thirds of the book, contain methods and formulas for 3500 histologic preservative, fixative, staining, mounting, and miscellaneous procedures. These are grouped according to a decimal classification. Each chapter begins with an outline of its contents. The directions are considerably condensed by the uniform use of the metric system, with the solutions adjusted generally to give 100 parts, except for the fixatives which are adjusted to give 250 parts.

A discussion of the more important methods is included, and practical applications are frequently given. Literature references appear to be complete.

It is unavoidable in a book of this type that many procedures of purely historical interest are included. Perhaps the book will serve to revive some of the beautiful techniques that were the pride of the older microscopists but which are unsuited to the modern mass production of slides.

The Microtomist's Formulary and Guide shows an almost deliberate avoidance of histochemical methods. Even the Prussian blue procedures, which have been used by biologists for almost a century, are excluded.

This book should be a part of the library of every serious histology laboratory.

FRANK B. JOHNSON
Armed Forces Institute of Pathology, Washington 25, D.C.

Instrumental Analysis. John H. Harley and Stephen E. Wiberley. Wiley, New York; Chapman & Hall, London, 1954. vii + 440 pp. Illus. $6.50.

This book aptly fills a very definite need. The tremendous increase in instrument methods of chemical analysis has called for just this type of treatment. The authors discuss both the theory and applicability of practically all currently used instrument techniques. Sufficient theory is given so that a clear-cut understanding of the principles of a method is possible. Copious literature references are included for the reader who seeks more detail, but the treatment in this book is adequate for most purposes.

It is refreshingly up to date and supplies the reader with pertinent information on specific commercial instruments now on the market. Of course it is inevitable that some of the information given no longer holds true, but that is the penalty paid for completeness. I would have liked to have seen some reference to the use of the pressed-disc KBr technique in infrared because of its importance and usefulness, but perhaps this is expecting too much since it is only a year or so since this technique was introduced.

In general the authors have brought the latest developments in each of the fields discussed to the fore, and they are to be commended on the clarity of their presentation. This book should be useful not only to the practicing analytic chemist, in giving him both the fundamental principles involved for new techniques and sufficient practical know-how so that he can make use of a method, but it should be of even greater value to the nonanalytic chemist in giving him, under one cover, the theory and power of the newer analytic techniques and sufficient information to enable him to make a good estimate of the probable applicability of a specific technique to a specific problem.

The instrument techniques that are discussed include visible, ultraviolet, and infrared spectrophotometry; Raman and emission spectroscopy; fluorometry; flame photometry; colorimetric *p*H, potentiometric, conductimetric, amperometric, and high-frequency titrimetry; polarography; x-ray and mass spectrometry; and, of course, radiotracer techniques. A chapter on practical experiments is included to serve for a college laboratory course. This is an excellent treatment, remarkably brief and clear, of a complex field of science.

H. A. FREDIANI
Process Research and Development Division, Merck & Co., Inc.

Adhesive Bonding of Metals. George Epstein. Reinhold, New York, 1954. ix + 218 pp. Illus. $2.95.

It is probable that relatively few people are aware of the increasing extent to which industrial adhesives are being used as substitutes for rivets, bolts, weldments, and other conventional methods of fastening metal parts together. The author states:

> It is the purpose of this book to give sufficient details so that an engineer or technician, faced with the problem of joining two materials, will be able to determine if an adhesive bonded joint would be advantageous, what type of adhesive to select, how to employ the adhesive and how to design the joint for optimum performance.

All things considered, the book comes surprisingly close to achieving this rather ambitious goal.

After an introductory chapter discussing the advantages of adhesive fastening, with perhaps insufficient attention to the disadvantages, the chemistry of the basic materials is reviewed. The real meat of the book is contained in three valuable and lucidly written chapters dealing with the problems of formulation of metal adhesives, design and testing of adhesive joints, and bonding techniques.

The roles and effects of the various ingredients in the formulation of adhesives are discussed extensively, and examples are given. Emphasis is placed on thermosetting structural (high strength) adhesives. In the chapter on bonding techniques, emphasis is placed on the very important step of surface preparation, and detailed instructions are presented for the optimum mechanical and chemical surface treatments for many metals and alloys.

Two briefer chapters are devoted to heat-resistant adhesives and adhesively bonded metal sandwich structures. The author has drawn extensively on the growing applications in the air-frame industry for most of the many illustrative examples.

The book is not without faults. The tyro is not warned of the difficulties that may be encountered because of adsorption of moisture. The second chapter, dealing with the chemistry of adhesives, will un-

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.

W. E. TAYLOR

Motorola Inc., Phoenix, Arizona

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.

PHILIP J. ELVING

Department of Chemistry, University of Michigan

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,