and difficult. For that reason they must be clearly stated and not submerged in detail. Here the book fails badly, as can be instanced by its treatment of the Schrödinger equation. The usual Hamiltonian for a single particle is given on page 396 as a special case of the classical Hamiltonian in generalized co-ordinates, which in this particular form, that is $H = T(p_1,p_2 \ldots) + V(q_1,q_2 \ldots)$, has not been justified and does not appear in the chapter on classical mechanics. The Schrödinger equation then follows by means of a fundamental postulate regarding operators, which is relegated to a footnote. On page 418 we then have the Schrödinger equation in spherical polar co-ordinates, without any discussion as to how the kinetic energy operator is now to be expressed. The time-dependent Schrödinger equation is already given on page 396, but not used until 210 pages later, when no reference back is given. This account gives a fair impression of the difficulties a reader must face when trying to extract principles from this book.

Where the book scores is in its detailed account of experiments. Thus five pages are devoted to J. J. Thomson's original experiment on positive rays, and this is followed by a description of four different mass spectrometers. At times, mathematical intricacies are treated with similar thoroughness, but at others, for example in the account of Rutherford scattering, crucial formulae are merely stated. The examples, of which there are only twenty-four for the whole book, are designed to increase mathematical dexterity rather than to promote physical understanding.

This book can be used with profit as a work of reference for detailed points, for there is much in it and, as far as I have tested it, all of it is accurate. But as an account designed to stimulate interest in and provide an understanding of the great revolution in physics that took place in the first thirty years of this century, it fails utterly. The blurb states that the book "is directly relevant to university courses in modern physics". In view of the type of examination questions that are set all too frequently on this subject in this country, this may unfortunately be true. L. R. B. ELTON

ELECTRONS FOR ENGINEERS

Electrons, Neutrons and Protons in Engineering

By J. R. Eaton. (International Series of Monographs on Interdisciplinary and Advanced Topics in Science and Engineering, Vol. 2.) Pp. xvii + 541. (Oxford, London and New York: Pergamon Press, Ltd., 1966.) 105*s*. net.

THE title of this book is misleading in giving little idea of the contents. The book sets out to give the physical basis for the properties of matter and materials in terms of classical and modern theory at a level comprehensible to engineers. While a rigorous and admirable background to the subject is given in terms resembling the treatment given to pure physics under titles such as "Properties of Matter", the follow-up which uses the physical principles described to explain real properties of materials is in many places extremely patchy.

The general discussion of mechanical properties and structure of solids is given insufficient space and the use of crystallographic terms is far from rigorous. In particular the discussion of polycrystalline materials is naive and generally incorrect.

The chapter on surfaces is generally good, but why are one and a half pages given to the most important topic of oxidation and corrosion, while six are given to electron emission from metals? A number of things are covered twice; for instance, in the chapter on high energy particles and again in the chapter on nuclear fission. More than one-fifth of the book is devoted to nuclear engineering.

The author admits that this book arises out of a course given to his students, and presumably to these students it is a most valuable source book. Further, the author's field is electrical and nuclear engineering and the sections of this book dealing with electrical and nuclear effects are excellent. For these sections I would recommend this book as a reference for students in materials science and engineering, but would be loath to recommend them purchasing it bearing in mind the high price and the lack of balance in the rest of the book. B. RALPH

GRAND OLD MEN

Sources of Quantum Mechanics

Edited with a historical introduction by B. L. van der Waerden. Pp. vii + 430. (Amsterdam: North-Holland Publishing Co., 1967.) 50 guilders; 100*s*.

FOR many people this collection of papers from the origin of quantum mechanics will have much the same value as a reprinting of Mark Twain or Jules Verne—a chance to read again or even for the first time (and in English) heroic tales now old enough to be legends. The notion that the critical papers in quantum mechanics should be collected together seems originally to have been due to Professor Max Born, but the selection has been made by Professor B. L. van der Waerden, who has also been responsible for the historical introduction (and presumably for the occasional whimsy in translation). Like the volumes of memoirs which are now beginning to appear, this collection will be an important tool for those who would reconstruct what happened in physics between the appearance of Planck's first quantum theory at the end of 1900 and the sweeping original statements of the quantum theory which were being used, not just proclaimed, three decades later.

Van der Waerden has done his best to help, not least of all by asking some of the participants in the drama to spell out the reasons for some of the more surprising things they wrote. The result is rewarding in a number of ways. In one of these informal comments, for example, Heisenberg makes it plain how he and his contemporaries were convinced, in the middle of 1925, that "something in the atom must vibrate with the right frequency" if the Einstein–Bohr relationship between frequency and energy increment were to be satisfied, and how Slater's talk of virtual oscillators (*Nature*, 113, 307; 1924) helped them to this view. (Many readers will be surprised to find that even though the papers are all translated into English, many of the informal comments by their authors are left in German.) The comments are also revealing of the people who took part. Slater records (in 1964) that he was persuaded by Kramers and Bohr "quite against my better judgment" that in his joint paper with them (*Phil. Mag.*, 47, 785; 1924), the central doctrine of the virtual radiation field should be clouded by a woolly discussion of the statistical conservation of energy and momentum in the radiation field. And there is Dirac's marvellously laconic description of how he came to generalize Heisenberg's first statement of quantum kinematics (*Zeits. Phys.*, 33, 879; 1925). "The first I heard of Heisenberg's new ideas was in early September, when R. H. Fowler gave me the proof sheets of Heisenberg's paper. At first I could not make much of it, but after about two weeks I saw that it provided the key to the problem of quantum mechanics. I proceeded to work it out by myself".

In making his selection, van der Waerden has been admirably tough-minded. Planck's first paper is not included, even for sentimental reasons. On the other hand, Kramers gets the showing he deserves for feeling his way to a quantum equivalent of the classical dispersion relations, and Ladenburg is singled out for his confident use of the classical formula for the strength of