

BOOKS

radiation and cloud processes in various atmospheric models, serves to bring together much of the earlier treatment and to underscore the significance of these processes to problems ranging from one-dimensional equilibrium studies of climate to three-dimensional general circulation studies of weather systems.

The book's style is largely mathematical, with over 1200 displayed equations. These equations are accurately presented and should make Liou's book a handy reference for researchers in this field. The variability in authoritative explanation and the relative lack of physical perspective in the text, however, will present some difficulty for newcomers who may find the substantial reference lists helpful.

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From c-Numbers to q-Numbers: The Classical Analogy in the History of Quantum Theory

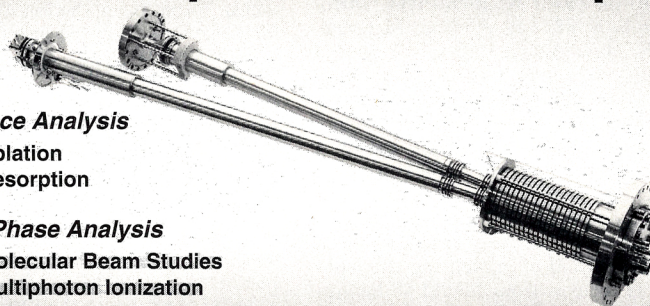
Olivier Darrigol
U. Calif. P., Berkeley, Calif.,
1992. 388 pp. \$60.00 hc
ISBN 0-520-07822-5

Quantum mechanics is so removed from our classical intuition that to have arrived at it is a tour de force of the human intellect. The subject is currently introduced to students via the efficient wave mechanical route of Louis de Broglie and Erwin Schrödinger rather than the earlier, and in many ways more profound, matrix route of Niels Bohr, Werner Heisenberg and Paul Dirac. This superb book fills in a yawning lacuna in the education of most young students of physics (and probably a good number of their professors as well).

Starting with the early disputes between Ludwig Boltzmann and Max Planck, continuing through the confusions, competitions and debates between Arnold Sommerfeld and Bohr and the pioneering work of Hendrik Kramers and Heisenberg, and culminating with the youthful misstarts and ultimate triumph of Dirac, the book lays out the entire sweep of the development of matrix mechanics in considerable technical detail. I can think of no better way to gain a grasp of quantum mechanics than by reading this book. It is a treasure.

Unfortunately, precisely because

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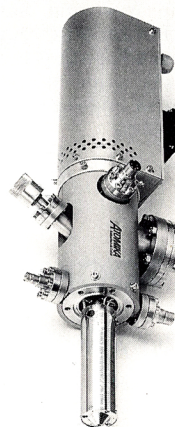
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of its technical detail, not only is the book way over the heads of the general reading public, it is even much too difficult for students in prequantum atomic physics courses, who are in sore need of a decent replacement for the classic texts of Max Born (*Atomic Physics*, Blackie, London, 1969) or Floyd K. Richtmyer (*Introduction to Modern Physics*, McGraw-Hill, New York, 1969). I would highly recommend it as a text for a graduate seminar on Bohr's correspondence principle and the development of matrix mechanics, led by a very knowledgeable professor, who will need to clarify the ingenious reasoning of even the false starts and errors, all elaborately described. The usual method of presenting this subject is to leap from height to height, neglecting the horrendous struggles of intellect involved in the act of creation. It is humbling and instructive to young students to see the creative process in action.

Among the surprises to be found in this book, at least to me, was learning that as late as 1916 Planck rejected Einstein's light quanta as well as discontinuous quantum jumps (indeed Bohr rejected Einstein's photons even as late as 1925, preferring an exclusively wave theory of radiation); that Dirac found the nonrelativistic time-dependent Schrödinger equation about the same time as Schrödinger even though he was completely hostile to Schrödinger's wave mechanics when initially learning of it; and that Dirac continued to regard the state of a system as given by a point in classical phase space even after developing the full transformation theory for quantum mechanics (the state vector was introduced somewhat later by Hermann Weyl and John von Neumann). But rather than going on and on, let me advise that every physicist who takes pride in being literate should read, indeed study, this magnificent work.

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NEW BOOKS

Astronomy and Astrophysics

Astronomy from Large Databases II. *ESO Conference and Workshop Proceedings 43.* Proc. Conf., Hagenau, France, September 1992. A. Heck, F. Murtagh, eds. European Southern Observatory, Garching bei München, Germany, 1992. 534 pp. Price not stated *pb* ISBN 3-923524-47-1

Automated Telescopes for Photometry

and Imaging. *Astronomical Society of the Pacific Conference Series 28.* S. J. Adelman, R. J. Dukes Jr, C. J. Adelman, eds. Astronomical Society of the Pacific, San Francisco, 1992. 200 pp. \$44.50 *hc* ISBN 0-937707-47-3

Instability, Chaos and Predictability in Celestial Mechanics and Stellar Dynamics. Proc. Intl. Astronomical Union Colloq., Delhi, India, October 1990. K. B. Bhatnagar, ed. Nova Science Publishers, Commack, New York, 1993. 450 pp. \$92.00 *hc* ISBN 1-56072-054-9

Particle Acceleration in Cosmic Plasmas. *AIP Conference Proceedings 264.* Proc. Wksp., Newark, Del., December 1991. G. P. Zank, T. K. Gaisser, eds. AIP, New York, 1992. 498 pp. \$120.00 (\$96.00, AIP members) *hc* ISBN 0-88318-948-8

Research Amateur Astronomy. *Astronomical Society of the Pacific Conference Series 33.* Proc. Symp., La Paz, Baja California Sur, Mexico, July 1991. S. J. Edberg, ed. Astronomical Society of the Pacific, San Francisco, 1992. 267 pp. \$44.50 *hc* ISBN 0-937707-52-X

Robotic Telescopes in the 1990s. *Astronomical Society of the Pacific Conference Series 34.* Proc. Symp., Laramie, Wyo., June 1991. A. V. Filippenko, ed. Astronomical Society of the Pacific, San Francisco, 1992. 367 pp. \$44.50 *hc* ISBN 0-937707-53-8

StarGuides: A Directory of Astronomy, Space Sciences, and Related Organizations of the World, Parts I and II. Observatoire Astronomique, Strasbourg, France, 1993. 1152 pp. Price not stated. *pb* ISBN 0764-9614

Atomic and Molecular Physics

Atomic Collisions: Heavy Particle Projectiles. E. W. McDaniel, J. B. A. Mitchell, M. E. Rudd. Wiley, New York, 1993. 681 pp. \$125.00 *hc* ISBN 0-471-85308-9

Atomic Physics 13. Proc. Conf., Munich, Germany, August 1992. H. Walther, T. W. Hänsch, B. Neizert, eds. AIP, New York, 1993. 589 pp. \$120.00 *hc* ISBN 1-56396-057-5

Biophysics and Medical Physics

Methods in Enzymology, Vol. 203: Molecular Design and Modeling: Concepts and Applications. Part B: Antibodies and Antigens, Nucleic Acids, Polysaccharides, and Drugs. J. J. Langone, ed. Academic (Harcourt Brace Jovanovich), San Diego, Calif., 1991. 764 pp. \$105.00 *hc* ISBN 0-12-182104-8

The Origins of Order: Self-Organization and Selection in Evolution. S. A. Kauffman. Oxford U. P., New York, 1993. 709 pp. \$75.00 *hc* ISBN 0-19-505811-9; \$29.95 *pb* ISBN 0-19-507951-5

The Physics of Three-Dimensional Radiation Therapy: Conformal Radio-

therapy, Radiosurgery, and Treatment Planning. *Medical Science Series.* S. Webb. IOP, Philadelphia, 1993. 373 pp. \$110.00 *hc* ISBN 0-7503-0247-X

Chaos and Nonlinear Systems

Chaotic Dynamics and Transport in Fluids and Plasmas. *Research Trends in Physics.* Proc. Conf., La Jolla, Calif., February 1991. I. Prigogine, ed. AIP, New York, 1993. 448 pp. \$120.00 (\$96.00 AIP members) *hc* ISBN 0-88318-923-2

In the Wake of Chaos. S. H. Kellert. Chicago U. P., 1993. 176 pp. \$19.95 *hc* ISBN 0-226-42974-1

Chemical Physics

Advanced Combustion Science. T. Someya, ed. Springer-Verlag, New York, 1993. 322 pp. \$129.00 *hc* ISBN 0-387-70114-1

Advances in Chemical Physics. *Advances in Chemical Physics LXXXIV.* I. Prigogine, S. A. Rice. Wiley, New York, 1993. 549 pp. \$150.00 *hc* ISBN 0-471-58726-5

An Introduction to Molecular Orbitals. Y. Jean F. Volatron, J. Burdett. Oxford U. P., New York, 1993. 337 pp. \$35.00 *hc* ISBN 0-19-506918-8

Chemical Change in Deforming Materials. *Oxford Monograph on Geology and Geophysics 21.* B. Bayly. Oxford U. P., New York, 1992. 224 pp. \$75.00 *hc* ISBN 0-19-506764-9

Fundamental Aspects of Combustion. *Oxford Engineering Science Series 34.* A. Liñán, F. A. Williams. Oxford U. P., New York, 1993. 167 pp. \$35.00 *hc* ISBN 0-19-507626-5

Hydrogen in Intermetallic Compounds II: Surface and Dynamics Properties, Applications. *Topics in Applied Physics 67.* L. Schlappbach, ed. Springer-Verlag, New York, 1992. 328 pp. \$98.00 *hc* ISBN 0-387-54668-5

McGraw-Hill Encyclopedia of Chemistry. Second edition. S. P. Parker, R. A. Corbitt, eds. McGraw-Hill, New York, 1993. 1236 pp. \$95.50 *hc* ISBN 0-07-045455-8

The Chemical Physics of Solid Surfaces. *Coadsorption, Promoters and Poisons 6.* D. A. King, D. P. Woodruff, eds. Elsevier, New York, 1993. 347 pp. \$182.75 *hc* ISBN 0-444-81468-X

The Fullerenes. H. W. Kroto, J. E. Fischer, D. E. Cox, eds. Pergamon, New York, 1993. 318 pp. \$53.95 *hc* ISBN 0-08-042152-0

Time-Resolved Macromolecular Crystallography. D. W. J. Bruickshank, J. R. Helliwell, L. N. Johnson, eds. Oxford U. P., New York, 1992. 174 pp. \$62.00 *hc* ISBN 0-19-855781-7

Computers and Computational Physics

Computer Algebra and Its Applications to Mechanics. Proc. Seminar, No-