



# The People's Physics Book

*Authors*

James H. Dann, Ph.D.  
James J. Dann

*Illustrator*

Jason P. Murphy

*Contributors and Consultants*

Byron J Philhour  
Kimberly M. Knestrick  
Mark Abruzzese

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**Textbook Website**

<http://scipp.ucsc.edu/outreach/TW/physicsbook08/index.html>



“Each discovery, each advance, each increase in the sum of human riches, owes its being to the physical and mental travail of the past and the present. By what right then can any one whatever appropriate the least morsel of this immense whole and say – This is mine, not yours?”

– Peter Kropotkin (1842 – 1921)

"One ought to be ashamed to make use of the wonders of science embodied in a radio set, while appreciating them as little as a cow appreciates the botanical marvels in the plant she munches. "

– Albert Einstein (1879 – 1955)

“Give me matter and motion, and I will construct the universe.”

– Rene Descartes (1640)

Dedication of the book is to two physicists who gave us particular inspiration. Their contributions to experimental and theoretical physics are all the more remarkable given that they worked as Jews in the Germany and Italy of the 1930's:

1. Bruno Rossi, author of *Optics* and *Momenti Nella Vita di uno Scienziato*.
2. Adolph Dannenbaum, author of *Die Dampfmaschine und ihre Steuerung* (text on thermodynamics).

JHD would like to dedicate this book to Aaron, Nisha, and Ashaan. Special thanks goes to Laurel Reitman for fruitful discussions and Keith Mansfield for fruitful discussions and lunch.

The authors would like to thank all the honors and AP Physics students at Natomas High School in Sacramento and St. Ignatius in San Francisco in the years 2000-5 for trying out all the early versions of the big ideas, key concepts, and many of the problems.

We also thank our fellow physics teachers at both schools for their immense help and contributions.



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## 3<sup>rd</sup> edition

### The Big Idea

The intent of the authors is to produce an inexpensive alternative textbook for high school and college physics students and teachers. Copies of the source documents are freely available for download at our website. You may ask a print or photocopy shop to print and bind the book at your own cost. You may sell the book to students if the following conditions are met: (i) you have written us and received permission to do so; (ii) you will use the book for educational purposes only; (iii) you will not sell the book for any profit, but only to recoup the cost of printing and distributing; and (iv) you will consider acting as a contributor to the project. Our vision is of a physics teacher cooperative that produces excellent work at little or no cost.

### How to Use This Textbook

This textbook is intended to be used as one small part of a multifaceted strategy to teach physics conceptually and mathematically. It is intended as a reference guide and problem text that students can carry to and from class with ease. Some students will need a more in-depth textbook for reading and sample problems: for this we suggest an in-class library that includes standard texts as well as current science magazines and articles. The textbook assumes a thorough knowledge of the subjects usually covered in Algebra II classes, including right triangle trigonometry and vector addition and components. Some previous familiarity with physical science or chemistry is assumed, including use of the periodic table, the mole and significant digits. And, of course, this textbook does not attempt to replace the important work that students and teachers do together, in the classroom.

### How to Print this Book on Your Own

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- You can choose which of the chapters you want to include in your version of the textbook. Each chapter is independently page-numbered with an even number of pages, so that new chapters always start on the right-hand page. You can use our table of contents, or edit it to include just the chapters you choose.
- We want this book to be useful and dynamic. Please provide comments, constructive criticism, alternative and additional chapters.

## AP Physics Exams

We think this book will be especially helpful for students preparing for the **AP Physics B** test. All material currently tested is in this book. Students planning to take the test should cover all chapters prior to the test except chapters 16, 20, 21, 22, and 23. Those chapters can be left for after the test or as enrichment. Also it is recommended that Chapters 9 and 15 be covered lightly since these topics are not tested in the detail that our book covers them.

For the **AP Physics C (mechanics)** test the book also is an excellent preparation. Chapters 1-10 need be covered thoroughly plus a considerable amount of supplemental material. For the AP physics C (electromagnetism) test the book is not sufficient; it can be used however, for some basic concepts and provide practice in solving circuits. (Use Chapters 12-16.)

## California State Content Standards for Physics

Physics Concepts	California standard	Chapter(s) in People's Physics Book
Kinematics	1 a	3
Newton's Laws	1 b, c, d	5
Universal gravitation and centripetal motion	1 e, f, g, l	6
Relativistic and quantum effects	1 h	20, 24
Two dimensional trajectories	1 i, j	4
Statics	1 k, m	6, 12
Conservation of energy	2 a, b, c	2
Conservation of momentum	2 d, e, f	7
Energy and momentum	2 g	8
Springs and capacitors	2 h	10, 15
Heat and thermodynamics	3 a, b, c, d, e, f, g	19
Waves and harmonic motion	4 a, b, c, d	11
Light waves	4 e	17
Characteristics of Waves	4 f	11, 17
Electric Circuits	5 a, b, c	13
Transistors	5 d	16
Magnetism	5 f, g, h, j, n	14
Electric Forces and Fields	5 e, k, l, m, o	12

## Table of Contents

- 0. Introduction and Vision**
- 1. Units and Problem Solving**
- 2. Energy Conservation**
- 3. One-Dimensional Motion**
- 4. Two-Dimensional and Projectile Motion**
- 5. Newton's Laws**
- 6. Centripetal Forces**
- 7. Momentum Conservation**
- 8. Energy and Force**
- 9. Rotational Motion**
- 10. Simple Harmonic Motion**
- 11. Wave Motion and Sound**
- 12. Electricity**
- 13. Electric Circuits: Batteries and Resistors**
- 14. Magnetism**
- 15. Electric Circuits: Capacitors**
- 16. Electric Circuits: Advanced Topics**
- 17. Light**
- 18. Fluids**
- 19. Thermodynamics and Heat Engines**
- 20. Special and General Relativity**
- 21. Radioactivity and Nuclear Physics**
- 22. Standard Model of Particle Physics**
- 23. Feynman Diagrams**
- 24. Quantum Mechanics**
- 25. The Physics of Global Warming**

## Appendices

- A. Answers to Selected Problems**
- B. Equations and Fundamental Constants**

