics; functional and harmonic analysis; Hp-spaces; representations of groups and semigroups; measure theory; distributions and test function spaces.



Quantum Information in Gravitational Fields

Marco Lanzagorta
US Naval Research Laboratory, Washington DC, USA

About the book

Einstein's General Theory of Relativity describes quantum information in classical gravitational fields and this book offers a concise discussion around this but also offers much more. Dr Lanzagorta looks at new results on steganographic quantum communications in inertial frames and qubits in Schwarzschild space-time and discusses examples of coupling a qubit's spin and space-time curvature, and gravitation effects in the context of quantum communications, entanglement, EPR experiments, quantum computation and sensing.

About the author

Marco Lanzagorta is a Research Physicist at the US Naval Research Laboratory in Washington DC. In addition, he is Affiliate Associate Professor and Member of the Graduate Faculty at George Mason University, and co-editor of the Quantum Computing series of graduate lectures published by Morgan & Claypool. He is a recognized authority on the research and development of advanced information technologies and their application to combat, and scientific systems. He has written more than 100 publications in the areas of physics and computer science, and has authored the books *Quantum Radar* (2011) and *Underwater Communications* (2012). He received a doctorate degree in theoretical physics from the University of Oxford in the UK. Previously, he was Technical Fellow and Director of the Quantum Technologies Group of ITT Exelis, has worked at the European Organization for Nuclear Research (CERN) in Switzerland, and at the International Centre for Theoretical Physics (ICTP) in Italy.

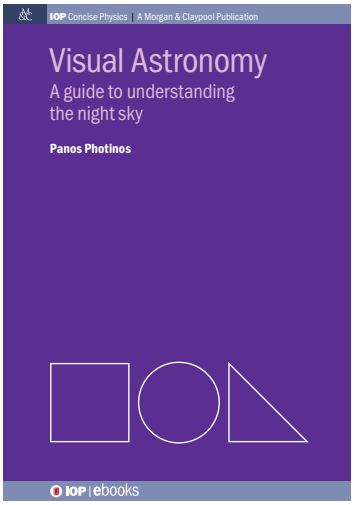
Subject
Quantum information and quantum computing

Published

295pp

ISBN 978-1-627-05330-3 (electronic)

ISBN 978-1-627-05329-7 (print)



Visual Astronomy

A guide to understanding the night sky

Panos Photinos
University of Southern Oregon, Ashland, Oregon, USA

About the book

This book introduces the basics of observational astronomy. It explains the essentials of time and coordinate systems, and their use in basic observations of the night sky. The fundamental concepts and terminology are introduced in simple language making very little use of equations and math. Examples illustrate how to select the relevant information from widely accessible resources, and how to use the information to determine what is visible and when it is visible from the reader's particular location. Particular attention is paid to the dependence of the appearance and motion on the observer's location, by extending the discussion to include various latitudes in both North and South hemispheres.

About the author

Panos Photinos has been a Professor of Physics at Southern Oregon University (SOU) since 1989 where he teaches Introductory Astronomy, Observational Astronomy and Cosmology. Prior to joining SOU he held faculty appointments at the Liquid Crystal Institute, Kent, Ohio; St Francis Xavier, Antigonish, Nova Scotia, Canada; and the University of Pittsburgh, Pennsylvania. He was visiting faculty at the University of Sao Paulo, Brazil, the University of Patras, Greece, Victoria University at Wellington, New Zealand. Panos completed his undergraduate degree in physics at the National University of Athens, Greece, and received his doctorate in physics from Kent State University, Kent, Ohio. He started naked-eye observations as a child in the Red Sea, and later upgraded to a pair of Merchant brass binoculars in Alexandria, Egypt, and his homeland, the island Ikaria, Greece. Ever since, he has visited and stargazed from all five continents, and shared his fascination with the night sky with students of all ages. He lives near Mt Ashland where he enjoys the beautify skies of S. Oregon from his backyard with his wife Shelley. This is Panos' first book in astronomy.

Subject
Astronomy and astrophysics

Published

114pp

ISBN 978-1-627-05481-2 (electronic)

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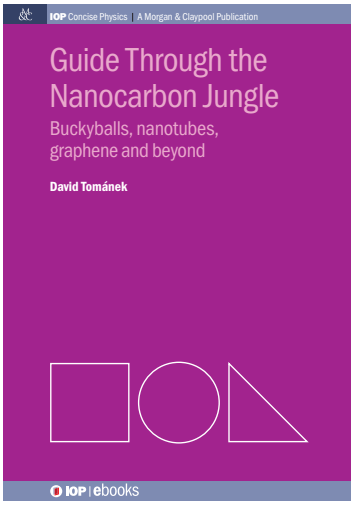
Readership
Trade, students and educators, hobbyist astronomers



Guide Through the Nanocarbon Jungle

Buckyballs, nanotubes, graphene and beyond

David Tománek
Michigan State University, USA

Subject
Nanoscience and nanotechnology

Published

100pp

ISBN 978-1-627-05273-3 (electronic)

ISBN 978-1-627-05272-6 (print)

Readership
Materials scientists, physicists, engineers, students and general reference

Key features

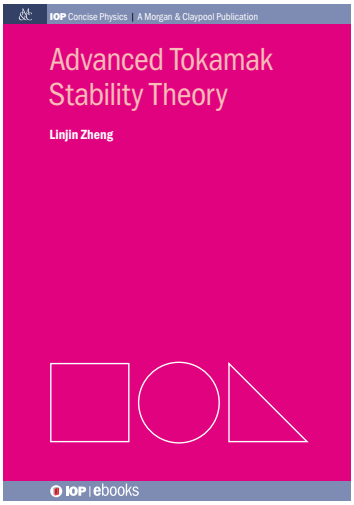
1. More than 300 entries, more than 100 figures and more than 2000 linked cross-references
2. Supplementary information, linked to each entry, is a dynamically growing resource containing multimedia material, additional references and links

About the book

This practical guide in a glossary format with more than 300 entries, 100 figures and 2000 cross-references helps to quickly identify (in contrast to a web search) relevant information for most topics related to nanocarbons. The compendium is rounded off with tables including the timelines of fullerenes, nanotubes and graphene, illustrating the growing interest in the field of carbon nanostructures. Supplementary information, linked to each entry, is a dynamically growing resource containing multimedia material, additional references and links.

About the author

David Tománek studied physics in Switzerland and received his PhD from the Free University in Berlin. While holding a position as Assistant Professor of Physics in Berlin, he engaged in theoretical research in nanostructures at the AT&T Bell Laboratories and the University of California at Berkeley. He established the field of computational nanotechnology at Michigan State University, where he holds a position as Full Professor of Physics. His scientific expertise lies in the development and application of numerical techniques for structural, electronic and optical properties of surfaces, low-dimensional systems and nanostructures. Since working on his PhD thesis, he has promoted the use of computer simulations to understand atomic-level processes at surfaces and in atomic clusters.



Advanced Tokamak Stability Theory

Linjin Zheng
University of Texas at Austin, Texas, USA

About the book

This book describes the advanced stability theories for magnetically confined fusion plasmas, especially in tokamaks. As the fusion plasma sciences advance, the gap between the textbooks and cutting-edge researches gradually develops. This book fills in this gap. It focuses on the advanced topics such as the spectrum of magnetohydrodynamics in tokamaks, the interchange modes, ballooning modes, and toroidal Alfvén eigenmodes, etc in the toroidal geometry. The theories are laid out in parallel with the ideal, resistive magnetohydrodynamics and gyrokinetics formalisms.

About the author

Linjin Zheng specializes in both analytic theory and large-scale numerical computation of magnetically confined plasmas. He received his MS degree from The University of Science and Technology of China and PhD from the Institute of Physics – Beijing, Chinese Academy of Sciences. He is currently working at the Institute for Fusion Studies, The University of Texas at Austin. He has published more than a 100 scientific papers and his research covers both ideal/resistive MHD and kinetic theories for MHD modes and drift waves, etc. His major contributions with his colleagues include the discovery of 2nd toroidal Alfvén eigenmodes, reformulation of gyrokinetic theory, development of physical interpretation of so-called edge-localized modes, etc. He also developed the AEGIS and AEGIS-K codes.

Subject
Plasma physics

Published

156pp

ISBN 978-1-627-05423-2 (electronic)

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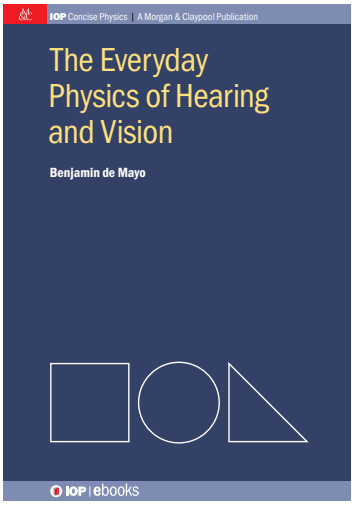
Readership
Nuclear and plasma physicists and researchers



The Everyday Physics of Hearing and Vision

Benjamin de Mayo
University of West Georgia, Georgia, USA

Subject
General physics

Published

124pp

ISBN 978-1-627-05675-5 (electronic)

ISBN 978-1-627-05674-8 (print)

Readership
Undergraduate level, trade

About the book

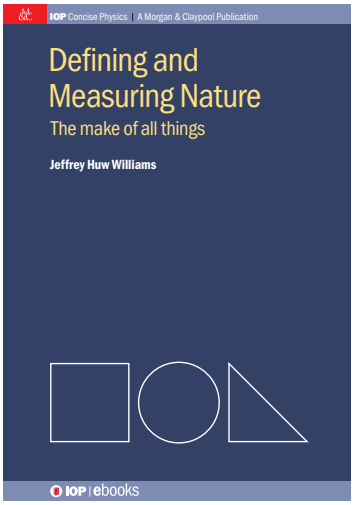
Humans receive the vast majority of sensory perception through the eyes and ears. This non-technical book examines the everyday physics behind hearing and vision to help readers understand more about themselves and their physical environment. It begins with a thorough discussion of sound and light waves then goes on to discuss how our eyes and ears gather and process information from those waves.

The ears and eyes are examined in their physical form in humans as well as in other members of the animal kingdom to show differences in how each receive information from the same waves and how hearing and vision may have evolved in humans. The book also discusses the perception of sound by examples such as sound intensity, decibels, and masking, while also covering the basis of music and resonance. Vision and the perception of light and color are also discussed at length including the psychology of color perception and color mixing.

This is an introductory text recommended for undergraduate students and for those wanting an overview of the subject area.

About the author

Benjamin de Mayo is a Professor Emeritus of Physics at the University of West Georgia. He has been at West Georgia since 1971, except for one year when he was a Visiting Professor of Physics at the Georgia Institute of Technology. He came to West Georgia from the University of Illinois, where he was a Research Associate in the Department of Mining and Metallurgy. He received his BS from Emory University (1962), his MS from Yale University (1964), and his PhD from Georgia Tech (1969) – all in physics.



Defining and Measuring Nature

The make of all things

Jeffrey Huw Williams
Formerly at the Bureau International des Poids et Mesures (BIPM), France

Subject
General physics

Published

134pp

ISBN 978-1-627-05279-5 (electronic)

ISBN 978-1-627-05278-8 (print)

Readership
Students, scientists, engineers and historians of science

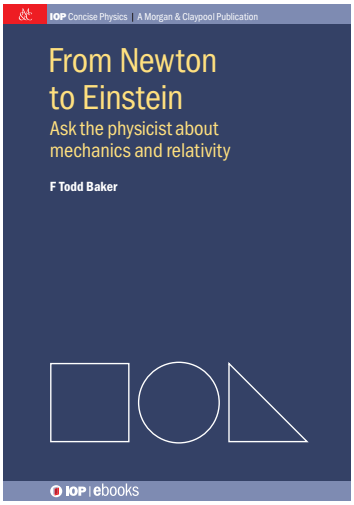
About the book

Weights and measures form an essential part of our ingrained view of the world. It is just about impossible to function effectively without some internalized system of measurement, enabling us to estimate and judge size, weight, duration, distance and value. In this volume, author Jeffrey Huw Williams outlines a history of the science of measurement, and the origin of the International System of Units (SI).

The simplicity and coherence of the metric system is outlined, and this book demonstrates how a system of weights and measures, based on only seven fundamental quantities, can be used as the basis of all science; the means of defining the make of all things. We will soon witness a redefinition of four of these seven fundamental quantities. This change will not be subject to any discussion or appeal; humanity will be presented with a *fait accompli*. What will this mean for us?

About the author

Jeffrey Huw Williams has published more than 60 technical papers and peer-reviewed articles, and was recently head of publications at the Bureau International des Poids et Mesures (BIPM), Sèvres. It was during these years at the BIPM that he became interested in, and familiar with, the origin of the metric system, its subsequent evolution into the SI, and the coming transformation into the Quantum-SI.



From Newton to Einstein

Ask the physicist about mechanics and relativity

F Todd Baker
The University of Georgia, USA

About the book

Want to know how physics explains the workings of the world? This book, aimed at general readers with an interest in physics, has built on material from the popular website **www.AskthePhysicist.com**. It emphasizes concepts over formalism and the mathematics is kept to a minimum throughout. Brief tutorials are included for essential concepts (e.g. Newton's laws) and the more technical details are retained in appendices.

About the author

F Todd Baker he received AB and MA degrees from Miami University and his PhD degree from the University of Michigan. His area of research is nuclear physics and he has more than 70 publications in refereed journals as well as numerous presentations at conferences and workshops. He has more than 35 years of college and university teaching experience. In 2006 he retired from The University of Georgia where he taught and performed nuclear physics research for 32 years. Previously, he held a postdoctoral research associate position at Rutgers University and teaching positions at Carroll College (Wisconsin) and St Lawrence University.

Subject
General physics

Published

95pp

ISBN 978-1-627-05497-3 (electronic)

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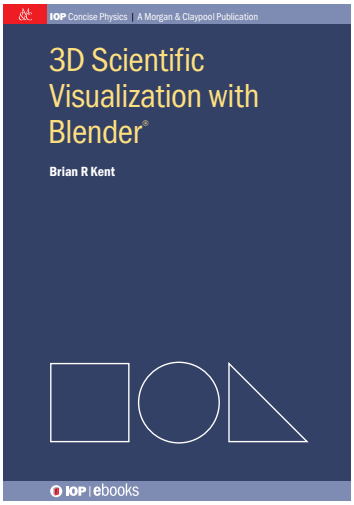
Readership
General readers, physics students, professional scientists



Subject
General physics

Published

90pp

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ISBN 978-1-627-05611-3 (print)

Readership
Astronomers, physicists, electrical and mechanical engineers, science and math educators, 3D graphics and special effects artists. Undergraduate level

3D Scientific Visualization with Blender®

Brian R Kent
National Radio Astronomy Observatory in Charlottesville, Virginia, USA

About the book

This is the first book written on using Blender® (an open source visualization suite widely used in the entertainment and gaming industries) for scientific visualization. It is a practical and interesting introduction to Blender for understanding key parts of 3D rendering and animation that pertain to the sciences via step-by-step guided tutorials. *3D Scientific Visualization with Blender®* takes you through an understanding of 3D graphics and modelling for different visualization scenarios in the physical sciences.

About the author

Brian R Kent is a scientist with the National Radio Astronomy Observatory in Charlottesville, Virginia. His publications and studies in astrophysics and computing include scientific visualizations of a variety of theoretical and observational phenomena. He is interested in visualizing data for scientific analysis as well as reaching a broad audience with the stunning visuals that modern 3D graphics can provide. Dr Kent received his PhD in Astronomy and Space Sciences from Cornell University. You can see several of his animations and visualizations on YouTube at: **www.youtube.com/user/VisualizeAstronomy**.

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