from the type of print used, there is no real novelty. As in all books on physical chemistry, the question sooner or later must be answered: what level of mathematical equipment is it fair to take for granted? No clue is given, and a mathematical appendix to the text would greatly improve it. No use, incidentally, is made of the hyperbolic notation, in spite of its great convenience in dealing with partition functions. Inverse power functions frequently appear, though unnecessarily restricted to the integers $n=12$ and $m=6$, that is the Lennard-Jones potential. The brief summary of the activities and interests of Albert Einstein is hardly worthy of that genius. The subject is more fittingly dealt with in that celebrated mine of information published under the title of *The Born-Einstein Letters*.

Many of the anecdotal trivia, though well-intended, could be dispensed with, especially when they are as long as the particular article reproduced from the *Los Angeles Times* of 1955.

Among what can be described as major sins of omission is the complete absence of London's quantitative treatment of the heat of desorption of a molecule from a plane surface and from a hemispherical cavity.

All the diagrams have been eponymously redrawn. The copy sent to me for review purposes had no price on it and I am not beyond hoping that it may prove to be a priceless treasure to many readers.

The author, proof-readers, printers and publishers may feel justly proud of their work.

E. A. MOELWYN-HUGHES

Solid Batteries

Fast Ion Transport in Solids. Edited by W. van Gool. Pp. xvi+728. (North-Holland Publishing Company: Amsterdam and London; American Elsevier: New York, 1973.) Dfl.100.

THE key to many problems in the management of electrical energy lies in storage. For example, we would long ago have dispensed with the burning of petrol in cars if enough energy for long runs could be carried in batteries weighing about a hundredweight; the battery, again, is the most inconvenient element in the new electronic wrist-watch. For this reason, intensive research is proceeding on improving electrical batteries. One major advance would be to get rid of the liquid in batteries. If no vessel is needed, then everything can be miniaturized and new degrees of flexibility in design are possible. This book gives an account of a ten-day Summer School, on the main technological problem involved in producing a battery without liquids, namely the achievement of high ion currents in solids. The contributors were about evenly divided between universities and industrial research laboratories, with a few from user agencies such as railways, defence, space and power-generating agencies. The book slightly condenses the twenty-three tutorial and thirty-seven research papers and adds accounts of discussions after each paper and a brief conference summary by R. A. Huggins. A very creditable effort has been made to capture the essence of an intensive discussion between diverse specialists on a subject of high technological interest and to publish it quickly. It is, of course, still a book for specialists, not undergraduates, for the tutorial papers do not add up to a grounding in the subject of batteries. Instead, mathematical treatments of ion transport in solids are balanced by, and often linked solidly with, experimental studies of transport in, or the structure of, materials exhibiting fast ionic transport (structure is important because the presence of a "crystallographic tunnel" is a prerequisite of rapid ionic transport). There are only a few theoretical treatments, such as papers by R. D. Armstrong and co-authors on the requirements for fast cationic transport, R. Kikuchi on theoretical techniques in ion transport, M. Rice on a theory of superionic conduction, and B. C. H. Steele and A. D. le Claire on diffusion theory. The selection of the papers has, in general, been well planned to cover the important aspects of fast ionic transport.

An important element in determining diffusion of atoms through solids is defect structure. Several experts discuss defects superficially and the concept underlies many of the papers on transport. A deeper treatment would thus have been desirable. The same can be said for intercalation compounds, which are promising electrode materials. It is unfortunate that there are virtually no general discussions of these compounds, although there is one particular attempt to use CrO_3 intercalated in graphite as a "sink" for sodium ions. Another system, classed under "promising new materials", is a polyaniline complex with a resistivity lower than 1 ohm–cm. Perhaps the dream of an organic semiconductor, with all the advantages of cheapness, low-temperature operation and fine adjustment by side-chain modification, may soon come true, but this book gives no guidance as to the prospect.

Perhaps the most stimulating paper is that by L. Heyne, who exhibits the rare ability to use sophisticated solid-state physical concepts and data (reflectance spectra, band-gap energies, defect levels, electronic conductivity, etc.) to aid in the selection of a "good" solid electrolyte. Likewise, Milberg's paper on ion motion in glasses opened up some interesting vistas, and the article by J. W. Geus on "Transport Properties of Thin Films" was impressive in the clarity of its exposition but disappointing in that it stopped short of explaining transport through films as thoroughly as it explained surface physics.

This book is a good expression of current research thinking in ionic transport in a small range of materials and achieves a reasonable if not perfect balance between the present and the future of this field.

A. G. HOLMES-SIEDLE

Aerosols and Atmosphere

Aerosols and Atmospheric Chemistry. Edited by G. M. Hidy. (The Kendall Award Symposium Honouring Professor Milton Kerker at the Proceedings of the American Chemical Society, Los Angeles, California, March 1971.) Pp. xviii+348. (Academic Press: New York and London, November 1972.) $14.50.

THE study of aerosols is now a science in itself. Each year one sees an increasing number of papers concerned with the formation, properties, behaviour and effects of aerosols. This follows from an increased awareness of the impact of aerosols on the environment and their involvement in varying fields such as meteorology, physiology and engineering. This book is essentially a collection of thirty-one papers presenting a wide variety of studies on the physical chemistry of aerosols and their relationship with atmospheric chemistry.

The book is in three parts. The first contains twelve papers on what might be described as general aerosol science. These papers cover the production of aerosols by X rays, the formation and properties of ultrafine particles and small ions conditioned by gaseous impurities in air, and also ultrafine oxide particle preparation in flame processes. Other topics covered are nucleation theories and studies of the kinetic growth of aerosol particles. Light scattering and the measurement of aerosol particle size distributions by other methods such as the spiral centrifuge are also discussed. This part ends with an interesting paper on the description of a new technique for the study of individual aerosol particles of diameters ranging from 100 to 500 nm held stationary in a laser beam by means of time varying electrostatic fields.

The second part of the book contains six papers which are mainly concerned with the application of basic aerosol science to atmospheric phenomena. Topics covered include the formation, growth and chemical reactions of atmospheric particles, the comparison of synthetic and natural smog aerosols, and