the year of Hertz's death from a bacterial infection at the age of 37.

Susskind, a professional engineer, has long been interested in Hertz and his family. Indeed, he became a good friend of Mathilde Hertz, Heinrich's younger daughter, who died in 1975, and, he tells us, "the knowledge derived from that acquaintance permeates almost every page" of this biography. This, as well as Susskind's obvious admiration for his subject, undoubtedly accounts for the palpable presence of Hertz in this book.

In telling his story, the author was greatly aided by Hertz's extraordinarily vivid memoirs, letters and diaries, published originally by Hertz's elder daughter, Johanna, and, in a second edition, with English translation, by Mathilde Hertz, Lisa Brinner and Susskind himself. Hertz's compelling letters to his parents, combined with the often daily diary entries, provided Susskind with ample material through which he captures the sense of a budding physics career in Germany just when that country was beginning to achieve widespread European dominance in the field. Susskind makes good use of these sources and tells a lively tale.

Although *Heinrich Hertz* derives a singular strength from its author's evident esteem for his subject—and no one who carefully studies Hertz's work can doubt the extent and power of his experimental and theoretical acumen—a bit of distance would have improved the result. Not that Susskind presents an altogether rosy picture, but it might have led to a deeper understanding of Hertz's career, his work and his place in German society and in science if Susskind had been a bit more detached from his subject and a bit less convinced of the stately and inevitable progression of physics. However, these caveats should not detract from the very real pleasure that a sympathetic reader will certainly gain from this short book.

JED BUCHWALD
Massachusetts Institute of Technology
Cambridge, Massachusetts

Particle Physics at the New Millennium

Byron P. Roe
Springer-Verlag, New York, 1996.
406 pp. $59.00 hc
ISBN 0-387-94615-2

Despite its rather grandiose title, *Particle Physics at the New Millennium* by Byron P. Roe is actually a sensible and practical—although not necessarily stand-alone—textbook for an introduc-

tory graduate course in particle physics. Its author uses what he calls a "bottom-up" method of exposition, in which each of the major points of the standard model is developed out of experimental evidence. This approach is excellent for graduate students intending to go into any branch of experimental physics, not just elementary particles.

One cannot emphasize too strongly that physics is an experimental science and that even beautiful ideas can be very wrong—perfectly spherical orbits, for celestial objects, for example. In this sense, this textbook is akin to *Introduction to High Energy Physics* by Donald H. Perkins (Addison-Wesley, 1982) or *Femtophysics: A Short Course on Particle Physics* by Michael G. Bowler (Pergamon Press, 1990). Those who are theoretically inclined may prefer Gordon Kane's *Modern Elementary Particle Physics* (Addison-Wesley, 1993), which starts from the standard model of elementary particles and then develops its consequences. But for students at an introductory level, it is probably best to begin with the physical evidence rather than abstract ideas. After all, students can take a subsequent course in quantum field theory.

My principal criticism of Roe's book is related to its treatment of the quark model. Historically, development of this fundamental subject was driven by experimental discoveries: strange particles that were produced strongly but decayed weakly, the entire galaxy of strongly decaying particle resonances discovered mostly in the 1960s, the J/ψ particle and associated charmed particles, the Υ and associated beauty particles and, most recently, the top quark. The parallel structure of the leptons also has been driven by experiment: the discovery of the muon, the nonidentity of electron and muon neutrinos, the tau lepton and the existence of only three generations of light neutrinos that couple to the Z^0. The resulting standard model of quarks and leptons accommodates all known experimental phenomena in this area, but it is intellectually incomplete.

Physicists anticipate discovery of the Higgs boson, which is the result of a particular mechanism for the assignment of particle mass—still an area of great mystery. Further, many physicists expect the discovery of supersymmetric partners to the known particles.

Despite this history, since supersymmetry is not an experimental fact, Roe gives it scant attention in his book. He presents the quark model as a *fait accompli*, with minimal interaction between experimental discovery and new ideas. This is somewhat like Kane's approach, but Kane does it more co-

herently and systematically.

Roe has written a reasonable textbook for an introductory graduate course in particle physics. The discussion of the data at the Z^0 resonance from the LEP collider at CERN is excellent both in its detail and in its conveying of the difficulty in extracting physically meaningful results from a complex experiment.

The exercises at the end of each chapter are sensible, if somewhat elementary; to challenge the best students, I recommend assigning a relatively large fraction of the exercises. Further, if this book is chosen for a course in particle physics, I recommend that the textbooks by Kane and/or Bowler be used as supplemental texts.

ALEXANDER FIRESTONE
Iowa State University
Ames, Iowa

NEW BOOKS

Materials Science

Materials Reliability in Microelectronics V. *Materials Research Society Symposium Proceedings 391.* Proc. Symp., San Francisco, Calif., Apr. 1995. A. S. Oates, W. F. Filter, R. Rosenberg, A. L. Greer, K. Gadepally, eds. MRS, Pittsburgh, Pa., 1995. 523 pp. $74.00 *hc* ISBN 1-55899-294-4

Metal-Organic Chemical Vapor Deposition of Electronic Ceramics II. *Materials Research Society Symposium Proceedings 415.* Proc. Symp., Boston, Mass., Nov. 1995. S. B. Desu, D. B. Beach, P. C. Van Buskirk, eds. MRS, Pittsburgh, Pa., 1996. 264 pp. $75.00 *hc* ISBN 1-55899-318-5

Neutron Scattering in Materials Science II. *Materials Research Society Symposium Proceedings 376.* Proc. Symp., Boston, Mass., Nov.–Dec. 1994. D. A. Neumann, T. P. Russell, B. J. Wuensch, eds. MRS, Pittsburgh, Pa., 1995. 796 pp. $77.00 *hc* ISBN 1-55899-278-2

Optical Properties of Low-Dimensional Materials. T. Ogawa, Y. Kanemitsu, eds. World Scientific, River Edge, N.J., 1995. 414 pp. $99.00 *hc* ISBN 981-02-2231-9

Organic Nonlinear Optical Materials. *Advances in Nonlinear Optics 1.* Ch. Bosshard, K. Sutter, Ph. Prêtre, J. Hulliger, M. Flörsheimer, P. Kaatz, P. Günter. Gordon and Breach, New York, 1995. 247 pp. $90.00 *hc* ($38.00 *pb*) 2-88124-975-2 *hc* (ISBN 2-88449-007-8 *pb*)

Physical Properties of Polymeric Gels. J. P. Cohen Addad, ed. Wiley, New York, 1996. 311 pp. $89.95 *hc* ISBN 0-471-93971-4

Polymers and Other Advanced Materials: Emerging Technologies and Business Opportunities. Proc. Conf., Kuala Lumpur, Malaysia, Jan. 1995. P. N. Prasad, J. E. Mark, T. J. Fai, eds. Plenum, New York, 1995. 791 pp. $65.00 *hc* ISBN 0-306-45210-3

Practical Analysis of Composite Laminates. J. N. Reddy, A. Miravete. CRC Press, Boca Raton, Fla., 1995. 317 pp. $69.95 *hc* ISBN 0-8493-9401-5

The Quantitative Description of the Microstructure of Materials. *Materials Science and Technology Series.* K. J. Kurzydlowski, B. Ralph. CRC Press, Boca Raton, Fla., 1995. 418 pp. $99.95 *hc* ISBN 0-8493-8921-6

Silicide Thin Films—Fabrication, Properties, and Applications. *Materials Research Society Symposium Proceedings 402.* Proc. Symp., Boston, Mass., Nov. 1995. R. T. Tung, K. Maex, P. W. Pellegrini, L. H. Allen, eds. MRS, Pittsburgh, Pa., 1996. 648 pp. $73.00 *hc* ISBN 1-55899-305-3

Spin–Orbit–Influenced Spectroscopies of Magnetic Solids. *Lecture Notes in Physics 466.* Proc. Wksp., Herrsching, Germany, Apr. 1995. H. Ebert, G. Schütz, eds. Springer-Verlag, New York, 1996. 287 pp. $73.00 *hc* ISBN 3-540-60843-5

Studies of High Temperature Superconductors, Vol. 16: Synthesis, High Pressure Effects and Some Miscellaneous Aspects. A. Narlikar, ed. Nova Sci-