

discussion of wave-packet scattering and of the three-body problem. There is an excellent appendix which covers basic formulae of angular momentum theory and functions required in the analysis of potential scattering. There is also an unusually up to date and well chosen list of references.

The range of material included is wide. Some of the topics, such as an elementary treatment of the deuteron and the introduction to the shell model, would normally be included in an undergraduate course in Britain, but the general level is that of an advanced postgraduate course and much of the material will be of value to experienced research workers in the field. For some topics, which depend on very advanced or unfamiliar aspects of quantum mechanics, a detailed step by step derivation of the required results is given. This procedure may cause the casual reader to lose touch with the main theme, but it should be helpful to those who want to know exactly how a result is derived or how a calculation is carried out. In fact, the author has succeeded admirably in his attempt to explain how each part of the theory is related to the central theme and how the relevant calculations are done. The reader may, however, be left still wondering why nuclear theory has developed in a particular way and why the results take a particular form.

DAPHNE F. JACKSON

## LABORATORY PHYSICS

### Practical Physics

By G. L. Squires. Pp. x + 224. (McGraw-Hill: Maidenhead, 1968.) 48s.

THIS book is clearly intended to produce in the undergraduate student a proper and critical appreciation of a laboratory physics course of the traditional type. Because it stands a good chance of success (and has in fact been found to achieve it), it is a valuable asset in the administration of such a course. The book does not prescribe an actual course, although it does describe a certain number of experiments as examples to illustrate particular principles of experimentation of fairly general application. It does not give much information, even of a general sort, about the design and operation of experimental apparatus. There is a good deal of information about random errors and the statistical handling of experimental results; indeed, it is my opinion that undergraduates fall with too much avidity on the statistical analysis of errors because they think to see a way of substituting obedience to mathematical prescription for the necessity of thought, and I feel that the book ought to warn more stridently against the misapplication of the assumption of random error. There are well placed warnings against arithmetical error, and good advice (which might again be stronger) in favour of well-tabulated and self-checking systems of calculation. There is helpful advice on the planning and construction of a scientific paper, and a useful list of reference books as well as a more local set of references on units and constants, on error distributions, and on simple least-square formulae.

H. J. J. BRADDICK

## AROMATICITY

### Aromatic Character and Aromaticity

By G. M. Badger. Pp. viii + 133. (Cambridge University Press: London, January 1969.) 35s, \$6 boards; 12s paper.

THIS is one of a series of books intended for final year honours chemistry undergraduates and graduates begin-

ning advanced courses. Its subject has interested chemists for a long time, not least because of the growing understanding that aromaticity cannot adequately be defined in terms of chemical reactivity. With this difficulty in view, the first chapter leads up to a definition of aromaticity based on the inclusion of all the  $\pi$ -electrons from all the annular atoms of a cyclic structure in bonding molecular orbitals. This definition in terms of electronic structure is, as the author points out, the main object of the book. The need to define aromaticity at all may be questioned by some, but undergraduates are inclined to suffer frustration when exposed to vague concepts which more experienced postgraduates take for granted. It may also be said that the ability of a compound to sustain an induced ring current is a sufficient requisite for aromaticity. Nevertheless, the author's attempt to define aromaticity simply, and in terms of valence, has obvious attractions to the chemist.

The application of molecular orbital and valence bond theories to aromatic compounds receives straightforward, if somewhat uncritical, attention. Though this is desirable for undergraduate readers, it is less so for graduates who might wish to develop more theoretical interests. For instance, the pitfalls apparent in the simple Hückel molecular orbital treatment of non-alternant hydrocarbons and rings containing heteroatoms, the uses of improved Hückel models and the self-consistent field approach, might have been briefly mentioned. The applicability of the rules of Hückel and Craig does, however, receive adequate attention and, because an outstanding quality of the book is its simple approach, inclusion of more theoretical material might have made it less readable. In the second chapter, there follows a discussion of those aspects of bond lengths, resonance energies, electron absorption spectra and induced ring currents peculiar to aromatic molecules and ions. The third chapter contains a systematic survey of non-benzenoid hydrocarbons containing 2, 4, 6, 8, 10, etc.,  $\pi$ -electrons, including the interesting cases of [16], [18] and [30] annulenes. The final chapter completes the survey with more complex systems such as the equivocal case of fulvene, the metallo-cenes and polycyclic systems. Almost all systems which are generally considered to be aromatic are included, but there is no mention of either antiaromaticity or homoaromaticity. This is a pity, because these derivative terms represent areas of growing and considerable interest.

Altogether, however, the impression conveyed is favourable, largely because the book is so readable. None but the salient facts are included which makes for a short text, and yet the subject appears to be developed without haste. The book should prove useful to undergraduates and stimulating to any chemist who is seeking either an introduction to this subject or reading material outside his own field of interest. The price of the paperback copy is remarkably low and is well within the means of undergraduates.

R. E. BUSBY

## EARTHQUAKE PREDICTION

### The Great Alaska Earthquake of 1964

Part A: Hydrology. Part B: Portfolio of 7 Charts. By the Committee on the Alaska Earthquake of the Division of Earth Sciences, National Research Council. Pp. (Part A) xvii + 441. (National Academy of Sciences—National Research Council: Washington DC, 1968.) \$19.75.

THE consequences of an earthquake are as many and varied as the causes are few. A really major earthquake like the Alaska earthquake of 1964 occurs very roughly once every four years somewhere in the Pacific region, and already some seismologists are expressing surprise that the