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Reviews

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Atoms by Jean Perrin published by Ox Bow Press, Woodbridge, CT 06525-4045, xiv + 231 pp., paperback (1990) (original: 1913 with the 1921 Appendix)

> Should we teach the idea of atoms and molecules in Middle School? No, … but it is going to be done, so we have to do it right! We can't just tell them, or otherwise the course just becomes a memorization effort. An essay on atomism from Democritus to 1960 by Lancelot Law Whyte, a Harper Torchbooks published in 1961 is an excellent history of the idea of atoms. You'll see in this very short book that acceptance of the idea took a long time and was very difficult. It was not until Einstein's famous paper on Brownian motion in 1905 that the tide turned toward general acceptance that atoms were real.
>
> We must build up the notion slowly and have the students carry out experiments that help them become convinced that atoms are real. We must argue in different ways to ensure that the notion, the size, and the consequences of these entities' existence are clearly recognized by our students. Having the students make measurements of ever smaller dimensions and then showing them how others have gone beyond with more sophisticated instruments has to be a part of their background experience. *Atoms* brings together 16 different ways of determining Avogadro's number. That illustrates the power of science! So many different areas of experimental science leading to the same conclusion that theory predicts strengthens our belief that atoms, do indeed, exist. *Atoms* reviews the experiments on Brownian motion, diffusion, electric charge, radioactivity, and the introduction of the idea of a quantum of radiation, all in a sense, "atomic". This book is a classic and should be read by all science teachers.
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> Perrin won the Nobel Prize in physics in 1926.

Middle School Science with Computers: Science Experiments Using Vernier Sensors with Logger Pro™ by Don Volz and Sandy Sapatka, published by Vernier Software & Technology, 13979 S.W. Millikan Way, Beaverton, OR 97005-2886, www.vernier.com, spiral-bound with CD (2000), $45.00

Middle School Science with Calculators: Science Experiments Using Vernier Sensors with the LabPro™ or the CBL2™ by Don Volz and Sandy Sapatka, published by Vernier Software & Technology, 13979 S.W. Millikan Way, Beaverton, OR 97005-2886, www.vernier.com, spiral-bound with CD (2000), $45.00

> A few years ago I would not have thought that such an effort would have been able to make an impact, but over the years I have seen many schools and many Middle School teachers implement the use of computers and calculators in their classrooms with great enthusiasm and success. There are 38 and 40 experiments respectively using Vernier software and probes that can be used with PCs or Macs in the computer version and Vernier LabPro or the TI CBL2 System and TI Graphing Calculators in the calculator version. The experiments are essentially the same in each version with student notes that can be copied and distributed, and detailed teacher notes for each experiment. The experiments cover a wide range of topics, many of which have immediate application to the student's everyday life: measuring

temperatures in a variety of situations, soil studies, reflectivity of light, insulation and insolation (cause of the seasons), making ice cream, a lemon "juice" cell, soap & water, cooling rates, heart rate in different situations, magnetism, grip pressure, as well as several motion experiments. The several appendices include one for equipment and supplies, and one describing the operation of the various Vernier products including costs. The CD includes word-processing files in Microsoft Word format (for both books) that can be used to alter student notes to taste before copying for the students.

The Science House at North Carolina State University had very good success with over 100 Middle School teachers with many of these experiments through their NSF-sponsored Project EMPOWER and continues to train Middle School teachers on a regular basis, converting both mathematics and science teachers to a more technology-oriented classroom. This material is excellent. I strongly recommend it for teachers of potential Middle School students, Middle School teachers interested in introducing more hands-on activities into their classes, and anyone interested in improving the laboratory experience of their students.

The Mystery of Gravity by Barry Parker and published by Benchmark Books (2002) 80pp., $19.95 hardback (One of a series entitled "Story of Science Series.")

"Gravity" is a phenomenon to be explained. It is not a force (as indicated on page 41 and 43) nor is it an acceleration. The early Greeks used geometry to describe the motions of the heavenly bodies. There was no search for a "force" that caused their perfect motion. For books at this level, it is particularly important that the language be clear.

Throughout the book, the author equates mass and weight that will cause confusion later. The Pendula shown on page 30 indicate too large an angle with the vertical for the simple pendulum case. The text should point out that only small angles should be used. The word "rate" should be clearly defined so that the reader will know whether speed or acceleration or even a time rate of change is being discussed. The diagram on pages 34 and 35 is incorrectly drawn. In fact, it supports a common misconception. Galileo died in 1642 and Newton was born in 1643 if one uses a common calendar. It makes no sense to declare that Newton was born in the year Galileo died if the two countries that they lived in used different calendars. I do not believe that Galileo put the pope's words in Simplicio's mouth. More likely, he was presenting the general view of philosophers of his time. On page 38 "mass" should be "masses" which is crucial to the expression of Newton's Law of Gravitation. On page 40, the First Law is not quite correctly stated. The illustration on pages 48 and 49 has the cannon firing a projectile over the North Pole from Africa misrepresenting Newton's drawing in a couple of ways.

This book is excellent in concept, but needs a careful scientist reviewer.

Force, Motion, and Energy by Haber-Schaim, Cutting, Kirksey, Pratt, and Stair published by Science Curriculum, Inc., 68 Leonard Street, Belmont MA 02478 (2002) ix + 150 pages. Toll-free: (888)501-0957, www.sci-ips.com

I started reading immediately as many folks have wondered about topics for 8^{th} and 9^{th} grades that were "missing" from **Introductory Physical Science** by the same authors that we have enthusiastically endorsed. The endorsement continues.

There are seven chapters: Forces; Pressure; Forces Acting in Different Directions; Distance, Time, and Speed; Waves; Heating and Cooling; and Potential Energy and Kinetic Energy. There are also four Appendices: Proportionality; Graphing; Conversion of Units; and Histograms.

Despite the fact that there are so many authors, the writing as a whole does

not suffer. There are none of the distractions that interfere with the narrative found in many of the commonly used books at this level. There is no wasted space showing how this material meets some set of standards — it will! There is no space wasted discussing careers that might not even exist when these children graduate, but children who take a course with these two books will be well-prepared for future science courses and even if they choose not to take other science courses, they will have an excellent understanding of the scientific approach.

Not too serious, but I would prefer recognizing that "force" is a vector quantity, and not using the phrase, "force vector," a redundancy. For a first course, I would like to see expressions such as "distance covered," "distance traveled," "time taken," and so on rather than simply "distance" and "time" in formulas as students quickly take on the bad habit of forgetting that all measurements are not made from some zero value. Lastly, in a more positive vein, I would like to see a 15-cm ruler and compass introduced with the study of vectors to ensure a solid kinesthetic experience with vectors.

The authors have avoided a familiar problem by using "thermal energy" rather than "heat" as a noun. There are several good suggestions for themes to be written, especially concerning common words that have a special meaning in physics. The notion of "calibration," often ignored, is very well handled. The number of questions and problems is just right. A chart, probably accompanying the Teacher's Guide, presents several options for a course sequence with and without **Introductory Physical Science.**

The laboratory items called for (motion detector and associated software being the most expensive) do not require a heavy expenditure of funds as the materials can be used in several ways.

I strongly recommend this book as well as its companion for a full year course at the 8^{th} or 9^{th} grade level.

Adventures with a Hand Lens by Richard Headstrom published by Dover in 1976 (originally in 1962.)

Perhaps the most important activity for a Middle School student is carrying out experiments and that requires good observational skills. This means learning how to use instruments, instruments that are very simple, at first, and then more sophisticated. A hand lens is not very simple, but the physics can come later. Here, the author with a "simple" hand lens the author leads the reader through a wide variety of activities designed to open up a new worlds around the house, the yard, open fields, and rocky terrain. The fields of biology, botany, and geology become open to even the youngest "scientist." Highly recommended to student and teacher alike.

The Formula Book: Easy, Safe Instructions for Making Hundreds of Personal Care and Household Products in Your Own Home!
and
The Formula Book 2: Easy, Safe Instructions for Making Hundreds of Personal Care and Household Products in Your Own Home! By Norman Stark published by Sheed and Ward in 1975 & 1976

Need some chemistry laboratory experience that you can carry out on the cheap and at the same time save money on household products? Several useful appendices dealing with formula ingredients, metric equivalents, conversion factors, sources of chemicals, equipment needed, and illustrations of equipment are included.

Too Good to Be True: The Colossal Book of Urban Legends by Jan Harold Brunvand and published by W.W. Norton & Company in 1999.

One of the skills that a scientist must cultivate is to be a bit skeptical and associated with that would be the ability to track down important pieces of information. Urban Legends are stories that "everyone knows to be true" usually because a "friend of a friend of my aunt" had this happen to her. The stories are almost always captivating and usually are humorous or horror-filled in the sense that you would not like that to happen to you. The author has been tracking down such stories under the guise of folklore for a long time. The stories often go back many years slightly altered to fit a time and place. They frequently carry a warning message such as "Don't pick up hitchhikers" or when visiting a foreign country "Watch out for …."

This book is a collection of stories from many sources including the author's **The Vanishing Hitchhiker**, **The Choking Doberman**, **The Mexican Pet**, and **Curses! Broiled Again!** You will be surprised at the number of stories that you will recognize that you think are absolutely true until you read of the author's detailed histories of the story and its variants. I had heard several of them while still a high school student in the early 1950s.

Besides the entertainment value of the stories, the author's investigations highlight the scientific approach in seeking their origin.

Each year I play a tape of "The Barrel of Bricks" which I taped off the BBC many years ago. There is a physics problem built around the story in all the editions of Miller's **College Physics**.

If you suspect a story to be an urban legend (they are increasing rapidly these days and promulgated through the Internet), visit www.snopes.com or www.urbanlegend.com. Searching for "urban legend" will result in many other sites.

The Health Hazards of NOT Going Nuclear by Dr. Petr Beckmann published by The Golem Press, Boulder CO (1976) v + 194 pages (Also published in pocket book form by Ace Books in 1980.)

The author published a newsletter, "Access to Energy: A Pro-Science, Pro-Technology, Pro-Free Enterprise Monthly Newsletter" for 25 years. It is available on a CD-ROM from Access to Energy, Box 1250, Cave Junction OR 97523. Approaching death, he handed the reins to Dr. Arthur B. Robinson, a like-minded individual who has continued publication without missing an issue. While his style is a bit different, it is still a worthwhile investment for a teacher.

After the Three-Mile Island Grand Disaster with no one killed, no one injured, and no one diseased, the author did not have to change a word in this book for the next several printings. Even today, after Chernobyl, nothing need be changed.

Other books of interest: **Nuclear Power: Villain or Victim?** by Max W. Carbon, Commonsense in Nuclear Energy by Fred & Geoffrey Hoyle, and **The Nuclear Energy Option** by Bernard L. Cohen. The general media totally misrepresent nuclear power; these books are all written by experts in clear English (although many have been translated to other languages) without the nonsense and they show that nuclear power is the cleanest, least dangerous, and could be the cheapest without the interference of the anti-nuclear crowd.

Imponderables, **Why Do Clocks Run Clockwise?, When Do Fish Sleep?, Who Put the Butter in Butterfly?, Why Do Dogs Have Wet Noses?, When Did Wild Poodles Roam the Earth?,** and **How Does Aspirin Find a Headache?** by David Feldman and published by Quill (1st), Harper & Row (2nd & 3rd), and HarperCollins (rest).

Imponderables are questions that cannot be answered using traditional means.

Nevertheless, they need answers. They are the fun questions that pop up at the oddest moments and stick with us day and night. David Feldman looked high and low for answers to hundreds of questions suggested by the titles of these books and thereby shows us his many approaches to locating answers. Years ago I had two boxes of potato chips — one by "Pringle's" and one by "Pringles". What happened to the apostrophe, which no longer appears? A call to the 800 number on the box got a call back that explained why it no longer appeared. Learning how to use resources is an important skill for the scientist in all of us. These books are a fun way of helping to develop this skill.

West's Great Ideas for Teaching Physics Consultants: Donald J. Bord and J. Clint Sprott West Publishing Company (1991)

West's Great Ideas for Teaching Astronomy 2nd edition edited by Stephen M. Pompea West Publishing Company (1994) (The 1st edition is quite good, also.)

The folks at West sent out a request for simple teaching ideas for physics and astronomy to physics and astronomy teachers and collected them in these little booklets. They are about 110 pages each. There are hundreds of excellent ideas having to do with demonstrations, ways of introducing topics, experiments, and in the astronomy booklet, and a list of common misconceptions.

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