

the molecular evolution of haemoglobin. Chapter four covers the enzymes, describing fully and clearly lysozyme and carboxypeptidase; ribonuclease, chymotrypsin and papain receive briefer treatment.

This work provides a clear and well integrated coverage of protein structure. Chemical reactivities and kinetic properties are discussed too briefly. In the context of a book on structure alone, this is quite acceptable, but a book on "the action of proteins" would have been better with a fuller consideration of these aspects.

Polar residues are found on the surface of proteins and non-polar residues tend to congregate in the interior of the molecules in the proteins analysed so far. But before elevating this generalization to a universal law, we should wait for the structural analysis of further proteins, such as lipases that are soluble in ether, or lipid-synthesizing enzymes that function in lipid membranes. Probably, these proteins are "inside out", showing their non-polar residues to the solvent.

This book is essential reading for every student of biology or chemistry. Almost all biological processes are either catalysed by enzymes or mediated by proteins, thus rendering indispensable a sound knowledge of protein structure. This superb book now provides just such a sound knowledge of protein structure. I would especially commend the illustrations by Irving Geis; these enhance the clarity and aesthetic enjoyment of this volume enormously.

S. SHALL

## PLANT GROWTH FOR SCHOOLS

### Plant Growth

By M. Black and J. Edelman. Pp. x+193+16 plates. (The Scholarship Biology Series.) (Heinemann (Educational): London, 1970.) 30s.

THE long overdue introduction of more material on plant growth and development into A-level and university teaching has created a need for an elementary textbook on this subject and to a large extent *Plant Growth* provides the necessary background.

The first section deals with the nature of growth, where it occurs, its measurement and its analysis. This is followed by a general account of subcellular differentiation and metabolic changes accompanying growth, including a section on wall formation and protein synthesis emphasizing the energy requirements of these processes. The book does not presuppose much chemical or mathematical background in the reader, which is probably a reasonable assumption considering the marked antipathy of many students of biology towards the physical sciences. Sensibly, however, the authors emphasize that a good understanding of plant growth and development cannot be achieved without a thorough grounding in many branches of science.

The second section looks at internal control mechanisms and includes discussions of the types of growth regulators, their effects on growth, including correlative effects, and their mode of action at the molecular level. The only criticism which can be levelled at this treatment is that the effects of growth regulators on gene expression may have been a little overdone and not enough consideration given to other primary processes, for example the very rapid effects of auxins upon cell extension.

The third part of the book considers the role of the environment in the control of growth and development and includes a comprehensive section on phytochrome and photomorphogenesis in general. This treatment is perhaps rather more advanced than the rest of the book, and parts of it, particularly the discussion of the "prolonged energy" reaction, may be somewhat confusing to students at the school level. In both the last sections I feel that ethylene perhaps deserves more than the passing mention that it

gets, particularly with regard to hook unrolling and geotropism.

The last section looks at the general control of development and includes chapters on cell differentiation, flowering, dormancy and senescence, all of which give good introductions to the subject.

The line drawings in this work are particularly impressive and illustrate the textual material admirably; on the whole the plates are good, although some of the electron micrographs could have been improved by enlargement and clearer labelling. In spite of these minor reservations, the book is a valuable contribution to teaching in this field and must be strongly recommended as a basic introduction to the subject. It is unfortunate in this context that nobody has so far produced a book dealing with experimental work in plant growth and development at the school level. The introduction of such material into school work could do much to demonstrate the dynamic aspects of plant science.

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## SOIL BIOLOGY

### Ecology of Soil Animals

By J. A. Wallwork. (European Animal Biology Series.) Pp. 283. (McGraw-Hill: Maidenhead and New York, 1970.) 68s.

THIS is the textbook on soil animals for which teachers of the biology of soil have been waiting. And now that it is published the magnitude of the need is the more obvious. In it Dr Wallwork covers the elements of pedology, systematic zoology and quantitative ecology in a thoroughly up to date and business-like way. Nothing comparable has been done before: in a field hitherto dominated by symposium reports, the advantages of a proper book, written by a single author, could hardly be better illustrated.

Although there is no major section on soil microorganisms—an impossible demand for a single author—they are not neglected in the general treatment of decomposition processes and a useful insight is given into their successional characteristics and their relations with the fauna. In the systematic sections, covering the chief animal groups, a standard layout is adopted: systematics, horizontal and vertical distribution, population numbers and feeding biology. This assists access to information and extra sections on life cycles, resistance to environmental extremes and other topics are added as appropriate. Well chosen reference lists follow each chapter; there is an extensive index and the standard of proof-reading and accuracy is very high.

Because a textbook involves condensation, the specialist can always find areas which he personally would have treated differently; I will mention only that there seems to be some inconsistency in the use of words such as "saprophages", "detritivores" and "decomposers". This does not fully account for the absence of feeding links from the latter group on the food chain diagram (13.2 on p. 230). In fact the role of Protozoa, nematodes and some Collembola as bacterial feeders, although mentioned in the systematic sections, is generally under-emphasized.

The illustrations are adequate, but not lavish considering the price of the book, the surface texture of the paper may not do justice to the originals. The photomicrographs, especially 8.2, 9.3 and 9.4a, might have been substituted by more lifelike stereoscan (or even incident-light) pictures and the first of these hardly achieves the stated purpose of distinguishing the main collembolan suborders.

The author has an easy, flowing style which conceals careful and precise writing; this should be particularly welcome to the student; one is led to hope that this will not be the last time he undertakes the exacting task of writing a textbook.

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