

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-