

good general summary of the properties of chloroplast proteins, lipids and pigments and an account of the fine structure of the different plastid types. There are also excellent short chapters on chloroplast permeability and photosynthesis. Dr Kirk is to be congratulated on the excellence of the summary of the new biochemical material and the development of ideas which he presents in this section.

Part II discusses the "Inheritance and Genetic Behaviour of Plastids" and is written by Dr Tilney-Bassett (chapters 13–22, pp.251–521). The form of presentation has obviously been completely rethought. New material has been incorporated, some old material discarded and a major rearrangement has been carried out. The new data on plastid mutagens and the causes of mosaic variegation are particularly valuable and the problem of sorting out of plastids is examined well. The origin and stability of chimaeras is discussed adequately, although the description demands a prior knowledge of the ontogeny of the shoot apex. The sections dealing with the reasons for the stability of periclinal chimaeras and for the existence of mericlinal chimaeras are acceptable but are sufficiently important to warrant a more extended treatment in the context of a discussion of plastid behaviour in higher plants. However, an expert who already knows the sort of details he is looking for is very likely to find them in this as in other sections, and the comprehensive subject, taxa and author indexes, will guide him well.

Chapter 22, which concludes Part II, is a completely new one which describes plastid inheritance in *Chlamydomonas*. It is a particularly helpful chapter and brings into focus the insight which the use of a unicellular plant can give to critical studies on extra-nuclear genes. As *Chlamydomonas* can be grown in accurately controlled conditions, it can be conveniently subjected to precise experimental manipulations; this is of particular importance in studying the expression of such genes.

Part III, written by Dr Kirk, examines the "Biochemical Basis for Plastid Autonomy and Plastid Growth" (chapters 23–28, pp.525–862). While keeping to the same general form of the first edition, it includes a mass of new information. For example, the section on biosynthetic capabilities now runs to 100 pages against a previous 30, an indication of an area of most rapid development in the past decade. Throughout Part III great care has been taken to ensure a good balance in the presentation. The whole topic of chlorophyll synthesis has now been assembled in one unit in the new volume, as opposed to the scattered treatment it received in the first edition, and de-

tails of modern work on the synthesis of δ -aminolaevulinic acid and its conversion to protochlorophyll are included. In the past decade much information on nucleic acids and protein synthesis has been obtained and this is well discussed in chapter 26. The section on plastid development (chapters 27 and 28) has been expertly updated.

Part IV (chapter 29, pp.875–894) gives us the benefit of the authors' joint views of the directions in which future research may be expected to proceed. The coverage of references generally is good up to 1976, but the immense work of printing such a large volume means that the literature between 1976 and 1978 (date of publication) has of necessity had to be largely ignored. It is therefore satisfying to note that the literature already contains papers on several of the topics outlined jointly by the authors in

Part IV.

This edition of *The Plastids* is more readable than the earlier edition, but it is definitely not for beginners. However, workers in this very wide field will find an immense store of information and references to the literature. For such a large book there are remarkably few printing errors and grammatical inexactitudes. The efforts of revising *The Plastids* has been well worthwhile; the volume is very impressive. So too, unfortunately, is the price, which will put it beyond the grasp of all but the most dedicated of research workers. It will, however, find a proper place on library shelves in departments of biochemistry and plant sciences throughout the world.

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Techniques at low temperature

Experimental Techniques in Low-Temperature Physics. Third edition. By G. K. White. Pp. 331. (Clarendon, Oxford University Press: Oxford 1979.) £15.

GENERATIONS of graduate students (including the present reviewer) were brought up on earlier editions of Guy White's book, which for years remained the only available supplement to the unwritten body of lore handed down by one's predecessors and supervisor and colleagues. It is a detailed exposition of the how of experimental physics at low temperatures: how to attain the low temperature, and how to measure it when you have got it; not only how to set about designing cryogenic apparatus, but also how to translate the design into a functioning and (one hoped) leakless reality. The third edition has been reworked more thoroughly than its predecessor, and is the better for it. Some of the less used sections have been pruned to make way for new material reflecting the growing emphasis on work below 1 K, and the whole book has generally been brought up to date.

The eleven chapters deal in succession with the production and storage of liquefied gases, heat exchangers, thermometry, heat transfer, temperature control, cryostat design, cooling with ^3He , adiabatic demagnetisation, vacuum techniques, and with the physical properties of solids at low temperatures. There are substantial appendices giving tabular data on: vapour

pressures of cryogenic liquids; platinum resistance and thermoelectric thermometry; relevant physical properties of elements at room temperature; electrical resistivity; and on the thermal contraction and thermal conductivity of typical constructional materials. There is an extensive (and international) list of suppliers of the cryogenic equipment, components and materials referred to in the text.

White's book no longer stands alone, of course; there are also, for example, the admirable little text *Low Temperature Laboratory Techniques* by A. C. Rose-Innes (English Universities Press: London, 1973), as well as the excellent but more specialised works by O. V. Lounasmaa (*Experimental Principles and Methods Below 1 K*; Academic: London, 1974) and by D. S. Betts (*Refrigeration and Thermometry Below One Kelvin*; Sussex University Press: Brighton, UK, 1976); but it probably remains unique in the amount of useful practical detail which is included, and in covering so wide a sweep of low temperature physics and engineering.

It is a pleasure to welcome the third edition of *Experimental Techniques in Low Temperature Physics*, and to commend it to a new generation of research workers. It is readable, it is packed with ideas and information culled from laboratories all over the world, and it has an extensive and up-to-date bibliography. It is a book which every designer or user of low temperature apparatus will wish to have at his elbow.

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