

and Nowotny, on carbide chemistry. With other chapters on chemical vapour transport, synthesis by electrolysis of fused salts and fluorine chemistry, about two thirds of the book can be welcomed as a useful source of information to those working in or entering the field.

The remainder of the book is probably unduly specialized: preparation of single crystals of III/V semiconductors and of cadmium sulphide, preparation of ferrites, oriented eutectic crystallization and so on, together with a chapter on elementary boron which is remarkable for its complete failure to mention the curious metallic borides, of very high boron content, which so long masqueraded as the element itself. These topics are important for technology, but they overweight one facet of the subject and some of them have been repeatedly discussed in other books. One saving point is that the writers have used the opportunity to deal with the principles underlying particular problems.

The book as a whole emphasizes principles and objectives, as well as methods. The editor has managed to get his collaborators to cover the ground without much overlap or repetition—even though one diagram, of a hydrothermal bomb, does appear in two different chapters. The book is well produced—as indeed it should be, at the price.

J. S. ANDERSON

## Atmosphere

*Handbuch der Physik/Encyclopedia of Physics. Gruppe 10: Geophysik, Band 49. Teil 4. Geophysik 3/Geophysics 3. Teil 4.* Chief editor, S. Flugge. Edited by K. Rawer. Pp. vi+579. (Springer: Berlin and New York, 1972.) 158.40 DM; \$50.30.

THIS is the fourth volume of a handsomely produced series covering several aspects of solar-terrestrial phenomena. It deals with ionospheric and magnetospheric problems and, as the editor K. Rawer points out in his introductory remarks, there is some overlap not only between the first two contributions but also with some articles published in earlier volumes. This was to some extent unavoidable. Again, there has been some delay, as much as 5 years, in the publication of these articles; in a rapidly advancing subject such as this, this may be said to be a serious drawback. It by no means detracts, however, from the considerable and valuable accounts given of ionospheric and magnetospheric phenomena.

I found the first article, by Dr H. Poeverlein, on the Earth's magnetosphere particularly rewarding. There is a good and novel account of magnetodynamic theory. A section on fast

particles trapped in the geomagnetic field naturally includes some account of the radiation belts around the Earth, and discusses such problems as the source and loss of particles, their collisions and diffusion and the acceleration of trapped particles in which Alfvén's mechanism, proposed originally in a theory of magnetic storms in 1939, is cited as an example. Convective motions in the magnetosphere, the solar wind and consequential terrestrial phenomena associated with the interaction of the wind with the geomagnetic field are included—for completeness, I think—and aurorae are also discussed at some length. There is a short section, contributed by N. Fukushima, dealing with more recent work such as the polar cusps, some recent theoretical work on the geomagnetic tail and the strong coupling between magnetosphere and ionospheric currents.

Dr Hess's article on the Earth's radiation belts naturally begins with charged-particle motions in a magnetic field. The inner and outer radiation belts are discussed at considerable length and there is a valuable account of the artificial radiation belts created by exploding nuclear devices high up in the atmosphere (including the Argus—the planning for which was well under way before the discovery of the van Allen natural radiation belt—Starfish and the USSR experiments).

The general characteristics of the outer radiation belt protons,  $\alpha$ -particles and electrons are fully discussed, as are also their time variations, dependence on solar activity—including magnetic storm effects—aurorae and their associated X-ray fluxes. The article ends with a brief description of the radiation belts of other planets.

Dr Selzer's long article on rapid geomagnetic variations gives detailed definitions and discusses the various techniques of observations. Dr Selzer also considers at length the classification and morphology of the variations and, since these pulsations are usually ascribed to magnetospheric phenomena in which wave propagation plays an important part, there is naturally a theoretical section on the interpretation of the pulsations. The article includes an atlas of 69 plates showing examples of different types of observed variations including sudden commencements of storms (SSC) and so-called "pearls" or pc-1, pi-1, etc.

Finally we have a masterly article on waves and resonances in magnetoactive plasmas, written jointly by Drs V. L. Ginzburg and A. A. Ruhadze. This highly mathematical and exhaustive review of the subject deals with foundations of plasma theory, particle collisions in plasmas, waves in plasmas—including magnetoactive plasmas—the stability problem and oscillations

and waves in inhomogeneous plasmas. The approach is sometimes novel, as in dealing with the collision integral in a completely ionized gas, where the authors apply the methods of quantum mechanics rather than the classical method of collisions. In writing this article the authors have borne in mind the ultimate applications of the theory to the ionospheric and magnetospheric plasmas.

The present editors of the *Handbuch* are to be congratulated on the excellence of the volumes on geophysics which they have produced. Their inception, I believe, was due in large measure to the work and enthusiasm of the late Julius Bartels.

V. C. A. FERRARO

## Noble Metals

*Recent Advances in the Analytical Chemistry of the Noble Metals.* By F. E. Beamish and J. C. Van Loon. Pp. xvi+511. (Pergamon: Oxford and New York, March 1972.) £14.

THIS book provides information on new techniques for the isolation and determination of the noble metals. It complements and updates the earlier excellent monograph in which Professor Beamish described the classical and some modern methods. It would be difficult to identify any significant publication on the analysis of noble metals which has not been referred to and received some critical examination in these monographs.

There are eight chapters covering methods of separation, atomic absorption, neutron activation, spectrochemical, X-ray fluorescence, electrochrometric, spectrophotometric, gravimetric and titrimetric procedures. Each chapter starts with an introduction which considers the techniques available and points out advantages and disadvantages. Frequently, areas where more research would be profitable, for example direct weighing precipitates for iridium, rhodium, platinum and ruthenium are identified. The authors also point out where much more research effort has been expended than is justified, for example spectrophotometric methods for palladium. For each element the alternative procedures are discussed and some suitable procedures selected for which practical details are given fully. Then follows a comprehensive review of published methods in which the authors' critical comments and identification of significant points are of considerable value.

The section on methods of separation includes ion exchange, precipitation, chromatography, solvent extraction and fire assay. The recently introduced technique of collection of noble metals in nickel sulphide could be usefully included in later editions.