doubtedly be of small value to most engineers (unless they are chemists as well) and may indeed overwhelm many. The chapter assumes a knowledge of terms such as "esterification," "polymerization," and "alkyl and aryl radicals," but in a later chapter the reader is cautioned regarding the proper method of diluting strong acids. The list of selected references appears to be rather insufficient for the persons to whom the book is directed.

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The Design and Use of Instruments and Accurate Mechanism. Underlying principles. T. N. Whitehead. Dover, printing 2, New York, 1954. xiv + 283 pp. Illus. Paper, $1.95; cloth, $3.50.

This second printing of a useful book that appeared originally in 1934 contains a new preface and minor corrections by the author. Instrumental errors are discussed in part I and the theory of instrumental errors that is developed in part I is applied, in part II, to a variety of typical mechanisms. Selected so as to illustrate principles, all examples are fully explained.

Spot Tests. Fritz Feigl. Trans. by Ralph E. Oesper. Eng. ed. 4 in 2 vols. vol. I, *Inorganic Applications,* xii + 518 pp. $6.50; vol. II, *Organic Applications,* xv + 436 pp. Illus. $6.25. Elsevier, Houston–Amsterdam, 1954.

There are some scientists who have devoted themselves so assiduously and unreservedly to particular subareas of chemistry that their names are practically synonymous with those areas. One such individual is Fritz Feigl, who by his large number of papers and books on the subject has identified himself with that technique of microchemical qualitative analysis known as spot tests. A new book or a new edition of an old book by Feigl is usually a good indication of the current status of the development and applicability of spot tests.

In his 1949 book, *Chemistry of Specific, Selective and Sensitive Reagents,* Feigl attempted to collect the material pertinent to the physical-chemical basis of spot tests. The present work, which deals exclusively with the application of spot tests, actually consists of two separate monographs, since the chapter on spot-test techniques, written by Philip W. West, is given in both volumes.

The format used in previous editions for the description of individual tests and procedures has been retained; an introductory section of one or several paragraphs on the basic chemistry of the reactions involved is followed by a succinct laboratory procedure. Then follow statements of the absolute limit of detection, the concentration limit, and the reagents required. Comments on interferences, possible modifications, and so forth, are then often given. A helpful device is the statement at the bottom of each page of the location in the text of the references cited on that page.

To save space, the bibliography of papers on the technical application of spot tests that was contained in previous editions has been omitted. On the other hand, the material on preliminary tests and on the possible technical application has been enlarged. Much heretofore unpublished material by the author and his coworkers is included, especially on the application of known tests of organic qualitative analysis to spot-test technique, as well as on the development of new tests suitable for organic substances.

The author stresses the fact that the material has been presented so as to allow the ready conversion of the tests to a macro scale as well as to apply the principles involved to chromatography and, in particular, to paper chromatography.

The material should be readily comprehended by the advanced undergraduate student who has had courses in organic and analytic chemistry, although the book is not a textbook but rather an annotated laboratory manual. One or both of the volumes would be helpful references to anyone concerned with rapid qualitative analysis, for example, biochemists, mineralogists, and so forth, particularly when only minute amounts of the sample are available.

The translation by Ralph E. Oesper is of the high quality characteristic of his translations. English-reading chemists are deeply indebted to Oesper for the labor he has expended in translating papers and books of interest, not only in analytic chemistry, but also in the history of chemistry.

The two volumes are well printed and seem free of serious typographical errors. The binding, however, is not of comparable quality. The price seems quite reasonable.

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Semimicro Qualitative Analysis. Edwin O. Wiig, Willard R. Line, and John F. Flagg. Van Nostrand, New York, rev. ed., 1954. viii + 238 pp. Illus. $3.25.

This textbook is an almost completely rewritten version of the original Flagg and Line *Semimicro Qualitative Analysis.* The theoretical section consists of eight chapters which deal with "Structure of matter," "Solutions," "Chemical equilibrium," "Applications of chemical equilibrium to homogeneous and heterogeneous systems," "Complex ions," "Amphoterism," and "Oxidation-reduction." An elementary but effective consideration of the factors involved in the solubilities of ionic compounds is included in Chapter 2. Several applications of the Nernst equation to the calculation of several types of equilibrium constants from the emf of cells are a unique feature of Chapter 8.

The experimental section includes discussions of semimicro techniques and the procedures to be used for the analysis of the ions of 22 metals and of 17 anions. The cations are classified into the five standard groups, with hydrogen sulfide being used as one of the reagents in the separation of groups II and III. The anions are classified into the volatile acid,

chloride, sulfate, oxidizing, and reducing groups. Notes adjoining the procedures point out the application of the theory of ionic equilibriums to the various separations and identifications encountered. Preliminary experiments on the properties of ions are omitted to allow more time for the analysis of "knowns" and "unknowns."

An adequate selection of problems follows six of the chapters on theory, and a set of general questions on the analytic procedures is placed at the end of the experimental section. The appendix contains four tables of equilibrium constants, a four-place log table, and answers to the numerical problems. Some of the values of equilibrium constants are not in agreement with some of the recently published values of Latimer and his colleagues.

The semimicro scale used involves, in general, volumes from 0.2 ml to 10 ml and weights from 1 to 25 mg.

This textbook seems to be appropriate for either the latter portion of a first-year college course or for a separate course in the sophomore year. A section on special procedures for ferro- and high-aluminum alloys may be used to provide additional analytic experience with several cations not usually included in the qualitative analytic scheme.

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Isotopic Tracers. A theoretical and practical manual for biological students and research workers. G. E. Francis, W. Mulligan, and A. Wormall. Athlone Press, London; John de Graff, New York, 1954. xvi + 306 pp. Illus. $7.

Although many excellent books dealing with isotopes are available, it is generally recognized that there exists a real need for a practical laboratory manual in this field. *Isotopic Tracers* is presented as such a manual and is, according to the authors, a full description of the course that they have given, over a period of several years, at the Medical College of St. Bartholomew's Hospital, London.

The book is divided into two parts. Part one, "Theorectical considerations," comprises approximately two-thirds of the volume. There is little in this section that cannot be found in a number of books previously published. Its chief advantage lies in its simplified and condensed presentation, which may be more palatable for students and beginners in the tracer field. Part two, "Practical course," contains detailed presentations of classroom experiments. Typical experiments are: the use of G.M. tubes for measurement of radioactive isotopes; the determination of atom percent excess N^{15} in a sample; incorporation of P^{32} into hen's eggs; calculation of circulating red-cell volume and blood volume based on persistence of injected P^{32} labeled red cells; localization of injected I^{131} in the thyroid; and determination of self-absorption curves. It is this second part that makes the book unique in its field. This part should prove extremely useful to the teacher in planning laboratory assignments and to the research worker as a manual for the indoctrination of newcomers to his laboratory into the proper use of isotopes.

A serious criticism of *Isotopic Tracers* is its limited presentation of C^{14} techniques, which play a most important part in biological applications of isotopes. No laboratory experiments with C^{14} are presented nor is any mention made of the windowless gas-flow counters that have become standard equipment for C^{14} assay, at least in the United States.

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Industrial Stoichiometry. Chemical calculations of manufacturing processes. Warren K. Lewis, Arthur H. Radasch, and H. Clay Lewis. McGraw-Hill, New York–London, ed. 2, 1954. xi + 429 pp. Illus. $7.50.

One of the early courses in the traditional chemical engineering curriculum deals with the analysis of process data through computations based on the laws of mass and energy conservation and chemical combination. A considerable portion of the chemical engineers in this country have cut their professional teeth on *Industrial Stoichiometry* by Lewis and Radasch. The second edition of this book is a completely revised text that retains the purpose and pedagogic viewpoint of the original version.

The case method is again used in developing and illustrating computational procedures. Combustion problems involving gaseous and liquid fuels serve to introduce techniques which are later extended to cases dealing with solid fuels, secondary fuels, and various inorganic chemicals. New chapters on nitrogen compounds, fixed alkalies, and ceramics are included. The material on equilibrium, sulfur, lime and cement, metallurgy, and design has been expanded considerably. In addition to the illustrative examples in the text, a total of 171 problems are included at the ends of the chapters. The problems are largely graded, and answers are indicated in a few instances.

The authors have clearly pointed out some of the problems encountered in analyzing industrial processes and evaluating experimental data. In general, however, the textbook is not meant to describe the whole process of which an illustrative operation or unit is a part. The consideration of energy balances is limited to cases in which the net enthalpy change of the system is equal to the quantity of heat exchanged with the surroundings. A more extensive discussion of energy relationships would be desirable.

As stated in its preface, the book is directed toward plant operating personnel and students just beginning their study of chemical technology. Knowledge of calculus and advanced chemistry is not necessary. The book is well written, but the reader's impression of its clarity and continuity will probably be determined largely by his reaction to the case method of instruc-