Appendix A free use is made of colored illustrations which make the phenomena described absolutely and unmistakably clear.

In subsequent chapters are discussed: the chemical shift, its origins and some generalizations; spin–spin splittings; applications to reaction kinetics; and the effects of the presence of nuclear quadrupoles on the appearance of NMR spectra. Three appendices (The Bloch equations, a short bibliography, and 20 spectra for practice in interpretation), a name index, and a subject index complete the book.

The chapters dealing with chemical shift, spin–spin coupling, kinetics and quadrupole broadening are liberally provided with well-chosen illustrative examples (some eighty-five spectra are reproduced in the book). Most of the important concepts are covered in each case, though necessarily very briefly, and occasionally sketchily. Topics which could profitably be covered in somewhat greater detail include remote dipolar shielding, solvent effects and complete analysis of spectra by use of the high resolution Hamiltonian.

Considering the formidable problem which the author set out to master, *i.e.*, the brief description in elementary terms of a process inherently complex and subtle, it is truly remarkable that the book is practically free of errors, and that essentially no compromise with accuracy has been allowed to creep in for the sake of lucidity of expression. There is one case. At the top of p. 18, it is stated that the first peak of a plot of signal strength *vs.* magnetic field represents the point at which the precession frequency of the nuclei is equal to the oscillator frequency. This is not true for any finite sweep speed. One might wish that the expression on p. 55 for the intensity ratio in "non-equivalence quartets" had been given in a simpler form, *e.g.*, $R = (\delta_{obs} + J)/(\delta_{obs} - J)$. These are minor quibbles, however, and the book will be hailed as admirably fulfilling the purpose for which it was written.

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Colorimetric Determination of Traces of Metals. Third Edition, Revised and Enlarged. By E. B. SANDELL, Ph.D., Professor of Analytical Chemistry, University of Minnesota. Interscience Publishers, Inc., 250 Fifth Avenue, New York 1, N. Y. 1959. xxii + 1032 pp. 16.5 × 23.5 cm. Price, $24.00.

The growing interest in the determination of traces of metals by colorimetric techniques is evidenced by the fact that the third edition of this treatise is fifty per cent. larger than the previous edition, although the latter is only nine years old. The aims and general plan of treatment is the same as in the earlier editions. The book is divided into two parts: Part I (213 pp.) consists of four chapters which deal with the general aspects of inorganic colorimetric trace analysis, methods for the separation and isolation of traces of elements, colorimetry and spectrophotometry in trace analysis, and a general discussion of colorimetric reagents, both inorganic and organic. Part II (765 pp.) begins with some practical notes that are of a general nature in photometric analysis; then follows forty-six chapters, each devoted to a metal and arranged alphabetically as follows: aluminum, antimony, arsenic, barium, beryllium, bismuth, cadmium, calcium (and strontium), cerium, chromium, cobalt, copper, gallium, germanium, gold, indium, iridium, iron, lead, lithium, magnesium, manganese, mercury, molybdenum, nickel, niobium and tantalum, osmium, palladium, platinum, potassium, the rare earth elements, rhenium, rhodium, ruthenium, scandium, silver, sodium, thallium, thorium, tin, titanium, tungsten, uranium, vanadium, zinc and zirconium.

In general, methods of separation are given for each metal, followed by several or more selected methods of determination and then a limited number of representative applications, such as the analysis of steels, non-ferrous metals and their alloys, ores, silicate rocks, soils, water, air, coal, gasolines and naphthas, and bio-materials.

From the mass of material on the separation and colorimetric determination of traces of metals that has appeared in the literature since 1950, the author has selected a number of methods for detailed treatment, either to augment or to replace the older methods. The aim has been to present those methods which are believed to be the most generally useful in applied analysis. If "some meritorious methods have been overlooked or not given the prominence they deserve. . . literature references will be found listed for most methods likely to prove useful in practice." Indeed, the book is replete with references, conveniently placed at the bottom of the pages plus a number of references inserted at the ends of some of the chapters to call attention to work published after the manuscript had been submitted to the publishers in 1957, though no attempt was made to compile a comprehensive list of recent publications. The book concludes with an appendix, which includes a table of four-place logarithms, a transmission–absorbance table, a table of international atomic weights, and author and subject indexes. Printing, paper and binding are good.

This monograph and its companion volume, "Colorimetric Determination of Nonmetals" (edited by D. F. Boltz, 1958), make a useful reference source for anyone interested in trace analysis, the importance of which is being recognized in a wide diversity of fields, including agriculture, biology, medicine, geology, mineralogy and industry, as well as in many phases of chemistry and physics.

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Colorimetric Methods of Analysis Including Photometric Methods. Volume IIA. By FOSTER DEE SNELL, Ph.D., President, Foster D. Snell, Inc., and CORNELIA T. SNELL, Ph.D., Research Chemist. Assisted by CHESTER ARTHUR SNELL, Ph.D., Director of Analytical Department, Foster D. Snell, Inc., D Van Nostrand Company, Inc., 120 Alexander Street, Princeton, New Jersey. 1959. x + 793 pp. 16 × 23.5 cm. Price, $15.00.

In 1921, F. D. Snell published "Colorimetric Analysis," a small book of 150 pages, which included procedures for 34 constituents. In 1936–37 the second edition, by F. D. and C. T. Snell, appeared as "Colorimetric Methods of Analysis" in two volumes of 1581 total pages. A third edition, published in 1948–54, required four volumes and 2407 pages. Volume II of this edition (916 p.) covered inorganic systems. Now, in 1959, Volume IIA has been issued as a supplement to bring Volume II up-to-date. Actually the material has been covered only through 1955. A third author, C. A. Snell, has been added.

The general form of the third edition has been followed. For copper, for example, a brief introduction on selected chromogenic agents is followed by directions for the preparative treatment of samples for 44 kinds of inorganic or organic substances. Next comes the operating procedures for applying each of 16 chromogenic agents covered. Then follow a flame photometric method and some six pages of miscellaneous material referring briefly to a variety of other methods. Altogether 177 references are cited in this section.

Such a compilation is of great service to one wishing to refer quickly to published methods for the 68 constituents covered. In using this type of source the novice must experience uncertainty in some cases. For example, of the 16 methods described for copper, which is best in a given situation?

The reviewer would not have included flame photometric methods in a colorimetric compilation. To him flame photometry is one kind of emission spectrometry, in which the elements susceptible to such determination are excited at the relatively low temperature of the flame used. This is in contrast to the high temperatures of arcs and sparks so widely employed in emission spectrometry.

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