

Dr. Ingram's work falls into two main sections, the first being concerned with the techniques of electron resonance, and with those parts of the theoretical background necessary for the interpretation of the spectra of free radicals. The 'experimental' part will be a most valuable guide to those contemplating work in this field, to many of whom microwave methods will be unfamiliar. The various types of spectrometer are clearly explained, and their relative merits discussed: the appendix, dealing with sources of equipment, is a worthwhile addition. A pleasing account of the sources of hyperfine structure follows. The rest of the book is a sectionalized review, with useful explanations, of work up to the present. There are chapters on stable free radicals (mostly fairly elaborate organic molecules or ions), on 'trapped' radicals produced by irradiation of solids or materials in glasses, and on the radicals formed in the course of polymerization and of pyrolysis (of solids). All are interesting, and suggest future applications. Dr. Ingram's field defines itself well without the rather odd definition of a free radical which he gives (p. 2), in which reference is made to 'normal chemical bonding'; all free radicals are held together by normal chemical bonding.

The book by Trotman-Dickenson is, in effect, an extended and intelligently written review covering a field of chemistry with a much longer history. It is of great value in so far as it ignores the artificial boundaries which appear to have arisen in chemistry, and because of its systematized account and assessment of a very large amount of material. It is not the author's fault if the available matter for some of the sections is inconclusive. The book will prove useful to those connected in any way with this amorphous field.

Both books attempt short treatments of 'biradicals', from very different points of view. This topic holds much for the future.

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## THE IMPORTANCE OF NEW DETECTORS

### Čerenkov Radiation and Its Applications

By Dr. J. V. Jelley. Pp. x+304. (London and New York: Pergamon Press, 1958.) 65s. net.

IT is seldom that the first book to appear on any topic is so thorough as this work by Dr. Jelley. The treatment of the largely new subject of Čerenkov radiation is very complete in its scope and the many workers in the field, whether they are engaged in fundamental studies of this form of radiation or in some relatively straightforward application of a tool based on the phenomenon, owe a debt of gratitude to the author for this comprehensive study. Those who heard the evening discourse by Academician Tamm at Geneva in 1958 were given a clear picture of the rather intriguing history of the subject and the relatively sudden introduction of practical detectors, based on the Čerenkov effect, seemed the more surprising.

Jelley has gleaned his material from many rather scattered sources and presented it here in a well-integrated form. The rather extensive theory is well supported by his clear expositions of the experimental work in the field and in this he shows the skill of one who has personally made considerable contributions to the subject. The author makes it obvious that the subject is likely to produce more surprises in the

future and those interested will find much to stimulate their thought in this volume. Many fruitful researches can be expected in this field and Jelley himself indicates some of these. Modern physics perhaps owes its rapid progress more to the introduction of novel detectors than to any other successes. We need but mention the Geiger and proportional counters, the Wilson cloud-chamber, the nuclear emulsion-plate, the scintillation counter, the Čerenkov detector and the bubble chamber to realize the fundamental nature of the contribution that stems from the study and perfection of these devices. Moreover, their value extends to many fields beyond that of pure physics.

The volume can be very highly commended as a most readable, careful and thoroughly up-to-date account of the subject.

## THE VERY COLD WORLD

### Experimental Techniques in Low-Temperature Physics

By Guy Kendall White. (Monographs on the Physics and Chemistry of Materials.) Pp. viii+328. (Oxford: Clarendon Press; London: Oxford University Press, 1959.) 45s. net.

ABOUT a quarter of a century ago, all low-temperature physicists (and there were not many of them) knew each other, and picked each others' brains fairly regularly, so that the dissemination of cryogenic techniques was rapid and satisfactory. To-day, however, when every well-equipped physics laboratory has or should have its cryogenic facility, the older method of communication is no longer adequate. Many physicists all over the world now want to be able to handle cryogenic liquids safely and efficiently; hence the timely appearance of this useful book on cryogenics, the first for nearly twenty years and the first in the English language.

A wholly satisfactory book on techniques is a difficult thing to achieve, probably because a technique is part of a craft and the communication of a craft is not easily done by the printed word. In spite of this difficulty, here is a book which will be of very great assistance to new hands at the low-temperature game, and of not inconsiderable value to the old hands as well. An especially good feature is the 'feel' it gives for cryogenic physics, which will be appreciated by its practitioners.

There are faults, of course. The book strays too frequently into theory. No one is seriously going to read this book to find out how electron spins align themselves in an external magnetic field, or to study the formal derivation of the absolute thermodynamic scale of temperatures. But there are excellent chapters on heat exchangers and their calculation, on mechanical thermal contact, and on thermometry. The important methods of cryostat temperature control are well described, although it would have been valuable to have included some of the electronic circuit diagrams with magnitudes of quantities to give any desired sensitivity of control.

The chapter on vacuum techniques, soldering and sealing is good so far as it goes, but there is no mention of how to make a soft soldered joint that (a) will be mechanically strong, (b) will never leak, and (c) can be non-destructively unsoldered. Further, there is no mention of leak-hunting, that grimmest of pursuits, or of real or virtual leaks, or indeed of whether or