The author says, "I shall be much obliged if readers discovering errors will let me know regarding them, so they can be corrected in future printings of the book" (Volume 2, p. VI). Without systematically looking for errors, this reviewer found one by accident: in Volume 1, page 25, line 1, the speed of light is represented as $c = 2.9973 \times 10^8$m/sec instead of $c = 2.99793 \times 10^8$m/sec. Other errors (if any) are not conspicuous. Incidentally, all quantum-minded physicists and chemists should be informed that this scholarly treatise on *Quantum Theory of Atomic Structure* is introductory to further works which John C. Slater hopes to prepare on the theory of molecules and of solids.

Experimental Nuclear Physics, Vol. 3. Edited by E. Segrè. 811 pp. John Wiley & Sons, Inc., New York, 1959. $23.00. *Reviewed by Kamal K. Seth, Duke University.*

THE third volume of Segrè's *Experimental Nuclear Physics* had been awaited for a long time, the other two having been published in 1953. Most of the articles in this volume were, by the admission of the authors, completed four to five years ago, but have been modified and extended to include the salient developments since then. That it is possible to do an excellent job of "renovating" an old article is illustrated by Deutsch and Kofoed-Hansen's chapter on beta rays. By adding a section on the consequences of parity nonconservation in weak interactions and updating the other sections with the latest experimental information, they have succeeded in producing a very readable and informative article which could hardly be recognized as being written, in the main, in 1955. The other chapters in this book are similarly very well written and sufficiently up to date for most of us, except possibly for the experts in these fields (but, then, the book is really not intended for them).

Except for McMillan's article on particle accelerators which provides very interesting reading in the history of the development and the basic principles of particle accelerators, the rest of the book could very well be called a modern version of Rutherford, Chadwick, and Ellis's classic book on radioactivity. The main difference is that now most of the study of radioactivity is concerned with what is sometimes called "artificial radioactivity" in the sense that the radioactive nuclei are mostly man-made rather than naturally occurring. Segrè introduces the subject of radioactivity with a discussion of the general rules and techniques of measurement of radioactive decay, as well as aspects of dosimetry and statistics. G. C. Hanna reviews alpha decay and Deutsch and Kofoed-Hansen discuss gamma rays and beta rays in two articles which are mines of information on both experimental and theoretical (from the interpretive point of view) aspects of the physics of these radiations.

The book, as its title implies, is meant for experimental physicists. However, by including simplified discussions of the pertinent theoretical aspects, the authors have made it quite self-sufficient. The printing and binding of the book are in the best Wiley tradition, that is, excellent.

Crystal-structure Analysis. By Martin J. Buerger. 668 pp. John Wiley & Sons, Inc., New York, 1960. $18.50. *Reviewed by J. Gillis, The Weizmann Institute of Science.*

THIS eminently practical volume will quickly find an assured place among the working tools of all engaged in crystal-structure work. It combines precise attention to detail with a genial and undaunted look at problems as a whole, thus reflecting clearly the personality of the author and his long and distinguished work in the field. Pure theory is kept to a minimum and is never allowed to become more abstruse than might be good for a practicing crystallographer. Indeed the emphasis throughout is on practical methods. There is an amusing instance of this attitude on p. 232 where the author, after quoting the official quantum-mechanical formula for the temperature correction factor, follows with the remark that "these relations involve quantities which are ordinarily unknown to the crystal-structure analyst and so are usually of little help in making a temperature correction".

The book includes valuable information on the various types of cameras and of the present state of the art of photography. There are also some very helpful chapters on reciprocal space and Fourier methods, written so as to make these concepts and methods intuitively intelligible. The chapter on direct methods is particularly complete and introduces the reader to all those which have been suggested so far. The last chapter, on refinement, is also likely to be found extremely helpful. The extensive bibliographies at the end of every chapter add considerably to the usefulness of the book. They are the more impressive when one realizes that the whole idea of x-ray crystallography is only due to celebrate its 50th anniversary in 1962.

The most notable omission is the subject of macromolecules in general and proteins in particular. In fact, the special problems of this field and the devices used for their treatment are hardly mentioned at all. There are some passing references in the discussion of heavy atom substitution methods, and the Cambridge idea of photographing the same molecules with different water contents is also reported, but that is about all. It would probably be fair to divide crystallographers into the classical and molecular biology groups and to say that the book under review is addressed to the former.

The explanation is lucid throughout and the examples always well chosen and carefully presented. The illustrations are beautifully drawn and reproduced and the general production of the book excellent. Indeed it can be wholeheartedly recommended for the purposes for which it is intended

The reviewer cannot resist the temptation to add a thought inspired by reading the chapter on direct

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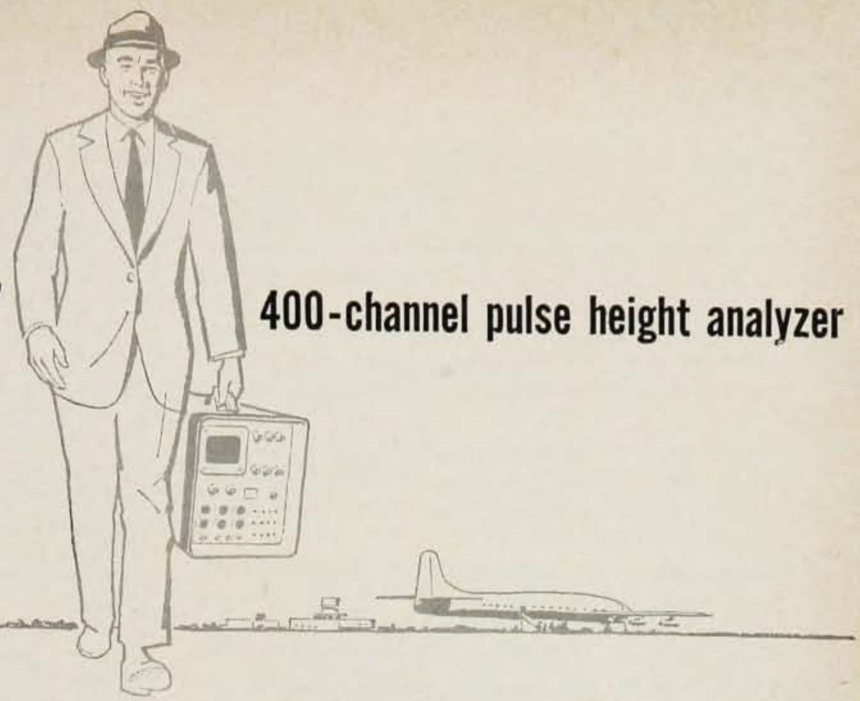

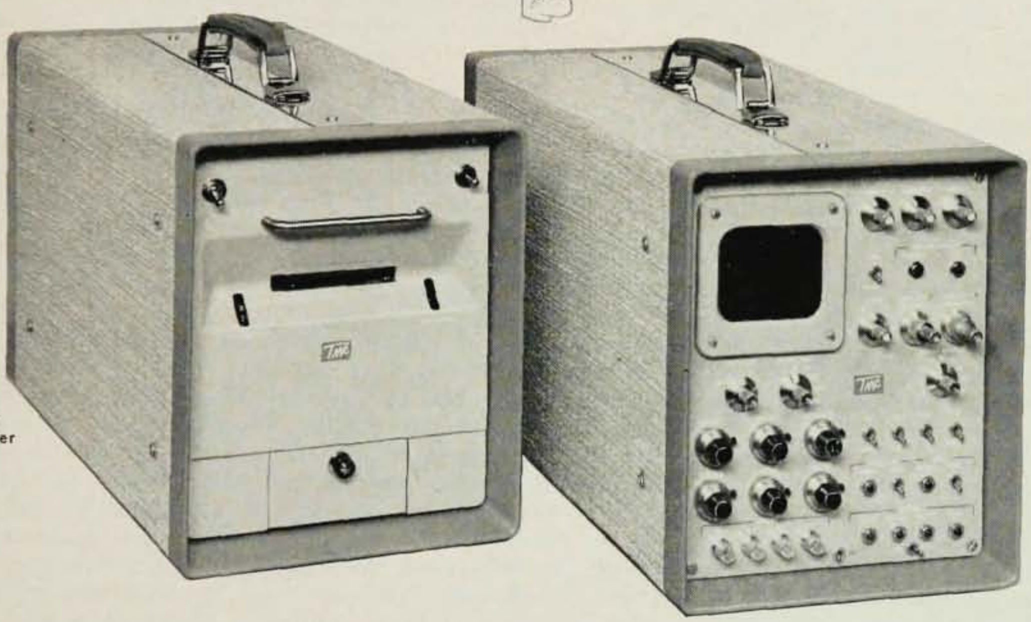

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LITERATURE ON REQUEST

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methods. There seems to be a rule in crystallography that every new idea for attacking the phase problem works well the first time and much less well after that. The obvious explanation that methods which fail at the first try are immediately abandoned and never reported is, unfortunately, inadequate; as would appear from careful questioning of some of the people concerned. It would be interesting to know the true explanation of this well-established phenomenon.

Thermoelectric Materials and Devices. Lectures (New York U., June 1959, 1960). Edited by Irving B. Cadoff and Edward Miller. 344 pp. Reinhold Publishing Corp., New York, 1960. $9.75.

Thermoelectricity. Including the Proc. of NRL-spons'd Conf. (Sept. 1958). Edited by Paul H. Egli. 407 pp. John Wiley & Sons, Inc., New York, 1960. $10.00. *Reviewed by Peter L. Balise, University of Washington.*

SCIENTISTS and engineers have recently become excited about thermoelectricity: the former because of the relevant problems awaiting solution in solid-state physics and thermodynamics, the latter because of the challenge to develop useful equipment for refrigeration and power generation. Perhaps no other field today offers greater opportunities in materials science for the understanding and creation of substances with specific properties. The public has read much about the marvelous thermoelectric devices that are around the corner, but economically feasible appliances are further away than the lay press implies.

Even technical books such as the two reviewed here tend to minimize the limitations of present materials. The basic criterion for performance of a thermoelectric device is the "figure of merit", which is improved by large Seebeck coefficients, and by low thermal conductivity and high electrical conductivity. The latter two requirements are obviously difficult to optimize coincidentally, and this is a practical reason for seeking understanding of the physics of materials. In addition, other properties are important in achieving good temperature range, life, and ease of fabrication.

The problems are being vigorously attacked, as attested by the papers on the subject; both these books are compilations of such papers. *Thermoelectric Materials and Devices* is a series of lectures given at New York University, dealing about equally with theory, materials, and devices. Basic principles are presented, and equations are derived for thermoelectric behavior of materials (including thermionic emission) and for performance-criteria of circuits. A considerable amount of data is given for many materials, refractories, and liquids (fused salts), as well as the more common compounds such as tellurides. Design calculations are given in detail, including nomographs and tables. A chapter is devoted to nuclear heat conversion. Experimental models of devices such as a refrigerator and an air conditioner are described.

Thermoelectricity is divided into four sections. The first considers fundamental concepts, with practical considerations for equipment, including generators in space vehicles. The second and third sections discuss the physics of materials and problems of application to high-temperature devices, including thermionic power conversion. The last section is devoted to measurement of material properties, particularly thermal conductivity, with emphasis on methods of meeting the difficulties imposed by high temperatures.

While both books are written at a high technical level and have similar coverage, *Thermoelectric Materials and Devices* seems somewhat better organized, with more data on specific materials. *Thermoelectricity* has a more attractive format and better information on measurement techniques. This reviewer suggests *Thermoelectricity* for the purchaser of only one book, but both would be wanted by anyone with a serious interest in the field.

Surface Microtopography. By S. Tolansky. 296 pp. Interscience Publishers, Inc., New York, 1960. $9.00. *Reviewed by J. Arol Simpson, National Bureau of Standards.*

AS physics experiments become more and more complex, more and more time is spent attempting to master techniques, inevitably tricky, which are, or at least should be, ancillary. It is always then a satisfaction to find that somewhere in the world there is someone who has made one of these techniques a life's work, and a joy if he has seen fit to describe his work in detail.

Just such a happy event has occurred in the appearance of this book. Professor Tolansky, who almost twenty years ago developed the technique of multiple-beam interferometry for the measurement of surface microtopography, has spent the intervening time refining the procedures until it is now possible to measure step heights of 20 A or less. In this book he tells *how to do it* and by means of over 350 interferograms taken in the process of his studies of such problems of the topography of diamond faces, the oscillation of quartz crystals, indentation-hardness testing of metals, and the wear of glazier's diamonds, shows eloquently the power of the method.

The book is a model of what a *how to do* book should be, for despite the author's interest in, and great knowledge of, the objects studied, he concentrates on the way the measurement was made rather than the result. Moreover, he describes some good ideas that did not work, modulated fringes, for example, and explains, as far as is known, why they did not. For those who are interested in the results the book is provided with a complete bibliography of the papers of the author and his co-workers including the degree thesis from his laboratory. Moreover, when the going gets rough, as in making the high-reflectance coatings for the optical flats, he provides "cookbook" instructions, "helpful hints", and simple tests to smooth the way. I only wish all authors were as considerate.

All in all this is a highly specialized but excellent