

on science, technology and society. He notes that while beginnings have already been made in this direction in many institutions, the movement is very inhomogeneous and has far to go. Ziman estimates at least another decade will elapse before widespread substantive innovation is accomplished.

At the present time it is not at all clear how such interdisciplinary studies of science and society could best be accomplished (provided that agreement is reached that they should be). Ziman does not offer specific prescriptions but, in his final chapters, he examines certain desirable characteristics. While these courses should involve the historical, philosophical and sociological aspects of science, they should not be in the hands of specialists of these nonscience disciplines. Furthermore, they should be relevant to the present and future concerns of the students and include questions of ethical responsibility.

Many questions remain unresolved: who will write the syllabi for such courses? Who will teach them? Will they be given within the existing framework of science departments or in divisions of general education? The scientific community clearly has a large stake in such an undertaking. All those concerned with science education and the role of science in modern civilization will benefit from reading Ziman's provocative and well-written book.

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Structural Phase Transitions

A. D. Bruce, R. A. Cowley
326 pp. Taylor & Francis, London, 1981.
\$15.00

In 1959 the "soft-mode" model gave structural phase transitions a firm theoretical basis. This model emphasized an explanation of many ferroelectric phase transitions based on a decrease of the frequency of the vibrational mode of a Brillouin zone center—to the point of crystal instability with respect to the restoring forces. In fact, this model appeared also to account for some nonferroelectric transitions due to soft modes at other points in the Brillouin zone. During the 1960s many experimental investigations showed that this idea was correct for many structural phase transitions.

Although the soft-mode model certainly does not (and was never meant to) apply to all structural phase transitions (such as reconstructive, order-disorder, and glass-to-crystal transitions), it is an excellent basis for further thinking in this area.

Thus, the observation of the "central

peak" by neutron diffraction methods in 1971 came as a surprise. The central peak is a response of the vibrational system that occurs at approximately zero frequency. Although this response was not provided for by the soft-mode model, it is visible in crystals thought to be completely understood in terms of soft modes. During the 1970s a flurry of papers on central peaks appeared. Theoretical papers have outnumbered the few basic experiments; and I suspect more years will elapse before we completely understand the origins of the central peak(s). It turns out that extrinsic effects (strains and impurities) cause some, but not all, of the observed effects.

Due to the complicated relationship between soft modes and central peaks, there is a large number of theoretical papers on well-defined models in which the experimental connection (to actual crystals) is not always clear. The experimentalist needs to understand the ranges of validity and interrelationships of the theories; the theorist needs to know the important basic experiments to help sharpen the models. The book under review by Alistair Bruce and Roger Cowley should help both experimentalists and theorists better understand their own and each others' work. The authors, both active in this field, have successfully brought their broad perspectives to this work. Cowley was one of the very early contributors, both theoretically and experimentally, to the soft-mode as well as central-peak models; Bruce has also worked on both theory and experiment.

The book, actually a reprint of three review articles published in 1980 in *Advances in Physics*, should already be available in many libraries. It is divided into three parts: Landau theory (basically soft modes); static critical behavior; critical dynamics and quasi-elastic scattering. The latter two parts concern the central-peak problem and the critical dynamics near the transition temperature for these structural phase transitions. There is a basic central-peak model, not yet on firm experimental ground, that assumes that the single ion potential is a double well and the coupling between the ions is harmonic. The second and third parts of this book successfully use this idea to discuss the published work.

The text is unusually well written; all aspects of the field are covered. The theoretical papers, which can be formidable for the uninitiated, are discussed in depth. The authors in each part demonstrate most of the phenomena on three or four crystals that have been extensively studied experimentally. Measurements in other crystals are also reviewed.

The book deserves the study of all

workers in structural phase transitions, current and potential, and the perusal of other interested physicists. It should help to give this field a modern, firm basis in theory. The articles in the series edited by K. A. Müller and H. Thomas, also called *Structural Phase Transitions* (Springer-Verlag, 1981) are a good complement to the work of Bruce and Cowley, among other recent worthwhile review articles on the topic.

The one criticism that I have about the book under discussion is the index. Because the 326 pages contain a huge amount of information and the three parts of the book are not really cross referenced (probably because they were originally intended to stand alone), an extensive index would have been useful.

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new books

Particles, Nuclei and High-Energy Physics

Advances in Nuclear Science and Technology, Vol. 13. J. Lewins, M. Becker, eds. 470 pp. Plenum, New York, 1981. \$55.00

Techniques and Concepts of High-Energy Physics. Proceedings of a NATO Advanced Study Institute, 1980, St. Croix. T. Ferbel, ed. 541 pp. Plenum, New York, 1981. \$65.00

Advances in Nuclear Physics: Vol. 12. J. W. Negele, E. Vogt, eds. 258 pp. Plenum, New York, 1981. \$35.00

The Second Workshop on Grand Unification, University of Michigan, Ann Arbor, 1981. J. Leveille, L. Sulak, D. Unger, eds. 321 pp. Birkhauser, Boston, 1981. \$19.95

Preparation of Nuclear Targets: A Comprehensive Bibliography. J. Jaklovsky. 324 pp. Plenum, New York, 1981. \$95.00

Growth Points in Nuclear Physics, Vol. 3. P. E. Hodgson, ed. 261 pp. Pergamon, New York, 1981. \$10.30. *supplementary second-level text*

Atomic, Molecular and Chemical Physics

Atomic Physics 7. Proceedings of the Seventh International Conference, MIT, 1980. D. Kleppner, F. M. Pipkin, eds. 573 pp. Plenum, New York, 1981. \$69.50

Nuclear and Radiochemistry. Third Edition. G. Friedlander, J. Kennedy, E. Macias, J. Miller. 684 pp. Wiley, New York, 1981. \$42.00. *second-level text*

Progress in Reaction Kinetics, Vol. 10. K. R. Jennings, R. B. Cundall, eds. 406 pp. Pergamon, New York, 1981. \$82.50

Potential Energy Surfaces and Dynamics Calculations for Chemical Reactions and Molecular Energy Transfer. Expanded Proceedings of ACS Sympo-

sium, 1980, Las Vegas. D. G. Truhlar, ed. 866 pp. Plenum, New York, 1981. \$85.00

Optics and Acoustics

Vibration and Sound (Paperback Edition). P. M. Morse. 468 pp. American Institute of Physics, New York, 1981. \$15.00. *undergraduate text*

Optical Information Processing: Fundamentals. S. H. Lee, ed. 308 pp. Springer, New York, 1981. \$49.50. *second-level text*

Astronomy, Cosmology and Space Physics

Astrophysics and Space Physics Reviews, Soviet Scientific Reviews, Section E, Vol. 1. R. A. Syunyaev, ed. 314 pp. Harwood, New York, 1981. \$82.00

Calcul Astronomique pour Amateurs: Adopté à l'Emploi d'un Calculateur ou à un Micro-ordinateur. Third Edition. S. Bouiges. 154 pp. Masson, Paris. no price stated

Astronomy: A Self-Teaching Guide. Second Edition. D. Moché. 284 pp. Wiley, New York, 1981. \$7.95

True Visual Magnitude Photographic Star Atlas. Three Volumes. C. Papadopoulos, C. Scovill. Pergamon, New York, 1981. \$675.00

X-ray Astronomy. J. L. Culhane, P. W. Sanford. 192 pp. Scribner's, New York, 1981. \$25.00. *undergraduate text*

Carbon Stars. Z. K. Alksne, Ya. Ya. Ikaunieks. 182 pp. Pachart, Tucson, 1981. \$24.00. *monograph*

The Isotropic Universe. D. J. Raine. 253 pp. Hilger (US dist.: Heyden, Philadelphia), 1981. \$49.00. *monograph*

Fluids and Plasmas

Two-Phase Flow Dynamics. Japan-US Seminar, 1979. A. E. Bergles, S. Ishigai, eds. 554 pp. Hemisphere, New York, 1981. \$75.00

Plasma Physics and Nuclear Fusion Research. Proceedings of Culham Summer Schools, 1978-1980. R. D. Gill, ed. 688 pp. Academic, New York, 1981. \$66.50 cloth, \$27.60 paper

Methods of Experimental Physics, Vol. 18B: Fluid Dynamics. R. Emrich, ed. 472 pp. Academic, New York, 1981. \$52.00. *compendium*

Cyclotron Waves in Plasma. D. G. Lominadze, ed. 206 pp. Pergamon, New York, 1981. \$36.00. *advanced graduate text*

Solid-State Physics and Electronics

Physics of Dielectric Solids 1980. Invited Papers, Conference, Canterbury, 1980. C. H. L. Goodman, ed. 151 pp. Institute of Physics (Heyden, Philadelphia), 1980. \$57.50

Very Large Scale Integration: Fundamentals and Applications. D. F. Barbe, ed. 279 pp. Springer, New York, 1980. \$31.00. *monograph*

Electronic Structure and Properties. F.

Y. Fradin, ed. 448 pp. Academic, New York, 1981. \$51.00. *compendium*

Festkörper Probleme XXI: Advances in Solid State Physics. Selected Invited Papers, German Physical Society Meeting, Münster, 1981. J. Treusch, ed. 443 pp. Vieweg, Braunschweig, 1981. DM 70

Biological and Medical Physics

Vertebrate Photoreceptor Optics. J. M. Enoch, F. L. Tobey Jr, eds. 483 pp. Springer, New York, 1981. \$49.50. *compendium*

Physics and the Circulation: Medical Physics Handbook 9. J. Rowan, ed. 122 pp. Hilger (US dist.: Heyden, Philadelphia), 1981. \$28.00

The Physical Basis of Medical Imaging. M. Coulam, J. J. Erickson, F. D. Rollo, A. E. James, eds. 354 pp. Appleton-Century-Crofts, New York, 1981. \$48.50. *monograph*

Radiation & Human Health. J. W. Gofman. 908 pp. Sierra Club, San Francisco, 1981. \$29.95. *reference*

Topics in Nucleic Acid Structure. S. Needle, ed. 221 pp. Wiley, New York, 1981. \$59.95

The Foundations of Biological Theory. E. H. Mercer. 232 pp. Wiley, New York, 1981. \$35.00. *undergraduate text*

Theory and Mathematical Physics

Image Reconstruction from Projections: The Fundamentals of Computerized Tomography. G. T. Herman. 316 pp. Academic, New York, 1980. \$29.50

Gauge Theories, Massive Neutrinos, and Proton Decay. Proceedings of Orbis Scientiae, 1981, Coral Gables. A. Perlmutter, ed. 392 pp. Plenum, New York, 1981. \$49.50

On Scientific Thinking. R. D. Tweney, M. E. Doherty, C. R. Mynatt, eds. 459 pp. Columbia U. P., New York, 1981. \$32.50 cloth, \$15.00 paper. *reader*

Modern Algebra: A Natural Approach with Applications. C. F. Gardiner. 288 pp. Wiley, New York, 1981. \$59.38. *undergraduate text*

Electric, Optic, & Acoustic Interactions in Dielectrics. D. F. Nelson. 539 pp. Wiley, New York, 1979. \$41.00. *advanced text*

Quantum Physics: A Functional Integral Point of View. J. Glimm, A. Jaffe. 417 pp. Springer, New York, 1981. \$16.80. *monograph*

Mathematics and Physics. Yu. I. Manin. 99 pp. Birkhauser, Boston, 1981. \$10.00. *monograph*

Quantum Mechanics. H. F. Hameka. 387 pp. Wiley, New York, 1981. \$32.50. *undergraduate text*

Faces of Science. V. V. Nalimov. 297 pp. ISI, Philadelphia, 1981. \$22.50. *essays*

Qualitative Analysis of Physical Problems. M. Gitterman, V. Halpern. 274 pp. Academic, New York, 1981. \$24.50. *second-level text*

Radical Knowledge: A Philosophical Inquiry into the Nature and Limits of Sci-

ence. G. Munévar. 125 pp. Hackett, Indianapolis, Ind., 1981. \$6.25. *monograph*

Density Matrix Theory and Applications. K. Blum. 217 pp. Plenum, New York, 1981. \$32.50. *second-level text*

Functional Analysis. B. V. Limaye. 376 pp. Wiley, New York, 1981. \$17.95. *second-level text*

Geometrical Methods of Mathematical Physics. B. Schutz. 250 pp. Cambridge U. P., New York, 1981. \$39.95 cloth, \$16.95 paper. *second-level text*

Geophysics and Planetary Science

The Science and Wonders of the Atmosphere. S. D. Gedzelman. 535 pp. Wiley, New York, 1981. \$25.95. *undergraduate text*

UFL Pulsations in the Magnetosphere. Reviews from Special Sessions at XVII General Assembly of IUGG, Canberra, 1979. D. Southwood, ed. 145 pp. Reidel, Boston, 1981. \$60.00

Materials Science and Condensed Matter

Crystal Cohesion and Conformational Energies. R. M. Metzger, ed. 154 pp. Springer, New York, 1981. \$24.80. *compendium*

The Chemical Physics of Solid Surfaces and Heterogeneous Catalysis, Vol. 1. Clean Solid Surfaces. D. A. King, D. P. Woodruff, eds. 372 pp. Elsevier, New York, 1981. \$112.25. *compendium*

Insulating Films on Semiconductors. Proceedings of Second International Conference, Erlanger, 1981. M. Schulz, G. Pensl, eds. 316 pp. Springer, New York, 1981. \$29.00

Landolt-Bornstein: Numerical Data and Functional Relationships in Science and Technology, Group III. Crystal and Solid State Physics, Vol. 13. Metals: Phonon States, Electron States and Fermi Surfaces, Subvol. a. Phonon States of Elements Electron States and Fermi Surfaces of Alloys. P. Dederichs, H. Schober, D. Sellmyer. 458 pp. Springer, New York, 1981. \$345.50. *reference*

Energy and Environment

Power Condenser Heat Transfer Technology: Computer Modeling/Design/Fouling. Proceedings of a Workshop, Naval Postgraduate School, 1980. P. J. Marto, R. H. Nunn, eds. 490 pp. Hemisphere, New York, 1981. \$47.50

Uranium and Nuclear Energy: 1980. Proceedings of the Fifth International Symposium, London. 359 pp. Butterworths, Woburn, Mass., 1981. \$62.95

Radioactive Waste from Nuclear Power Plants. T. B. Johansson, P. Steen. 197 pp. University of California P., Berkeley, 1981. \$15.95

Solar Electricity: Making the Sun Work for You. C. Bullock, P. Grambs. 231 pp. Monegon, Gaithersburg, Md., 1981. \$12.95

The Energy Crisis, Conservation and Solar. H. Rose, A. Pinkerton, ed. 210 pp. Butterworths, Woburn, Mass., 1981. \$14.95. *general-interest survey* □