NEW BOOKS

Applied Capillary Microscopy: The Role of Microorganisms in the Formation of Iron-Manganese Deposits, B. V. Perfil'ev et al. (Consultants Bureau, 122 p, 1965, $22.50).

This book is a translation from the Russian of nine papers by seven authors, of material which is not available elsewhere except in the Russian language. References are given to considerable previous Russian work in the area covered by the book.

The papers deal with microbial transformations, mainly oxidative, of Mn and Fe compounds in mud bottoms of water bodies and methods developed for carrying out such studies. Chief among these is the "capillary microscopy," or "capillary microbial-landscape method." The method involves the insertion of small capillaries into a selected environment, in this case of water saturated muds, and subsequent withdrawal and examination under the microscope. The nature of the microbial population can thus be followed as can certain chemical processes, e. g., the precipitation of Mn and Fe compounds.

No detailed description of the capillaries or of their construction is given. From figures in the papers it can be deduced that they are thin, narrow glass strips penetrated lengthwise by small capillary passages, rectangular in cross section, and with dimensions of about 0.1 mm by 1 mm. In an alternative form two thin glass strips are strapped together but separated about 0.1 mm by the insertion of small pieces of a microscope cover glass on other suitable material.

These capillary structures, called "peloscopes," are inserted vertically into the mud. The capillaries become filled with the liquid phase of the mud with little or no intrusion of mud particles. At appropriate intervals the peloscopes are withdrawn, the outer surfaces cleaned, and the capillaries examined under the microscope. The changes taking place in the capillaries are said to correspond to those occurring in the mud outside as determined by more tedious methods.

Mud from lake bottoms, mixed and placed in laboratory vessels, showed a slow development of characteristic horizons differing in color and composition due to Mn and Fe transformations. In an upper layer a few millimeters thick Mn became oxidized mainly by chemical oxidation. Immediately below this another thin layer brownish-black in color appeared. Mn in this layer was oxidized mainly to the trivalent form and was accompanied by development of Mn oxidizing bacteria. As soluble Mn diffused upward from the reduced zones below it was precipitated by the bacteria and accumulated to fairly high concentrations. Below this horizon in some cases there appeared an orange or yellowish horizon resulting from the accumulation of oxidized Fe accompanied by an abundant development of Fe oxidizing bacteria of the genus *Siderococcus*. In the absence of these bacteria this layer did not form. Mud below these layers remained in a reduced state with low concentrations of Mn and Fe in reduced forms. The precipitated Mn and Fe in their respective layers were always accompanied by smaller concentrations of compounds of the other element. From determination of dissolved oxygen, redox potential, quantities and form of Mn and Fe, and microscopic studies the authors conclude that bacteria are important agents in the precipitation of these elements in muds and offer explanations for various types of deposition found in nature.

There is a brief discussion of the reduction of Mn and Fe compounds by certain bacteria under sufficiently anaerobic conditions.

Methods are described for determination of Mn compounds of different valence states, the polarographic determination of dissolved oxygen in thin layers of mud, and a modification of the Winkler method permitting, determination of dissolved oxygen in volumes as small as 1 ml.

The book has a table of contents but no index.

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Interpretation of NMR Spectra: An Empirical Approach, by R. H. Bible, Jr. (Plenum Press, 227 West 17th St., New York, N.Y., 10011, 1965, 150 p, price $12.50).

The author's objectives in this book are: "1) to teach the organic chemist how to interpret proton magnetic resonance spectra, and 2) to provide the reference data which are constantly needed in the use of proton spectra." This concise, well-written book fulfills its purposes to a high degree.

This is the first text which deals with NMR in a purely empirical manner. While this approach may be objectionable to some workers, most organic chemists will be glad to find the facts concisely and clearly stated and illustrated.

The first chapter discusses the properties of nuclei which make them useful to NMR, the particular nuclei which have proven to be most useful to the organic chemist, and the types of information obtainable from NMR spectra. Beyond the first chapter, this text deals only with proton spectra. The effect of other nuclei on proton spectra is dealt with in chapter 3.

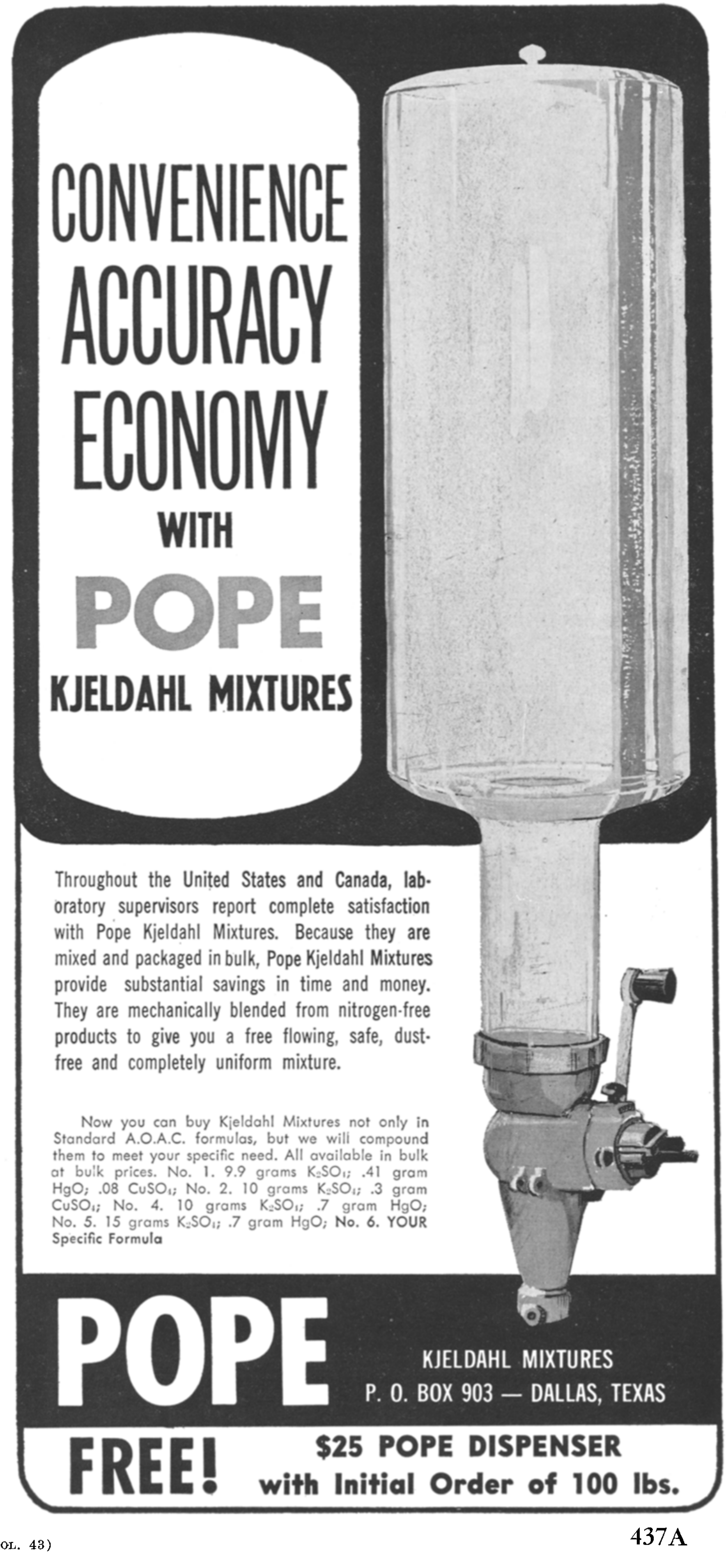
The second chapter deals with the fundamentals such as the coordinates usually plotted, sample requirements, correlation of peak positions with chemical environments, use of the integration curve, D_2O exchange technique, and simple spin patterns.

The third chapter discusses simple spin patterns in detail, shows that coupling can occur to other magnetic nuclei, and examines the cases in which methylene protons may be magnetically nonequivalent.

The fourth chapter proceeds to more complicated spin multiplets and discusses the characteristic features found in these patterns. The difficulties which may arise from the application of first-order approximations to higher-order systems are emphasized. The AB, AB_2, and ABX patterns are considered in detail. Patterns characteristics of typical four proton systems (A_2B_2 and related types) are shown and discussed. Of particular value is a one-page summary of the patterns produced by all of the more common spin systems.

The problems which complicate the interpretation of spectra are presented in chapter 5 along with suggestions as to how these difficulties may be overcome. The advantages to be gained by examining spectra obtained in several different solvents is stressed.

A final chapter proposes a systematic, step-by-step, approach to the interpretation of spectra. This chapter contains a one-page summary of the



analysis of spin patterns from their characteristic appearances.

A glossary of all of the commonly employed terms is given as well as a step-by-step procedure for operation of the Varian A-60 instrument.

A rather unusual feature of the book is the presentation of tabular summaries of the important points in each section. It is unfortunate, however, that subheadings have not been employed, especially in the rather long discussion of higher-order spin patterns.

The absence of a discussion of the theory causes some obvious difficulties in the explanation, especially in the discussion of spin-spin coupling. To the organic chemist, these problems are probably less severe, however, than the problems which would arise in the explanations required for a complete discussion of the theory.

Although this text will be of little value to those interested only in theory, it can be of considerable value to: 1) organic chemists who are primarily interested in the interpretation and use of NMR spectra, and 2) those interested in the theory who would like to survey the experimentally observed facts and their applications to organic chemistry. This book is probably the best one available to the organic chemist for use as a general guide to the interpretation of proton spectra.

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Physical Methods in Inorganic Chemistry, by R. S. Drago (Reinhold Publishing Corporation, xviii + 430 p, 1965, $14.50).

The text is divided into two parts, the first of which covers in 98 pages the theoretical background necessary to understand the techniques or methods to be described in the second. The first chapter is devoted to a description of wave mechanics and the electronic structures of the atoms. The second and third consider the nature of bonding in molecules and complexes. The fourth chapter, although part of the second part of the text, might better be in the first, for it covers symmetry principles, group theory, and character tables, while the fifth, entitled "General Introduction to Spectroscopy," discusses the nature of radiation, energies corresponding to various kinds of radiation, energies for atomic and molecular transistions, selection rules, determination of concentration, "fingerprinting" and isosbestic points.

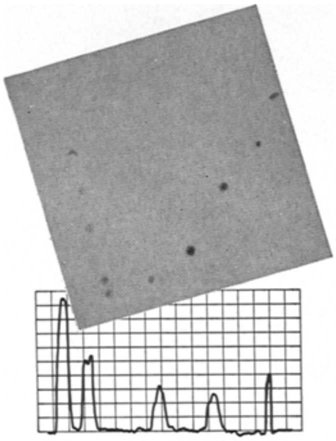
Although the treatment in the first five chapters must be cursory because of the magnitude of the subject area covered, it appears to be generally good. It is surprising, however, to find such cases as that of the FeF_6^{3-} ion (p 46) given the Pauling "outer orbital" rather than the ligand field or molecular orbital treatment, especially in consideration of the later excellent discussions of these much more versatile theories.

The remaining seven chapters, which will certainly be of greater interest to the chemict interested maily in obtaining factual information and the methods most appropriate to do it, describe electronic absorption spectroscopy; infrared, Raman and microwave spectroscopy; nuclear magnetic resonance; nuclear quadrupole resonance; electron paramagnetic resonance, Mössbauer and mass spectroscopy. Appendices cover magnetism, character tables for selection point groups, Tanable and Sugano diagrams for O_h fields, calculation of Dq (Δ) and β for 0_hNi^{II} and T_dCo^{II} complexes, normal vibration modes for common structures and conversion of NMR chemical shift data.

The chapter on electronic absorption spectroscopy has a good coverage of the theory of electronic transitions, their assignments, intensities and selection rules. Following are thirty pages devoted to applications, which are usually confined to the spectral region between 2100 and 7500 Å. Identification of compounds and effects of solvation (and charge transfer) are covered. The electronic spectra of transition metal complexes are considered in some detail, including intensities and selection rules, nature of transitions, effects of electronic structure and symmetry.

Infrared, Raman and Microwave (vibrational and rotational) spectra are given similar treatment. The important concept of molecular symmetry as it affects these spectra is discussed in considerable detail, along with the information on molecular structure which can be obtained from the spectra. The uses of microwave spectroscopy to determine bond angles and distances and of rotational Raman in the study of homonuclear diatomic molecules are also discussed. There follows a section on procedures, optical materials, sample preparation, the useful ranges for 16 common solvents, and the effect of solvent and physical state on spectra. The well-known use of infrared for identification and the use of all three spectra for determination of structure and the nature of bonding wind up the chapter.

Although it is not possible in a review of this sort to continue to describe the subsequent chapters in such detail, let it be said that the treatments of the other spectroscopic techniques are generally good. There are good discussions of the methodology of NMR spectroscopy, particularly the application of spin-spin decoupling to structure determination, the double resonance technique, the information to be derived from the magnitude of the coupling constants and such complicating factors as the near equivalence in magnitude of the spin-spin coupling constants between two nonequivalent nuclei and the chemical shift between them, the consequences of nuclei with quadrupole moments, and factors affecting line width, such as chemical exchange. The effect of chemical exchange on spectra and the evaluation of reaction rates for fast reactions is given extensive treatment. As befits a text on inorganic techniques, exchange



reactions between ligands and metal ions, the effects of paramagnetism and other typically inorganic problems to which NMR studies are applicable are given considerable attention.

Nuclear quadrupole resonance (10 pages) and Mössbauer spectroscopy (9 pages) are given far less extensive treatment, presumably because much less work has been done with them. Instrumentation for NQR is not discussed but reference is made to the text of Das and Hahn. No general reference is given in the text to Mössbauer instrumentation, but the reader of this review is referred to a review of *"Mössbauer Effect Methodolgy," Vol. I,* edited by I. Gruverman in JAOCS, this issue. While NMR is applicable largely to the fluid states, NQR and Mössbauer are limited to the solid (or at least a highly viscous) state. All three techniques produce much the same type of information.

Electron paramagnetic resonance spectroscopy is given considerably more extensive treatment; with good coverage of basic theory, hyperfine splitting, factors affecting the magnitude of the g-values, unpaired electrons in metal complexes, Kramers' degeneracy, nuclear quadrupole interaction, and solid state EPR. The coverage appears to be quite adequate for the purposes of the book.

The final chapter on mass spectrometry is very short (13 p) for a technique which has proved so useful for both identification and structure determination of organic compounds and promises to be equally useful for covalent inorganic compounds. The treatment of this technique is not up to the standard of most of the rest of the book.

Each chapter is followed by a list of references and by a set of exercises which should prove very valuable in learning the details of the techniques covered.

There seem to have been few attempts in the past to gather together knowledgable discussions of the physical methods which can be applied to inorganic systems. This text does an excellent job in presenting those methods which are available and discussing their applications and limitations. Inasmuch as the techniques described can derive severally analytical and structural information from a wide variety of systems, organic and inorganic, it cannot fail to be useful to almost any chemist interested in this type of information. It should therefore prove to be a valuable text in almost any chemist's library.

The text is well printed on good paper. The index seems somewhat slim, but most of the topics covered can be found in the table of contents.

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Perfumery and Cosmetic Exhibit in Barcelona

The II Semana de Química Cosmética y Perfumería will take place in the Palacio de las Naciones of Barcelona (Spain) from Sept 18–25, 1966, under the auspices of the Sociedad Española de Químicos Cosméticos. This Society is a founding member of the International Federation of the Societies of Cosmetic Chemists.

The Semana is a monographic exhibition of raw materials, machinery, packaging and all other things related to cosmetic industry, as well as of the finished products of cosmetic and perfumery firms.

The Asociación Española de Aerosoles (AEDA) has arranged for the European Federation of Aerosols (F-EA) to hold the annual meetings of its Directive, Technical and Public Relations Committees in the Palacio de las Naciones during the II Semana de Química Cosmética y Perfumería.

Several sessions have been planned: a Symposium, Aerosols, Dermatology and Microbiology applied to the cosmetic industry; a short Marketing course, in charge of members of the Sales Directives Club, an Assembly of the Asociación Nacional de Químicos de España and a meeting of the Asociación Nacional de Fabricantes de Perfumería y Afines.

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Pittsburgh Group Plans Inclusive '67 Conference

The Eighteenth Pittsburgh Conference on Analytical Chemistry and Applied Spectroscopy, Inc., sponsored by the Spectroscopy Society of Pittsburgh and the Analytical Chemistry Group of the Pittsburgh Section of the American Chemical Society, will be held at the Penn-Sheraton Hotel in Pittsburgh, March 6–10, 1967.

The following symposia are now being arranged: 1) Laser Excitation Raman Spectroscopy; 2) Information Retrieval and Data Handling; 3) Biomedical Applications of Gas Chromatography; 4) Coblentz Symposium: Where Does Infrared Spectroscopy Go from Here; 5) Analytical Chemistry in Air and Water Pollution; 6) Computer Applications in Analytical Chemistry; 7) X-Ray Analysis of Light Elements; 8) Analytical Techniques in Nonaqueous Systems; 9) Carbon-13 NMR Spectroscopy; 10) Emission Spectroscopy in the Vacuum Ultraviolet.

A program of activities for the wives and lady attendees of the Conference is also being arranged.

Correspondence regarding papers should be submitted in duplicate to: Dr. G. L. Carlson, Program Chairman, The Pittsburgh Conference, Mellon Institute, 4400 Fifth Avenue, Pittsburgh, Pa. 15213.

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