Annual Review of Nuclear Science

Volume 13. Edited by Emilio Segre. Pp. vi+590. (Palo Alto: Annual Reviews, Inc., 1963.) 8.50 dollars.

THE mixture as before comes from Annual Reviews; one dozen assorted articles on various aspects of nuclear science. No one will want to read them all, but each will be interesting and useful to many. This kind of review tends to remain a standard reference for several years.

In the field of nuclear reactions, Glendenning discusses stripping at considerable length, while Stelson and McGowan survey Coulomb excitation more briefly. In high-energy particle physics, Puppi and Dalitz deal with the pionic and strange-particle resonances, respectively. As usually happens with such reviews, several new particles have appeared while they were in the press, but Dalitz has partly insured against this risk by discussing the predicted Ω^-. The surprise particle of two years ago is covered by Feinberg and Lederman, in a paper on the muon and the muon neutrino.

There are two correlated papers on the slowing-down of charged particles in matter; Fano deals with protons, α-particles and mesons, while Northcliffe takes the rather different case of heavy ions. Cumming contributes a review of data and techniques used for monitoring high-energy proton beams. The automatic analysis of bubble chamber data is a new technology; Rosenfeld and Humphrey tell the inside story, full of evocative code-names—*Franckenstein* is a machine, *Quest* and *Fake* are computer programmes.

Finally, there are three shortish surveys representing some other sciences in the nuclear field. Sayre summarizes the methods and uses of activation analysis, Björnerstedt and Edvarson describe some questions needing further research in the physics, chemistry and meteorology of fall-out, and Hutchinson writes about the effects of radiation on biological macromolecules.

On the whole, these reviews are meant for serious students and research workers in the subjects concerned, but several of the shorter ones will interest the casual onlooker who simply wants to widen his horizons. This volume is a worthy continuation of a useful series.

R. J. N. Phillips

Atomic Structure and Chemical Bonding

A Non-Mathematical Introduction. By Fritz Seel. Translated from the Fourth German edition and revised by N. N. Greenwood and H. P. Stadler. (Methuen's Monographs on Chemical Subjects.) Pp. vii+112. (London: Methuen and Co., Ltd.; New York: John Wiley and Sons, Inc., 1963.) 15*s*.

THE translation of Prof. Seel's *Atombau und Chemische Bindung* by Prof. Greenwood and Dr. Stadler makes readily available to English students a monograph which has proved very popular in Germany. It provides an introductory treatment in non-mathematical terms of the theory of chemical bonding, being concerned with the development of principles underlying the whole of chemistry without arbitrary sub-division. Undoubtedly students will appreciate the clear synoptic view of the subject which it develops clearly and concisely. Not only are the more conventional aspects of bonding theory introduced descriptively but these ideas are also very widely applied. Having developed the theory underlying the formation of molecules and crystals the author provides a discussion, supported by pictorial models, of material ranging from stereochemistry and chemical reactivity, over intermetallic compounds and electrical conduction to the strength of materials and the elasticity of rubber. This coverage in a small book is achieved only as the result of a very concise style of writing. In places the material is condensed to the point of terseness, and a student will probably gain little here, if this is his first encounter with the ideas, although he might well find it useful in providing perspective in the area after making a more detailed investigation.

Some parts of the book can be criticized for over-simplification. The directions of chemical processes are discussed without reference to entropy changes and in one place relative rates of two reactions are accounted for by writing seven versus six resonance structures for the transition state. Ideas are frequently introduced rather loosely: "The electron in each cell traces out a particular pattern or *orbital* . . ." serves to define an orbital; transition state is introduced by referring to "the energy level of the *transition state*".

More seriously, it seems a pity that some feeling for the relative strengths of chemical bonds is not developed. The book is weak generally on energetics; there is little on lattice energies, almost nothing on solvation energies and bond energies are not mentioned.

The great merit of the book is the way in which it relates bonding theory to chemistry at a simple descriptive level. It can confidently be recommended as a stimulating introduction to the subject.

D. J. Millen

Introduction to the Constructive Theory of Functions

By Prof. John Todd. (International Series of Numerical Mathematics, Vol. 1.) Pp. 127. (Baslo and Stuttgart: Birkhäuser Verlag, 1963.) 27.50 Sw. francs.

THE constructive theory of functions deals with approximations to a given function in terms of simple elements, such as polynomial approximation to a continuous function in a basic interval, or approximation to a periodic continuous function by trigonometric polynomials. It is, therefore, a well-defined field of mathematical analysis, which may serve as a theoretical basis to much recent work on numerical methods.

Weierstrass's fundamental theorem, that a polynomial can be found which will not differ from a given continuous function over a finite interval by more than a prescribed ε, leads us at once to ask what may be meant by a 'best' polynomial approximation, and how, when defined, it may be found. Here the Chebyshev polynomials which, of all polynomials in (–1, 1) with leading coefficient unity, deviate least from zero become relevant, and this book gives a very concise but reasonably comprehensive table of the main formal properties of these and of other orthogonal polynomials arising from a suitable weighting of the mean square error. The Bernoulli polynomials are discussed so far as is needed for dealing with the Euler–Maclaurin summation formula. A brief chapter on interpolation stresses, by means of exercises, the simplification, due to A. C. Aitken, which reduces n-point interpolation to successive linear interpolations. The concept of 'best' approximation is generalized by the use of function spaces, enabling a discussion of existence and uniqueness to be given in economical form. Finally, numerical integration is briefly developed on a Gaussian basis.

The text, apart from the solutions to the exercises, takes up only ninety pages, so the large amount of ground covered necessitates a terse exposition. The author demands full co-operation from the reader, but shows remarkable skill in emphasizing the key-points of an argument, so that the conscientious reader should never have any difficulty in filling in details. There are about 100 exercises, with solutions; some develop more fully matters which are briefly sketched in the main text, others arise fairly from the text but seldom degenerate into points of routine drill. Obviously much care has gone into the construction of these problems, and a young student could scarcely fail to find his curiosity strongly stimulated. The book reads as if the author had thoroughly enjoyed writing it, which should encourage many students to enjoy reading it. The new series of texts on numerical mathematics is off to a flying start.

T. A. A. Broadbent