

mean kinetic energy for each degree of freedom from the above-mentioned independence and from the form of Q given. The author gives to Q the form $Q = \sum m (u^2 + v^2 + w^2) + \sum \sum b (uu' + vv' + ww')$, where b is a negative function of the distance r at the instant considered between the two molecules whose velocities are u, u' , etc., which function is inappreciable except for very small values of r . The author shows that without the coefficient b the motion can not be stationary. Other investigators have proved that assuming the independence, the motion is stationary; the author does not question the proof but the axiom. The result of giving to Q the new value is that molecules near to each other have on an average a motion in the same direction; *i. e.*, they tend to form streams. The author admits that the usual form holds very well for ordinary gases under ordinary conditions, since for them the b coefficients are probably very small, but he maintains that his form is more general, applying without restriction as to density, except when the gas is liquefied or very near its point of liquefaction.

The subject is treated in ten chapters to which is added a short appendix containing proofs of certain mathematical propositions (relating chiefly to determinants) used in the book. Throughout the work the author considers critically the methods and results of other prominent writers on the kinetic theory in connection with his own. The style is clear and forcible. The book is not a treatise that seeks to present the subject in an elementary form; it is rather a piece of original work which every student of the kinetic theory should read.

The book is printed on good paper. The type is clear and the cloth binding is neat and durable.

The appearance of this book is additional evidence that interest in the kinetic theory is still being maintained in spite of the fact that kinetic explanations are at present viewed rather with disfavor by a number of prominent scientists.

LOUIS KAHLENBERG.

INORGANIC CHEMICAL PREPARATIONS. BY FELIX LENGFELD, Assistant Professor of Inorganic Chemistry in the University of Chicago. The Macmillan Company. 1899. 57 pp.

The teaching of inorganic chemistry in the laboratory has been developed along analytical lines almost entirely. While there is

getting to be a livelier appreciation of the value of the synthetical chemistry as a part of every chemist's training, there is even now a comparatively small number of laboratories where a regular course in the preparation of pure inorganic compounds from crude and impure materials, is required of the students. Wherever such a course is offered, or contemplated this little book of Dr. Lengfeld's will be welcomed. It contains careful and *workable* directions for the preparation of about fifty compounds, beginning with easily prepared substances, like sodium chloride, potassium chlorate, and acid sodium carbonate, and proceeding with compounds the preparation of which requires greater experience and skill, and finally ending with hydrogen dioxide, hydroxylamine sulphate, and phosphonium iodide.

To quote from the preface: "An attempt has been made to introduce all processes generally used, and at the same time to avoid repetition. The student should study each preparation in detail, work out other methods of making the same substance, understand and criticise every step he takes and read some original articles. Therefore references to the literature have been given." The student who conscientiously follows this advice, and works through such a list of preparations, will find his knowledge of chemistry increased quite as much as it would be by any equal amount of labor that he could undertake.

G. M. RICHARDSON.

THE ELEMENTS OF QUALITATIVE ANALYSIS. By WM. A. NOYES, PH.D., Professor of Chemistry in the Rose Polytechnic Institute. Fourth Edition. Henry Holt & Co. 1897. 97 pp. Price, 88 cents.

Each one of the earlier editions of this work has proved itself an extremely useful and complete outline of the general subject covered by Fresenius in his larger work on Qualitative Analysis. The present edition does not differ radically from those preceding it, but it embodies many useful additions and minor changes, which will increase its value. Its mode of treatment throughout is characterized by the same explicitness in the directions to students. Copious tables of reactions are a feature of the book. A brief introductory chapter upon the dissociation theory of solutions calls attention to the many applications of the theory