ABOUT THE BOOKS PROGRAM

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AIP Publishing’s NEW digital books program provides reliable and up-to-date information for researchers, scientists, engineers and students across the physical sciences. The books complement our journal portfolio and are fully integrated on our content platform, scitation.org.

The portfolio provides researchers resources to help them maintain proficiency, learn about new developments, or learn new techniques for data collection and analytics in a subject area. The books offer reference materials and research methodology as well as cutting-edge original research.

Books in this collection are published as one of four types:

- **Principles**: Presents a comprehensive overview of a topic, providing introductory material for new entrants and covering recent developments for experts
- **Methods**: Provides tutorial content documenting experimental methods, protocols or best practices, and provides instructions at various levels of expertise
- **Professional**: Recommends guidance on training and development for physics educators and professionals
- **Perspectives**: Offers in-depth analysis of a specialist topic, written by experts in that field

Now available for purchase, this collection will encompass 40 titles published between June 2020 - December 2021.

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As our collection continues to evolve, this list will be updated regularly until all 40 books are published.
Summary: *F=ma Contests: 2011-2019 Solutions Manual* presents clear and detailed solutions to problems from the annual F=ma contest hosted by the American Association of Physics Teachers (AAPT) between 2011 and 2019. The competition and is the precursor to the USAPhO (United States National Physics Olympiad) and the IPhO (International Physics Olympiad).

- Presents scenarios in classical mechanics using pre-calculus, and occasionally calculus, to solve the problems presented in the competitions
- Demonstrates a wide variety of exam questions ranging from the simple to the highly complex
- Explains how problems can be solved in more than one way when viewed from different angles and using very different approaches.

*F=ma Contests: 2011-2019 Solutions Manual* bridges a significant gap in existing literature for competition preparation and is a great resource for students preparing for physics exams and competitions.

Readership:
- Physicists and other scientists interested in physics problem solving.
- Supplementary reading in physics courses for non-physics majors. A great resource also for high school students preparing for the F=ma exam.

Offering:
- Resources to practice and improve physics problem solving skills

Related journals from AIP Publishing:
- *American Journal of Physics*
- *Physics Today*
Book Title:  
Teaching High School Physics: The Nature of Physics Teaching

Book Type:  Professional
Subject:  Education
Author(s):
- Rebecca Vieyra, American Association of Physics Teachers K-12 Program Manager
- Carl Wenning, Illinois State University Physics Department

Publication Date:  June 2020

Summary: Teaching High School Physics, is centered on the principle that teachers need to be educated rather than trained and helps to form a substantive and substantiated foundation for a new way of teaching. Providing a mix of theory and practice, these books describe more than 40 important topics and encourages an inquiry-oriented approach to physics teaching. It includes numerous examples and helpful resources.

Teaching High School Physics: The Nature of Physics Teaching:
- Explores the role of educational research, teaching philosophies, and scientific epistemology as a foundation for good teaching
- Places a strong emphasis on learning by inquiry
- Prepares teachers with a solid philosophical and practical foundation focusing on the nature of physics teaching

Readership:
- Prospective high school physics teachers and candidates and current physics teachers.
- Physics teacher educators.

Offers:
- A solid philosophical and practical foundation and focuses on the nature of teaching physics.

Related journals from AIP Publishing:
- American Journal of Physics
- The Physics Teacher
- Physics Today
Summary: Teaching High School Physics, is centered on the principle that teachers need to be educated rather than trained and helps to form a substantive and substantiated foundation for a new way of teaching. Providing a mix of theory and practice, these books describe more than 40 important topics and encourages an inquiry-oriented approach to physics teaching. It includes numerous examples and helpful resources.

Teaching High School Physics: Interacting with Physics Students:
- Addresses practical techniques for supporting student learning in the day-to-day classroom
- Details how to facilitate active engagement and cooperation in an equitable manner, manage learning difficulties and differentiations, and other situations teachers face in the classroom
- Prepares teachers with a solid philosophical and practical foundation focusing on interactions with students

Readership:
- Prospective high school physics teachers and candidates and current physics teachers.
- Physics teacher educators.

Offered:
- A solid philosophical and practical foundation and focuses on the interaction of students.

Related journals from AIP Publishing:
- American Journal of Physics
- The Physics Teacher
- Physics Today
Teaching High School Physics: Managing the Physics Classroom

Book Title:

Teaching High School Physics: Managing the Physics Classroom

Book Type: Professional

Subject: Education

Author(s):

• Rebecca Vieyra, American Association of Physics Teachers K-12 Program Manager
• Carl Wenning, Illinois State University Physics Department

Publication Date: June 2020

Summary: Teaching High School Physics, is centered on the principle that teachers need to be educated rather than trained and helps to form a substantive and substantiated foundation for a new way of teaching. Providing a mix of theory and practice, these books describe more than 40 important topics and encourages an inquiry-oriented approach to physics teaching. It includes numerous examples and helpful resources.

Teaching High School Physics: Managing the Physics Classroom:

• Prepares physics teachers with a solid philosophical and practical foundation on how to manage the classroom
• Addresses the professional practice of teaching from curriculum development to lesson planning to assessment to evaluation
• Informs readers about how to engage in the physics education community as a leader

Readership:

• Prospective high school physics teachers and candidates and current physics teachers.
• Physics teacher educators.

Offers:

• A solid philosophical and practical foundation and focuses on how to manage the physics classroom.

Related journals from AIP Publishing:

• American Journal of Physics
• The Physics Teacher
• Physics Today
Book Title: Essential Electron Transport for Device Physics

Book Type: Principles
Subject: Condensed Matter
Author(s):
• Anthony F.J. Levi, University of Southern California
Publication Date: June 2020

Summary: Essential electron Transport for Device Physics Introduces key elements of electron transport most applicable to the study of semiconductor electron devices. It is a convenient reference and summary of fundamental knowledge to be understood before exploring more sophisticated electron device models and concepts.

This book is:
• Easy to read and understand
• Concise descriptions of essential electron transport concepts
• Quantitative results, example problems and, as supplementary material, MATLAB code for most numerically generated figures.

The contents serve as a foundation for scientists and engineers, without the need to invest in specialized detailed study.

Readership:
• Electron device physicists who seek a summary of essential knowledge to be understood before exploring more sophisticated models and concepts
• Students studying electron device physics

Offers:
• Foundational material on semiconductor transport physics and serves as a useful reference source

Related journals from AIP Publishing:
• Applied Physics Letters
• Journal of Applied Physics
• Journal of Chemical Physics
Book Title: 
Real and Complex Numbers for Physicists

Book Type: Principles 
Subject: Mathematical Physics

Author(s): 
• Nicolas A. Pereyra, University of Texas Rio Grande Valley

Publication Date: July 2020

Summary: Real Numbers for Physicists presents a rigorous, in-depth introduction to natural numbers, integers, rational numbers, and real numbers. It addresses a gap in the mathematical library and offers a strong foundation in analytics and problem-solving to its readers.

The book addresses:
• In-depth introduction to real numbers geared toward physicists and natural scientists
• Different number systems without side-tracking into theoretical discussions
• Specific calculus-based knowledge and skills as applied to physics

A valuable resource for scientists working with real numbers, this book also helps instructors teaching number theory and the physical sciences and will strengthen students’ mathematical and problem-solving skills.

Readership:
• Physics students and instructors involved in courses on number theory
• Math instructors who teach science students problems in physics, as this book could strengthen students’ mathematical and problem-solving skills

Offers:
• A focused, valuable and rigorous resource on different number systems.

Related journals from AIP Publishing:
• American Journal of Physics
• Journal of Mathematical Physics
Book Title:  
**Next Generation Materials for Batteries**

**Book Type:** Principles  
**Subject:** Energy  
**Author(s):**  
- Rajeev Ahuja, Uppsala University, Dept of Physics and Astronomy  
**Publication Date:** October 2020

**Summary:** *Next Generation Materials for Batteries* consolidates many different areas of battery technology into a single resource and summarizes the fundamentals of battery materials. It details the tools used in material research and describes some of the most promising recent developments.

The book:  
- Combines theoretical and computational methods with experimental battery research, while demonstrating how findings from one field can support efforts in another  
- Explores materials including Na-ion batteries as alternatives to the Li-ion batteries in wide use today  
- Provides outlook and direction of next generation battery materials

**Readership:**  
- Researchers working in the manufacturing and production of batteries, consumer electronics, hybrid vehicles, and other industries  
- Policy makers  
- Those interested in sustainable energy will find this book an invaluable reference.  
- Ph.D. and postdoctoral researchers in battery materials, super capacitors, solid-state physics, and electrochemistry

**Offers:**  
- A single resource that contains several of the most interesting current and developing topics in the rapidly evolving field of next-generation battery materials

**Related journals from AIP Publishing:**  
- *Journal of Applied Physics*  
- *Journal of Renewable and Sustainable Energy*  
- *The Journal of Chemical Physics*
Book Title:

Synthetic Solar Irradiance: Modelling Solar Data

Book Type: Perspectives
Subject: Energy
Editor(s):
• Dr. Jamie M. Bright, Solar Energy Research Institute of Singapore
Publication Date: November 2020

Summary: Synthetic Solar Irradiance: Modelling Solar Data is the first book to cover the principles and methods of this emerging field. Filling a void in the industry, this timely book is edited by one of the world’s premiere authorities on synthetic solar irradiance with contributions from other leading experts. It covers key applications of synthetic solar irradiance and established mathematical approaches for synthetic time series production.

Other key topics include:
• Use cases of key definitions, literature, and data availability
• Determining success of generated synthetic irradiance
• Challenges and alternatives facing synthetic solar irradiance

Readership:
• Solar engineering researchers, power and electrical engineers, applied mathematicians, applied computer scientists
• Professionals in the solar resource assessment and solar farm industries
• Those who works with fluctuations of power being injected into the grid from solar panels

Offers:
• The first book to be published on synthetic solar irradiance, covering the principles and methods of this emerging field with academic and industrial applications

Related journals from AIP Publishing:
• Applied Physics Letters
• Journal of Applied Physics
• Journal of Renewable and Sustainable Energy
Book Title:  
Analysis and Design of Membrane Processes: A Systems Approach

Book Type: Principles  
Subject: Chemical Physics  
Author(s):  
• Mingheng Li, PhD, California State Polytechnic University  
Publication Date: December 2020

Summary: Analysis and Design of Membrane Process: A Systems Approach highlights the fundamentals and emerging technology in the field of industrial reverse osmosis desalination and membrane processes. It provides a unique, systems engineering perspective of membrane operation, focusing on analysis, design and optimization of membrane processes. An explanation of mathematical and optimization knowledge is introduced and then applied throughout the book.

Key topics include:
• Hydrodynamics and mass transfer in reverse osmosis (RO) membranes  
• Predictive models for RO module performance  
• Analysis and optimization of brackish and seawater RO desalination  
• Energy production using pressure retarded osmosis (PRO)  
• Integration of RO and PRO for energy-efficient desalination  
• Dynamic operation of batch RO and batch PRO

Readership:  
• Researchers who are interested in membrane-based processes as well as undergraduate and graduate students  
• Water industry professionals

Offers:  
• Insight into a unique system engineering perspective of membrane operation.

Related journals from AIP Publishing:  
• Journal of Physical and Chemical Reference Data  
• Journal of Renewable and Sustainable Energy  
• The Journal of Chemical Physics
Book Title:  
Soft-matter Thin Film Solar Cells: Physical Processes and Device Simulation

Book Type: Methods  
Subject: Energy

Editor(s):  
- Dr. Jingzheng Ren, Hong Kong Polytechnic Institute  
- Dr. Zhipeng Kan, Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences

Publication Date: December 2020

Summary: *Soft-Matter Thin Film Solar Cells: Physical Processes and Device Simulation* provides a guide to modern innovations and developments in solar photovoltaic cells. Edited and written by global authorities in their respective fields, this book explores newly developed materials and incorporates numerical and computational experiments in materials research. It provides a top-level look into the research and utilization of a novel class of photovoltaic material.

Some key topics covered in this book include:  
- Origin, theoretical studies, and device simulation for perovskite solar cells  
- Charge recombination, transfer states, and energy losses in organic solar cells  
- Device physics in organic solar cells and drift diffusion simulations

Readership:  
- Investigators, postdoctoral fellows, and graduate and advanced undergraduate students  
- Materials scientists and engineers in the solar energy sector and analysts, and other industry experts will also find this book an invaluable resource

Offers:  
- A guide to modern innovations and developments in solar photovoltaic cells

Related journals from AIP Publishing:  
- *AIP Photonics*  
- *Journal of Renewable and Sustainable Energy*
Future Distribution Networks: Planning, Operation and Control

Summary: Future Distribution Networks: Planning, Operation, and Control presents a curated collection of leading information on the planning and operation of smart grids and next-generation distribution networks. It offers a look into the future of electricity networks that enable sustainable energy services and examines how these networks will link small- and medium-scale sources with consumer demand. It discusses how intelligent grid infrastructure provides flexibility for supply and demand.

The book contains:
- Recent developments in smart grids and next-generation energy distribution networks, including industry and academic/laboratory contributions
- Up-to-date information in a subject generating significant research interest and new developments
- Structure and clarification to the concept of ‘smart grids’ offering a clear, agreed-upon definition

Readership:
- Professionals in renewable energy or sustainable development fields
- Academic and industry researchers in the energy and energy distribution fields
- Undergraduate and early graduate students studying electrical power systems or renewable energy
- ‘Futurists’ and enthusiast supporters of sustainable development

Offers:
- A curated collection of leading information on the planning and operation of smart grids and next-generation distribution networks

Related journals from AIP Publishing:
- Journal of Renewable and Sustainable Energy
**Book Title:**
Principles of Fiber Optics

**Book Type:** Principles  
**Subject:** Optics  
**Author(s):**  
- Jeff Hecht  
**Publication Date:** March 2021

**Summary:** *Principles of Fiber Optics* explains the basics of fiber optics for professionals trained in other specialties in physics, engineering, medicine and other sciences. Fiber optics has become a vital tool for photonics, the technology of light that is widely used in science, engineering and medicine. To understand the potential of fiber optics and use it intelligently, professionals in other fields need to understand how fiber optics works and what it can do. This book provides essential information and is written as a tutorial, assuming readers have some rudimentary knowledge of optics, physics and electronics, but are not experts familiar with fundamental concepts, standard applications, or the jargon of the field. It's also intended to be used as reference, so users can look up terms and find explanations and vital information, like the meanings of terms used in the measurement of light and the attenuation of optical fibers.

**Readership:**  
- Physicists and students from undergraduate level  
- Physicists in other fields, engineers. Fiber optic technicians

**Offers:**  
- A foundation reference on the principles and applications of fiber optics

**Related journals from AIP Publishing:**  
- *APL Photonics*
Book Title: Biomedical Optical Imaging

Book Type: Methods
Subject: Optics
Editor(s):
  • Jun Xia, State University of New York at Buffalo
  • Regine Choe, University of Rochester
Publication Date: March 2021

Summary: This book covers mainstream biomedical optical imaging techniques and their applications. Of particular interest, and in contrast to other texts, *Principles of Fiber Optics* covers super-resolution imaging and other advanced techniques and takes a tutorial approach suitable for application.

Readership:
  • Research scientists, post-doctoral, graduate students and senior undergraduate students. Researchers in the field of optical imaging and medical imaging.
  • Clinicians and medical professionals in imaging

Offers:
  • A primer on biomedical optical imaging, including the latest techniques and developments

Related journals from AIP Publishing:
  • *Journal of Applied Physics*
  • *APL Photonics*
  • *APL Bioengineering*
Book Title:
Photovoltaic Sustainability and Management

Book Type: Methods
Subject: Energy
Editor(s):
• Jingzheng Ren, Hong Kong Polytechnic Institute
• Zhipeng Kan, Chongqing Institute of Green and Intelligent Technology, Chinese Academy of Sciences
Publication Date: April 2021

Summary: Photovoltaic Sustainability and Management provides an examination of the ‘soft’ aspects of PV cell use – nontechnical details that greatly influence how effective they are. This is the first book to focus solely and comprehensive on these aspects. Such aspects include economic/cost-benefit analysis of PV construction, life-cycle environmental analysis of cell manufacture and disposal, and policies and barriers that affect new deployment.

Readership:
• Academic researchers (professors and graduate students) engaged in PV research; Technicians and consultants working in the PV/renewable energy industry
• Administrators and policy experts involved in energy policy or management; Undergraduates and MS candidates interested in PV/renewable energy

Offers:
• An in-depth analysis of the sustainability of photovoltaic technologies goes beyond their purely technical and scientific details.

Related journals from AIP Publishing:
• Journal of Renewable and Sustainable Energy
• Physics Today
Book Title: Light Sheet Microscopy and Imaging

Book Type: Principles
Subject: Optics
Author(s): Partha Pratim Mondal, Indian Institute of Science
Publication Date: May 2021

Summary: *Light Sheet Microscopy and Imaging* offers an introduction to the fundamentals and important advanced developments in light sheet technology. This book provides the basics principles of light sheet physics, optical imaging, computational techniques and experimental design with applications ranging from applied physics to biological imaging.

Readership:
- Research scientists, post-doctorate, graduate students and senior undergraduate students. Researchers in the field of optical imaging and medical imaging.
- Undergraduates studying on courses titled: imaging optics and field measurement, light-sheet microscopy and applications

Offers:
- Primer on light sheet microscopy and imaging, including the latest techniques and developments

Related journals from AIP Publishing:
- *Journal of Applied Physics*
- *APL Photonics*
- *APL Bioengineering*
**Book Title:**

Electron Microscopy of Defects in Compound Semiconductors

**Book Type:** Methods

**Subject:** Materials

**Author(s):**
- Yifei Meng, EAS Laboratories

**Publication Date:** May 2021

**Summary:**

*Electron Microscopy of Defects in Compound Semiconductors* is based on real-world problems from the compound semiconductor industry. This book introduces practical TEM techniques for crystalline defects in both single crystals and structured devices. It also discusses TEM-based analytical techniques for chemical composition determination. Scanning electron microscope (SEM)-based techniques are included after TEM. Researchers and engineers can learn the state-of-art methods for defect analysis, potentially boosting the development of new electronic devices.

This book:
- Focusing on the recent, rapidly developing field of compound semiconductors
- Serves as a manual for hands-on application of electron microscopy techniques to semiconductors
- Includes fundamentals of crystalline semiconductor structures, electron microscopy, and EM method selection

**Readership:**
- Researchers and engineers in compound semiconductor research and development
- Graduate students in material science, solid-state physics, and related fields
- Engineers in integrated circuit, photovoltaic, and other industries that heavily utilize semiconductor materials

**Offers:**
- A detailed, comprehensive, and up-to-date guide to the use of electron microscopy in compound semiconductor defect analysis.

**Related journals from AIP Publishing:**
- *Journal of Applied Physics*
- *Review of Scientific Instruments*
Summary: This book, about twenty-five well-known historical physicists, introduces readers to a variety of physics discoveries, as well as elaborate on the lives of the physicists themselves. Some of these stories are well known, as is the science, but this is the first book that brings the science together with personal anecdotes. In this way, the authors have challenged common stereotypes of both science and its practitioners. Each chapter comprises a description of the science, combined with relevant personal anecdotes. The main focus is physics and related astronomy and mathematics. The science is described simply but comprehensively to make the book accessible to a wide audience of physicists and general audiences interested in physics.