BOOK REVIEWS

SCHOOL PHYSICS

Physical Science

A Study of Matter and Energy. By Verne H. Booth. Second edition. Pp. xvi+742. (New York: The Macmillan Company; London: Collier-Macmillan, Ltd., 1967.) 70*s*.

IF the Schools Council has its way with the curriculum of the sixth form and reduces the number of subjects to be studied and externally examined to two, students entering the science and technology departments of colleges and universities might well have followed a course of the type which Dr Booth has devised for "non-science majors in colleges". Such a course is very different both in degree and in kind from those now followed in sixth forms and also from those now being tested by the "A" level teams of the Nuffield Science Teaching Project.

This American course exhibits a considerable and welcome breadth, even though it is limited to a study of matter and energy. Its design is well revealed by the sequence of section headings: the solar system; force and motion; molecules and energy; the electrical nature of matter; atomic structure and chemical combination; matter and energy in the study of the Earth; the energy within nuclei. Within these sections, the treatment is largely historical. For example, the first sections trace the growth of the theories of planetary astronomy from the early days to the time of Newton, interpolating a chapter on simple mathematical ideas and symbolism (ratio, proportion, graphical representation, vectors but not the calculus). Only after the simple kinetic model of an ideal gas has been considered is any aspect of chemistry treated. This is a familiar historical unfolding of the development of the atomic hypothesis from Boyle to Mendelyeev. Subsequent chemistry includes a lengthy treatment of the Bohr atom with little of later developments, and a descriptive and very brief chapter on carbon chemistry. Indeed, a somewhat critical chemist who examined the book was convinced that it must have been written by a physicist; on the other hand, a physicist was especially impressed by the section on the Earth sciences.

In a course of this nature, omissions are inevitable and must be welcomed. The debate must concern the criteria for inclusion and the author would seem to have had the question "What must I include?" in mind rather than the desperate "What dare I leave out?". Designers of new courses which the coming revolution in the sixth form will enforce would do well to follow his example in this respect. But it is to be hoped that no course developed on this side of the Atlantic would carry so little evidence that laboratory work by the student is an essential part of education in science. E. J. WENHAM

MODERN IDEAS IN CALCULUS

Theoretical Analysis

By Lester J. Heider and James E. Simpson. (Saunders Mathematics Books.) Pp. xii+379. (Philadelphia and London: W. B. Saunders Company, 1967.) 59*s*. 6*d*.

THE Committee on the Undergraduate Program in Mathematics (USA) has recommended a course in calculus which shall emphasize the logical structure and the nature of mathematical proof. The authors of the present text, while attempting to meet this requirement, are careful to explain that their book does not replace standard texts in advanced calculus, for skill in technique and applications must still be acquired; overemphasis of abstract concepts may reduce the average undergraduate to mathematical sterility. The reader is expected to have had at least a good first course in calculus.

The underlying notion is that of functional analysis, in metric or normed spaces. Thus the first six chapters lead to the Riemann and Riemann–Stieltjes integrals, as providing an ordered linear topological space with a norm (the integral) determining its topology. But this space is not complete, and the next step is to embed this space in a complete space by means of the Lebesgue integral. From the L^2 space, Hilbert space is easily reached in a chapter which goes as far as the famous functional extension theorem of Hahn and Banach. There is a short chapter on multiple integrals, and a final chapter tracing connexions with classical calculus: orthogonal polynomials, the Fredholm integral equation, the spectrum of a self-adjoint operator.

This is a very stimulating volume; but stimulants must be employed with care, and an external motivation might have to be strongly urged to save the weaker students from a hangover. The honours undergraduate interested in pure mathematics should be able to digest most of the book readily enough, especially as the discussions in the earlier chapters are taken quite slowly and in full detail. The authors also hope that teachers of mathematics in schools may find help here in bringing their knowledge up to date. T. A. A. BROADBENT

ELECTRON DIFFRACTION

Interpretation of Electron Diffraction Patterns

By K. W. Andrews, D. J. Dyson and S. R. Keown. Pp. xi+188+5 plates. (London: Hilger and Watts, Ltd., 1967.) 105*s*. net.

THIS book is intended for those who observe high energy electron diffraction patterns, particularly in a transmission electron microscope.

The first section contains sixty-three pages devoted to the theory and interpretation of electron diffraction patterns from crystalline materials. When discussing the determination of unknown crystal structures the authors only consider numerical methods and make no reference to Bunn charts. Moiré fringes are mentioned but are not explained. This subject is of sufficient importance to merit detailed consideration. Alternatively a reference should have been made to a suitable book such as that by Hirsch *et al.*[1]. The subject matter of this section is not always presented in a manner which would be readily intelligible to a beginner; for example, Laue zones and reciprocal lattice streaks are discussed before the intensity formula is given from which such effects may be deduced.

The second section contains seventy-seven pages of well presented information about plane spacings, interplanar and interzonal angles, angles required for the construction of stereographic projections and standard diffraction patterns with and without double diffraction. The information applies to tetragonal, hexagonal, rhombohedral and cubic crystals. Allowed diffraction maxima are listed for the various cubic lattices (primitive, b.c.c. and so on) and many stereographic projections are given. These illustrate, among other things, twinning in cubic crystals and the various inter-relations between lattices in martensitic transformations. A table of electron scattering factors is not given.

The third section contains information of the type given in the previous section, but it applies to specific materials such as metals, metallic carbides and intermetallic compounds. The relation between cementite and ferrite is considered. The book, which concludes with a description