by most undergraduates unlikely and possibly by many postgraduate workers too. Words like "electronation" (for cathodic reduction) irritate but neither this, nor our other criticisms, should mask the fact that the authors have produced the most comprehensive theoretical text so far, quite apart from their thesis that electrochemistry should be regarded as a new interdisciplinary subject. The two volumes are a must for any university/research library and those individuals who might be able to have their own copies should be agreeably satisfied with their purchase.

R. F. PHILLIPS
N. A. HAMPSON

Learning in Bed

Learning and Sleep. By F. Rubin. Pp. xi+138. (John Wright and Sons: Bristol, June 1971.) £1.75.

If one mentions "sleep learning" to an academic psychologist one is likely to meet the same sort of defensive disbelief elicited by ESP. Fifteen years ago Simon and Emmons established that retention of material presented to a sleeping person is negligible unless he is in only very light sleep. Since then, outside the Soviet Union and Eastern Europe, the idea of sleep learning has been treated with scepticism, and criticism of studies has almost entirely been centred on electro-encephalographic evaluation of whether subjects were "really asleep". The baby has been thrown away with the bathwater: the idea that people might be able to learn in bed, at times when they are not soundly asleep, has been almost entirely ignored by professional psychologists.

This book therefore may serve an excellent purpose, bringing to the attention of those involved in teaching language courses, for example, the possibility of facilitating learning while we are in bed and not yet sound asleep. The opening chapters dispel misconceptions many people have about hypnopædia (the term the author prefers). No wild claims of using all eight hours of sleep are made: learning is restricted to a period immediately after retiring and shortly before rising in the morning. The author lays great stress on the fact that here is no quick, easy short cut to knowledge. He discusses at length Soviet and Czech experiments (chiefly in language tuition), which present words or phrases, with their mother-tongue equivalents, to highly motivated students who simultaneously receive daytime tuition in the language. The crucial point is that the presentation of material during the drowsy state can facilitate learning, in properly structured courses. The experiments he describes have often not been rigor-

ously designed: only three experiments with control groups are reported; nevertheless, the theory and evidence are sufficient to warrant practical tests of the scope and usefulness of hypnopædia in the West.

A paperback aimed at the popular market would seem a good way of putting these points across: a pity therefore the book is priced so high. There are other annoying things, such as a pair of tables describing sleep stages which are blatantly inconsistent (pages 19 and 21). This might not worry the casual reader, but there are more infuriating points: at times the author hardly makes sense (page 39, for example), and he is fond of quoting and re quoting references, as if to impress the reader. The organization of the book is particularly frustrating. The fourth chapter is a study by the author which belongs with the other experiments discussed at the end of the book. Why does he proceed to practical details of which tape recorders to use and how to intone lessons in the fifth chapter only to return to the experimental evidence that sleep learning really works in the eighth chapter?

In spite of these serious faults I would still recommend this book to those not prone to irritability, who want a fresh look at a subject neglected by "serious" psychologists.

HUGH FIRTH

Underwater Acoustics

Underwater Acoustics. Edited by R. W. M. Stephens. Pp. vii+269. (Wiley Interscience: London and New York, December 1970.) £6.75.

THIS book comprises eight articles on various aspects of underwater acoustics, which are based on a series of lectures given at Imperial College, London, in 1967. The contributors are either physicists or engineers who are actively engaged in research in the different specialist topics presented in the book.

The purpose of the introductory chapter by the editor is to provide the reader with background information on the sea as an acoustic medium. In thus setting the scene for the specialist contributions that follow on topics such as sound velocity, sound attenuation, noise, reverberation and cavitation are briefly reviewed.

The first specialist chapter is a mathematical study of the propagation of acoustic waves underwater, when the effects of the medium boundaries and the medium's velocity profile are included. The limitations of solutions by ray theory methods in these circumstances are discussed. The approach favoured by the author is the method of normal modes which arise from the solution of the wave equation in cylindrical co-ordinates with the appropriate

boundary conditions applied. The general complex solutions obtained are presented and discussed in some detail. Space is also devoted to the "not so spherical cow", that is the effects on the solutions when factors such as the "real" sea surface and bottom cause departure from the mathematical model analysed. The sea surface is in general nonspecular in its behaviour, and so the next chapter, which is an authoritative review of the back and specular scattering of acoustic waves from the sea surface, follows quite naturally. The discussion involves a fair degree of mathematical content, the scattering theory being developed from the Helmholtz-Kirchhoff integral. Frequent comparisons are made between theory and experimental results. A comprehensive reference list is also provided.

The fourth chapter is basically a review of the sonar equation and some pertinent aspects of signal processing in relation to acoustic exploration. In particular the discussion is based on the recognition differential and noise terms in the equation. Factors such as detection threshold, processing gain and visual integration are briefly examined. A fairly detailed review on background noise is presented which includes such aspects as reverberation, self noise, cavitation noise and ambient noise. The next chapter may be regarded as based on the target strength term in the sonar equation. It is essentially a detailed and lengthy review of experimental results associated with the echoes from simple geometrical objects and from more complex objects, in particular—fish. The information presented is extensive and the topics covered too numerous to detail here.

Non-linear acoustics form the subject of the sixth chapter. The emphasis is on the basic physical mechanism behind the non-linear effects within the range of validity of perturbation theory. A brief discussion of some of the applications of non-linear effects in underwater acoustics is also included. The next chapter is a review of underwater instrumentation. Subjects briefly discussed include transduction, telemetry, wave measurement and acoustic navigation systems. The final chapter is concerned with the audio communication between free divers. Physiological factors, such as hearing and word formation are discussed in addition to a number of the technical problems.

Although an attempt is made to retain a theme throughout the book, probably because of the diverse authorship, the book in general is a mixture. Consequently it is difficult to see for whom the book is intended. A number of the chapters are suitable for the more general reader but the remainder are specifically aimed at the research worker.

B. V. SMITH