

attempt has been made "to choose examples which are as simple as possible, so that they will not be beyond the means of small schools". This section should be useful for those wishing to organize courses in experimental biology for senior students.

A minor defect of the book is the considerable number of verbal slips which are encountered; for example, 'serum' when 'plasma' is meant (p. 200). The work can be recommended, however, as a clear and interesting account of some valuable methods; the more solid matter is enlivened here and there by some delightful quotations from ancient authors, which serve as texts for some of the chapters.

HONOR B. FELL

## BELOW 1° K.

### Magnetic Cooling

By C. G. B. Garrett. (Harvard Monographs on Applied Science, No. 4.) Pp. xi+110. (Cambridge, Mass.: Harvard University Press; New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1954.) 36s. net.

JUST over twenty years have elapsed since the temperature region below 1° K. was opened by the adiabatic magnetization of paramagnetic salts. Except for the war years there has been a steady increase in the work in this field, and the stage has now been reached where magnetic cooling is becoming a standard technique in many cryogenic laboratories. Comparing the progress of the magnetic cooling method with the state of gas liquefaction two decades after Cailletet and Pictet, there exists a strong resemblance which is reflected in Dr. Garrett's book. Now, just as then, the physical properties of the cooling agent completely hold the stage. Dr. Garrett is as preoccupied with the susceptibility of paramagnetic salts as the low-temperature physicists of the nineties were with the equation of state. The result is that his book seems a little out of balance, which is particularly noticeable in a short monograph of only 105 pages length. Detailed discussion of the paramagnetic phenomena is, at the present stage of development of magnetic cooling, certainly justified, but this means that "other experiments" had to be dealt with in eighteen pages. Rather more serious is the summary way in which the whole of demagnetization technique is treated in only eight pages. The sealed capsule method, for example, is not mentioned here at all. Description of experiments admittedly lacks the glamour of the theoretical discourse, but a monograph in applied science could have afforded slightly more space for technicalities at a time when the magnetic cooling method is being taken up by more and more laboratories.

While one may criticize the choice of balance in the book, it should be emphasized that the material has been treated competently and with clarity. The chapter on technique is followed by one on thermodynamic relations and one on the magnetic temperature scale. The following three chapters deal with the theory of paramagnetism at low temperatures, with the results of specific heats and susceptibilities for a number of salts and finally with co-operative effects. This section with its extensive set of references to original work will be found most useful by those who work in the field of adiabatic demagnetization or who are entering on it. A closing chapter gives a short survey of the use to which paramagnetic

cooling has been put, such as investigations on liquid helium and on superconductors. Multi-stage demagnetization and nuclear alignment also receive here a short mention.

Subject to its limitations, the book will be of interest to most low-temperature physicists and to students specializing in either cryogenics or magnetism. It is unfortunate that the price will put it out of the reach of many of the latter.

K. MENDELSSOHN

## SCINTILLATION COUNTERS AND PHOSPHORS

### Scintillation Counters

By Prof. J. B. Birks. (Pergamon Science Series: Electronics and Waves.) Pp. viii+148+4 plates. (London: Pergamon Press, Ltd., 1953.) 21s.

THE development of scintillation counters in the past seven years is one of the most rapid contemporary advances in the techniques of nuclear physics, and Prof. J. B. Birks's book gives a timely summary of this recent work and a picture of the present state of the art.

The subject of these instruments is dealt with, not only from the point of view of those who wish to use them as tools, but also of those who are interested in the properties of the phosphors themselves. The author follows a logical sequence beginning with a brief but adequate summary of the principles of scintillation counting; this is followed by a discussion of photomultiplier tubes and data on the commercially available types. Measurements of instrumental resolution are then considered, and the next three chapters are devoted to descriptions of the various types of phosphors. The final section is a survey of some applications of scintillation counters.

Prof. Birks's main interest has been the study of organic crystalline phosphors, and the section on these materials forms the longest single chapter in the book. This is a comprehensive account including results of recent work by the author, and his interpretation of these results in terms of the 'photon exchange' process which he has proposed as an alternative theory to the 'exciton migration' process as a mechanism of energy transfer in mixed crystals. One wonders whether a monograph, particularly with the present title, is the best place for the detailed presentation of such a theory, at least until there is general agreement on its tenets. As one concerned with the use of counters, the reviewer would have preferred to see a greater proportion of the space devoted to discussion of problems likely to arise in the applications of the instruments. For example, to anyone wishing to use the fast response of these counters to their best advantage, a fuller indication of the circuit problems met with in the millimicro-second region would be a welcome addition. A description of experimental methods of crystal production would also be useful.

Prof. Birks has, however, written a very readable book and he has included a good bibliography which will be useful to the reader interested in further experimental details.

The publishers are to be congratulated upon the speed with which the book was produced, an essential requirement for a monograph in a rapidly developing subject: very few misprints occur, and the diagrams and type are pleasing.

A. R. CRATHORN