

financial backing is by no means the only factor. Moreover, while inadequate support may limit the rate of advance, an increase in funds does not necessarily lead to an acceleration. The intractable character of some problems may mean that advance depends on progress in other fields, not obviously related, and even so, new understanding makes no impact on health until it is translated into new medical procedures.

The paper does well to point out that under the National Health Service there is now no danger that the public will be deprived for economic reasons of the benefits of medical research, a danger which the safeguard of compulsory licensing in the patent system was originally intended to avert. There is, on the contrary, the question how far the system now affords sufficiently effective protection to ensure a flourishing and progressive pharmaceutical industry in Britain, but behind this lie the more fundamental questions asked in this paper: how much should be spent by the Health Service on medical goods, and where does the balance of public advantage lie? Does it lie in stimulating medical research or in obtaining short-term economies in National Health Service expenditure?

These questions dig at the very roots of the issues concerned with the relations between the research-based industries supplying medical goods and the Health Service. Public accountability for expenditure has tended to emphasize the Government's present responsibility at the expense of the long-term commitments with which the Federal Government is primarily concerned in the United States. Moreover, appraising the economics of these industries in traditional terms, with excessive emphasis on costs of production, and failing to take into account the relation between research and production, only aggravates the problem. Nor does it help to ignore the implications of the use of trade-marks or brand names by industrial firms to protect their discoveries. To the inventor these also are part of the means of financing further research, and some 95 per cent of branded medicines prescribed under the National Health Service are manufactured by companies undertaking major research programmes. While some of these products are not the results of present-day research, all carry a share of its cost.

There is no simple way to judge whether Britain's present expenditure of some £27 million on medical research is either too low or too high or approximately right. There can be no objective standard for the right level for expenditure on medical research. This arises from the nature of research. What should be remembered is that the progress of medical science is a dominant factor affecting expenditure on the National Health Service, but the motive force of this progress is not economic. Where research is financed through revenue from the Health Services, the search for economies can impede research. In recent years finance for medical research which does not come from sales to the National Health Service has risen faster than that which does.

The conflict between the claims of present-day responsibility for health expenditure and long-term responsibility for the health of the community was implicit in the discussions in Parliament over the costs of drugs. Here it is brought out explicitly, with the warning, too, that depression of one sector of medical research may lead to false economies. When the question of the costs of medical care predominates, there may be a strong argument for encouraging lines of research which combine lower costs

with more effective care, and the paper instances, as a promising field, lines of investigation making feasible domiciliary rather than hospital treatment.

The final assessment of the level and direction of medical research must depend on the broad issues of health and welfare of the community, not on narrow economic considerations. The level, moreover, may be adequate, but the allocation of resources may be poor, and this is at present tied closely to the system of financial support. We should be asking whether the right opportunities are being taken, whether funds at present spent on cancer or poliomyelitis research might return greater benefit if directed to the field of mental health, and again, whether if so much research is pursued along the lines of medical disciplines there may not be excessive concentration on the therapeutic rather than the preventive aspects of medicine. The paper does not pretend to give the answers to the searching questions which it asks, but it puts the whole problem of medical research into a perspective which should facilitate realistic and reasonable discussion.

FIBRE STRUCTURE

Fibre Structure

Edited by Dr. J. W. S. Hearle and Prof. R. H. Peters. Pp. xxv + 667. (Manchester: The Textile Institute; London: Butterworth and Co. (Publishers), Ltd., 1963.) 126s.

FOR the fifteen years since it was first published, Preston's *Fibre Science* has been a standard text in university courses in textiles. In recent years, however, its usefulness has been diminished by progress in the development of new fibres and in the understanding of old ones. The time is ripe, therefore, for a replacement, and this book on *Fibre Structure* is designed to that end. The general scheme of the new volume is similar to that of the old (it comprises a number of separate contributions which are, in fact, based on lectures delivered in a course at Manchester in 1959), but in one important respect there is a change. *Fibre Science* was aimed at the ordinary undergraduate or non-specialist; to a large degree it retained the philosophy of Astbury's *Fundamentals of Fibre Structure* that the basic sciences, as well as their special application to fibres, were unfamiliar to the reader. This volume is, in general, more sophisticated, and should appeal rather to honours students or postgraduates.

The title phrase is taken to cover not only molecular and fine structure but also grosser features of morphology and external characteristics, and the book is thus divided into three sections dealing with texture on three different levels. The first section opens with a discussion by Sharples of chain configuration in cellulose solutions and the possible chemical inhomogeneity of cellulose. In connexion with this latter topic I noted one of the few instances of discrepancies between different contributors, for Sharples can accept no more than about 1 per cent of non-glucose sugar in cellulose hydrolysates, whereas Preston, in a subsequent chapter, cites one source of what he defines as cellulose which contains as much xylose as glucose. The other chapters in this section deal with synthetic polypeptides and proteins (Bamford and Elliott), with nothing new but giving a good review, particularly of the chemistry and physics of the polypeptides; and with synthetic fibre-forming polymers (Goodman) and tactic polymers (Gordon), two chapters which I thought exceptionally good. My only adverse criticism of this section on molecular structure, and I hope that this is not tendentious, is that it would have

been nicely rounded off by a chapter on wool chemistry. Certainly those (there are still a few of us) who regard the study of wool as something of a cult will agree that in this one respect *Fibre Science* surpasses its successor.

The second section of the book is, perhaps, the most important, since it deals with topics which are more controversial. It starts with an introductory chapter (Hearle) of a historical character, which surveys the development of micellar/fibrillar hypotheses and describes the author's own fringed fibril concept. A feature of this chapter is the attention directed to the ideas of Kargin and his school; but, in trying to be fair, Hearle has been too objective in his treatment, quoting extensive extracts from the Russian papers without criticism. In particular, to offer to students without comment the notorious fragment "Electron microscope investigation of cellulose and its ethers reveals that they are amorphous and that the entire electron diffraction pattern is determined by the ordered arrangement of atoms in the molecule of cellulose and this gives evidence of the absence of strict order in the mutual distribution of their molecules" is distinctly unwise. In my opinion, the apparent unorthodoxy of Kargin's views arises largely out of a lack of agreement as to the proper definition of such terms as "crystalline", "amorphous", and "oriented".

The chapters on fine structure in plant fibres (Preston) and animal and man-made fibres (Sikorski) emphasize the part which electron microscopy plays in structural investigations nowadays; since both emanate from Leeds it would be improper for me to do more than mention their scope. Preston's contribution is largely based on his own work on algae and wood tracheids, and Sikorski's does something to redress the comparative neglect of keratin in previous chapters. Treloar (the non-crystalline state) and Keller (crystallinity) have complementary topics. Treloar deals somewhat briefly with mechanical properties, with a good introduction to transition phenomena. Keller gives a very readable account of a fascinating field of study only marred by a teasing tendency to stop a discussion with the apology that space does not permit more. He is, of course, chiefly concerned with crystallization from the melt or from solution, where the evidence for folded chains is now conclusive; the phenomenon of fibrillation in drawn fibres he regards as one which illustrates the inadequacy of our knowledge of fibres at present, an opinion which is echoed by Thompson in a later chapter when he notes that "... the final fibre structures are very similar whether crystallization occurs first at spinning or is delayed until drawing".

The remainder of the book deals with grosser structural characteristics, surface and fibre morphology, skin and core effects, and other properties which are important in end-product use or in the technology of fibre manufacture. It also includes, as a welcome luxury, chapters on glass (Jellyman) and asbestos (Whittaker) fibres.

There is no doubt that *Fibre Structure* will exert a very considerable influence on the teaching of fibre science at the higher levels for a long time, and the standards of topic and presentation are such that this influence will be mostly for the good. It is a pity, therefore, that the editorial introductory chapter should fall below the general level of excellence; it is here that I noted the few examples of inadequate proof reading (dicarboxylic acids $\text{HO}(\text{CH}_2)_n\text{COOH}$ on p. 5, wrong formulae III (p. 6) and VI (p. 8); and if II (p. 6) is not wrong it seems particularly inapt for student consumption). There are also one or two examples of factual error, particularly in references to keratin; but perhaps more disturbing, since we often grumble about the standard of student English, is the number of inelegances in the editorial English, of which one example will suffice: "The disposition of the cells varies with the fibre and may be peripheral, as in mohair, or composed only of one kind". Having just finished marking degree scripts, I am in no mood to stomach this sort of thing in a text-book!

H. J. WOODS

BRYOPHYTE BIOLOGY

The Structure and Life of Bryophytes

By E. V. Watson. Pp. 192. (London: Hutchinson and Co. (Publishers), Ltd., 1964.) 15s. net.

THE writing of a small book on a very large subject is not an enviable task; it is a task, however, which Dr. E. V. Watson has fulfilled and fulfilled admirably. In spite of the fact that this is one of the "University Library" series, it may be recommended whole-heartedly to other than university students—a tribute in itself in days when 'student' and 'university student' are often thought of as synonymous, and books so tailor-made for syllabuses as to deter the 'amateur' who learns for the pleasure of learning, and whose existence is frequently ignored. Dr. Watson obviously enjoys his subject, and thus writes enjoyably. Abundant references for those who wish to take any point further are skilfully interpolated without losing the thread of a discussion or the flow of reading matter.

The title of the book gives a true idea of its contents, and every aspect of bryophyte biology is dealt with. Taxonomy, physiology, ecology... all disciplines are given their rightful, equal place, and Dr. Watson takes a thoroughly balanced view. As with most modern biological investigations, the phylogenetic aspect is stressed, though some might consider the opening sentence of the concluding chapter—"The gross morphology of a bryophyte is chiefly of interest in an evolutionary context"—to be going a bit far. Few will quarrel with the statement that the clue to phylogeny is to be found in the aberrant (taxonomic entities); rather might this be extended to the downright teratological. It is good to see (p. 87) natural relationships stressed against technical characters even of the sporophyte. Too often natural genera have been split on such characters (*Tortula*, *Polytrichum*). On the other hand, through lack of them, even the family of a well-known species, for example the plant known as *Trichostomum sinuosum*, may remain somewhat in doubt.

It may be noted (apropos of the differences between *Calobryum* and *Haplomitrium*, p. 45) that Berrie (*Proceedings of the Linnean Society of New South Wales*, 87) has already aired Schuster's conclusion that the distinctions between these two genera are invalid. *Orthotrichum* does not always have the peristome teeth reflexed (p. 86). Of the mosses with 'amphigastria', the Rhacopilaceae simulate hepatics rather more than the Hypopterygiaceae. I myself feel that the number of bryophytes found in the tropics and temperate zones of both hemispheres will be higher than that of flowering plants as the monographic revisions so much desired by Dr. Watson and all bryologists are accomplished (p. 156). Unfortunately, since "bryophytes are unlikely to achieve great economic importance" (p. 175), these revisions are likely to remain as pathetically small as the number of full-time bryo-taxonomists... Practically cosmopolitan species are not confined to the 'weedy species'. *Campylopus introflexus*, for example, has a tremendous area. The occurrence of the otherwise Australasian genus *Echinodium* in Macaronesia (p. 158) looks even more remarkable when we credit the area with *Gollania* (mainly far eastern) and *Tetrastichium* (South American affinities). Among the adaptations to xerophytic conditions, mention might have been made of strongly contorted leaves in the dry state, exposing chiefly the multistratose nerve to the influence of the atmosphere (for example, *Tortella nitida*, *Timmia* spp.). The selection of material for the ecological section must have caused as much heart-searching as for that on geography, but it is a pity that mention could not have been made of Tutin's remarkable photographs of zonation of epiphyllous liverworts in the article by Richards in the *Manual of Bryology*.