

on natural and synthetic products are good and reasonably up to date; those on "Vitamins and Conjugated Proteins" and on "Steroids" are excellent.

It is clear that the authors are very sceptical of the developments in theoretical organic chemistry of the past twenty years. For this reason the text, particularly in Part 3, suffers from a lack of balance. Topics such as heterolytic and homolytic substitution are either omitted or only mentioned in a rather unsatisfactory manner. Free radicals of long life are dealt with as compounds of abnormal valency, in a chapter also devoted to steric hindrance. The use of semi-colons and full-stops at the end of equations (for example, p. 1041) makes it difficult for the reader to be sure if the formation of radicals is intended. In the discussion of the Walden inversion, no hint is given of the light that has been thrown on this problem from the elucidation of the mechanisms of aliphatic substitution reactions.

However, within the limitations mentioned above, this new edition of "Perkin and Kipping" should continue to serve students of organic chemistry as its predecessors have done during the past half-century.

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FIBRES

Fibre Science

Edited by J. M. Preston. Pp. xiv+341. (Manchester: Textile Institute, 1949.) 30s. net.

Physics and Chemistry of Cellulose Fibres, with particular Reference to Rayon

By P. H. Hermans. (Elsevier's Polymer Series, No. 2.) Pp. xxii+534. (New York and Amsterdam: Elsevier Publishing Co., Inc.; London: Cleaver-Hume Press, Ltd., 1949.) 50s.

DURING the past quarter of a century, fibre structure has been the subject of much research in many parts of the world. As a result, a substantial measure of agreement has been reached as to the fundamental nature of the fibrous state and about the way in which this determines those properties of fibre-forming materials which have come to be recognized as essentially fibre-like. This broad foundation carries upon it superstructures relating to the individual fibres or groups of fibres, the most impressive being those for the cellulose and keratin groups, which are concerned with the more intimate details of structure and properties. No specialist, however, can afford to disregard work which is being done on fibres other than his own; and the general reader wishing to know something about fibres will be well advised to obtain, at the outset, a picture of the entire field of fibre study.

The Textile Institute has, in recent years, set itself the task of presenting such a picture, both in a popular and more advanced form, to as wide a circle as possible. "Fibre Science" is a series of articles of degree standard by thirteen contributors, based upon lectures given in 1947 in Manchester. These articles range over the whole field from the chemistry of the different fibre types and X-ray analysis to the physical and physico-chemical properties of the fibres. Covering such a wide ground, they must appear in places to deal rather superficially with certain topics, but this can be condoned in a work which, on the whole, gives a very good idea of the achievements of research in this very complicated field of inquiry. A few minor points of criticism may be noted. The appearance of the volume is not

improved by the use of two kinds of paper. On p. 207 stress in kilometres weight is wrongly referred to as *breaking* load per unit linear density, and on the next page the reader is asked to envisage the process of "extension of the fully extended polypeptide chains". Finally, I have a personal dislike of the use of the two terms 'amorphous' and 'crystalline' as mutual exclusives, and even though some contributors do explain what they mean by the former and perhaps may use inverted commas round it, this can at best turn the dislike into reluctant tolerance.

The question of the influence of the non-crystalline parts of fibres on their properties has become one of the major subjects of active research. It is dealt with in two chapters of "Fibre Science", and in a sense is the underlying theme of P. H. Hermans's book, "Physics and Chemistry of Cellulose Fibres". Hermans is, indeed, one of the leading authorities on this subject, as far as cellulose fibres are concerned, and his "Contributions to the Physics of Cellulose Fibres" is well known to British workers. The subject-matter of that monograph (with minor modifications and the addition of a chapter on mechanical properties) forms the second of the three parts into which the present book is divided. The first part has chapters on crystal structure, solutions and gels, chain-length, degradation and the differences between native and regenerated cellulose, and it serves as a general physico-chemical introduction. In the third part Hermans discusses the very complex swelling, shrinkage and deformation behaviour of gels; this, as he rightly affirms, must be properly known and understood if the technology of regenerated fibres is to be anything more than a series of semi-empirical operations. The picture of a cellulose gel which he adopts is one of a continuous network of chain molecules with nodes (not necessarily restricted to the more crystalline patches) which on the whole remain stable during the deformation. Quantitatively, his theory is a modification of Kuhn's, and while Hermans admits that full agreement with experiment is not attained—and indeed this would be too much to expect—there is no doubt that considerable progress has been made in exploring this most difficult field.

As usual, Hermans's writing is very stimulating. He has an extraordinary knack of getting the most out of the simplest physical ideas, and it is perhaps on these grounds rather than because of the conclusions reached that the book will be most useful. Mention should be made of the immense scholarship shown by the compilation of well over a thousand references, many of them multiple; some readers may, however, find that here and there the text is rather overburdened with undiscussed statements that 'X said this, and Y observed that'. A few spelling mistakes have been noted, as well as a displaced line of print towards the bottom of p. 88, and on p. 269 (eight lines from foot of page) "fineness" is wrongly used for "strength".

"Physics and Chemistry of Cellulose Fibres" will undoubtedly be read by the majority of research workers on fibres. "Fibre Science" will have a wider appeal; and if it is to be reprinted (the Textile Institute has just announced the exhaustion of the first issue) it could, with some modifications (I have in mind a rather more specific treatment of the physical properties of the various fibres), be made into a very useful text-book for university students of textiles and other sciences, for example, botany.

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