extremely condensed; with almost every other sentence in some passages putting a question or making some pertinent demand on the student, the quantity of food for thought provided is enormous and quite out of proportion to what one would expect from a book of such modest size. That the result is not indigestible owes much to Professor Riter's sense of style and feeling for the subject matter. His questions have a provocative and searching flavour difficult to convey here, which would be altogether more cramped in a conventional textbook. There is a droll humour, an unwavering sense of relevance, an infectious but entirely mature enthusiasm for chemical physics as a field and a sympathy with the authors whose work is dissected in such fascinating detail.

This adds up to one of the most successfully achieved ideas in advanced teaching that I have seen in a long time, and one which could no doubt be copied, though perhaps not so suitably, in many other branches of science.

M. R. Hoare

The nature of sleep

The Functions of Sleep. By Ernest L. Hartmann. Pp. ix+198. (Yale University: New Haven and London, January 1974.) £3.50 cloth; £1.25 paper.

This is a short readable book which should often succeed in interesting and informing the non-expert as well as the specialist. The author has been a prominent worker and prolific writer in the field of sleep research for over a decade. The emphasis in much of the book is on his own sleep research findings and he concludes by advancing yet one more theory concerning the nature of sleep. This latter is contained within the now generally accepted proposition that sleep has a restorative and reprogramming function. In contrast to some others, Hartmann's view is that the former is associated with slow wave sleep wherein synthesis of protein, RNA and other macromolecules crucial to cerebral function occurs, while the latter process is related to paradoxical or D sleep which follows on slow wave sleep and within which reconstruction of memory at the synaptic level can then occur.

Hartmann builds up his case systematically in the early chapters. Other theories are given brief and initial attention before a series of chapters within the rump of the book is given over to the various experimental approaches that can be made. Sleep deprivation studies are presented as having proved to be of limited heuristic value. Consideration is given to his own investigations of personality differences between long and short sleepers, and also to the clinical correlates of variable sleep which include behavioural, affective, nutritional and occupational items. Some physiological and chemical accompaniments of the various sleep stages are described as are also the ways in which their manipulation can affect sleep in animal studies and the human. A brief but interesting chapter on the different kinds of tiredness and a final one in this section concerning the nature of dreaming serve to remind the reader of the author's firm clinical roots.

The final chapter of the book concerns the integration of his theory of sleep into a more extensive one concerning the nature of the mind and he outlines the possible chemical bases of a variety of psychological mechanisms. Although speculative, it also reflects an important attempt to mobilise psychoanalytic concepts in physiochemical terms in a way which opens up the prospect of experimentation.

For all its chauvinism this is an attractive monograph in which the author, from a position of wide experience in the field of sleep research, has come clean to stoutly defend his holistic and multi-faceted approach and the need for it at this stage in our attempt to understand the chemistry of mind.

The style in which the references are set out (placed at the bottom of each page as well as in an alphabetical list at the end of the book) also makes for easy reading.

A. H. Crisp

Text on bacteria

Fundamental Principles of Bacteriology. By A. J. Salle. Pp. x+1094. (McGraw Hill: New York and London, May 1973.) £8.85.

This book is intended for "introductory majors courses in microbiology or bacteriology". But although there are chapters on yeasts, moulds, bacterial viruses and viral diseases of man, it cannot be regarded as a satisfactory microbiology text because protozoa and algae are scarcely mentioned in their own right and because, in the chapters on various aspects of the environment, microorganisms other than bacteria are more or less completely ignored. The short chapter on associations of bacteria does not compensate for these shortcomings and the book must therefore be judged as a bacteriology text.

In the preface the author states that he "attempts to include only sound fundamental material" and that he places emphasis "on the use of chemistry for a clearer understanding of the composition of bacteria and the reactions they produce". The extent to which these aims are achieved varies, of course, but in some chapters there are striking differences in the treatment of comparable topics. For example, the composition and chemistry of the bacterial cell wall are inadequately treated. There is no mention of teichoic acids although the existence of these polymers is acknowledged in the previous edition. Does the author now doubt the soundness of the work on their composition and structure? In contrast, immediately following the section on the cell wall there is a comparatively full and satisfactory treatment of flagella.

Although the book has many illustrations of chemical structures and equations for reactions, often these do not add very much to the student's understanding of the processes in which they take part. Perhaps the most striking instance is in the chapter on enzymes, where there is a 30-page incomplete list of bacterial enzymes "to show how enzymes are named and classified". This is somewhat extravagant if space when many other topics could, with advantage, have been dealt with more fully.

In many instances archaic nomenclature is used. For example, although it is true that some bacteriologists are extremely conservative in the names they use for carbohydrates, surely nobody now uses 'levulose' (*sic*) in preference to 'fructose' these days, and even if they do it must be confusing for any student to find such inconsistent usage as ". . . sucrase hydrolyzes sucrose to glucose and levulose," (page 354). Another criticism is that some at least of the reading lists are not very well chosen.

The index is inadequate and the layout of the print on the page is irritating in that although there are large outer margins the print approaches the bottom of the page so closely as to appear to be in danger of falling off!

It is remarkable that although the first edition appeared in 1939 most of the one thousand or so pages of this the, seventh edition, are still by the original author. Collaborators are responsible for only four of the thirty-one chapters—some eighty-nine pages. It would perhaps have been better had more authors been involved, for clearly it is beyond the capabilities of any one person to be sufficiently up to date in the many different fields that are covered by this book to be able to extract and present the essential information from each area within the time scale required in the preparation of a new edition.

Of course there is a lot of sound, thoroughly well presented material but deficiencies and distortions of relative importance prevent it being a serious contender for selection as a text for an undergraduate course. Perhaps the nicest way to summarise is to adapt the comment made by one British ex-politician about a recently deceased ex-colleague, and say that it is not fundamentally a bad book.

R. C. W. Berkeley