chemistry Blumenthal makes the following basic points. The valence of zirconium is four in nearly all its compounds. Zirconium tends to reach the highest coordination number that is sterically possible by the addition of ions or molecules from the environment. Zirconium never forms a simple monatomic ion but is always covalently bound. In aqueous solution this means that all zirconium compounds are complex, and an explanation is thus provided for the slow reactions frequently observed, as well as for the fact that the behavior of a zirconium-containing solution often depends on its previous history. However, it will come as a surprise to many chemists to read, "it is incorrect to associate the positive charge of zirconium-containing cations with the zirconium atom. It is rather to be associated with the oxygen atom" (page 37).

Chapter 2, on interstitial and intermetallic compounds, treats zirconium carbide on the basis of Hägg's interstitial solution theory, with no reference to Rundle's work [*Acta Cryst.* **1**, 180 (1948)], which has invalidated much of this theory while providing a foundation for further advance in this field. The facts about formation and properties are, of course, not in question here.

Hafnium is mentioned only incidentally and is treated as a heavy isotope of zirconium for the purposes of this book. There are 1786 references (not all different, however), and 1866 authors' names are indexed. A thorough job of literature searching is thus indicated for this work, which will surely be a standard in the field of zirconium chemistry for many years.

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Nouveau traité de chimie minérale. vol. 4, group II. Glucinium, magnésium, calcium, strontium, barium, radium. Paul Pascal, Ed. Masson, Paris, 1958. xxxiii + 973 pp. Illus. Cloth, F. 8500; paper, F. 7500.

A review of volumes 1 and 10 of this work appeared in *Science* of 1 March 1957 [**125**, 401 (1957)], and that of volume 3 in the 18 July 1958 issue [**128**, 138 (1958)].

According to volume 4, the originally contemplated 19 volumes of the treatise have been extended to 20 volumes. The original volume 11, which was to cover arsenic, antimony, bismuth, vanadium, niobium, tantalum, and protactinium, will cover only arsenic, antimony, and bismuth. The other four elements named will be discussed in volume 12.

In volume 4, 125 pages are devoted to beryllium (in French, glucinium), 148 to magnesium, 266 to calcium, 200 to strontium, 182 to barium, and 28 to radium. At the end of each section bibliography the cut-off date of the literature is given.

The new volume maintains the standard of excellence of the previously published volumes; this is an indication of the care that is being taken in the preparation of this modern treatise on inorganic chemistry.

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Project Satellite. Kenneth W. Gatland, Ed. British Book Center, New York, 1958. 169 pp. Illus. $5.

There are four chapters to this addition to the rapidly growing space literature. The first, entitled "From small beginnings," was written by Wernher von Braun and reviews rocket work in Germany from the late 1920's through the famous Peenemünde effort. Chapter 2, "The satellite project," by Kenneth W. Gatland, presents early thinking on the creation of artificial earth satellites, reviews a number of rocket developments, such as the Aerobee and the Viking, and discusses the American and Soviet satellite programs. The third chapter, by Harry E. Ross, is entitled "Orbital bases" and gives the engineering problems involved in creating and operating manned space stations. Ross reviews a number of designs for such space stations and discusses briefly their military and scientific value. In the fourth chapter, A. V. Cleaver discusses interplanetary flight, with some discussion of the advanced techniques that will have to be developed in order to achieve flight into space. Cleaver ventures some predictions about how long it will be before man will be able to take a trip to the moon, or out to the near planets, and suggests appreciably longer times than many others have given in their predictions.

All of the authors have had close association with, and long interest in, the fields about which they write, and they represent considerable technical experience and competence.

Von Braun's chapter is written in a fast-moving, lucid style and makes enjoyable and informative reading. Interest for the reader is greatly enhanced by von Braun's personal and effective role in the history he portrays. The remaining chapters are informative but rather pedestrian in style. The presentation is uninspired and unimaginative from a teaching point of view, but clear enough. For the general reader who has as yet done little reading on artificial satellites and space flight, the book can be recommended. The reader who has already read several books on the subject will probably find little that is new in this one.

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Man the Maker. A history of technology and engineering. R. J. Forbes. Abelard-Schuman, New York, rev. ed., 1958. 365 pp. $5.

"The average American of 1776," says R. J. Forbes (page 328), "used the help of one servant for two weeks in the year, while today he is the owner of sixty slaves." It is astonishing, in view of this statistic, how little interest the average American has shown in how this came about. It is scarcely less astonishing how few attempts have been made to tell him, at least in other than economic terms. This being the case, almost any book on the history of technology is welcome. This book, essentially a reissue of the 1950 edition, is doubly welcome, for it is the work of a leading authority.

One of the principal difficulties in writing such a book is the problem of organizing its varied subject matter. Forbes has managed this well and has produced what is probably the smoothest narrative account of this subject to date. Unlike some earlier historians he has not eased his task by the arbitrary elimination of certain sectors of technology. He has also succeeded notably in reducing the barrier of technical terminology. In short, even if this were not almost the only book in English on this subject, it would deserve recommendation.

The condensation inevitable in a book of this sort (the period 1830 to 1930 is covered in about 90 pages) can only be accomplished through drastic oversimplification. Forbes' treatment of the history of the windmill, steam engine, and telephone illustrate this. He is evidently steeped in these subjects, but condensation has squeezed most of the juice out of his account of them. Condensation may also have led to such misstatements as the reference to Bernard Palissy's *Discours* as an important book on mining and metallurgy (page 165); the inference that Smeaton's analysis of wind- and water-power machines was merely a report based on his observation of foreign practice (page 184); and the apparent confusion of dates in his descriptions of early sulfuric acid manufacture (page 220) and transatlantic steam navigation (pages 263–264). These and other questionable passages seem partly attributable to the exigencies of condensation and partly to Forbes' evident determination to be definite about essentially

nebulous questions of invention and discovery. It must be admitted that he could hardly have produced so brief a book on this subject had he done otherwise, but the reader would be wise to check elsewhere for the details of any particular technology.

The book is illustrated (although not particularly well) and indexed, and it has a good bibliography. It differs from the edition of 1950 only in the addition of ten pages at the end.

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New Books

Advances in Agronomy. vol. 10. Prepared under the auspices of the American Society of Agronomy. A. G. Norman, Ed. Academic Press, New York, 1958. 559 pp. $12.50. Contents: "Agronomic trends and problems in the Great Plains"; "Changing concepts of plant nutrient behavior and fertilizer use"; "Race 15B of wheat stem rust—what it is and what it means"; "Australian soils and their responses to fertilizers"; "Castorbeans: a new oil crop for mechanized production"; "Safflower"; "Reactions of ammonia in soils"; "New grasses and legumes for soil and water conservation"; "Role of sulfur in soil fertility"; "Corn plant population in relation to soil productivity"; "Liming."

Advances in Carbohydrate Chemistry. vol. 13. Melville L. Wolfrom, Ed. Academic Press, New York, 1958. 398 pp. $11. Contents: "Formation and cleavage of the oxygen ring in sugars"; "Lobry De Bruyn-Alberda Van Ekenstein Transformation"; "Formation reaction in carbohydrate research"; "Four-carbon saccharinic acids"; "Methyl ethers of 2-amino-2-deoxy sugars"; "Glycosyl ureides"; "Nonulosaminic acids"; "Polysaccharide hydrocolloids of commerce"; "Alkaline degradation of polysaccharides"; "Starch nitrate."

Advanced Mechanics of Fluids. D. W. Appel, P. G. Hubbard, L. Landweber, E. M. Laursen, J. S. McNown, H. Rouse, T. T. Siao, A. Toch, C. S. Yih. Hunter Rouse, Ed. Wiley, New York; Chapman & Hall, London, 1959. 458 pp. $9.75.

Anatomy and Physiology Laboratory Manual. Catherine Parker Anthony. Mosby, St. Louis, Mo., ed. 5, 1959. 320 pp. $3.50.

Biological Laboratory Data. L. J. Hale. Methuen, London; Wiley, New York, 1958. 142 pp. $2.75.

Chemical Constitution. An introduction to the theory of the chemical bond. J. A. A. Ketelaar. Elsevier, Amsterdam, ed. 2, 1958 (order from Van Nostrand, Princeton, N.J.). 456 pp. $8.95.

Cold Injury. Transactions of the Fifth Conference, 10–15 March 1957. Arctic Aeromedical Laboratory, Ladd Air Force Base, Alaska. M. Irene Ferrer, Ed. Josiah Macy, Jr. Foundation, New York, 1958. 341 pp. $5.95.

Compact Heat Exchangers. A summary of basic heat transfer and flow friction design data. W. M. Kays and A. L. London. McGraw-Hill, New York, 1958. 168 pp. $6.

Convex Surfaces. Herbert Busemann. Interscience, New York, 1958. 205 pp. $6.

Dynamics of Proliferating Tissues. Dorothy Price, Ed. Univ. of Chicago Press, Chicago, Ill., 1958. 111 pp. $3.25.

Electromagnetic Phenomena in Cosmical Physics. International Astronomical Union Symposium No. 6. Held in Stockholm, August 1956. B. Lehnert, Ed. Cambridge Univ. Press, New York, 1958. 558 pp. $10.

Elementary Practical Organic Chemistry. pt. I, "Small scale preparations"; pt. II, "Qualitative organic analysis"; pt. III, "Quantitative organic analysis." Arthur I. Vogel. Longmans, Green, New York, 1958. 918 pp. $9.75.

Elements de mathematique. vol. II, Algebre. Chapitre 8, "Modules et anneaux semi-simples." 189 pp. F. 2000.

Embryonic Nutrition. Dorothea Rudnick, Ed. Univ. of Chicago Press, Chicago, Ill., 1958. 113 pp. $3.25.

Engineering Fluid Mechanics. Charles Jaeger. Translated from the German by P. O. Wolf. St. Martin's Press, New York, 1957. 547 pp. $11.50.

Expansion Machines for Low Temperature Processes. S. C. Collins and R. L. Cannaday. Oxford Univ. Press, New York, 1958. 116 pp. Paper, $3.

The Essentials of Chemistry. R. P. Graham and L. H. Cragg. Rinehart, New York, 1959. 590 pp. $6.50.

Extensive Air Showers. William Galbraith. Academic Press, New York; Butterworths, London, 1958. 227 pp. $7.50.

Fine Particle Measurement. Size, surface, and pore volume. Clyde Orr, Jr., and J. M. Dalla Valle. Macmillan, New York, 1959. 353 pp. $10.50.

The General Science of Nature. Vincent Edward Smith. Bruce, Milwaukee, Wis., 1958. 413 pp. $7.

Génétique du vison. II. Andrée Tétry and Martial Villemin. Vigot, Paris, 1959. 215 pp. F. 2600.

Grundriss der Allgemeinen Zoologie. Alfred Kuhn. Thieme, Stuttgart, Germany, 1959. 296 pp. $4.25.

Hymenoptera of America North of Mexico. Synoptic catalog. Agriculture Monogr. No. 2, 1st Supplement. Karl V. Krombein *et al.* U.S. Department of Agriculture, Washington, 1958 (order from Supt. of Documents, GPO, Washington 25). 305 pp. $1.75.

Interference between Power Systems and Telecommunications Lines. H. R. J. Klewe. Arnold, London, 1958 (order from St. Martin's Press, New York 17). 264 pp. $12.50.

Introduction to Geophysics. Benjamin F. Howell, Jr. McGraw-Hill, New York, 1959. 410 pp. $9.

Introduction to Neutron Physics. L. F. Curtiss. Van Nostrand, Princeton, N.J., 1959. 391 pp. $9.75.

Investment in Innovation. C. F. Carter and B. R. Williams on behalf of the Science and Industry Committee. Oxford Univ. Press, New York, 1958. 178 pp. $2.40.

Irreducible Tensorial Sets. U. Fano and G. Racah. Academic Press, New York, 1959. 178 pp. $6.80.

Laboratory Instructions in Biochemistry. Israel S. Kleiner and Louis B. Dotti. Mosby, St. Louis, Mo., ed. 5, 1958. 289 pp. $3.50.

Laminated Plastics. Including high-pressure and low-pressure types and reinforced plastics. D. J. Duffin. Reinhold, New York; Chapman & Hall, London, 1958. 263 pp. $5.75.

Liquid Scintillation Counting. Proceedings of a conference held at Northwestern University, 20–22 August 1957. Carlos G. Bell, Jr., and F. Newton Hayes, Eds. Pergamon, New York and London, 1958. 303 pp. $10.

Modern Foundry Practice. E. D. Howard, Ed. Contributions by 18 specialist authors. Philosophical Library, New York, ed. 3, 1959. 464 pp. $15.

Die Muskeltätigkeit. Versuch einer biophysik des quergestreiften Muskels. Eugen Ernst. Ungarischen Akademie der Wissenschaften, Budapest, Hungary, 1958. 355 pp.

Nuclear Magnetic Resonance. Applications to organic chemistry. John D. Roberts. McGraw-Hill, New York, 1959. 126 pp. $6.

Nuclear Reactions. vol. I. P. M. Endt and M. Demeur, Eds. North-Holland, Amsterdam; Interscience, New York, 1959. 514 pp. $12.50.

Physics of Meteor Flight in the Atmosphere. Ernst J. Opik. Interscience, New York, 1958. 182 pp. Paper, $1.95; cloth, $3.85.

Polarography. In medicine, biochemistry, and pharmacy. M. Brezina and P. Zuman. Translated from the Czech by S. Wawzonek. Interscience. New York, revised English ed., 1958. 880 pp. $19.50.

The Potential Theory of Unsteady Supersonic Flow. John W. Miles. Cambridge Univ. Press, New York, 1959. 232 pp. $8.50.

Principles of Horticulture. Ervin L. Denisen. Macmillan, New York, 1958. 518 pp. $6.95.

Psychopharmacology Frontiers. Proceedings of the Psychopharmacology Symposium, Second International Congress of Psychiatry. Nathan S. Kline, Ed. Little, Brown, Boston, 1958. 556 pp. $10.

Selected Bibliographies of Hydrothermal and Magmatic Mineral Deposits. Memoir 75. John Drew Ridge. Geological Soc. of America, New York 27, 1958. 208 pp.

Soviet Economic Aid. The new aid and trade policy in underdeveloped countries. Joseph S. Berliner. Praeger, New York, 1958. 247 pp. $4.25.

Statistical Theory of Irreversible Processes. R. Eisenschitz. Oxford Univ. Press, New York, 1958. 92 pp.

Surface Phenomena in Chemistry and Biology. J. F. Danielli, K. G. A. Pankhurst, A. C. Riddiford, Eds. Pergamon Press, New York and London, 1958. 330 pp. $10.

Tables of Interatomic Distances and Configuration in Molecules and Ions. Special Publ. No. 11. L. E. Sutton, Ed. Chemical Soc., London, 1958.