where we did not expect it. We can already see some empirical relations between the compounds in which these separations and rearrangements take place and can predict to a certain extent where they are liable to occur. But we are still wholly in the dark as to the real forces which lie behind and are the cause of the transformations.

J. J. Thomson, Rutherford and others have shown that in the phenomena of conductivity of gases and of radioactivity we have new and most powerful means of studying the properties of matter and energy which have thrown a flood of light upon the nature of atoms. Ostwald at the other extreme has wished to discard atoms altogether and to explain structural organic chemistry on the basis of thermodynamics. Richards, from a somewhat intermediate point of view but with distinctly more sympathy with Ostwald than with Thomson, has given us a conception of compressible atoms which is surprisingly like the latter's corpuscular theory of chemical combination as developed in his latest book. Michael wishes to explain phenomena of this sort by the law of entropy. Thiele, imbued with the ideas of structure, explains them in part by partial valences. Still others have attempted to study such problems from the properties of crystals, the absorption of light, and a great variety of other phenomena. The great number of properties which must finally be coördinated in any true explanation of atomic and molecular forces is discouraging and gives some basis for that agnostic point of view which considers the number of possibilities infinite and that we can never hope for a knowledge of the truth even as to the existence of atoms. Let us rather take the more hopeful view that some one, in a not too distant future, will give us a simple and comprehensive theory of the nature of atoms and of the forces which bind them together in compounds. The one who is to do this must not look at science as cut up into water-tight compartments but must be able to coördinate the evidence which comes from workers in many diverse fields of chemistry, of physics and of other sciences.

URBANA, ILL.

NEW BOOKS.

Elements of Chemistry. By HOLLIS GODFREY. Girls High School, Boston, Mass. 448 pp. New York: Longmans, Green and Co Price, $1.10.

This book is written in an entirely different style from most text books on chemistry; interest is made the prime object and exactness in details is often sacrificed to this end. Its object is to cover the whole field, not requiring any laboratory work or lecture experiments to accompany it. In taking up the discussion of a substance the practical application is first made apparent and then the general properties and mode of preparation are considered. The manner of presenting the subject should attract younger students and stimulate their interest to a wider knowledge of the subject. The book is profusely illustrated, almost to excess, as some of the illustrations are not well chosen. A very complete review-chapter and a chapter of questions follow the main text.

The book would be of no use in a college but is particularly well adapted

for use in secondary schools where the subject is taught in the class room alone. O. L. SHINN.

The Periodic Law and the Hydrogen Spectrum. By W. F. KEMBLE AND C. R. UNDERHILL. pp. 1–16; 5 figs. New York: D. Van Nostrand Co., 1909. Price, 50 cents.

It is somewhat hard to comprehend exactly what the authors of this pamphlet are driving at. They state, however, in the preface, that they "have endeavored to show a connection between the possible action of a spiral nebula and the Periodic Law;" that they "find a surprising relationship between the series [of strong lines in the hydrogen spectrum] and the order of recurrence of the elements of greatest atomic volume;" and believe that they "have herein shown some of the fundamental principles of the long-sought laws which have stood as a mere dividing line between the sciences of physics and chemistry!" *Verbum sat sapienti.*

J. JOHNSTON.

Outlines of Chemistry. A Text-book for College students. By LOUIS KAHLENBERG, 548 pages. New York: The Macmillan Co. 1909. Price, $2.60.

That elementary chemistry is recognized as a part of the most important work in the chemical laboratory, requiring the best judgment and experience, is evident from the fact that in most institutions the Freshman course is in charge of the head of the department. The large number of excellent text-books that have appeared within recent years still further emphasize its importance. Doubtless the preparation of numerous works on this subject has received a stimulus from the re ent great expansion of physical chemistry. Without question the experimental method has been greatly improved by the free use of theoretical conceptions, yet in some instances, it is to be feared that the desire to prepare an up-to-date work has led the author to include much theoretical matter that is really beyond the beginner to assimilate—matter that properly belongs in the Sophomore or Junior courses in physical chemistry.

The point of view from which Professor Kahlenberg's book is prepared is well set forth in the preface—the book is to be used in connection with a course of experimental lectures and laboratory exercises representing a year's work in chemistry in college—it is intended to meet the needs of students who are preparing for careers in chemistry, pharmacy, medicine, engineering, agriculture, or for work in natural sciences, or as a means of general culture.

The first five chapters are mainly devoted to experimental work on hydrogen, oxygen and chlorine as a foundation of fundamental facts and laws for the sixth chapter in which the atomic and molecular theories are presented. After two chapters devoted to ozone, hydrogen peroxide, allotropy and the halogens, in Chapter IX acids, bases and salts, hydrolysis, mass action, and chemical equilibrium are concisely defined on