

paragraph in section 2-7 where the changes in molar volume that can be correlated with hydrogen bonding are discussed in a confused manner. This is so much so as to give the impression that the phenomena concerned are quite different in organic chemistry and in inorganic chemistry! Again, on page 50 it is stated that "The force constant  $k$  is . . . directly proportional to the frequency ( $\nu$ ) and indirectly proportional to the square root of the reduced mass . . .". This statement is in contradiction to equation (3-2) on the previous page. Also on page 50 the diagrams of the vibrations of a water molecule are crudely and partly incorrectly drawn. Because of errors of this type the book cannot be recommended for basic teaching purposes. The problems set at the end are rather repetitive in type, mostly involving equilibria deduced from spectroscopic measurements.

Nevertheless the balance and coverage of the literature are good and the book will undoubtedly be useful to many more expert scientists who will be pleased to see the salient aspects of the subject spelled out, and who are not likely to be put off by the errors scattered about. I have the impression that the book has been written in too much of a hurry and as a result is of much lower standard of execution than it ought to be. Nearly all the errors noted would almost certainly have been corrected if the authors had asked experts in the subject-matter of the various chapters to read and comment on them before printing. It could still be worthwhile to do this for a possible later impression.

N. SHEPPARD

## Dyes and Pigments

*Colour Chemistry*. By R. L. M. Allen. Pp. xii+336. (Thomas Nelson and Sons: London, 1971.) £5.

FOR several years there has been a need for a modern introductory textbook on colour chemistry, and this work by R. L. M. Allen is the second book to appear in the last three years intended to fill this gap. The author has indicated that the book is presented as an introduction both for specialist colour chemists and for students whose main interests lie in related branches of pure chemistry or technology. Consequently a comprehensive coverage of the field has not been attempted, and the reader is frequently referred to the more specialist literature where a deeper treatment is required.

The development of the subject-matter of the book follows well established lines, and after introducing the reader to the physical basis of colour and the history and classification of dyes, subsequent chapters deal with classes of dyestuffs largely according to their chemical constitution. Pigments

are briefly dealt with, and to illustrate the less obvious applications of colour chemistry, chapters on fluorescent brighteners and colour photography are usefully included.

It is obviously very easy to criticize the content of a book of this type, since the selection of material is very much a matter of personal choice. Generally, however, the field has been well covered, and the more obvious omissions that have been made, for example the intermediates of dyes and pigments, do not detract from the value of the book. Perhaps a more serious omission is the absence of a discussion of the mechanistic principles of diazotization and coupling, two of the most important processes of colour chemistry. The theoretical treatment of colour and chemical constitution is brief but adequate for a book of this level, but surprisingly few practical examples of empirical colour relationships are given. The new student is given little indication of the position and type of auxochromes necessary to give, for example, red monoazo dyes, or blue anthraquinone dyes.

The author has succeeded in presenting material relevant to modern colour chemistry, largely by drawing on his own industrial experience and by frequent reference to the recent patent literature. The latter is commendable in a field where disclosures of important technological developments often only occur many years after their introduction. One criticism concerns the brevity with which disperse dyes are treated by comparison with dyes for natural fibres, which does not reflect the true technological importance of the former dyes at the present time. A heavier emphasis on disperse dyes for synthetic fibres, perhaps at the expense of azoic and direct dyes, would have presented a more accurate picture.

This is a readable, well presented book which will provide the reader with a useful, up to date background to colour chemistry.

J. GRIFFITHS

## Fish Adaptation

*Explorations in the Life of Fishes*. By N. B. Marshall. Pp. 204. (Harvard University: Cambridge, Massachusetts; Oxford University: London, October 1971.) £2.30.

A SERIES of lectures given at Harvard in 1963, and refurbished in 1964 and in 1967-8 for the Universities of British Columbia and of Miami, is at last published in revised form. The revision must have been thorough, for a large proportion of the bibliographic references are (as one would hope) subsequent to 1963.

Marshall's *The Life of Fishes* was published in 1965, during the gestation period of this book (and it may well be that publication of this book was

delayed for that reason). The two books are, however, very different. The earlier one was large, comprehensive in scope, and apparently intended to be accessible to the lay enthusiast as well as to professional zoologists. The new book is smaller, more selective and seems to assume substantial ichthyological knowledge in its readers, who are expected to be familiar with the wide variety of fishes cited as examples and to be enlightened by remarks such as "one has only to think of the gobies". There is an appendix which deals briefly with the classification of teleosts, but this will not be much help to the novice, particularly as it is unillustrated and includes no references to illustrations of fishes elsewhere in the text. Technical terms such as "hypural" and "stenobathic" are used without definition and the reader is expected to be able to fill in for himself the explanations behind statements such as "Yet a large swimbladder has disadvantages: for the greater its capacity, the more effort a fish must exert to keep station after a given rise or fall above a level of equilibrium".

The book has three main sections. Chapters 1 and 2 discuss the success of teleosts and some features of their design for swimming. Chapters 3 and 4 are about the specializations of deep sea teleosts and chapter 5 is a long discussion of convergent evolution. The discussion of success is extremely interesting, though some of the main arguments are only sketched out. The section on deep-sea teleosts is especially welcome on account of Marshall's unrivalled knowledge in this field. The section on convergent evolution overlaps rather awkwardly the section on deep-sea fishes; the eyes, lateral lines and swimbladders of deep-sea fishes are discussed in both sections and there is even a part of the convergent evolution chapter specifically about convergences of deep-sea fishes. I would have found this chapter more interesting if fewer examples of convergences had been considered and the space so saved used to show in a few cases precisely why it is believed that certain resemblances are due to convergence rather than to common ancestry.

The book is illustrated by line drawings which are apt, informative and attractive, but are sometimes rather too small for comfortable study. This is because the text has been set up so as to fill only two-thirds of the width of each page, and most of the illustrations have been squeezed into the margins.

This is a stimulating book and I am glad to have my copy, but it would be more generally useful if it had been written with more thought for the reader who may be a sound zoologist but is not particularly knowledgeable about fishes.

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