

lenses are treated, but not by the method of principal points; (ii) the potential energy of an electrostatic system is worked out for two conductors, but not for many; (iii) a formula for the bending of a beam is stated without proof; (iv) it is assumed that the gravitational attraction of the earth for all bodies near or far acts as if the mass of the earth were all concentrated at its centre. Electromagnetic waves receive scant attention. Yet in other directions the book goes far, treating, for example, the gyroscope, the mass-spectrograph, the three-colour analysis of vision, and the triode-amplifier; but not the triode-generator. The reviewer is left wondering to what extent syllabuses in Britain and the United States are determined by scientific or social necessity, and to what extent by academic habit.

The outstanding merit of the book resides in its illustrations. There are 584 line diagrams in the text. In addition, there are 64 pages, called plates, showing photographs accompanied by descriptions. Many of these photographs are taken from cinematograph records so as to exhibit the successive phases of lecture-experiments. From these sequences the student can obtain a much more vivid impression of what actually occurred than he could from a single line diagram; but, to gain this advantage, he will probably have to make an extra effort; for the photographs inevitably show many features that are not essential to the principle of the experiment and which must be sorted out mentally. Also some essential marks are almost, or quite, invisible in the print, notably the clock-hand in several dynamical experiments. Perhaps a bright hand on a black face would have photographed better. The defect is, however, repaired by printing the clock-readings. Many of the plates are superb.

The text flows along interestingly. The discoverers, of many nationalities, are mentioned with their dates, and with allusion to the more important controversies. There are exercises for the student both in calculation and in thinking out what would happen if the experimental conditions were varied. Thus the book affords that training in method and criticism the absence of which was lamented in a recent review ("Shortened Physics", *NATURE*, July 3, p. 7). But, with these merits, the work of Lemon and Ference could not be short. It weighs 2.3 kgm.; and inquiry of the English publishers elicits a provisional price of 42s.

The descriptive text is interspersed with mathematical proofs of the usual kind, employing the calculus sparingly. There is an appendix of 16 pages on pure mathematics, partly an explanation, partly a summary of useful but unproved formulae.

There is an unfortunate muddle about the paraboloidal mirror. If we ignore diffraction, then all the rays from an infinitely distant point which are reflected by the mirror meet again in a common point-image, provided the object-point lies on the axis of the paraboloid, but not otherwise. As the object moves off the axis its image becomes increasingly blurred. Lemon and Ference call the image "aplanatic" (p. 482). But that is contrary to the usage of Abbe, who discovered the sine condition for aplanaticism, by which he meant the sharpness of the image both on and off the axis.

Detailed criticism must not hinder the recognition of the general excellence of this book by Profs. Lemon and Ference. It will be of particular value to any students who are unable to attend demonstration-lectures.

LEWIS F. RICHARDSON.

PETROLOGY OF IGNEOUS ROCKS

Eruptive Rocks

Their Genesis, Composition, Classification and their relation to Ore-Deposits; with a Chapter on Meteorites. By Dr. S. James Shand. Revised second edition. Pp. xvi+444+3 plates. (London: Thomas Murby and Co. Ltd.; New York: John Wiley and Sons, Inc., 1943.) 25s. net.

THIS second edition of Prof. Shand's valuable text-book has been fully revised, partly rewritten and rearranged, and enlarged by 84 pages. The sequence of chapters is much the same as in the first edition, although their contents have been to some extent redistributed, but new chapters on the order of crystallization, compatible and incompatible phases, and eruptive rock complexes, have been inserted into the petrological part of the book. The chapter on eruptive ore deposits which formed part of the first edition has been omitted.

The result of this revision and rearrangement is that what was originally a good account of the physical chemistry and origin of igneous rocks is now perhaps the best in print. However, in the chapter on temperature and pressure in the magma, there seems to be some confusion between magmatic reservoir temperatures and temperatures of intrusion or extrusion. The conclusion on magmatic temperature (p. 69), that there is no evidence that any body of deep magma ever had a temperature higher than 1170° C., and that, in many cases, the temperature may not have exceeded 870° C., may be correct in regard to intrusion or extrusion temperatures. But in view of H. H. Thomas's work on the xenoliths occurring in basaltic sills of the Loch Scridain district (Mull), the new minerals in which imply reservoir temperatures of between 1400° C. and 1250° C. before intrusion, the above conclusions cannot be maintained with regard to reservoir temperatures.

Prof. Shand's powerful strictures on the Rosenbuschian order of crystallization, and on the vague uses of the ill-defined term "magmatic differentiation", will now probably be subscribed to by the majority of petrographers.

The second half of the book deals with classification, nomenclature, and description, and in this Prof. Shand excels. Something might be said in criticism of the mode of classification, which is based, as the author says, on antipathies rather than affinities between the igneous rocks, but much more space than is here available would be needed for its adequate discussion. The classification is simple, easily understandable, easily applied, economical of names, and will thus appeal strongly to the student. Researchers, however, will turn with grateful enthusiasm to the wealth of excellent digests of recent work on igneous petrography, which are drawn from the petrographical literature of the whole world, not even excluding the Soviet Union.

The book is clearly and simply written with many exciting passages in Prof. Shand's well-known pungent, not to say pugnacious, style. The chapters are headed by apposite quotations which testify to his wide humanistic reading, and end with well-selected and unhackneyed lists of literature. Although it does not consider some important aspects of igneous rocks as, for example, their distributional and tectonic relationships, the book is, in the reviewer's opinion, by far the most complete and satisfying text now available to put into the hands of the advanced student of the subject.

G. W. TYRRELL.