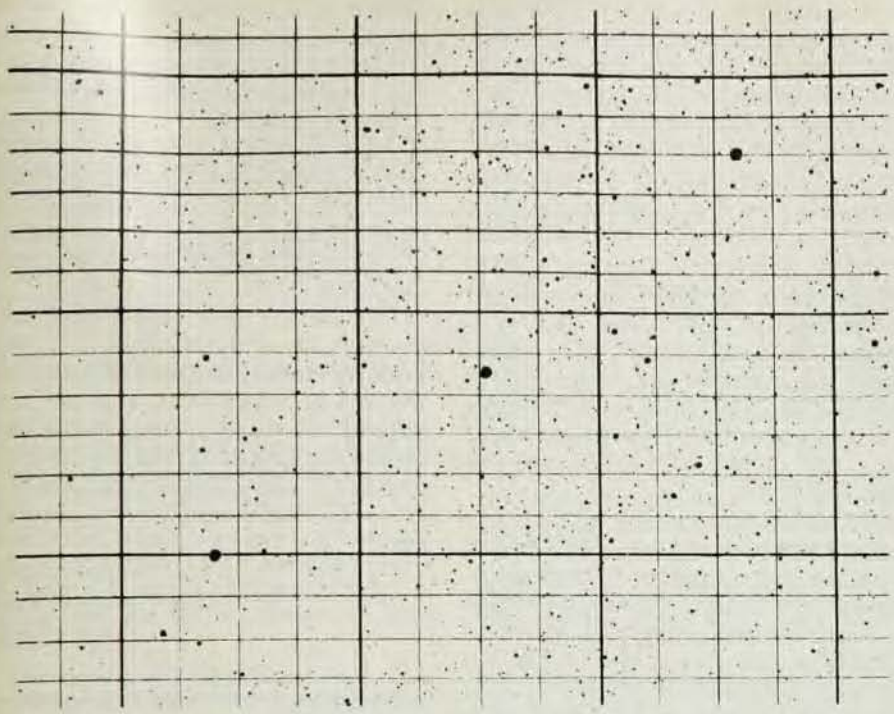

The stars of Orion's belt appear in this portion of one of the 456 photographic plates that comprise the *True Visual Magnitude Photographic Star Atlas* compiled by C. Papadopolous and C. Scovil (Pergamon, New York, 1981. $675.00). The Atlas includes stars visible from the Earth with magnitudes of 13.5 or greater, shown in the same relative magnitudes that the human eye sees them. The distortions toward red or blue that photographs of stars usually suffer have been eliminated.

The photographs, each about 330 mm square, cover areas of 11 degrees square, with centers 10 degrees apart. Transparent overlays, shown here in black, are supplied for estimating the positions of observed objects.

Acoustics both contains and omits by comparing it to other advanced texts. The 1968 text by Philip M. Morse and Karl U. Ingard spends a great deal of time on linear oscillators; waves on strings, plates and so on; plasma acoustics; and interaction with light waves; little on these topics will be found here. Eugen Skudrzyk's *Foundations of Acoustics* (1971) includes a unique long introduction on mathematical techniques, statistics and signal processing. Both books, but especially the latter, treat radiation problems in various ideal coordinate systems with a detail not found in Pierce's text. However, nothing comparable to his treatment of propagation is found in either of the other books. In balance, I prefer Pierce's mix of topics. With significant reductions of mass and cost, he has set forth a deep but comprehensive exposition of the principles of physical acoustics, which will prepare the student well for more advanced study of one of more specialties.

Each chapter contains about 30 statements of interesting problems, for which the publisher has announced that a book of solutions is forthcoming. The author assiduously cites original references, modern as well as historical, whenever possible; only occasionally does this praiseworthy habit seem to interfere with citations of recent literature that might more effectively guide the student to appreciate the concept being discussed. The subject index is excellent; it never failed me.

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How to Grow Science

M. Moravcsik
206 pp. Universe Books, New York, 1980. $12.50

Teaching and Learning About Science and Society

J. Ziman
190 pp. Cambridge U. P., New York, 1980. $22.50

Michael Moravcsik and John Ziman are both practicing physicists whose experiences have led them to scrutinize contemporary science and the perceptions of it by nonscientists. These two books result from the authors' convictions that more understanding of the nature of scientific endeavor is essential for its optimal integration into our culture.

Moravcsik, professor of physics and research associate in the Institute of Theoretical Physics at the University of Oregon, has long been active in scientific policy and funding considerations and is the author of *Science Development: The Building of Science in Less Developed Countries* (1976). In *How to Grow Science* he comments on the current *modus operandi* within science, the interaction between science and technology, the social implications of both, and "the science of science." His tone is generally upbeat and optimistic. In addition to addressing the general public, Moravcsik has much to say to nonscientists making science policy. Scientists, for the most part, will find little that is new to them. Finding themselves nodding in agreement with most of what Moravcsik says, they will be able to recommend this book to provide answers to general questions asked of scientists.

Moravcsik provides a selective bibliography useful for further reading, but he does not give specific references for information incorporated into his text. For the most part, this is not a serious detraction, but some readers might be curious to know more about "Lotka's Law" (page 88), for example. Moravcsik has also provided four appendices: How to Correct One-Dimensional Thinking; Evolving the Organism of Science: Applying A Fable; Two Ways of Mountaineering; and How Can Two Scientists Disagree? These contain valuable insights and provide a few glimpses of the author's humor.

John Ziman's book *Teaching and Learning About Science and Society* is more sharply focused than Moravcsik's. Equally concerned about the misconceptions of science that abound in our society, Ziman proposes that definite educational reform is to remedy or at least ameliorate the situation.

Ziman is professor of physics at the University of Bristol and already known to a wide audience through his earlier books *Public Knowledge* (1968), *Force of Knowledge* (1976) and *Reliable Knowledge* (1978).

Ziman criticizes present education in science: It is geared at all levels toward the training of research scientists and thus does not answer the needs of the vast majority of students, including future science teachers; it fosters doctrinaire scientism; it fails to explicate what science is, what it can do, what it is like to be a scientist and what good science is.

Ziman's model of the scientific enterprise, illustrated with clever diagrams, identifies the individual and social components within the scientific community and the interrelations with other elements of society, such as the general public, the managers of big science, the makers of science policy and the technological developers. This model and its ramifications, so Ziman argues, can be presented within the educational structure through courses

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 quasielastic 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-