

TEACHING THE LATEST CHAPTERS IN PARTICLE PHYSICS

α , β , γ ... Z: A Primer in Particle Physics

L. B. Okun

Harwood Academic,

New York, 1987. 114 pp.

\$25.00 hc ISBN 3-7186-0374-8;

\$9.00 pb ISBN 3-7186-0405-1

Modern Elementary Particle Physics

Gordon Kane

Addison-Wesley, Redwood City,

Calif., 1987. 344 pp.

\$39.95 hc ISBN 0-201-11749-5

Reviewed by Gabriel Karl

With the discovery of the W and Z particles a new chapter of subatomic physics has been completed, and the corresponding theoretical structure, the standard model, has been generally accepted. There has been a profusion of new books intended to expose readers to the new concepts required to understand the standard model and the new questions posed in this framework. Of the two books under review here, one—that by Lev Okun—is written at the level of the general literate reader in the Soviet Union, while the other, by Gordon Kane, is at the level of a third- or fourth-year undergraduate physics major in North America. The two levels are not so far apart.

Okun is one of the best-known Soviet particle physicists. He is particularly famous for his very articulate writing. His textbook on weak interactions, published some 25 years ago, was very influential, and his more recent text *Quarks and Leptons* seems to have been equally well received. His *Primer* is an attempt to present the standard model, with “a

bare minimum of special terms and concepts,” to high school graduates. Although it is hard to know precisely what a high school graduate in the USSR has learned, it seems to me that by selecting the topics and ideas very carefully, Okun has succeeded in his task.

The book starts with such elementary concepts as scalar and vector products of two vectors (in three dimensions), momentum and angular momentum, and works around to grand unification and superunification. The author's mastery of the subject and of language makes the book a pleasure to read. It touches on many subjects within and about particle physics in a very attractive way. I cannot resist quoting from the end of the book, where Okun discusses the high cost of particle physics research: “In a certain sense the money spent on high-energy physics is like the money spent on our children: Neither is the best investment for immediate financial return. Nevertheless, the world is unthinkable without children and the future of science is unthinkable without particle physics.”

New physical ideas from the standard model and beyond are treated sympathetically and with a minimum of formulae. Its slim size makes the *Primer* a suitable book for the particle half of a semester-long undergraduate course in nuclear and particle physics at an American or Canadian institution.

Kane's book is addressed to a slightly more sophisticated audience. It is meant for a semester course in particle physics at the undergraduate level. The content is strongly oriented toward experiments at the highest energies and the theoretical concepts underlying them. The book is therefore incomplete as a text on elementary particles—even K-K $\bar{K}$ mixing and ordinary beta decay go undescribed. In contrast to books meant for a graduate audience, such as Francis Halzen and Alan Martin's text *Quarks and Leptons* (Wiley, New

York, 1984), Kane's book does not attempt to teach students to compute precise cross sections or half-lives. Instead Kane stresses order-of-magnitude estimates for these quantities.

A great many topics, both within and beyond the standard model, are discussed in the book. Often the discussions are too brief to be useful and will only confuse the reader. To give a single example, light mesons and baryons are discussed in five pages, one of which consists of tables. This is a pity because this material would blend in well with whatever knowledge of spectroscopy and nuclear physics the students might possess. On the other hand Kane gives many references to remedy the situation. The book will be useful in an undergraduate class where the teacher is thoroughly familiar with the material discussed, but it probably will be of less use for studying on one's own.

The Earth's Core

J. A. Jacobs

Academic, San Diego, Calif.,

1987. Second edition. 416 pp.

\$65.00 hc ISBN 0-12-378951-6

The Physics of the Earth's Core: An Introduction

Paul Melchior

Pergamon,

New York, 1986. 256 pp.

\$39.95 hc ISBN 0-08-032607-2;

\$19.95 pb ISBN 0-08-032606-4

The Earth's Core by John A. Jacobs is an encyclopedic book that discusses not only the physics of the core but also summarizes what has been inferred about the cores of the other terrestrial planets from our findings about the Earth. It deals with issues such as the chemical and mechanical processes involved in the accretion of the Earth as well as with the origin of its core. Although the first chapter has some tutorial material on the seismic properties of the Earth and

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