

Subs., 0.1330: (Kjeldahl), 7.3 cc. 0.1 *N* HCl.

Calc. for  $C_{10}H_{15}O_2N$ : N, 7.74. Found: 7.69.

**2,4-Diethoxy-chloroacetanilide.**—One g. of the base was dissolved in a mixture of 5 cc. of acetic acid and 5 cc. of saturated sodium acetate solution, diluted with 30 cc. of 50% acetic acid, and chloroacetylated in the usual way. After dilution the product was filtered off and recrystallized from 85% alcohol, separating as delicate, woolly needles, which melt at 102–3° with slight preliminary softening. The substance is quite soluble in alcohol at room temperature, very readily in acetone, chloroform, or benzene. It is difficultly soluble in cold ligroin, readily on heating, and also dissolves sparingly in boiling water.

Subs., 0.1541: (Kjeldahl), 5.85 cc. 0.1 *N* HCl.

Calc. for  $C_{12}H_{16}O_3NCl$ : N, 5.44. Found: 5.32.

NEW YORK CITY.

### NOTE.

**Correction.**—In the paper on the "Constitution of Capsaicin," appearing in the July number,<sup>1</sup> vanillyl amine is by error described as 3-hydroxy-4-methoxy-benzylamine on pp. 1118, 1119, 1121, instead of 4-hydroxy-3-methoxy-benzylamine.

E. K. NELSON.

### NEW BOOKS.

**An Advanced Course in Quantitative Analysis.** By HENRY FAY, PH.D., D.Sc. John Wiley & Sons, Inc., New York, 1917. Pp. vi + 111.

Text books on quantitative analysis may usually be placed in one of two groups; either the author has selected methods with reference primarily to the training of the student in the principles of quantitative analysis and in stoichiometry and has ignored the practicability of the methods described or else he has based his text book upon current and so-called "standard methods." In the latter case, too often, simplified manipulation, rapidity and occasionally great accuracy are the reasons for the selection of the material and the question of the effect upon the student of such a course is apt to be overlooked; the main idea being to have the student become proficient in the methods of analysis used in the industries.

Professor Fay has tried to produce a text which falls in neither extreme group. The material he has selected has been "chosen to illustrate principles and to train the student in manipulation." Since the author's work and interests lie mainly in iron, steel and commercial alloys, in which field he is a recognized authority, it is not surprising to find the bulk of the book devoted to the analysis of steel and closely associated raw and finished materials. Although the methods given have been selected

<sup>1</sup> THIS JOURNAL, 41, 1115 (1919).

with discriminating skill and are ably, accurately and minutely described, probably not a few teachers will question the soundness of a course in advanced quantitative analysis based entirely upon products of a similar nature (*e. g.*, ores and alloys). Even though the methods include varied manipulation there must perforce be a certain sameness of viewpoint and the student is not apt to acquire so satisfactory a foundation as if he were required to analyse materials of very different nature; for after all a course in advanced quantitative analysis should give the student something more than increased manipulative skill and stoichiometric ability.

It is, however, gratifying to find a text book in which the author has refrained from introducing all the numerical data and all the factors necessary for the calculation of results, leaving little for the student to do but go through the procedure like a machine. It is no wonder that the complaint is made that our young chemists do not know how to calculate the results of an analysis unless a text book is at hand. Professor Fay is to be congratulated upon his foresight in giving the student merely the necessary formulas and a few reactions and requiring him to compute his factors and calculate in full all his results.

The description of methods and details as to manipulation are clear and concise and are more comprehensive than are generally to be found in text books of this small size. The plan followed has been to give first in detail the method of procedure but with no reasons therefore or cautions as to difficulties to be encountered or possible sources of error. This concise description is in every instance followed by a series of excellent "Notes"—wherein the chemistry involved is discussed at length and full reference to the literature given. The bibliographic references are in fact a very valuable feature and raise the book to a plane somewhat above that of an ordinary text book.

The author has divided the subject matter into two parts. Part I—Mineral Analysis in which the following analyses are described and discussed: Determination of silica in a decomposable silicate, in a refractory silicate; determination of potassium and sodium in silicates (J. Lawrence Smith and perchloric acid methods); analysis of spathic iron ore; determination of sulfur in pyrite (4 methods); determination of titanium in titaniferous iron ore; Low's iodimetric determination of copper in copper ores; analysis of coal. Part II—devoted to the analysis of commercial alloys, includes phosphor-bronze; determination of carbon, manganese, phosphorus, sulfur, copper, nickel, chromium, tungsten, and vanadium in steel; determination of sulfur and of silicon in cast iron.

A table of atomic weights and a table of 4 place logarithms completes the book.

The pages are attractive with clear, black, legible type and are free from fine type and specially arranged paragraphs.

E. M. CHAMOT.

**A System of Physical Chemistry.** 2nd Edition, in 3 volumes, Vol. III, Quantum Theory. (Text-books of Physical Chemistry, edited by SIR WM. RAMSAY.) By WM. C. McC. LEWIS, M.A. (R. U. I.), D.Sc. (Liv.), Brunner Prof. of Phys. Chemistry in the Univ. of Liverpool. Longmans, Green and Co., New York, 1919. viii + 209 pp., 14 figures. 14.5 × 22.5 cm. \$2.50 net.

This is the third volume of Professor Lewis' "system" of physical chemistry. It presents a very complete survey of the numerous fields in which quantum theory has been applied.

The quantum theory itself is in a very shadowy stage of development, and Professor Lewis has attempted merely to bring together a complete account of existent work, rather than to clarify and sharpen the outlines of the theory itself. Perhaps this is all that can be done with profit at the present time, although I miss in this book such attempts at a logical development as were made by Planck in his original book, as have been made by Jeans (see for example the last edition of his "*Dynamical Theory of Gases*") or, at the risk of impertinence, as I have myself essayed ("A General Theory of Energy Partition with Applications to Quantum Theory").<sup>1</sup> The book does not even contain a complete mathematical development of the classical equipartition theory, from which quantum theory is a variant.

The enormous range of application of the quantum idea is well shown by Professor Lewis' collection of material. Thus we find the fundamental quantity " $h$ " which first occurred in Planck's radiation formula, now occurring in all the various proposed formulas of Einstein, Nernst-Lindemann and Debye for the specific heat of solids, in Bjerrum's, Krüger's and Euchen's expressions for the specific heat of gases, in Bohr's treatment of the spectra of the elements, in all discussions of the photoelectric effect and the inverse photoelectric effect, in expressions for minimum ionization potential for gases, in calculations of the amount of radiant energy necessary to produce photochemical reactions, in expressions for the temperature coefficient of the rates of ordinary chemical reactions and in expressions for the mass action constant of ordinary chemical equilibria, etc.

The clearest cut example of the importance of " $h$ " is of course the photoelectric effect, but it seems certain that whatever our final quantum theory becomes, the quantity " $h$ " has permanently entered physical science and will be used in the treatment of many, if not all, of the phenomena listed above.

Professor Lewis' adequate collection of material from many sources makes the book an indispensable one for scientists who wish to assist in the clarification of the quantum theory.

It is interesting to note that the major part of the original work in this

<sup>1</sup> *Phys. Rev.*, 11, 261 (1918).

highly theoretical field has been done by Germans, much of it appearing during the war, and that the most important contributions to quantum theory from other sources comes from a group of brilliant Englishmen. Let us hope that this will argue for a future coöperative spirit in the affairs of science and the world.

RICHARD C. TOLMAN.

**A Textbook of Physical Chemistry.** By AZARIAH T. LINCOLN. D. C. Heath and Co. 1918. vi + 547 pp. 14 × 20 cm. \$3.50.

This book is intended primarily for beginners in the subject of Physical Chemistry and follows in general the usual lines for such texts. The author has found from his experience that it is necessary to review the fundamental concepts which have been given to the students in their elementary work. The first 7 chapters are mainly devoted to this purpose as well as parts of many other chapters. The author also recognizes that it has been necessary to exclude subject matter which he would gladly have presented, and presumably would have treated more exhaustively some subjects introduced had space permitted.

These difficulties seem to be generally experienced by teachers and text-book writers on Physical Chemistry. There is a tendency to go further back "to get a start," a situation which has resulted not from choice but from the necessity of getting results. Physical Chemistry deals with the theoretical and fundamental side of the science and should be introduced as early and as completely as possible in the elementary teaching and in all courses in chemistry. Due to the popularity of the subject, this has been done to an extent that is most gratifying to the physical chemist; but in view of experiences with third year students, one wonders whether there are not some real difficulties and particularly whether ideas have not frequently been introduced before a sufficient background of chemistry had been imparted to enable the student to grasp them. Certain it is that many of these students acquire a very superficial conception of important ideas which have been presented to them, and what is most unfortunate they often seem to have been rendered immune from gaining any real conception of these ideas. A revision of courses in general chemistry must give most careful consideration to this point and to the question of perspective so that the student may have some idea of the extent and importance of the various branches of the science. The students who elect the full course in chemistry are presumably the best of the beginners and most interested in the subject, so that for them little overlapping or repetition should be necessary.

The difficulties have been met by the author quite as well as in several of our recent text-books; the derivation of the gas equation by a direct application of a theorem in variables is perhaps to be preferred to either of the two methods given and the experimental data and methods of ar-

iving at the value of the unit volume of an ideal gas would be to the point as considerable and proper attention has been given to gas laws, kinetic theory and gas reactions. The various theories of solutions are presented with a chapter on concentrated solutions, one on hydration, and one on hydrolysis. There are chapters on thermochemistry, colloids, and rate of chemical reactions. The appendix contains an interesting collection of problems, many taken from the industrial world and arranged particularly for the convenience of the instructor. The author seems to have presented a very workable text-book. G. A. HULETT.