Books

Six Easy Pieces

Essentials of Physics Explained by Its Most Brilliant Teacher

by Richard P. Feynman
Addison-Wesley Publishing Company, Reading, Massachusetts, 1994

The six easiest of Feynman's *Lectures on Physics* (actually five easy ones and one hard one) may not provide much food for thought for Caltech graduates who have tasted the real thing in two years of the famous three red books. The editors intended this to be a physics primer for a wider nontechnical audience and to introduce the nonscientific public to Feynman's genius as a teacher. But the book comes with an added bonus: six tapes or CDs of Feynman himself, originally recorded on reel-to-reel tape in 201 East Bridge when Feynman began the course. The old tapes, which have languished in Caltech's Archives for 30-something years, have been digitally remastered; the sound quality leaves something to be desired by today's standards, but Feynman's unique style (and his Brooklyn accent) come through loud and clear.

The five "easy" lectures (atoms in motion, basic physics, the relation of physics to other sciences, conservation of energy, and the theory of gravitation) were recorded in September and October 1961. Then it's fast-forward to April 1962 for quantum behavior, which he describes to his class as an "entertainment lecture." He admits in his preface to the original edition of *Lectures on Physics*, which is included in this volume, that his experiment to describe the principles of quantum mechanics in a way that did not require partial differential equations was not entirely successful. But it *is* entertaining.

In addition to Feynman's own original preface, the book comes with an introduction by Paul Davies, and a special preface, by David Goodstein and Gerry Neugebauer, to a commemorative edition of *Feynman's Lectures on Physics* published in 1989. Goodstein and Neugebauer call Feynman "a truly great teacher, perhaps the greatest of his era and ours," and also "an extraordinary teacher of teachers." They note that in 1961–62 students began dreading the class (it was not known as "easy"); as their numbers dropped off, their seats were taken by more and more faculty and grad students. If you want to relive Freshman Physics with Feynman for yourself, the set can be ordered from the Caltech Bookstore (with tapes, $49.95; with CDs, $59.95; the book alone is $22.00).

Braving the Elements

by Harry B. Gray, John D. Simon, and William C. Trogler
University Science Books, Sausalito, California, 1995

After the nonscientific public has mastered physics with Feynman, it can take on chemistry with Harry Gray, Caltech's Beckman Professor of Chemistry and director of the Beckman Institute, and his two coauthors from UC San Diego. Ostensibly a textbook for nonchemists, something with the title *Braving the Elements* has to be—you would think— livelier than an ordinary textbook. And indeed it is. Anyone "interested in learning about modern chemistry and how it relates to the environment, energy, health, and other areas of human concern" should find it readable. This includes, according to the authors, lawyers, media people, "and even physicists."

Under the chapter heading "Newsworthy Molecules" the reader can discover the chemical structure of, among many others, ibuprofen, sunscreen, vitamin C, testosterone, AZT, LSD, caffeine, TNT, and sarin (but this isn't a how-to book; it doesn't tell you how to make them). You can learn the chemistry of indigestion and of book decay; read about the chemical industry, including titanium alloy bike frames and composite tennis rackets, in a chapter called "Wall Street Chemistry"; and discover everything a potential juror should know about DNA; not to mention the chemistry of nuclear power, ozone depletion, global warming, smog, cancer treatment, and just about everything else an informed citizen, who doesn't happen to be a chemist, might just be curious about.

The book is briskly and entertainingly written, sprinkled with historical sketches of great moments in modern chemistry—the first controlled nuclear fission reaction, the invention of nylon, the cleanup of the Love Canal. Chemistry is alive and well, say the authors, and to prove it they have written what might almost qualify as a page-turner.

Books continued

The Art of Alessandro Magnasco: An Essay in the Recovery of Meaning

by Oscar Mandel
Leo S. Olschki Editore, Florence, Italy, 1994

The immediate subject of Professor of Literature Oscar Mandel's monograph is a rather peculiar painting by Magnasco (1667–1749) that hangs in Pasadena's Norton Simon Museum. Labeled *Calefactorium with friars*, the painting depicts a ragtag bunch of gaunt, hooded Capuchin friars untidily, and unreligiously, warming themselves around a monastery fireplace; the disorderly—some would say decadent—scene was described, even in Magnasco's time, as "bizarre." Mandel begins his search for the painting's meaning by querying present-day museumgoers on their perception of the painter's attitude toward his subjects; although opinions varied widely, a clear majority thought it hostile or at least uncomplimentary. After comparing these responses to the opinions of "experts" (i.e., art critics), the majority of whom found the painter either sympathetic to his Capuchins or morally neutral (only a few thought it scornful), Mandel reveals that he himself lines up with those who consider the painter neutral or uncommitted. He then procedes to marshall the historical and textual evidence for his view. He explores Magnasco's own and his contemporaries' attitude toward the church and compares the painting with traditional representations of monks and friars in Italian art, concluding that Magnasco's painting, while perhaps eccentric, is devoid of any moral or ideological viewpoint and represents no negative propaganda.

Why bother to go to such lengths to recover the meaning of a work of art? Mandel approaches this question from an aesthetic point of view: perceiving the meaning of a work adds to the pleasure of viewing it. But he's also using Magnasco's friars to illustrate a larger point about art (and, one presumes, literature). A work's meaning often "spreads out" during the intervening centuries; why is it important to recover the artist's original intent rather than to adopt an interpretation that speaks to our own times? Mandel maintains that we normally dislike separating the work of art from the "hand" that gives it to us. We labor to recover original meanings because aesthetic pleasure is embedded in the larger pleasure of grasping the whole human act of creation: the creation and the creator bound together.

Nano

by Ed Regis
Little, Brown and Company, Boston, 1995

This is not another book about Richard Feynman, although his ghost hovers protectively over most of the story. Subtitled "The Emerging Science of Nanotechnology: Remaking the World —Molecule by Molecule," it's mostly about K. Eric Drexler, who, as an MIT undergraduate in the seventies, conceived the visionary idea of a molecular nanocomputer and, ultimately, a molecular manufacturing machine: a little black box that "will make for you, atom by atom, everything you ever wanted." He was chagrined to discover in 1979 that Feynman had thought it all up first—two decades earlier. In "There's Plenty of Room at the Bottom," Feynman's talk to the American Physical Society in December 1959 (and reprinted in the February 1960 *E&S*, where, over the past 35 years, it has become our most requested article), he prophesied building on an atomic scale: "I am not afraid to consider the final question as to whether, ultimately—in the grand future—we can arrange the atoms the way we want; the very *atoms*, all the way down! . . .The principles of physics, as far as I can see, do not speak against the possibility of maneuvering things atom by atom."

The grand future was not so very far off. Feynman never bothered to think up a way to use his atomic machines, but Eric Drexler did. He started by designing atomic bearings and gears. Working scientists greeted his work with some skepticism—atoms, after all, aren't marbles. He also had to fight the science fiction label and the ridicule of a "Captain Future" image. By the beginning of the nineties, however, which was coming to be known as the nanotechnology decade, Drexler had written a book full of equations. He then was pronounced sane and even testified before Congress. Nanotechnology *is* the future, it is now assumed, and all that remain are the philosophical questions: Will nanomachines take over the world? And what will people do when work becomes unnecessary?

Ed Regis, the author of *Who Got Einstein's Office*, has previously written about the weirder fringes of science in *Great Mambo Chicken and the Transhuman Condition*, in which Drexler also appears. He writes with humor but treats his subject seriously at the same time. It may sound like science fiction, but it isn't anymore.