

A. A. Snales, *Microbiological Techniques for Inorganic Ions* by E. E. Snell, *Instrumentation and Interactions of Beta Particles with Matter* by E. H. Müller, *Trace Element Sensitivity (comparison of Methods)* by W. W. Meinke, and *Separation, Concentration, and Contamination* by R. E. Thiers.

Each of the chapters contains a general exposition of the principles and general applicability of the particular field and, in most cases, includes material of specific interest in trace analysis.

A number of participants refer to the not too sharply defined "trace level" in terms which reflect the advances in analytical methods. "A trace," which signifies an amount just within the limit of detection, naturally will undergo changes in meaning as the sensitivity of the method improves. Currently, quantities below a microgram are considered as traces. In favorable cases, 10^{-10} to 10^{-12} g./ml. of certain elements may be determined by neutron-activation analysis, 10^{-8} - 10^{-9} g./ml. by sensitive color reactions. A thorough analysis of a sample 4.5×10^{-12} cm.³ can be obtained using X-ray micrography. Millimicrogram quantities of many simple substances can be determined to 1% by means of coulometry. The meaning of "trace level" might be sufficiently altered by the time the next trace analysis symposium convenes so that only submillimicrogram quantities would qualify.

In a work of this kind, readers are bound to be somewhat disappointed in chapters dealing with areas familiar to them. The nature of the symposium required each of the speakers to review much material that was obtainable previously. It is safe to say, however, that very few readers will be sufficiently familiar with all of the fields discussed so as not to derive benefit from this book. This reviewer can recommend it not only to those interested in the trace constituents of matter but to all who are interested in analytical chemistry. The book should provide a useful frame of reference for a stimulating course in analytical chemistry or analytical seminar.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF ARIZONA
TUCSON, ARIZ.

HENRY FREISER

Nouveau Traité de Chimie Minérale. Volume III. Groupe Ia: Rubidium-Césium-Francium. Groupe Ib: Généralités-Cuivre-Argent-Or. PAUL PASCAL, Membre de l'Institut, Professeur Honoraire à la Sorbonne. Masson et Cie., 120, Boulevard Saint-Germain, Paris 6^e, France. 1957. xii + 838 pp. 17.5×26 cm. Price, Broché 6.900 fr., Cartonne toile, 6.900 fr.

This is the third publication in a nineteen volume series. Volumes I and X have already appeared, and the series is expected to be completed by 1960. The contributors to Volume III are R. Hackspill (rubidium and cesium), M. Perey (francium), J. Isabay (copper), R. Collongues (silver) and P. Hagenmuller (gold). P. Pascal provides a brief general discussion of the elements of Group Ib.

The substantial advances in theoretical chemistry, especially in the understanding of atoms and molecules, which have come about during the last twenty years have prompted Professor Pascal and his collaborators to undertake the complete revision of the first edition of twelve volumes published in 1931. In spite of the decision to eliminate most of the discussion of industrial aspects of inorganic chemistry, the new work will be considerably larger than the original. Another notable change is the presentation of the elements in the order of the Mendeleeff Periodic Table leading to the inclusion of the coinage metals following the alkali metals in the present volume. In the previous scheme they appeared with the rare earths and mercury. Since, however, the chemistry of each element is given a more or less inde-

pendent treatment, the advantage of this modification is not apparent.

The really significant feature of the new treatise is the stated purpose of the edition—to use the modern theories of inorganic chemistry to organize and classify the details of the chemistry of the elements and their compounds. Otherwise the objective remains the same as the first treatise—to present a readable account of inorganic chemistry accompanied by a selected bibliography and to avoid the mere compilation of data.

These aims have not been uniformly achieved in Volume III. The brief authoritative chapter on francium by its discoverer, Marguerite Perey, contains forty references (fourteen of them the author's own work) which range from Mendeleeff to 1956. It is a pity that the chapter on rubidium and cesium could not have been included in a volume with potassium. (The seven pages devoted to the hydrides deal mostly with sodium and potassium hydrides.) The gradation in properties of the elements in this group is largely dependent on the progressive increase in ionic radius. The opportunity to apply this unifying principle is lost. There is essentially no discussion of the structural features of the compounds. The nomenclature employed in the chapter and indeed throughout the volume is unsystematic and inconsistent. The archaic term protoxide is used for M_2O , the formulas M_2O_4 and MO_2 are used, and the compounds are called tetroxides or peroxides. The latter name is also used for M_2O_2 , but more frequently the term dioxide is employed. No explanation is offered for the compounds M_2O_3 which are named trioxides.

In spite of this, the author succeeds in giving an interesting account. A wealth of detail is presented on methods of isolation of the elements from natural sources.

Throughout the volume one is continually impressed by the great appreciation of the authors for the historical development of the chemistry of these elements. In some instances they appear to be rather overwhelmed by it. Frequently the earlier work up to the beginning of the twentieth century is given in great detail while more recent contributions are given scant treatment. This is most noticeable in the chapter on copper where in not a few cases the researches of the last twenty years are dismissed in the text with "see also." Rarely does one find a critical evaluation in controversial issues such as the existence of cuprous hydroxide, cuprous fluoride or the polymorphism of gold. There appears to be an occasional reluctance to apply the modern ideas of ionic and molecular structure. Thus, while it is stated at the beginning of the section on trivalent gold that Au^{3+} most likely always tetra-coordinated, there is no attempt to rationalize such formulas as $NOCl-AuCl_3$, $RAuCl$, etc., on this basis. The organization of the subject matter tends to some measure to discourage the use of correlative principles. Sulfides and salts of oxyacids of sulfur are described in one section, selenides and salts of oxyacids of selenium in another. This kind of arrangement makes it relatively easy to find whatever information is available on a particular compound. It is perhaps a concession to the tendency to provide a complete reference book, but it does make comparisons of similar compounds rather awkward.

The treatise has a special appeal to the French readers since specific information about the collections of many of the provincial libraries is provided—a most thoughtful service. The publication, however, will be welcomed by all inorganic chemists throughout the world. Nowhere would be found a more readable summary of the early work on the chemistry of the elements. Should the treatment of the more recent papers in some cases be lacking, there is an excellent bibliography conveniently arranged and extending to late 1955.

The printing is excellent, the binding of good quality.

DEPARTMENT OF CHEMISTRY
UNIVERSITY OF CONNECTICUT
STORRS, CONN.

ROLAND WARD