AIP Publishing Books

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AAPT Book Archive Collection

AAPT PHYSICS EDUCATION

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ABOUT THE AAPT BOOK ARCHIVE

In partnership with the American Association of Physics Teachers (AAPT), **AIP Publishing has digitized a collection of historic texts**. The AAPT Book Archive collection is hosted on AIP Publishing's Scitation platform and the books are available in HTML, PDF, and ePub formats for the first time. The AAPT Archive is available through an institutional license with no DRM, and the platform supports IP authenticated access, and unlimited simultaneous access for multiple users.

Digitally remastered to provide modern options for readers, the AAPT Book Archive includes 34 titles originally published in print between 1977 and 2017 and covers:

- Astrophysics
- General physics
- Society and organization
- Interdisciplinary physics
- Condensed matter physics
- Optics and optical physics
- Materials science
- Mathematical physics
- Astronomy & astrophysics
- Mechanics
- Energy
- Particle physics
- Electronics
- Classical mechanics
- Magnetism

AIP Publishing Books

50 Years On Teaching Physics

Reprints of American Journal of Physics articles from the first half century of AAPT

Editor:
Melba Phillips

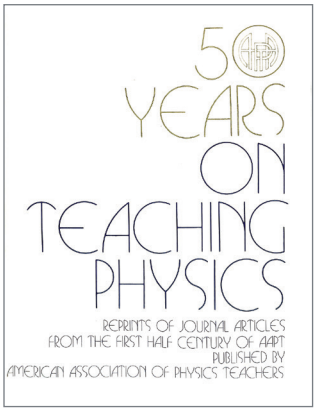
Subject Area:
General physics

Summary:
This book features a reprint collection of *American Journal of Physics* articles from the first half century of the American Association of Physics Teachers (AAPT). These often timeless articles are still significant in their impact on physics education today. *50 Years On Teaching Physics* brings together reflections on the first 25 years of the AAPT — amongst these are the thoughts and opinions of recipients of the Oersted medal, the AAPT's most prestigious award which recognizes notable contributions to the teaching of physics.

Key highlights:

- Millikan's idea of what makes a good teacher
- Historical detail from Klopsteg, the founder of the AAPT, and his ideas on the value of technology in a university
- The first Richtmyer lecture, written by A.H. Compton soon after Pearl Harbor
- Robert W. Pohl on Thomas Young's discovery of interference

50 Years On Teaching Physics is an excellent resource for those in physics education, as well as general physics and the history of science.



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ISBN (epub):
978-0-7354-2133-2
ISBN (print):
978-0-7354-2156-1

A Demonstration Handbook for Physics

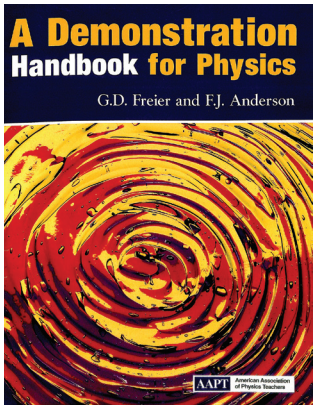
Authors:
G. D. Frier and F. J. Anderson

3rd Edition

Subject Area:
Interdisciplinary physics

Summary:

Created as a guide for high school and college physics teachers, this handbook contains hundreds of apparatus demonstrations that require only low-cost, everyday materials. The wide spectrum of topics addressed in this book makes it an excellent resource for every physics teacher's library. *A Demonstration Handbook for Physics* is one of the only resources of its kind that is still in print and now available digitally.



Publication Year: 1996

ISBN (online):
978-0-7354-2087-8

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978-0-7354-2086-1

ISBN (epub):
978-0-7354-2088-5

ISBN (print):
978-0-917853-32-6

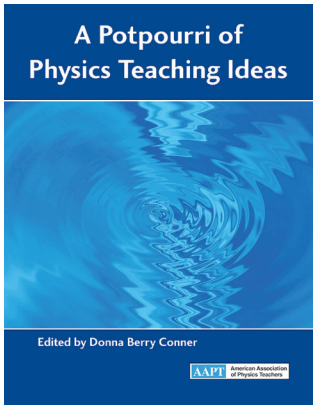
AIP Publishing Books

A Potpourri of Physics Teaching Ideas

Editor:
Donna Berry Conner

Subject Area:
General physics

Summary:
A Potpourri of Physics Teaching Ideas, edited by Donna Berry Conner, was first printed by AAPT in 1987 and is still going strong. From the pages of The Physics Teacher (1963–1986) comes this collection of articles on apparatus and ideas for teaching physics. Articles concerning mechanics, fluids, and heat; electromagnetism; optics and waves; sound; toys; and others are reproduced. An additional 71 articles describe how to stow-it, do-it, make-it, show-it, and adapt-it.



Publication Year: 1987

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ISBN (epdf):
978-0-7354-2038-0

ISBN (epub):
978-0-7354-2040-3

ISBN (print):
978-0-917853-27-2

Amusement Park Physics

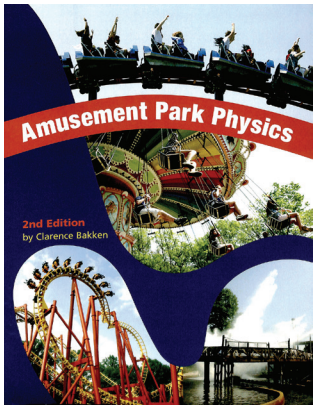
Author:
Clarence Bakken

2nd Edition

Subject Area:
Energy

Summary:

This book briefly discusses a gamut of subjects ranging from ways to incorporate amusement parks in class-room work to practical suggestions for taking a class to Physics Day. *Amusement Park Physics* discusses methods of collecting data and approaches to analyzing it. Many resources are included as well as suggestions of useful Internet sites.



Publication Year: 2011

ISBN (online):
978-0-7354-2042-7

ISBN (epdf):
978-0-7354-2041-0

ISBN (epub):
978-0-7354-2043-4

ISBN (print):
978-1-931024-12-9

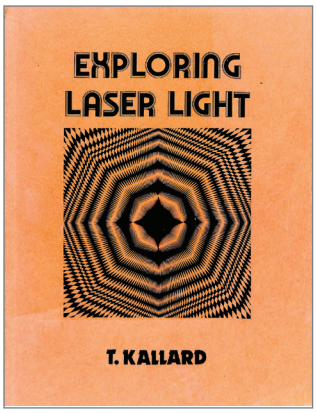
AIP Publishing Books

Exploring Laser Light

Author:
T. Kallard

Subject Area:
Optics and optical physics

Summary:
The low-power helium-neon (He-Ne) gas laser is an invaluable and dependable educational tool, used at all levels from high school physics to complex university installations. *Exploring Laser Light* is a manual of optics experiments performed with He-Ne lasers, for use in lecture demonstrations, teaching laboratories and home study experimentation.



Publication Year: 1977

ISBN (online):
978-0-7354-2090-8

ISBN (epdf):
978-0-7354-2089-2

ISBN (epub):
978-0-7354-2091-5

ISBN (print):
978-0-877390-04-6

Exploring Physics in the Classroom

An AAPT IPTRA Manual

Authors:
George Amann, Jon E. Barber and Hank J. Ryan

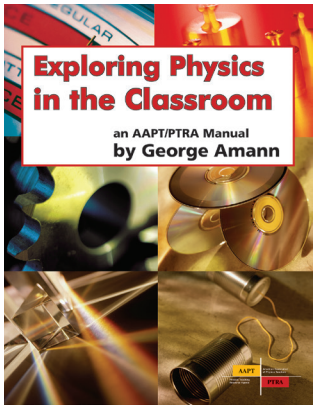
Subject Area:
General physics

Summary:
The National Science Education Standards promote the teaching of science in the United States as a process-oriented activity rather than a body of knowledge.

This AAPT/PTRA manual presents examples of two techniques that are proven to increase active student involvement in your classroom – exploratories and practicums.

- Based on the "5E" model of learning, exploratories are designed to foster inquiry, engaging students in new material in the classroom while allowing them to explore different aspects of it.
- Practicums provide opportunities for scientific debate in the classroom. Fostering cooperation and consensus, they encourage students to take responsibility for their own learning.

While addressing issues raised by the National Science Education Standards, the techniques and activities included here will help teachers achieve their goals within the context of the classroom.



Publication Year: 2005

ISBN (online):
978-0-7354-2123-3

ISBN (epdf):
978-0-7354-2122-6

ISBN (epub):
978-0-7354-2124-0

ISBN (print):
978-1-931024-07-5

AIP Publishing Books

How Things Work

Author:
H. Richard Crane

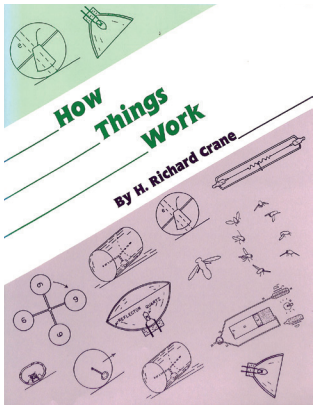
Subject Area:
General physics

Summary:
For many years, Crane's column How Things Work appeared in The *Physics Teacher.* This book represents 70 columns appearing between 1983 and 1991. Unpuzzling the mysteries of everyday life, Crane explains clearly the inner workings of things, all of which are familiar, household objects. All the devices and phenomena covered involve physics principles and require explanations that are not immediately obvious.

Key highlights

- Topics range from toys to spider webs, from ring interferometers to gasoline pumps
- Explanations are simple and understandable at all levels
- Entertaining and educational

How Things Work is highly readable and will appeal to anyone interested in physics generally. The collection is invaluable for physics teachers as a useful source of inspiration in the course of their teaching. Students will gain considerable understanding from the author's flair for experimental devices.



Publication Year: 1992

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ISBN (epdf):
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ISBN (epub):
978-0-7354-2049-6
ISBN (print):
978-0-917853-44-9

Insights Into The Universe

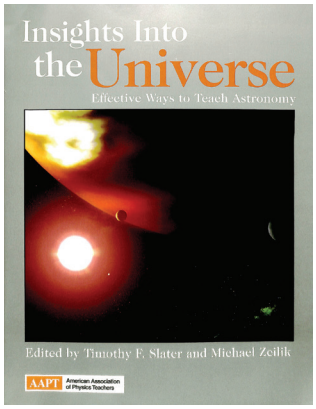
Effective Ways to Teach Astronomy

Editors:
Timothy F. Slater and Michael Zeilik

Subject Area:
Astronomy & astrophysics

Summary:
This book is a collection of *AstroNotes* columns and related articles from *The Physics Teacher. AstroNotes* was started to give physics and astronomy teachers insightful approaches to engage their students. This book continues that tradition. Timeless ideas and classroom-proven strategies will help the novice teacher and the seasoned pro find more effective ways to teach astronomy. Many of the articles focus on a single concept and nearly all embody a new slant on teaching a topic.

Insights Into The Universe is a great tool to help invigorate astronomy classes.



Publication Year: 2003

ISBN (online):
978-0-7354-2135-6

ISBN (epdf):
978-0-7354-2134-9

ISBN (epub):
978-0-7354-2136-3

ISBN (print):
978-1-931024-04-4

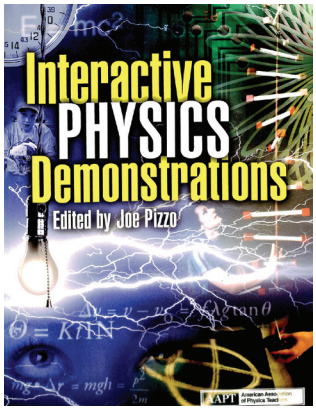
AIP Publishing Books

Interactive Physics Demonstrations

Editor:
Joe Pizzo

Subject Area:
Interdisciplinary physics

Summary:
Interactive Physics Demonstrations contains 42 free-standing fun physics experiments you can try with your class. Compiled from *Deck the Halls* columns in *The Physics Teacher*, the demonstrations, suitable for a school hallway or corner of your classroom, will help students understand physics through the active exploration of specific physics concepts, from mechanics and heat, vibrations and waves, electrostatics, to optics and chaos.



Publication Year: 2001

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ISBN (epub):
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ISBN (print):
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Making Contributions: An Historical Overview of Women's Role in Physics

Based on a Special Session Sponsored by the Committee on Women in Physics of the American Association of Physics Teachers

Editor:
Barbara Lotze

Subject Area:
Society and organization

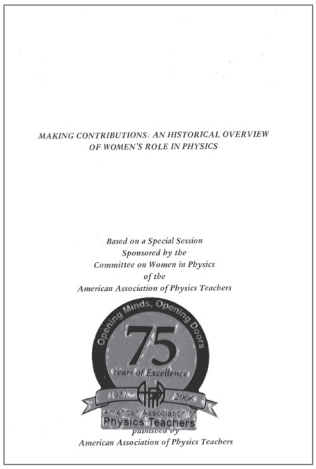
Summary:
This book offers a collection of papers based on a special session sponsored by the Committee on Women in Physics of the American Association of Physics Teachers.

The under-representation of women in physics is a profound problem worldwide. Given the importance of encouraging more women to engage with physics, there is a lot to be learned from women who have succeeded in the field. With an introduction by Barbara Lotze, herself an eminent physicist, this book explores women in physics over time, highlighting the achievements and profiling the careers of some highly successful women physicists.

Chapters include:

- Women Physicists in Past Generations — Katherine R. Sopka
- Lise Meitner's Scientific Legacy — Sallie A. Watkins
- Cecilia Payne-Gaposchkin: The Making of an Astrophysicist — Peggy A. Kidwell
- The Lady Wanted to Purchase a Wheatstone Bridge: Sarah Frances Whiting and Her Successor — Janet B. Guernsey
- Women in Physics: Today and Looking Toward the Future — Lucille B. Garmon.

Making Contributions: An Historical Overview of Women's Role in Physics is a fascinating resource for anyone interested in physics, and women's roles and contributions to the field. It also speaks to those interested in the history and philosophy of science.



Publication Year: 1984

ISBN (online):
978-0-7354-2093-9

ISBN (epdf):
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ISBN (epub):
978-0-7354-2094-6

ISBN (print):
978-0-917853-09-8

AIP Publishing Books

Physics and 21st Century Science Standards

The Role of Physics in the NGSS

Author:
AAPT

Subject Area:
Materials science

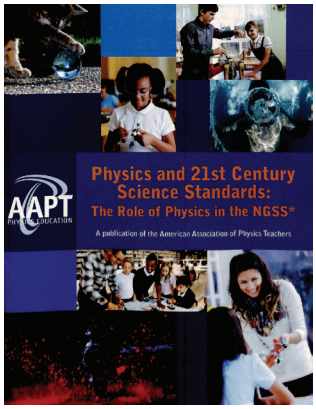
Summary:
Describing the role of physics in the Next Generation Science Standards (NGSS), this book provides an overview and history of the NGSS, as well as guidelines to reading and interpreting the performance expectations which are embedded with the three dimensions of science learning.

The NGSS provide a coherent set of internationally-benchmarked guidelines for K—12 science teachers. These standards are supported by input from the AAPT, American Physical Society, American Chemical Society, American Institute of Physics, American Society for Engineering Education, and the Department of Energy, as well as high school physics educators. Their support is based on the National Research Council and National Academy of Science's Framework for K—12 Science Education: Practices, Crosscutting Concepts, and Core Ideas.

Key highlights:

- Identifies physics concepts across all K—high school grade bands
- Analyses the high school physics standards that are included in and excluded from performance expectations
- Identifies weaknesses and omissions in the guidelines, with recommendations for improvement.

Physics and 21st Century Science Standards will help K—12 physics and science teachers better understand how their classroom practice is or could be aligned with the NGSS.



Publication Year: 2017

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ISBN (epub):
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ISBN (print):
978-1-931024-31-0

Preconceptions in Mechanics

Lessons Dealing with Students' Conceptual Difficulties

Authors:
Charles W. Camp and John J. Clement

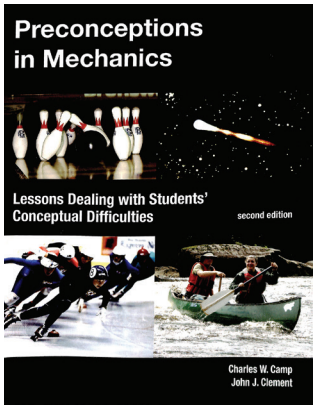
2nd Edition

Subject Area:
Mechanics

Summary:
As the second edition of Charles Camp and John Clement's book, this resource contains a set of 24 innovative lessons and laboratories in mechanics for high school physics classrooms that was developed by a team of teachers and science education researchers. Research has shown that certain student pre-conceptions conflict with current physical theories and seem to resist change when using traditional instructional techniques.

Preconceptions in Mechanics provides a set of lessons that are aimed specifically at these particularly troublesome areas: Normal Forces, Friction, Newton's Third Law, Relative Motion, Gravity, Inertia, and Tension. The lessons can be used to supplement any course that includes mechanics.

Each unit contains detailed step by step lesson plans, homework and test problems, as well as background information on common student misconceptions, an overall integrated teaching strategy, and key aspects of the targeted core concepts. This edition has a number of substantial changes based on teacher input. A number of the lessons are adaptable for college level courses as well. Evaluations using pre-and post-tests have shown large gain differerfces over control groups.



Publication Year: 2010

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978-0-7354-2058-8

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978-1-931024-13-6

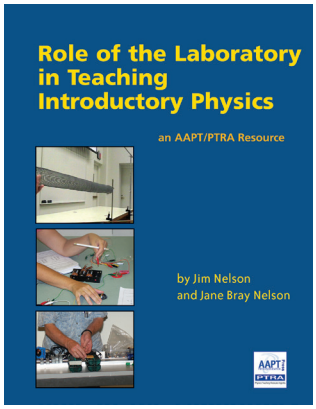
AIP Publishing Books

Role of the Lab in Teaching Introductory Physics

An AAPT/PTRA Workshop Manual

Authors:
Jim Nelson and Jane Bray Nelson

Subject Area:



Summary:
This excellent resource comprises an introduction to the philosophy and rationale for including a laboratory component in introductory physics courses. *Role of the Lab in Teaching Introductory Physics* offers more than 30 sample laboratory activities, with camera-ready student directions.

A wide range of topics are covered, some of which include:

- Speed
- Centripetal force
- Motion of a pendulum
- Heating and cooling
- Ohm's law
- Magnetic fields
- Induced EMF

Publication Year: 1995

ISBN (online):
978-0-7354-2102-8

ISBN (epdf):
978-0-7354-2101-1

ISBN (epub):
978-0-7354-2103-5

ISBN (print):
978-0-917853-61-6

Safety in Physics Education

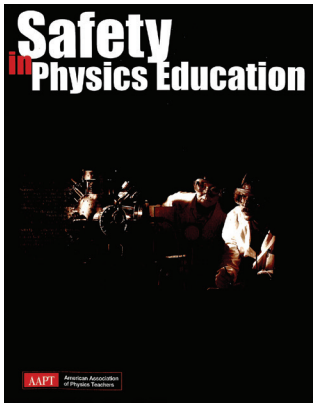
Author:
American Association of Physics Teachers Apparatus Committee

Subject Area:
General physics

Summary:
Science by its very nature can never be completely risk-free. This manual seeks to provide a framework that educators can use in assessing the risk in their own activities and provide guidance for some of the more common hazards. Not all of the hazards discussed will be applicable to every level but some concession to completeness is necessary. The goal of this manual is to create an awareness of safety, to encourage safe habits and to teach respect for potential safety hazards.

Safety in Physics Education seeks to develop an awareness of the risks involved in teaching physics and the steps to take to protect students as well as educators.

This book is intended for a broad audience in the physics teaching community and can be used across the spectrum of experimental and demonstration activities -from elementary to advanced undergraduate laboratories.



Publication Year: 2001

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ISBN (epub):
978-0-7354-2061-8
ISBN (print):
978-1-931024-01-3

AIP Publishing Books

String and Sticky Tape Experiments

Author:
R.D. Edge

Subject Area:
Interdisciplinary physics

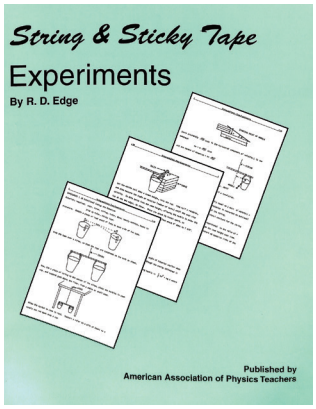
Summary:
Physics is an experimental science, and the only way to get a feel for it is by doing hands-on experiments. However, experimenting with expensive physics equipment in schools is not an option for students. *String and Sticky Tape Experiments* brings together a host of experiments demonstrating fundamental physics laws in a practical way which students can work with on their own. Materials are deliberately chosen for their simplicity, availability and low cost, so they can be done at home as well as at school.

Many of these experiments were published in the American Association of Physics Teachers' journal *The Physics Teacher.*

String and Sticky Tape Experiments organizes and ranks experiments by:

- Subject — Mechanics, Properties of Matter, Hydrodynamics, Heat, Wave Motion, Light, Sound, Atomic and Nuclear Physics, Solid State and Crystallography, Electrostatics, Magnetism, Current Electricity, Psychophysics, and Physics Games
- Difficulty
- Educational level
- Qualitative or quantitative nature
- Fundamental nature
- Entertainment value

Students across all physics disciplines and at all levels will learn and gain enjoyment from this book, from elementary level to high school and university. It is also a valuable resource for physics teachers.



Publication Year: 1987

ISBN (online):
978-0-7354-2096-0
ISBN (epdf):
978-0-7354-2095-3
ISBN (epub):
978-0-7354-2097-7
ISBN (print):
978-0-917853-28-9

Teaching about Color and Color Vision

An AAPT IPTRA manual

Author:
Bill Franklin

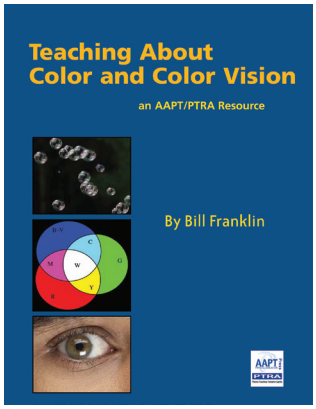
Subject Area:
Interdisciplinary physics

Summary:
Teaching about Color and Color Vision explores how the human eye perceives color, and how that color perception is triggered by the light sources and objects around us.

The colors of soap bubbles and other thin films are studied in detail. This investigative approach is extended to explain the colors of transparent materials sandwiched between polarizers.

Designed to encourage and entertain high school physics students, this useful resource incorporates:

- Laboratory activities and demonstrations, both new and tried and tested
- Important commercial applications
- Sample questions
- Physics Olympics events



Publication Year: 1996

ISBN (online):
978-0-7354-2108-0

ISBN (epdf):
978-0-7354-2107-3

ISBN (epub):
978-0-7354-2109-7

ISBN (print):
978-0-917853-68-5

AIP Publishing Books

Teaching About Cosmology

An AAPT/PTRA Resource

Authors:
Lawrence M. Krauss and Glenn D. Starkman

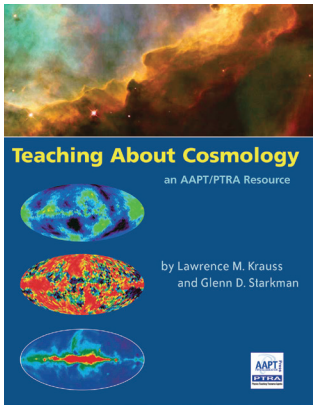
Subject Area:
Astronomy & astrophysics

Summary:
The origins of the universe are fascinating to us all. As we look further away and farther back in time, this is a golden age for cosmology as a science. Yet cosmology is not often represented on the high school curriculum, and teachers are challenged in presenting this mostly new-found knowledge in an accessible way.

This book is an attempt to begin filling that void. Since discoveries in cosmology depend on physics that is accessible, this resource presents an essential understanding of what is currently known about the universe.

- Each section of the manual stands on its own, with sections ordered in a sequence for presentation.
- For each topic, essential information for understanding the concepts is presented, including the uncertainties in our current understanding.
- Classroom activities are suggested activities that illustrate concepts.

Teaching About Cosmology is an invaluable resource for high school physics teachers, as well as teachers of other scientific disciplines and those generally interested in the origins of the universe.



Publication Year: 1999

ISBN (online):
978-0-7354-2114-1

ISBN (epdf):
978-0-7354-2113-4

ISBN (epub):
978-0-7354-2115-8

ISBN (print):
978-0-917853-92-0

Teaching About D.C. Electric Circuits

An AAPT/PTRA Resource

Authors:
Earl R. Feltyberger, James Mallmann, Judy M. Schmidt and Thomas Senior

Subject Area:
Electronics

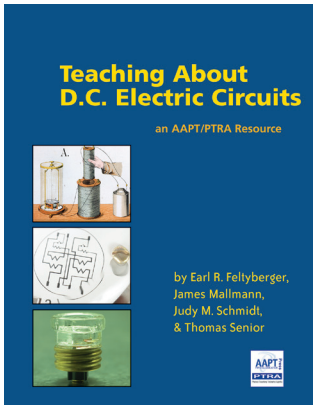
Summary:
This book offers a collection of experiments forming an integrated workshop for introductory physics courses. Experiments included are all linked, building on one another so that ideas or devices that are studied in one experiment can be used in subsequent experiments.

Teachers will work through the workshop independently, modifying the content for use in their teaching. The majority of the experiments are a valuable supplement to other material presented in laboratory manuals.

Experiments are included on:

- Field mapping, providing a link between electrostatics and current electricity.
- The performance of individual devices in circuits, as well as series and parallel circuits of both light bulbs and resistors.
- Capacitors, including their basic behavior, which provides foundational knowledge for use in later experiments.
- Semiconductor devices.
- The behavior and use of diodes, light emitting diodes, transistors and an integrated circuit.

Teaching About D.C. Electric Circuits is ideal for all teachers of introductory physics who wish to give to their students a reasoned, graduated set of laboratory experiences in electric circuits and electronics.



Publication Year: 1990

ISBN (online):
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978-0-7354-2062-5

ISBN (epub):
978-0-7354-2064-9

ISBN (print):
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AIP Publishing Books

Teaching About Electrostatics

An AAPT/PTRA Resource

Author:
Robert A. Morse

Subject Area:
Particle physics

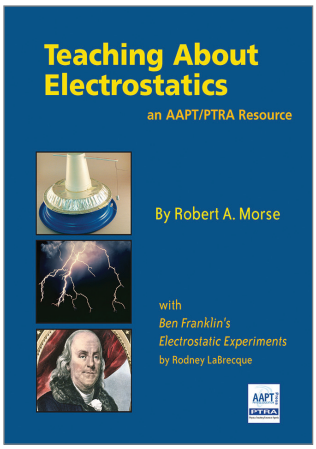
Summary:
Teaching About Electrostatics is an invaluable resource and workshop guide, designed to deepen students' understanding of this important and fascinating subject through enjoyable hands-on experience.

It describes the construction of reliable electrostatics equipment from materials which are simple and inexpensive, and easily obtained at hardware stores. The activities and demonstrations in this guide are intended to be adapted and used as needed by teachers to fit their curricular needs.

Key Highlights

- **Appendix A** contains a sample sequence of activities designed to help students build an initial understanding of electrostatics.
- **Appendix B** is an excellent teaching unit by Rodney LaBrecque, recreating Ben Franklin's important and entertaining electrostatics experiments for the classroom.

Teachers will find these workshop activities suitable for students at all levels, from elementary to high school.



Publication Year: 1992

ISBN (online):
978-0-7354-2066-3

ISBN (epdf):
978-0-7354-2065-6

ISBN (epub):
978-0-7354-2067-0

ISBN (print):
978-0-917853-51-7

Teaching About Energy

An AAPT/PTRA Resource

Author:
John L. Roeder

Subject Area:
Energy

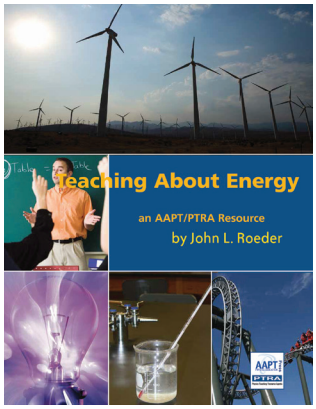
Summary:
Energy was only recognized as a physical concept as recently as the 19th century, but is now a fundamental concept in physics. This book examines the role energy plays in every aspect of the world around us, sustaining life on earth and enabling the development of our consumer society. It focuses primarily on the conversion of energy amongst its many forms.

Teaching About Energy begins with the relationship between the force and distance required to pull a roller coaster to the top of its first hill along inclines of different slope. It ends with the energy choices we will need to make for our future.

Key highlights

- Covers many aspects of energy
- Presents activities leading to the quantitative and qualitative measurement of all forms of energy
- Includes energy games and teachers' notes
- The ultimate learning resource on energy

This manual on energy is a key resource for all teachers of physics and will facilitate the learning of their students.



Publication Year: 2008

ISBN (online):
978-0-7354-2126-4

ISBN (epdf):
978-0-7354-2125-7

ISBN (epub):
978-0-7354-2127-1

ISBN (print):
978-1-931024-09-9

AIP Publishing Books

Teaching About Impulse and Momentum

An AAPT IPTRA Manual

Author:
Bill Franklin

Subject Area:
Interdisciplinary physics

Summary:
This AAPT/PTRA resource features unique laboratories and demonstrations that physics teachers can use to give students hands-on opportunities to learn about impulse and momentum.

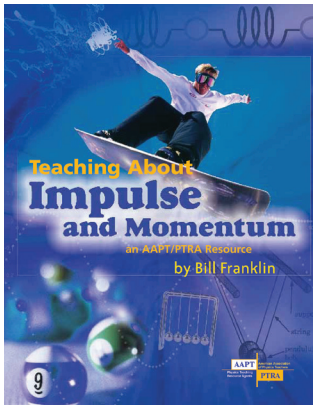
Teaching About Impulse and Momentum aims to build teachers' conceptual understanding so they feel comfortable making their own curriculum decisions. A range of possible labs and demos are presented, for them to select what suits a given audience. Instructions for building the apparatus are included.

Among the topics treated are automobile safety, wing lift, water nozzle reaction, and spacecraft use of gravity "slingshots".

Key Highlights

- Activities range from introductory level to challenging for advanced placement or college level
- Apparatus can be built inexpensively
- Several of the designs have won low-cost apparatus awards in AAPT contests

This manual will be useful for physics classroom teachers and those providing pre-service or in-service training for teachers.



Publication Year: 2005

ISBN (online):
978-0-7354-2120-2

ISBN (epdf):
978-0-7354-2119-6

ISBN (epub):
978-0-7354-2121-9

ISBN (print):
978-1-931024-06-8

Teaching About Kinematics

An AAPT/PTRA Resource

Authors:
Jane Bray Nelson and Jim Nelson

Subject Area:
Classical mechanics

Summary:
Based on physics education research, this AAPT/PTRA Teacher's Guide covers teaching and learning kinematics. Carefully thought out, it provides the resources needed to introduce students to some of the fundamental building blocks of physics.

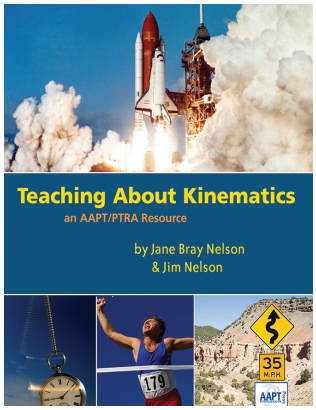
Inquiry, measurement and analysis of laboratory data are emphasized throughout this step-by-step, laboratory-based introduction to concepts in motion.

Key highlights

Written by master teachers, *Teaching About Kinematics* includes:

- The measurement of time and space
- The distinctions between speed, velocity, and three types of acceleration
- Dozens of laboratory activities measuring kinematics quantities
- Worksheets, transparency masters, teacher notes, typical answers to questions, and helpful hints.

Physics teachers will find this resource useful for introducing students to foundational knowledge on kinematics, leaving them well-prepared for further study on physical phenomena.



Publication Year: 2009

ISBN (online):
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ISBN (epdf):
978-0-7354-2068-7

ISBN (epub):
978-0-7354-2070-0

ISBN (print):
978-1-931024-11-2

AIP Publishing Books

Teaching About Kinematics – Student Edition

An AAPT/PTRA Resource

Authors:
Jane Bray Nelson and Jim Nelson

Subject Area:
Classical mechanics

Summary:
Based on physics education research, this AAPT/PTRA resource covers teaching and learning kinematics. Carefully thought out, it provides the resources needed to introduce students to some of the fundamental building blocks of physics.

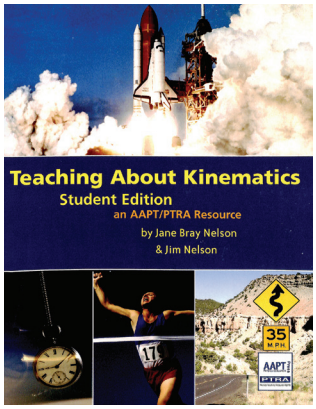
Inquiry, measurement and analysis of laboratory data are emphasized throughout this step-by-step, laboratory-based introduction to concepts in motion.

Key highlights

Written by master teachers, *Teaching About Kinematics* includes:

- The measurement of time and space
- The distinctions between speed, velocity, and three types of acceleration
- Dozens of laboratory activities measuring kinematics quantities
- Worksheets, transparency masters, teacher notes, typical answers to questions, and helpful hints.

Students studying physics will find this resource a useful introduction to foundational knowledge on kinematics, leaving them well-prepared for further study on physical phenomena.



Publication Year: 2015

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978-0-7354-2072-4

ISBN (epdf):
978-0-7354-2071-7

ISBN (epub):
978-0-7354-2073-1

ISBN (print):
978-1-931024-27-3

Teaching about Lightwave Communications

An AAPT IPTRA Manual

Authors:
Mark Davids, R. Stephen Rea and Paul Zitzewitz

Subject Area:
Optics and optical physics

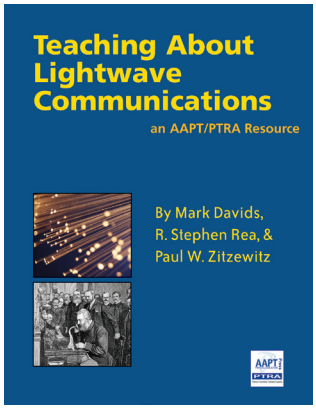
Summary:
The study of lightwave communications is both interesting and highly relevant for high school students. *Teaching about Lightwave Communications* is designed to provide them with both the historical and theoretical background information necessary to understand the fundamentals of the subject.

This useful resource contains a workshop guide, comprising a set of hands-on student lab investigations. Starting with simple components, students will learn to build a number of devices that will allow them to understand the mysteries of modern lightwave communications systems.

Key highlights

- Ties together the topics of sound, light, electric circuits, electromagnetic interactions, and digital communications
- All the materials required are easy to source, inexpensive and re-usable
- Much of the content of this guide is based on work done at the Rutgers National Leadership Institutes for Physics Teachers, where high school teachers were able to learn directly from research physicists

Teaching about Lightwave Communications equips high school physics teachers with enough material to run full day workshops, with up to 6 or 7 class periods.



Publication Year: 1994

ISBN (online):
978-0-7354-2105-9
ISBN (epdf):
978-0-7354-2104-2
ISBN (epub):
978-0-7354-2106-6
ISBN (print):
978-0-917853-63-0

AIP Publishing Books

Teaching About Magnetism

An AAPT/PTRA-PLUS Workshop Manual

Author:
Robert Reiland

Subject Area:
Condensed matter physics

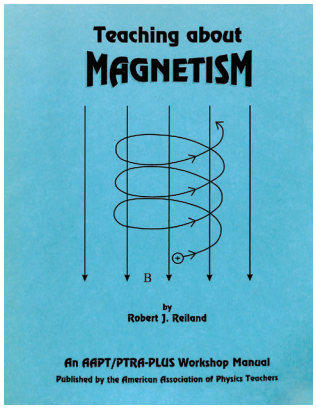
Summary:
This book is a comprehensive workshop manual on teaching magnetism, listing 12 laboratory activities on a wide range of magnetism topics. It also covers demonstrations and displays, and computer applications for teaching magnetism. Sections on homework assignments, the use of technology for teaching magnetism, and physics contest events are included.

Teaching About Magnetism has been tested and improved over time following feedback from participants.

Key highlights

- An invaluable resource on how to use demonstrations to inspire students
- The workshop was initially tested in the 1993 class of PTRA-PLUS (Physics Teaching Resource Agent), a program designed to train superior physics teachers across the US in giving workshops for under-prepared physics and physical science teachers.
- Sources of inspiration contributing to the manual include the journal of the American Association of Physics Teachers (AAPT), The Physics Teacher.

This workshop manual is an excellent resource for physics teachers. It is also of interest to anyone who works with magnetic devices, magnetic equipment, magnetic flux, magnetization dynamics, magnetochemistry, or nanomagnetism.



Publication Year: 1996

ISBN (online):
978-0-7354-2138-7

ISBN (epdf):
978-0-7354-2137-0

ISBN (epub):
978-0-7354-2139-4

ISBN (print):
978-0-917853-65-4

Teaching About Magnets & Magnetism

An AAPT/PTRA Teacher Resource Guide

Authors:
Jane Bray Nelson and Jim Nelson

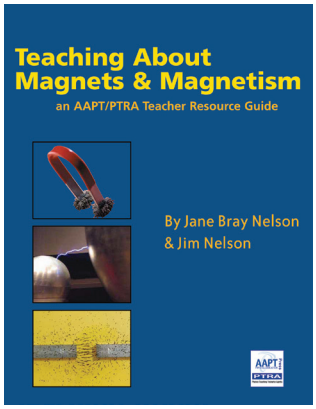
Subject Area:
Magnetism

Summary:
This practical guide to teaching about magnetism contains numerous demonstrations and activities, tried and tested by teachers over many years.

Teaching About Magnets & Magnetism requires students to consider, and put into writing, what they expect to happen before carrying out the activities. Students are asked to suggest alternatives to their expectations, and as they gain experience, offer more detailed and quantitative hypotheses. Teachers are encouraged to prepare detailed hypotheses and assist students in refining their own.

- Most activities involve inexpensive and simple materials that are commonly available and easy to put together.
- Students are encouraged to construct equipment themselves if possible.
- Hypotheses that can be suggested to students appear with the activities.

This AAPT/PTRA Teacher Resource is an invaluable companion for all teachers of physics.



Publication Year: 2013

ISBN (online):
978-0-7354-2075-5

ISBN (epdf):
978-0-7354-2074-8

ISBN (epub):
978-0-7354-2076-2

ISBN (print):
978-1-931024-15-0

AIP Publishing Books

Teaching About Newton's Second Law

An AAPT/PTRA Teacher Resource Guide

Author:
Robert A. Morse

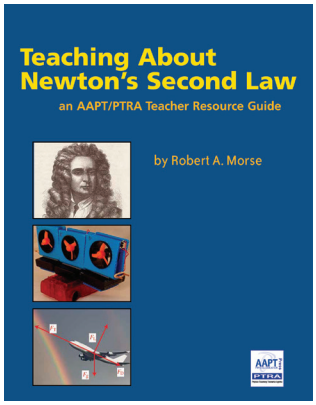
Subject Area:
Classical mechanics

Summary:
This AAPT/PTRA teacher resource guide describes the use of microcomputer-based laboratory (MBL) techniques to teach Newton's second law, forces, and solve problems concerning force and motion.

Teaching About Newton´s Second Law promotes the effective and appropriate use of computer technology in teaching, demonstrating the pedagogical advantage of real-time graphing of data with MBL techniques. Teachers and students can design experiments using these techniques that were not easy to do without them. Existing curricula using these ideas include Workshop Physics, Real-Time Physics, and the CPU project materials. All of these materials have been carefully developed and tested and represent exemplary curricula.

Key highlights

- Helps students first build first a qualitative, conceptual understanding of Newton's second law and then a quantitative, problem-solving understanding.
- Includes laboratory activities that cannot be done without these techniques.
- Describes additional guidance necessary, such as rewriting activities, and adding homework.



Publication Year: 2013

ISBN (online):
978-0-7354-2078-6

ISBN (epdf):
978-0-7354-2077-9

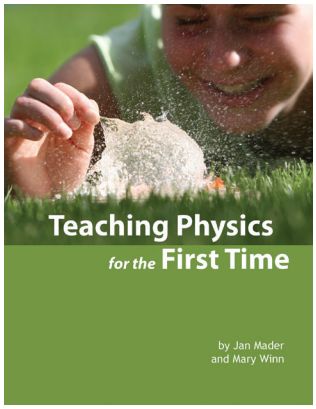
ISBN (epub):
978-0-7354-2079-3

ISBN (print):
978-1-931024-17-4

Teaching Physics for the First Time

Authors:
Jan Mader and Mary Winn

2nd Edition



Subject Area:
Interdisciplinary physics

Summary:
This book is designed to be a quick and easy resource for anyone teaching physics for the first time, whether he/she is new to teaching or new to teaching physics. Jan Mader and Mary Winn have worked extensively with beginning teachers and with teachers who were teaching physics and/or physical sciences without formal preparation in the content areas.

The goal of the book is to provide a supply of reliable activities (labs, demos, etc.) that work easily when attempted in the classroom. The activities emphasize the hands-on approach to learning physics concepts. Lesson plans written in learning cycles as well as teacher notes for every activity are included.

The book is not the end — it is a beginning of a "bag of tricks" on which new physics teachers will build. Soon both the instructor and students will realize that a day without physics does not exist and that physics is a "phun" adventure.

Publication Year: 2012

ISBN (online):
978-0-7354-2081-6

ISBN (epdf):
978-0-7354-2080-9

ISBN (epub):
978-0-7354-2082-3

ISBN (print):
978-1-931024-10-5

AIP Publishing Books

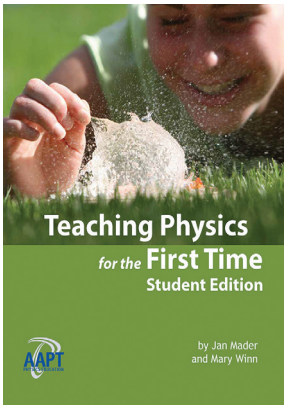
Teaching Physics for the First Time – Student Edition

Authors:
Jan Mader and Mary Winn

Subject Area:
Interdisciplinary physics

Summary:

Glossing over kinematics often leaves students poorly prepared to continue their study of physical phenomena. This AAPT/PTRA Resource, based on physics education research, provides the resources needed to introduce students to some of the fundamental building blocks of physics. The approach features a carefully thought-out, step-by-step laboratory-based introduction to the foundation upon which much of physics is built. Inquiry, measurement, and analysis of laboratory data are emphasized throughout. This book starts with chapters on the measurement of Time and Space, followed by chapters designed to distinguish among Speed, Velocity, and three types of Acceleration. In addition to dozens of laboratory activities, it provides worksheets, transparency masters, and helpful hints by two master PTRAs.



Publication Year: 2012

ISBN (online):
978-0-7354-2099-1

ISBN (epdf):
978-0-7354-2098-4

ISBN (epub):
978-0-7354-2100-4

ISBN (print):
978-1-931024-24-2

The Dick and Rae Physics Demo Notebook

Authors:
D. Rae Carpenter, Jr. and Richard B. Minnix

2nd Edition

Subject Area:
Interdisciplinary physics

Summary:

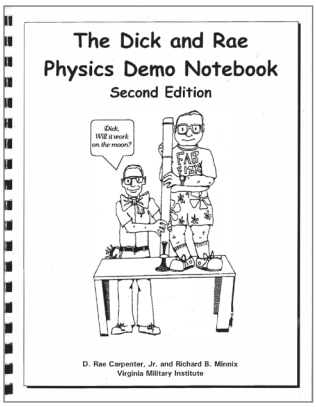
Demonstrations have long been a part of the physics classroom, dating back as far as Lord Kelvin in the 19th century. Good demos are known to play a crucial role in physics education, boosting students' interest and understanding. *The Dick and Rae Physics Demo Notebook* lists hundreds of demonstrations, stemming from 16 summer workshops held at Virginia Military Academy by the authors over a period of 20 years.

Known as The Ultimate Demonstration Book, *The Dick and Rae Physics Demo Notebook* is a unique and inspirational collection of clearly presented demos. All teachers need is access to simple tools and equipment, such as commonly found items from the laboratory, garden, or kitchen.

Key highlights of this book:

- Explains physics concepts clearly at all levels
- Lists 460 main demonstrations, with several hundred alternatives
- Demonstrations are organized by the main areas studied in first year undergraduate courses – mechanics, fluids, heat, waves and sound, electricity, magnetism, optics, and modern physics
- Up to 25 demonstrations are included on each topic
- Includes over 700 photos and 750 references

Teachers of physics at all levels, from elementary to college, will find *The Dick and Rae Physics Demo Notebook* an invaluable addition to their classroom. Some of the simplest demos are suitable for public audiences, ranging to other more complex ones appropriate for graduate level.



Publication Year: 2003

ISBN (online):
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ISBN (epub):
978-0-7354-2268-1

ISBN (print):
0-735422-78-8

ISBN (print soft cover):
978-0-7354-2278-0

AIP Publishing Books

The Role of Graphing Calculators in Teaching Physics

An AAPT/PTRA Workshop Manual

Authors:
Cherie Bibo Lehman, Linda J. Antinone and John E. Gastineau

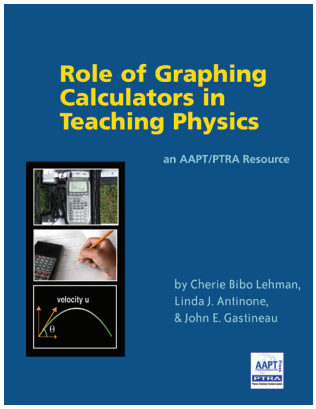
Subject Area:
Mathematical physics

Summary:
This workshop manual is designed to familiarize students with the TI-83 graphing calculator. It includes demonstrations, and laboratory and classroom activities that utilize the graphing features of the calculator.

Students will learn how to utilize:

- The graphics features
- The statistics mode, to analyze laboratory data
- The solvers, to solve complex equations.

The solvers in the CALCulate menu enable students to find the minimum and maximum values of a function, the intersection of two functions, and the numerical derivative and integral of a function.



Publication Year: 1999

ISBN (online):
978-0-7354-2111-0

ISBN (epdf):
978-0-7354-2110-3

ISBN (epub):
978-0-7354-2112-7

ISBN (print):
978-0-917853-91-3

The Role of Toys in Teaching Physics

An AAPT/PTRA-PLUS Workshop Manual

Author:
Jodi McCullough and Roy McCullough

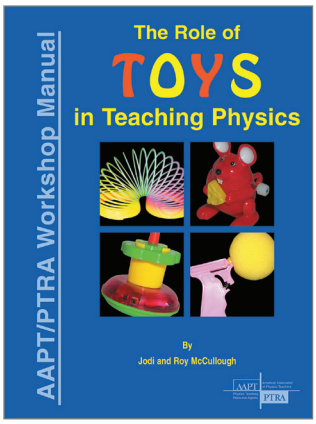
Subject Area:
Interdisciplinary physics

Summary:

Toys are a useful addition to the laboratory. Many physics concepts can be demonstrated effectively using simple toys that would otherwise be hard to grasp. They are less expensive and more readily available than standard equipment, and bring excitement and enthusiasm to the classroom.

The Role of Toys in Teaching Physics contains experiments, demonstrations, and displays involving toys that can be used to introduce most of the major topics covered in a typical introductory physics class.

The activities in this manual help students make easier connections between their physics learning and everyday applications.



Publication Year: 2000

ISBN (online):
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ISBN (epdf):
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ISBN (epub):
978-0-7354-2118-9
ISBN (print):
978-0-917853-97-5

AIP Publishing Books

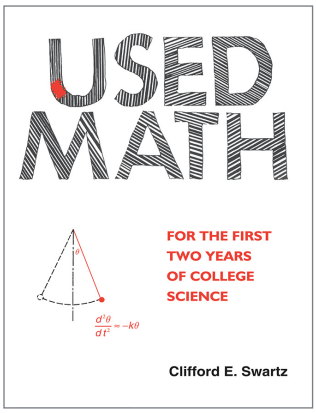
Used Math

For the First Two Years of College Science

Author:
Clifford E. Swartz

2nd Edition

Subject Area:
Astrophysics



Summary:

Here is a helpful reference work designed for the college science student needing a quick explanation of the mathematics found in the first two years of the college science curriculum. Rather than giving lengthy explanations of abstract mathematical theory, this useful handbook focuses on math as a scientist's working tool.

Part reference and part reminder—the volume reinforces the student's previous knowledge of math and guides the reader through the many unfamiliar mathematical computations that are part of his or her science requirements. Numerous examples throughout the book are drawn from actual situations encountered in science courses. The chapters may be used in any sequence and are extensively cross-indexed for user convenience.

Demonstrating how formal course work in chemistry, physics, astronomy, and the other sciences employ certain vital areas of mathematics, the book covers a broad range of important subjects, including reporting and analyzing uncertainty, units and dimensions, graphs, the simple functions of applied math, statistics, quadratic and high power equations, and simultaneous equations. Other chapters are devoted to determinants, vectors, complex numbers, calculus-differentiation, integration, series and approximations, common differential equations, and differential operators. The book contains many useful reference tables and summaries of formulas and techniques.

A valuable study aid for every science student and an auxiliary reference work certain to be used frequently, Used Math gives solid explanations and examples of the "old and used" math fundamental to all science courses.

Publication Year: 1993

ISBN (online):
978-0-7354-2084-7

ISBN (epdf):
978-0-7354-2083-0

ISBN (epub):
978-0-7354-2085-4

ISBN (print):
978-0-917853-50-0

With You When You Fly: Aeronautics for Introductory Physics

Author:
NASA and AAPT

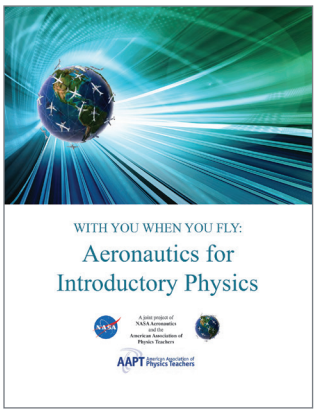
Subject Area:
Energy

Summary:
Although there are many right ways to teach physics, there is a growing need for teaching by inquiry in context. This is the most effective way, ensuring classes are relevant and practical. *With You When You Fly* is an educators' guide which addresses this need, providing a solid content base and actively engaging with topics necessary to the development of 21st century skills.

With You When You Fly: Aeronautics for Introductory Physics is founded on 26 aeronautics-related teaching ideas presented by seasoned high school and college physics teachers, and articles that have appeared in the American Association of Physics Teachers' (AAPT) publication, *The Physics Teacher.* The lesson ideas are combined with NASA aeronautics education resources and ongoing research, as well as student experiences with flight.

- Reviewed by acting high school and college/university AAPT members
- Each activity includes objectives and/or guiding questions related to the physics of flight, followed by a detailed listing of the NGSS and CCSS addressed by students who successfully complete each activity
- The activities can also be used to teach fundamental physics concepts and inquiry skills.

With You When You Fly: Aeronautics for Introductory Physics is suitable for high school and introductory university level physics courses. Teachers as well as anyone interested in aeronautics and astrophysics will find this book useful and informative.



Publication Year: 2015

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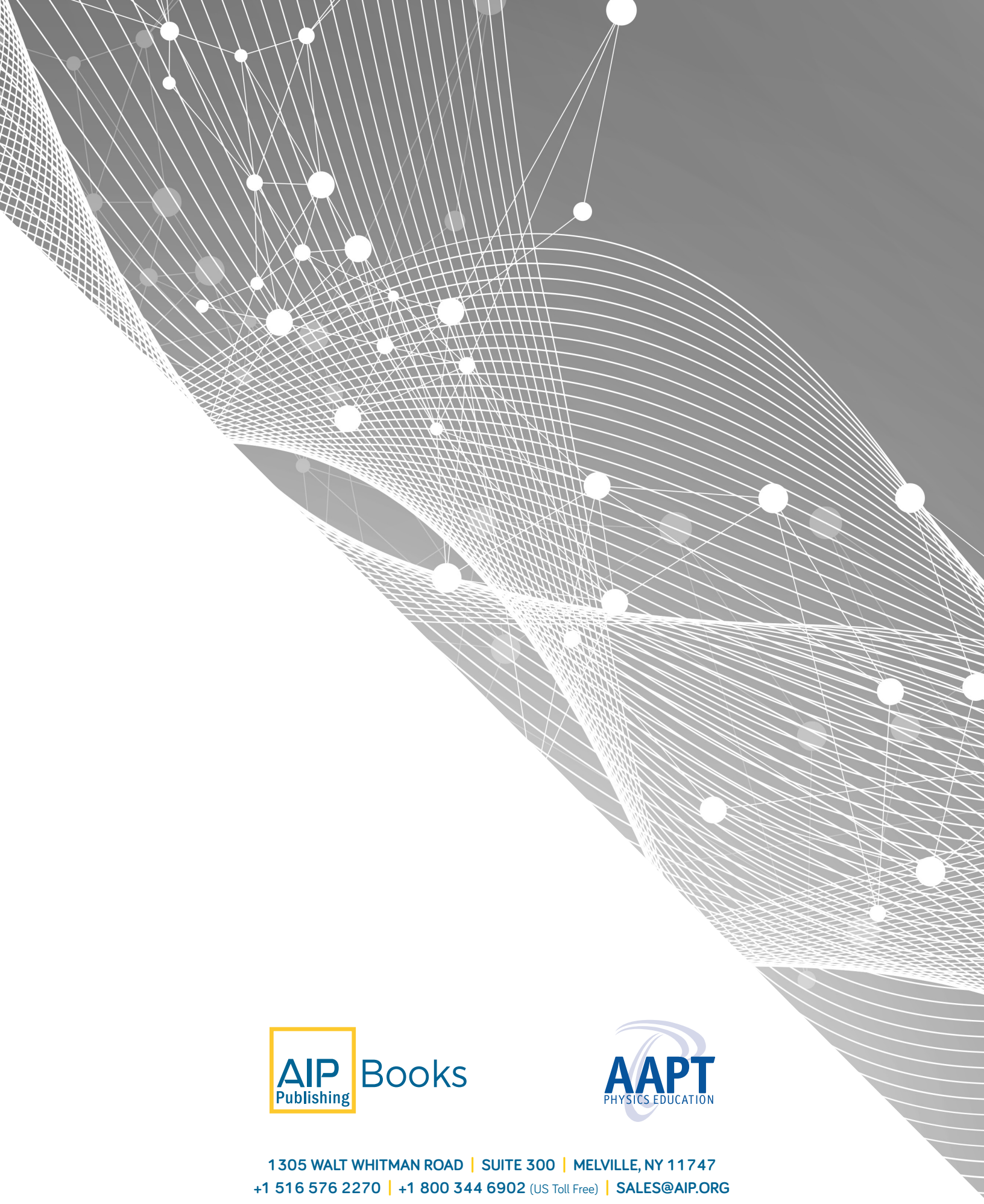

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