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-

tion. In particular, some teachers of chemical engineering will feel that the evolution of separate cases obscures general principles and encourages memorization of distinct techniques. Other teachers who have used the original edition successfully will welcome the expanded coverage of the second.

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***Induction and Dielectric Heating.*** J. Wesley Cable. Reinhold, New York, 1954. vii + 576 pp. Illus. $12.50.

The author may be justly proud of his lucid and comprehensive interpretation of the fundamentals and the engineering phases of induction and dielectric heating. This work conveys a historical and technical panorama of the art and practice with such clarity that it is an excellent reference for the student and practicing engineer, and a highly functional guide for the technical and nontechnical members of industry who are associated with these forms of heating.

In reality this work comprises two basic subjects, induction heating and dielectric heating. While the two subjects are treated separately, frequent cross references point out the similarities and dissimilarities between the two types of heating, and demonstrate the advantages and disadvantages of each form. The engineering principles are competently discussed, and the theory is conveyed to the reader over a bridge of analogies for rapid digestion. The book is sprinkled with a number of pertinent graphic relationships that enhance the understanding of the subject matter and provide useful design data. The author is to be commended for selecting and furnishing only those equations germane to the comprehension and application of the science. Writers often succumb to the temptation to encumber their work with numerous mathematical or physical relationships with an apparent effort toward erudition but with wanton disregard of the real function of the text, which is to convey information accurately and directly.

Following the summary of the technical aspects of the art, Cable reviews the sources of energies available. This survey provides valuable engineering information on the various means of generating the high-frequency power necessary. The author's skill is again revealed by his ability to draw the reader's attention to such technical or economic facets of the equipment that are pivotal in determining its practical qualifications. To illustrate, in the discussion of the effects of bus voltage variations upon electronic generators, he presents pertinent graphs demonstrating the effect of filament voltage variations on the emission and life characteristics of an oscillator tube. Although this information, per se, is not unusual, it is a valuable help in determining the economic feasibility of electronic power supplies in plants suffering a certain degree of voltage variation.

Coil and electrode designs in large part determine the effective application of induction and dielectric heating, respectively, and the two chapters devoted to this phase of the art provide a very adequate background and guide for solving the design problems encountered.

The major part of the book is devoted to the application of induction and dielectric heating in industry and laboratories. This coverage presents a very thorough and comprehensive treatment of various industrial and other specialized uses of high-frequency electric heating. Its completeness, in fact, is extended to include speculation on the future potentialities of dielectric heating. The number of illustrations is ample, and they add significantly to the understanding of heating problems and applications.

The completeness of this book is further attested by the inclusion of a discussion of radio interference produced by the operation of the high-frequency electric heating equipment. I feel that *Induction and Dielectric Heating* is a valuable adjunct to the libraries of the designer and of the application engineer.

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***Nuclear Reactors for Industry and Universities.*** Ernest H. Wakefield, Ed. Instruments Publ., Pittsburgh, 1954. ix + 93 pp. Illus. $2.

This brief book has three very timely and worthwhile objectives: (i) to call attention to the fact that small research-type reactors are now at such a stage of development that any large university or industry should be able to afford one; (ii) to stimulate and encourage the widespread use and further development of research reactors by universities and industry; and (iii) to present in compact form information that will "aid universities and industries in making decisions about the installation of reactors."

The first objective is well supported by a summary of a cost estimate prepared by Henry J. Gomberg and colleagues at the University of Michigan. It indicates that $370,000 will cover the cost of reactor and tank for a modified "swimming pool" arrangement, including operating necessities and safety instrumentation but exclusive of fuel, which must be obtained by arrangement with the Atomic Energy Commission. To this must be added the cost of the building ($60,000 to $300,000) and of the laboratory research facilities for which some sketchy estimates are indicated.

The second objective is supported by a stimulating preface by K. S. Pitzer and by a very brief analysis of the value of a research reactor, which would well merit broader consideration and treatment than that allotted to it.

Four chapters of elementary, semipopular, technical information about reactor classifications, control, instrumentation, and radioactive measurements, one chapter on radiation protection, and one chapter on legal aspects, are intended to support the third ob-