

spin as well as the orbital angular momentum of the transferred nucleon, to obtain more detailed spectroscopic information than previously available.

One of the major directions of nuclear physics in the last decade, made possible by the new heavy-ion accelerators, has been the study of interactions between large nuclei. Satchler devotes much attention to the direct reactions induced by heavy-ion beams, an unexplored subject at the time of Austern's book. The calculation of heavy-ion cross sections, computationally difficult because of the short wavelengths of the heavy-ion projectiles, requires hundreds of partial waves in the angular momentum expansion of the scattering amplitude. Satchler's theoretical discussion ranges from the numerical tricks used to speed up the computation to semiclassical diffraction theory: Diffractive scattering effects (analogous to the classical Fraunhofer and Fresnel diffraction) can be seen in heavy-ion reactions and can be used to interpret the data.

Another recent advance, brought about partly by the obvious need in heavy-ion physics, is fast computer codes for calculating cross sections that include many reaction channels simultaneously. Satchler goes beyond the formalism to discuss the actual computational techniques. In one section, for example, he discusses a method by which a computationally time-consuming multipole expansion of the interaction is avoided. While Austern had only the formalism of the coupled-channel theory, Satchler has many examples of how it works and what it does for different kinds of reactions.

Satchler's book is well written and may well serve as the definitive work on direct reactions in nuclear physics. It describes the detailed status of direct reaction theory and experiment; it also provides information for users of the distorted wave theory who need a reference on such matters as the sign convention for polarization measurements or specific potential interactions for inelastic scattering calculations.

GEORGE F. BERTSCH
Michigan State University

Newtonian Mechanics

R. Baierlein

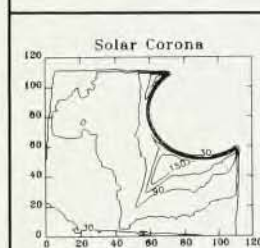
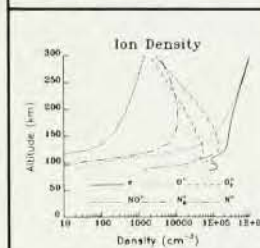
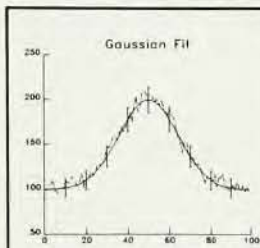
326 pp. McGraw-Hill, New York, 1983.
\$31.50

While many authors of elementary texts attempt to give the reader an intuitive feeling for physical phenomena, authors of classical mechanics texts for juniors and seniors are less likely to make such an attempt. I believe the greatest success of Ralph Baierlein's book is his ability to make the reader reach out and understand

what is happening qualitatively in a particular physical situation. The coherence of the book also makes it successful. In "A note to the problem solver," he quotes a colleague who, teaching from a preliminary edition, advised students to read each chapter in its entirety before trying the problems. I second the colleague's advice.

Baierlein has a lively and informal style that will engage and encourage readers. He motivates readers to continue the study of classical mechanics

by mentioning numerous applications of the mathematical expressions to modern-day problems in physics: For example, the structure of the equation for the damped harmonic motion resembles, for some purposes, a bound oscillating electron. In the chapter on nonlinear oscillators he cites van der Pol's equation, which first appeared around 1920 and reappeared in the 1960s in a theory of lasers; theories of turbulence and of biochemical self-organization also build on properties of



**Data Reduction and Analysis.
Publication Quality Graphics.
Image Processing.**

IDL integrates it all

**Designed to free you from
programming . . . to let you focus
on research and analysis.**

- Compatible with VAX/VMS™ computer systems, most graphic terminals and image display systems
- Lets you see your data at every step
- Allows immediate interactive compilation and execution
- Vector and array operators for powerful interactive capabilities
- The software choice of today's top advanced research centers

IDL is an advanced scientific research tool—a software system so complete, so integrated it drastically cuts or eliminates programming.

Quickly transform your raw data into results using IDL's advanced features, including: Statistical Analysis, Interpolation, Smoothing, Curve Fitting, Data Editing, Modeling, Interactive Graphics, Image Processing Display and Analysis.

To receive our informative IDL brochure call or write:

RSI RESEARCH SYSTEMS, INC.
2021 Albion St. Denver CO 80207 (303) 399-1326

Voyager image courtesy of NASA and JPL.
VAX/VMS are trademarks of Digital Equipment Corp.

Circle number 29 on Reader Service Card

nonlinear systems described by van der Pol's equation.

Appendix D, "The craft of the physicist," is a typically exemplary feature. This Appendix lists what I shall call "prescriptions for success in problem solving," and cites locations in the text that illustrate particular strategies. There are a large number of excellent problems. While Baierlein gives you an intuitive feeling for a topic, he does not spare the teaching of analytical techniques.

Baierlein consistently organizes material in ways it would be learned best. In the first chapter, rather than listing scalar and vector operations, he ties the properties of these operations to applications of physical law, including the implications of invariance under space translation, rotation, and time translation. He provides an excellent introduction to nonlinear oscillators as early as chapter 3. He introduces Lagrange's equations by means of Hamilton's principle, which is more logical than starting with D'Alembert's principle and then transforming to generalized coordinates. In addition, he smooths the way by an early introduction of Fermat's principle.

Even while the book is effective in teaching, it is not a text for the faint of heart. There is no customary reminder of what students learned in an introductory course. It is instead a very sophisticated and concise text. At times, topics seem to fly by. For examples, there is no chapter on rigid bodies; in the chapter on extended bodies in rotation, Baierlein calculates the moment of inertia for a sphere from the inertia tensor.

I recommend the adoption of the book most highly for an advanced course in mechanics. For an intermediate course, you will want to add it to your reserve list, recommend various chapters to your students, and definitely add this book to your reading list.

PHYLLIS J. FLEMING
Wellesley College

new books

Atomic, Molecular and Chemical Physics

Comprehensive Treatise of Electrochemistry. Vol. 7. Kinetics and Mechanisms of Electrode Processes Series. B. Conway, J. Bockris, E. Yeager, S. Khan, R. White, eds. 788 pp. Plenum, New York, 1983. \$95.00

Advances in Magnetic Resonance. Vol. 11. J. S. Waugh. 282 pp. Academic, New York, 1983. \$49.50

Production and Physics of Highly Charged Ions. Proc. International Symposium, Stockholm, June 1982. *Physica Scripta*, Vol. T 3. L. Liljebj, ed. 256 pp. Royal Swedish Academy of Sciences, Stockholm, 1983. price not stated

Chemistry, Quantum Mechanics and Reductionism: Perspectives in Theoretical Chemistry. Second Corrected Edition. H. Primas. 451 pp. Springer-Verlag, New York, 1983. \$29.50

Semiclassical Theories of Molecular Scattering. *Chemical Physics* 26. B. Chan Eu. 229 pp. Springer-Verlag, New York, 1984. \$31.00. monograph

Principles of Nuclear Magnetism. *International Series of Monographs on Physics*. A. Abragam. 599 pp. Oxford, New York, 1983. \$29.50 paper. text

Atomic and Molecular Physics of Controlled Thermonuclear Fusion. Proc. NATO Advanced Study Institute, July 1982, Santa Flavia, Italy. G. J. Joachain, D. E. Post, eds. 576 pp. Plenum, New York, 1983. \$79.50

Optics and Acoustics

Tandem Mass Spectrometry. F. W. McLafferty, ed. 506 pp. Wiley, New York, 1983. \$46.20. compendium

Time-Resolved Vibrational Spectroscopy. Proc. International Conference, Lake Placid, New York, August 1982. G. H. Atkinson, ed. 398 pp. Academic, New York, 1983. \$43.00. compendium

Acoustique Industrielle et Environnement. *Collection de la Direction des Etudes et Recherches d'Electricite de France* 46. P. Lienard, P. Francois, eds. 252 pp. Eyrolles, Paris, 1983. no price stated

Optical Properties of Glass. *Glass Science and Technology* 5. I. Fanderlik. 320 pp. Elsevier, New York, 1983. \$80.75. reference

The Physics and Chemistry of Color: The Fifteen Causes of Color. K. Nassau. 454 pp. Wiley, New York, 1983. \$43.95. general readership

Optical Phase Conjugation. *Quantum Electronics—Principles and Applications Series*. R. Fisher, ed. 636 pp. Academic, New York, 1983. \$59.50. compendium

Particles, Nuclei and High-Energy Physics

Energy in Atomic Physics, 1925–1960. *Benchmark Papers on Energy* 10. R. B. Lindsay, ed. 381 pp. Hutchinson Ross, Stroudsburg, Pa., 1983. \$45.00. reprinted articles

Short Distance Phenomena in Nuclear Physics. Proc. Pacific Summer Institute, Pearson College, Canada, Aug.–Sept. 1982. *NATO Advanced Science Institute* 104. D. Boal, R. Woloshyn, eds. 429 pp. Plenum, New York, 1983. \$62.50

SU(3) × SU(2) × U(1) and Beyond. Proc. 13th GIFT International Seminar on Theoretical Physics and 10th International Winter Meeting on Fundamental Physics, Masella, Spain, Jan.–Feb. 1982. A. Ferrando, J. A. Grifols, A. Mendez, eds. 506 pp. World (US dist. Heyden, Philadelphia), 1983. \$60.00

The New Physics of Symmetrical Energy Structures. E. J. Bacinich, dir. 226 pp. Alpha Omega Research Foundation, Palm Beach, Fla., 1983. \$29.95

Atomic Physics 8. Proc. International Conference on Atomic Physics, Chalmers, Univ. of Technology, Goteborg, Sweden, August 1982. I. Lindgren, A. Rosen, S. Svanberg, eds. 592 pp. Plenum, New York, 1983. \$79.50

Fundamental Processes in Energetic Atomic Collisions. Proc. NATO Advanced Study Institute, Maratea, Italy, Sept.–Oct. 1982. H. O. Lutz, J. S. Briggs, H. Kleinpoppen, eds. 675 pp. Plenum, New York, 1983. \$95.00

Electroweak Interactions at High Energies. Proc. 1982 DESY Workshop. R. Kogerler, D. Schildknecht, eds. 383 pp. World (US dist. Heyden, Philadelphia), 1983. \$38.00

Some Perspectives on Fundamental Nuclear and High Energy Research. Papers dedicated to the memory of Lorenzo Federici. M. Conversi, R. Santonico, C. Schaerf, eds. 399 pp. Hadronic, Nonantum, Mass., 1983. \$50.00

Recent Developments in High Energy Physics. Proc. 22nd Internationale Universitätswochen für Kernphysik, Steiermark, Austria, Feb.–March 1983. H. Mitter, C. B. Lang, eds. 547 pp. Springer-Verlag, New York, 1983. \$53.60

Quarks, Mesons and Isobars in Nuclei. Proc. 5th Topical School on Nuclear Physics, Granada, Spain, September 1982. R. Guardiola, A. Polls, eds. 381 pp. World (US dist. Heyden, Philadelphia), 1983. \$30.00

Fourth Nordic Meeting on Nuclear Physics, Fuglsø, August 1982. *Physica Scripta* Vol. T 5. J. Bondorf, G. Hagemann, eds. 223 pp. Royal Swedish Academy of Sciences, Stockholm, 1983. \$74.00

Nuclear Collective Dynamics. Lectures of the International Summer School of Nuclear Physics, Poiana Brasov, Romania, Aug.–Sept. 1982. D. Bucurescu, V. Ceausescu, N. V. Zamfir, eds. 521 pp. World (US dist. Heyden, Philadelphia), 1983. \$58.00

Topical Symposium on High Energy Physics. Talks from a symposium, University of Tokyo, September 1982. T. Eguchi, Y. Yamaguchi, eds. 391 pp. World (US dist. Heyden, Philadelphia), 1983. \$40.00

Neutron Scattering and Muon Spin Rotation. *Tracts in Modern Physics* 101. R. E. Lechner, D. Richter, C. Riekel, eds. 229 pp. Springer-Verlag, New York, 1983. \$37.00. two articles

Astronomy, Cosmology and Space Physics

The Very Early Universe. Proc. Nuffield Workshop, June–July 1982. G. W. Gibbons, S. W. Hawkins, S. T. C. Siklos, eds. 480 pp. Cambridge, New York, 1983. \$49.50

Understanding the Universe. Based on Talks, UN/IAU International Seminar on the Occasion of UNISPACE '82, Hofburg, Vienna, August 1982. R. West, ed. 249 pp. Reidel (US dist. Kluwer, Boston), 1983. \$34.50

Early Evolution of the Universe and Its Present Structure. Symposium No. 104 of the International Astronomical Union, Kolybari, Crete, Aug.–Sept. 1982. G. O. Abell, G. Chincarini, eds. 536 pp. Reidel (US dist.