they are applied to the land. In many cases farmers who until now have made little use of fertilizers were ordered by the War Agricultural Committees to give their corn a dressing this spring, and there is no question that this provision of extra supplies of available plant food in the top soil has given the country bigger crops than could otherwise have been expected.

It is true that this has been an exceptional growing season, and that the growth of some crops was so lush that the straw did not stand battering by wind and rain and patches of corn are now lying flat. Even so, on balance the nation will gain extra crops. In a few of the worst cases the promise of extra grain has been lost and the farmer is faced with a heavy task in saving what he can. That is part of the gamble that is inherent in farming in an uncertain climate. Last harvest there was no such trouble, however generously chemical fertilizers had been applied. This year the trouble is not confined to fields where sulphate of ammonia was used. Some of the laid corn is to be found on land newly ploughed out of old grass rich in plant food. The lesson to be learned is surely that chemical fertilizers used prudently can greatly increase the yield of crops—especially if the farmer knows enough about his business to grow the stiffer strawed varieties of corn that will stand to harvest on well-fed land even in an exuberant season like this.

Everywhere farmers with long experience of arable farming will vouch for the value of chemical fertilizers when used properly as a supplement to the organic matter in the soil which provides the reservoir of the plant foods on which the crops draw year after year. In our settled type of farming livestock have long played a dominant part, and, despite the reduction in numbers of pigs and the grass flocks of sheep, they continue to do so to-day. The encouragement lately given to hurdled flocks should bring more sheep on to the lighter arable lands where they can be most valuable in maintaining fertility. Unless the balance of our farming is seriously upset—and there is little prospect of that—there is no risk of soil exhaustion and erosion, such as occurs in the New World, where wheat is grown by the square mile and then the land abandoned while fresh areas are tapped. In this green island we are now ploughing and cropping 4,000,000 more acres than we did two years ago, and dormant fertility lying under the grass sod is being stirred to produce the extra cereals, potatoes, and other crops that the nation needs in war-time. Other fields which have grown a succession of corn crops are being under-sown with clover and grass to grow a productive sward for long enough to allow the store of organic matter to be replenished. There is really no special virtue in dormant fertility.

Moreover, if agriculture is to regain its full place in the nation's life, the soil itself must be alive and fully productive. The tenets of good husbandry are so well understood in this country that the general public need have little fear that the land will suffer if farmers are allowed to use their discretion in developing production. On the contrary, the new life that is stirring in agricultural Britain is one of the few benefits arising from the present conflict that must be allowed to persist in the years after the war.—*The Times, London.*

SCIENTIFIC BOOKS

QUALITATIVE ANALYSIS

Elementary Qualitative Analysis. By J. H. REEDY. Third edition. x + 156 pp. New York: McGraw-Hill Book Company. 1941. $1.50.

THERE is a growing trend in colleges to teach qualitative analysis by semi-micro techniques. The obvious advantages are the substitution of centrifuging for filtration and a saving in time and material. This latest edition of Professor Reedy's text adds another to the list of books in which these techniques are used. In the present instance, however, the change is not complete since macro procedures are retained for a few of the analytical steps.

This text is presumably designed for a one-semester course for sophomore students in chemistry. In contrast to the more usual text in this field in which sections on theory, description and analysis are to be found, this book contains only the analysis material. Consequently its use will probably involve a companion text covering the other two parts of the subject.

There are two main parts to the book, a section on cation analysis and another on anion analysis. There is also a brief section on the systematic analysis of various solid substances. In addition to detailed and probably quite satisfactory directions for analysis, the two main sections contain well-organized sets of preliminary experiments and groups of study questions for each of the several groups of ions considered. The cation analysis material takes up the usual restricted list of ions and employs standard methods of separation. There are, however, new procedures for the Tin Sub-Group and for the Alkali Group. The anion analysis section considers an unusually large number of anions. The method of analysis is the now common combination of group eliminations and subsequent specific tests.

The book is well made and printed and typographical errors are infrequent. It does contain a few expressions that depart from common chemical usage. Examples are "complexing" for "complex ion forming" and "alkalize" for "make basic." The definition of a buffer as "a salt that will neutralize a solution" is decidedly unorthodox. For the most part ionic equations are given for reactions in which strong electrolytes are involved, but unfortunately this is not done consistently. Some of the explanations given in the otherwise admirable notes are not in accord with prevalent concepts of inorganic and physical chemistry.

Among the desirable features of this book are the well-organized preliminary experiments and directions for analysis and the adherence to more easily understood inorganic tests. Some teachers will find less desirable the inconsistent treatment of ionic reactions, the paucity of explanations based on quantitative equilibrium data and the occasional inclusion of explanations of doubtful accuracy.

F. A. LONG

Semi-Micro Qualitative Analysis. By CARL J. ENGELDER, Ph.D., professor of analytical chemistry, University of Pittsburgh; TOBIAS H. DUNKELBERGER, Ph.D., assistant professor of chemistry in the Graduate School, Duquesne University; and WILLIAM J. SCHILLER, Ph.D., head, Chemistry Department, Mount Mercy College. Second edition. xii + 305 pp. 15.5 × 23 cm. New York: John Wiley and Sons, Inc. 1940. $2.75.

THE first edition of this book appeared in 1936 and introduced the semi-micro technique in qualitative inorganic analysis, which was readily adopted by many laboratories. The new and enlarged edition will be welcomed by all those interested in qualitative analysis. The theoretical section has been rearranged and modernized. Sets of questions and problems have been inserted at frequent intervals throughout the book, and a new scheme for anion analysis has been added. Many supplementary tests given in the first edition have been omitted. More than 200 references to the original literature are listed in the sections on cation and anion analysis.

JOHN H. YOE

An Introduction to Quantitative Chemical Analysis. By WARREN C. VOSBURGH, professor of chemistry, Duke University. viii + 356 pp. 18 tables, 27 figures. New York: Henry Holt and Company. $2.75.

THE preface states, "This book is designed as a textbook for a quantitative analysis course of about one semester's length in which theory and practice are given about equal weight." Although there are interesting features in the book, it does not rank with leaders in the field.

There are twenty-five chapters covering the usual theoretical and practical aspects of quantitative analysis. Interspersed in this material are twenty-seven exercises which may form the laboratory work of an introductory course. This arrangement of material necessarily causes some duplication and waste of space. In the early part of the book, some topics are perhaps handled in too elementary a manner. The first three chapters contain conventional material regarding apparatus, the use of the balance and calibration of weights. Beginning with chapter four, subject-matter is arranged so that gravimetric analysis is treated first and volumetric methods second. Two chapters on the theory of precipitation cover solubility product and formation of precipitates. Volumetric analysis is presented in the following order: nomenclature and calculations, apparatus and calibration, acidimetry and alkalimetry, hydrogen ion concentration, theory of titration, titrations involving precipitation, oxidation and reduction theory and practice, potassium permanganate, ceric sulfate and iodometry, oxidation potentials. For the most part, this conforms to the older arrangement of a course in quantitative analysis and has several advantages. There will be differences of opinion regarding the manner in which subject-matter has been handled. One or two illustrations will suffice. This reviewer believes that the presentation of "the titration of weak acids," "buffers" is inadequate. A fault is shared with other texts in that very little space is devoted to the discussion of water and to the preparation of samples in spite of the fact that the analysis is no better than the selection and preparation of the samples. Alternative parts of procedures are placed in the body of some of the exercises, a confusing method. It is believed that alternative sections should come at the end of the procedure or be placed in the footnotes. A final illustration concerns the choice of procedures and the order of presentation. Particularly in that section of the book which deals with gravimetric analysis, one gains the impression that the exercises are separate, independent procedures, unrelated to one another. The ideal course should be developed so that starting with simple principles and gradually adding more complex ones, a fundamentally sound, although elemental, picture of quantitative analysis is produced at the end of the semester. This text falls short of this goal. Gravimetric iron, phosphorus and magnesium are presented as independent, almost unrelated, procedures, and limestone or natural rock are barely mentioned. Thus a rare opportunity is missed to present an important relationship between qualitative and quantitative analysis and to determine more than one element in one sample. Adequate presentation of solution of natural samples is also omitted. There are some good sections in the book. The use of definite exercises facilitates the organization of a course. In general, the reaction of the reviewer toward this text is unenthusiastic.

Villiers W. Meloche

Ionic Equilibrium as Applied to Qualitative Analysis. By T. R. Hogness and Warren C. Johnson, both at the University of Chicago. x + 306 pp., with 18 tables and 23 illustrations. New York: Henry Holt and Company. 1941. $2.00.

According to the preface this book "consists of the revised edition of the complete text, 'Qualitative Analysis and Chemical Equilibrium.' It is designed to meet the needs of teachers who either prefer to use their own particular scheme of analytical procedure or want to include in their course supplementary material on chemical equilibrium in the form of problems and exercises."

Separate publication of Part I with minor additions and improvements over the 1937 edition should make this well-known exposition more attractive as a basis for class work. While the Brønsted theory is now included the authors still rightly maintain that its consistent and exclusive use is not advisable—*Cf. Jour. Chem. Education,* 14: 448, 1937.

Byron A. Soule

SPECIAL ARTICLES

TYPICAL URINARY CRYSTALS OF THREE SULFANILAMIDE DERIVATIVES PRODUCED IN VITRO[1]

Following the administration of sulfapyridine, sulfathiazole or sulfadiazine to humans, corresponding crystals with characteristic shapes may appear in the urine (Fig. 1). These crystals were found to consist for the most part of the acetylated derivatives of the aforementioned compounds. Their appearance, however, is entirely different from the simple rectangular, rhomboid or trapezoid structures which can be obtained by crystallizing the pure acetyl derivatives from water.[1a] It seemed of interest, therefore, to investigate the influence of urine upon the crystal shape of acetylated sulfanilamide compounds.

Crystallization of the pure acetyl derivatives of sulfapyridine, sulfathiazole and sulfadiazine from *normal* human urine gave crystals identical with the simple forms obtained from water. This result remained uninfluenced by the addition of the free compounds to the urine. The presence of sugar and albumin in the specimen likewise had no effect upon the crystal forms. If, however, the urine of patients, receiving one of the above-named sulfanilamide derivatives, was used for crystallization of the acetyl compounds, the forms obtained in a large majority of experiments were identical with *urinary* crystals (Fig. 1), occurring naturally in such urines. The *in vitro* formation of these urinary crystals was not dependent upon the original presence of such forms in the patient's urine. The faculty of producing typical urinary crystals of sulfanilamide derivatives, apparently occurring exclusively in urines of patients receiving the compounds, suggests the presence of a certain substance in these urines responsible for the effect. Experiments on the nature of the crystal-forming reaction are in progress.

The structures of urinary crystals outlined in Fig. 1 are those most commonly encountered. They are

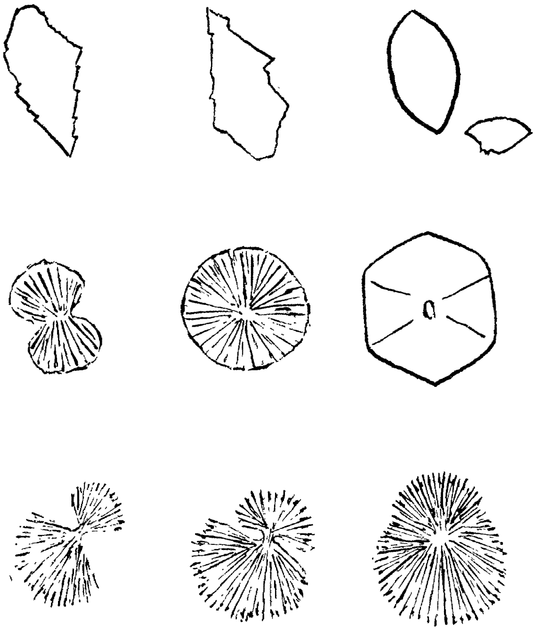

Fig. 1. Crystals appearing in human urine after administration of (top to bottom): *Sulfapyridine*—arrowheads and whetstones. *Sulfathiazole*—Striated dumb-bells (shocks of wheat with central binding), rosettes with radial striations and regular hexagonal platelets (all structures *symmetrical*). *Sulfadiazine*—Striated dumb-bells (shocks of wheat with excentric binding) and shell-forms with radial striations (all structures *asymmetrical*). It is apparent that the sulfathiazole rosettes and the sulfadiazine shells grow out of their respective dumb-bell forms. (Traced from micro-photographs of urinary sediment, enlargement 250 ×)

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[1] Aided by a grant from the Sidney C. Keller Research Fund.

[1a] A saturated aqueous solution of any of these urinary crystals contained the acetyl derivative of the respective drug in a concentration which very significantly exceeded the solubility in water of the chemically pure acetylated compound. It was usually about twice as high.