

theory of the optical properties of imperfections in non-metals. An article by G. Borelius on changes of state of simple solid and liquid metals is essentially a summarizing survey of a recent series of papers by him dealing with a semi-macroscopic analysis of energy, entropy and volume into vibrational and structural parts. Finally, there is an account of macroscopic symmetry and properties of crystals by C. S. Smith in which a systematic development of the formal theory is supplemented by physical arguments, and applied in the discussion of a wide range of physical properties.

There is no doubt that most of the articles in these volumes will be of value to those engaged in, or preparing to undertake research on, the topics with which they are concerned. This would hold even of articles which are essentially compilations of condensed information about work presented in many different journals, or which are advanced expositions of some particular theoretical topic. A reader with a good general background knowledge of solid state physics, for whom this series is intended, may, however, properly wish to be conducted into some more particularized field, rather than pushed into it. Such a reader will emerge from some of these articles with no clear impression at all. The writers, as guides, are often too conscientious, too modest, or just plain indifferent: too conscientious in trying to make reference to every piece of work they have been able to find; too modest in not allowing any trace of personal judgment, even by selection, to become apparent; or plain indifferent in not caring whether a condensed piece of theoretical exposition is likely to be intelligible to an average reader or even, sometimes, whether it is intelligible to themselves.

In these volumes there is a theoretical article which begins at a level so far beyond that of most physicists as to be virtually useless by itself in this form. Another theoretical article is a first-rate piece of exposition, at an appropriate level, though even this jumps the traces occasionally, and would be improved by the addition of a few explanatory sentences or paragraphs. On the more experimental side there is an article which contains more than seventeen pages of tables, mostly of experimental data of very specialized interest, which are completely out of place in a series of this kind. Other primarily experimental articles suffer from a congestion of factual material. In some, however, much thought has clearly been given to presenting a clear and balanced picture of a particular field, at the expense of omissions which are likely to be deplored only by a few of the less able writers of Ph.D. theses.

The adverse comments which have been made must not be taken to imply that the average standard of the articles in these volumes is unusually low; indeed, compared with the general run of review articles, it is unusually high, in keeping with the already established reputation of the series. Even here, however, the prevalent diseases of review articles and their writers are becoming apparent: the spotted reference fever of the one, and the introversion of the other. These can be controlled, and when they are, and other more positive conditions are satisfied, review articles may result which, like a few of those here, are in their own right substantial contributions to science.

I am indebted to my colleagues Dr. P. Rhodes and Dr. E. F. W. Seymour for also reading a number of the articles in these three volumes, and giving me the benefit of their comments. E. C. STONER

MUSIC AND ELECTRONIC COMPUTERS

Experimental Music

Composition with an Electronic Computer. By Prof. L. A. Hiller, Jr., and Leonard M. Isaacson. Pp. vii+197. (London: McGraw-Hill Publishing Company, 1959.) 46s. 6d.

SO much is heard nowadays of the capabilities of the computer robot in imitating every human activity that it is not surprising to read of experiments in which the computer is made to compose music. Perhaps to say that the machine 'composes' is putting the experiments described in this book at too high a level, as probably the authors would be the first to admit. What the computer has been asked to do is, in fact, to produce a *canto fermo*, a series of notes following certain rules which every student of harmony has to practise at an early stage of the music course. Since these rules are largely negative, it is, of course, quite easy to feed into it a programme in which it may choose the next note at random, provided it does not, for example, form a tritone, jump more than an octave, and so on. The result is something which will pass a music examiner, or would have done in the past century, but is scarcely a composition. It is rather like asking a laboratory technician who can blow glass, solder, join wood and nothing more to carry out an original piece of research.

This writing of a *canto fermo* is not the sole musical experience of this particular electronic computer. There are others, and the authors have gone so far as to orchestrate them for string quartet. Read as scores (given in the text) they are not very impressive. One cannot expect to create a mechanical Bach or Mozart, but it evidently takes more than a few programmes to endow our robot with the divine afflatus which could produce even a simple folk tune. Nevertheless, these experiments are amusing and the account of them is well written, so that one does not need to be a *habitué* of the computer room to understand what the authors were planning.

E. G. RICHARDSON

SEMICONDUCTORS

Optical Properties of Semi-Conductors

By Dr. T. S. Moss. (Semi-Conductor Monographs.) Pp. x+279. (London: Butterworths Scientific Publications; New York: Academic Press, Inc., 1959.) 50s.

Fluctuation Phenomena in Semi-Conductors

By Prof. A. Van der Ziel. (Semi-Conductor Monographs.) Pp. viii+168. (London: Butterworths Scientific Publications, 1959.) 35s.

Progress in Semiconductors

Vol. 3. Edited by Dr. Alan F. Gibson, Prof. R. E. Burgess and Prof. P. Aigrain. Pp. viii+210. (London: Heywood and Co., Ltd., 1958.) 55s. net.

An Introduction to the Theory and Practice of Semiconductors

By Dr. A. A. Shepherd. Pp. 206. (London: Constable and Co., Ltd., 1958.) 18s. 6d. net.

HALF of Dr. Moss's book gives a general discussion of the theory of optical effects in solids. The other half presents summaries of the optical proper-