

nent in this construction can be challenged. There is no real evidence that Grassi was the author of G3; the handwriting samples reproduced in the book do not support the claim, nor is there any other halfway convincing argument. Atomism is only a quite minor theme in *The Assayer*; in no sense can that work be construed as a defense of it. Galileo took over a view that had become widespread among natural philosophers and used it for his own purposes without any particular emphasis. There is not the slightest evidence that this issue was ever so much as mentioned in the course of the debates that followed the appearance of the *Dialogue*. The evidence that the Pope was violently angry with Galileo is overwhelming. Far from attempting to protect the scientist, the Pope's evident feeling of betrayal led him to carry on the vendetta against his former friend even into Galileo's last years at Arcetri, and indeed even beyond the grave.

The likely reasons have often been laid out. Galileo had promised to treat Copernicanism "hypothetically," that is, as a calculational fiction. (This was how Urban used the term "hypothetical.") But the *Dialogue* claimed that the offending doctrine could be proved. The issue was no "venial crime." It was not a matter of astronomy nor of displacing man from the center of the universe. It was a matter of the authority of Scripture, in an age where this issue (even more than the Eucharistic doctrine) was at the foreground of theological debate between Protestant and Catholic. There is no evidence that the charge against Galileo was seen as the lesser of two alternatives, none that Galileo was satisfied with the outcome, nor any that di Guevara and Grassi were "exiled" because of their roles in the affair.

In short, we have here an engaging "theater of shadows" to match the Rome that Redondi so eloquently invokes. The book is an altogether impressive example of what sheer erudition and a powerful historical imagination can do to transform shadow into highly readable substance.

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Introductory Nuclear Physics

Kenneth S. Krane

Wiley, New York, 1987. 845 pp.
\$54.90 hc ISBN 0-471-80553-X

In the past decade and a half, many new nuclear phenomena have been observed. In addition, nuclear physics

is now increasingly relevant to astrophysics, the recent naked-eye supernova being only the most strikingly obvious example. Nuclear experimental techniques have also been adapted to solve problems in medicine and other disciplines. Someone teaching the subject would surely like to address many of these issues within an introductory undergraduate nuclear physics course. Until recently, however, the only available texts were ones written in the late 1960s or early 1970s and few have been revised since. New texts are clearly needed. *Introductory Nuclear Physics* by Kenneth Krane is a welcome addition to the literature; it discusses many of the new phenomena and has many attractive features that lead me to strongly recommend it for an undergraduate course.

The book is divided into four sections, covering nuclear structure, radioactive decay, nuclear reactions, and advanced topics and applications. The section devoted to nuclear structure discusses the nucleon-nucleon interaction, the masses and radii of stable nuclei, and the shell and collective model descriptions of the low-lying nuclear levels. The section on radioactivity deals with weak, strong and electromagnetic decay modes of the nucleus; it also contains a chapter on detection techniques. In the section on nuclear reactions, there are separate chapters on accelerators, fusion and fission. The latter two chapters include descriptions of solar fusion, nuclear reactors and nuclear weapons. The final section, on advanced topics and applications, includes chapters devoted to meson physics, particle physics, nuclear astrophysics, and applications of nuclear physics to other disciplines such as medicine.

The text emphasizes experimental observations, not the formal development of nuclear theory. In most cases, theoretical concepts are discussed at a level comparable to that of Walter Meyerhof's undergraduate text *Elements of Nuclear Physics* (McGraw-Hill, New York, 1967), but sometimes at a simpler level than found in Bernard Cohen's text *Concepts of Nuclear Physics* (McGraw-Hill, New York, 1971) or in W. E. Burcham's text *Elements of Nuclear Physics* (Longman, London, 1979). Formulas that require a nontrivial understanding of the quantum theories of angular momentum or many-body systems are usually motivated by simple and often classical arguments. Even in this simplified approach, some prior familiarity with three-dimensional quantum mechanics

is necessary, and a review chapter on the subject is included in the text. Beginning students will find the resulting text easy to read. Despite the book's considerable length (about 800 pages), an instructor can construct even a short, 10-week introductory course using this text, without a loss in continuity.

I recommend this text strongly. It covers an impressively large scope of topics and includes a number of interesting recent developments in nuclear physics and related topics. For example, spontaneous C^{14} emission, the natural fission reactor in Gabon in Africa, rotational backbending, hypernuclei, CP violation and grand unification theories are all briefly discussed. Krane has also taken special efforts to illustrate even the more traditional topics, such as β decay, with examples from the recent literature and to relate these measurements to issues beyond the domain of nuclear physics. With respect to β decay, for example, one finds discussions of β -delayed nucleon emission; experimental measurements of double β decay and their relationship to lepton number conservation; recent neutrino mass measurements and their relationships to the closure of the universe, lepton number mixing and the solar neutrino problem; and also a discussion of the measurement of the solar neutrino flux by Raymond Davis. As other examples, the chapter on electromagnetic decay contains a description of measurements of the gravitational redshift via the Mössbauer effect, and the chapter on neutron-induced reactions contains descriptions of the low-energy neutron interference measurements that demonstrated the phase shift of the neutron wavefunction caused by the gravitational potential. These and other inclusions of modern topics and examples really help interest the student and communicate the liveliness of the scientific endeavor.

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Collider Physics

**Vernon D. Barger and
Roger J. N. Phillips**

Addison-Wesley, Redwood
City, Calif., 1987. 592 pp.
\$44.95 hc ISBN 0-201-05876-6

A major achievement by particle physicists in recent years is the discovery that the strong, weak and electromagnetic forces can be described by gauge theories in what has come to be known as the "standard model." *Collider Physics* covers the