Books

Photoconductivity in the Elements. By Trevor Simpson Moss. 263 pp. Academic Press Inc., New York; Butterworths Scientific Publications, London, England, 1952. $7.00.

There is probably no other field in the domain of physics of solids which has undergone a more rapid experimental and theoretical development in the last decade than the electrical properties of semiconductors and insulators. The stimulus for this growth came both from basic fundamental interest and from the numerous industrial and military applications. Moss's book on photoconductivity in the elements, a very recent development indeed, is another example of an outgrowth of a doctoral thesis. The author's original contributions, for the greater part as yet unpublished, have been augmented by an extensive up-to-date review of photoconductive and related effects in pure elements.

The book is divided into two parts: the first theoretical and the second experimental. The theoretical part, which constitutes about a third of the book, is an excellent summary of our present ideas about semiconductors and insulators; it gives a general qualitative picture of the basic features and a quite complete list of the various important formulae and relationships without going into the detail of their derivation. Particular stress is laid on the interrelation between photoconductive and other photoelectric effects on the one hand, and such properties as Hall effect on the other hand. A brief chapter, summarizing the main features of bands in solids, is followed by an equally brief treatment of Hall effect and of conductivity. Optical properties of materials are summarized next and this is followed by chapters on photoconductivity and on its spectral distribution, on the theory of photoresponse and on photovoltaic effects. A discussion of the temperature dependence of spectral response and activation energy followed by a treatment of the correlation between threshold wavelength and refractive index and by a chapter on emission effects in semiconductors closes the theoretical part.

The second part, dealing with experimental methods and with the description of results, is about twice as long as the first part. The material is divided into twelve chapters dealing with specific elements: boron, diamond, silicon, germanium, grey tin, phosphorus, arsenic, antimony, sulphur, sodium, tellurium and iodine and one chapter in which the whole field is discussed in terms of the occurrence and general properties of photoconductivity and a comparison is made between thermal and optical activation energies and their relation to other properties. Each chapter, on a particular element, ends with a section in which general conclusions and discussions pertaining to that element are summarized. It should be mentioned here that although no definite data on photoconductivity of tin are available and the results on antimony are still somewhat dubious they have been included since the author believes that the difficulties here are primarily experimental and will be overcome. His main thesis, i.e., that all nonmetallic elements which have a high refractive index are photoconductive, seems to be well-confirmed.

A particularly laudable feature of the book is the thorough and up-to-date coverage of the literature, both European and American. It is a very welcome book.

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Mechanics. Lectures on Theoretical Psysics, Volume I. By Arnold Sommerfeld. Translated by M. O. Stern. 289 pp. Academic Press Inc., New York, 1952. $6.50.

This is Volume I in a series of English translations of the lectures on theoretical physics given by the author at the University of Munich over a period of thirty-two years. Their popularity in the original German form (first edition, 1942) is attested by the fact that the translation has been made from the fourth German edition. It seems likely that the English language edition will attract like favorable attention.

An interesteing foreword, contributed by P. P. Ewald of the Polytechnic Institute of Brooklyn, himself a holder of the doctorate from Munich, describes briefly the character of Sommerfeld's lectures and his method of instruction, which led so many of his students to future careers of notable distinction in physical research. It is generally admitted that as an effective lecturer Sommerfeld has been rarely if ever surpassed. His clarity is indeed remarkably well exemplified in the volume under review.

The author took mechanics seriously as a branch of physics. In fact the first sentence in his book is: "Mechanics is the backbone of mathematical physics." He has therefore been solicitous in presenting his material to do ample justice to those fundamentals which are used again and again in applications throughout all branches of physics. We find, for example, not only the mechanics of a single particle but also the basic theorems for the mechanics of aggregates, a strong chapter on rigid body motion and three final chapters on Lagrangian and Hamiltonian mechanics. Much of the treatment follows standardized lines, but there are many ingenious comments to help the learner over the rough spots. For example, there is an unusually clear account of the concept of degrees of freedom of a general dynamical system. Moreover, the author has not disdained to introduce many rather elementary practical applications of the fundamental principles, so that the student will be sure to see that he is studying physics,