Electrolytic Conductance

By Prof. Raymond M. Fuoss and Prof. Filippo Accascina. Pp. ix+279. (New York: Interscience Publishers, Inc.; London: Interscience Publishers, Ltd., 1959.) 59*s*.

THIS book deals with the theory of electrolytic conduction as developed on the basis of the Onsager equation by Fuoss and Kraus and later workers of their school. Briefly, their treatment was to introduce the Bjerrum hypothesis of the formation of ion pairs into the theory of Debye and Hückel, and to extend the treatment so as to cover non-aqueous solutions. In 1955, Fuoss and Onsager solved the theoretical problem for a model in which the ions were represented by charged spheres instead of point charges. The resulting equation involved two arbitrary constants, the limiting conductivity of the Onsager equation and the ion size. Fuoss later extended the treatment to electrolytes in which the ions are associated into ion pairs, but the equation is limited to very dilute solutions. The authors say in the preface that they do not think there is any hope of extending the theory to higher concentrations, where they think the treatment must start from fused salts, which are supposed to be diluted with non-electrolytic material.

The theory is developed in the book, the necessary mathematics being first summarized in short chapters on such matters as vectors and tensors (restricted to Gibbs's dyadics), hydrodynamics, and statistical mechanics. The static phenomena such as activity coefficients are fairly simply disposed of. The difficulty begins when conductivities are considered. The relaxation field is extended to higher terms, then binary and higher associations of ions are brought in. In general, the mathematical treatment is clearly set out, but it would be a help to the reader if it were stated at the beginning of each chapter just what was to be done in it. The book is restricted to the particular theory stated, but it contains material useful in the study of the alternative theories, which are not considered.

J. R. PARTINGTON

The Physics of Electricity and Magnetism

By Prof. William Taussig Scott. Pp. xvi+635. (New York: John Wiley and Sons, Inc.; London: Chapman and Hall, Ltd., 1959.) 70*s*. net.

ONE is conscious at the present time of the feed-back from research and discovery to the matter and methods of elementary instruction, or, more accurately perhaps, of the need for such a cycle. Physicists, for example, while complaining that the younger generation is ill-versed in the principles developed in the seventeenth and eighteenth centuries, also take exception to syllabuses and treatments that date from somewhere about the middle of the nineteenth. But it is not easy to see how to improve matters by any process of mere addition of information; substitution would be even less effective. The problem is one of integration, and the volume under review, though not elementary in standard, adopts this very refreshing approach with success.

Prof. Scott, after explaining the general ideas of charge, field, and potential in the first chapter goes on to the physics of the metallic state in the second and the behaviour of dielectrics in the third. By chapter seven, he is introducing the idea of the magnetic field in terms of the Lorentz law of force on a moving charge. The mathematical development, which is in itself ageless, is as firmly implanted in the pattern of modern physical thought as Maxwell's was in the physics of his day. The author claims that the book gives a sound logical basis for understanding the physics of electricity and magnetism, and this claim is justified. The level is about that of the honours degree.

G. R. NOAKES

A Degree Physics

By Dr. C. J. Smith. Part 5: Electricity and Magnetism. Second edition. Pp. vii+743. (London: Edward Arnold (Publishers), Ltd., 1959.) 45*s*. net.

THIS book contains what the author describes as the fundamentals of electricity and magnetism for general degree students. It can be recommended without reservation. Throughout, it shows the mark of the experienced teacher, who knows where stress should be laid and where difficulties lie for students. He pays proper tribute to the pioneers—Faraday, Curie, and so on—so that students can see how the various branches of the subject have arisen.

The M.K.S. system is not used because the author claims that it has no academic (as distinct from utilitarian) value. This is probably true; nevertheless, it is a pity that he has also rejected the idea of differentiating between the dimensions of B and H and of D and E, an offshoot of the M.K.S. approach. Thus, in discussing dimensions he has to say, for example, "if we suppress the dimensions of $\varkappa$" (p. 700) and that the equation $\mu = \mu_0 + 4\pi\chi$ is better than $\mu = 1 + 4\pi\chi$.

But this is a minor criticism in an otherwise admirable book. It is a pity that, on the grounds of expense, a chapter on electromagnetic waves could not be included; a treatment of this subject in the same vein as the rest of the book would have been invaluable.

H. LIPSON

Valency

Classical and Modern. By Dr. W. G. Palmer. Second edition. Pp. xi+244. (Cambridge: At the University Press, 1959.) 30s. net.

THE first edition of this book was published in 1944. It became deservedly popular as a good down-to-earth account of valency, with a pleasant historical flavour, and closely related to observable chemical behaviour. No less than three reprints were called for. Now Dr. Palmer has brought forward a new edition. It must be said at once that this new version preserves the admirable qualities of the older one; and the author has taken the opportunity to correct a few of the slips that had crept in. But, without extending the size of the book, he has added more information about the transition elements, the ubiquitous hydrogen bond and electron-deficient compounds. This additional material enhances the value of the book.

The author is at his best when describing, and collating, experimental results, and many of his tables of numerical data will be exceedingly valuable. But he is less confident with the more theoretical side of the field. Thus a false account of the energies of the molecular orbitals in oxygen still survives, the words 'ligand-field-theory' do not appear in the index, nor (I believe) in the text, and very little explanation is offered for the hydrogen bond. But these are minor blemishes in a useful and sensible account.

C. A. COULSON