

beautiful collection from the tribes living near the boundary between Oregon and the State of Washington. In the course of this work, information has been secured on the customs and languages of the Alsea, a tribe which is on the verge of extinction.

The industries and arts of the Indians of the Great Plains have received their share of attention. The work of the Museum was directed particularly to an investigation of the Arapaho Indians. The funds for this inquiry were given by Mrs. Morris K. Jesup. The work has resulted in a most remarkable expansion of the North American collections of the Museum; and much information of great scientific value, largely referring to the specimens collected, has been obtained.

A favorable combination of circumstances has made it possible for the Museum to collect from several points of the Arctic coast of America interesting scientific data, illustrated by numerous specimens. In this way has been obtained an almost complete series of collections illustrating the life of the Eskimo, extending from Smith Sound in the east, to the west coast of Hudson Bay, and accompanied by notes on the customs and beliefs of the various tribes, which are in process of publication in the *Bulletin* of the Museum.

Besides these collections, which are due to systematic investigation, additional material has come into the possession of the Museum by gift and by purchase. Some of the important gifts of the Duke of Loubat, in connection with Central American and Mexican archeology, have already been mentioned. He also presented to the Museum reproductions of ancient Mexican codices, and archeological specimens from Guatemala and South America. The Museum received as a gift from Mr. J. Pierpont Morgan a beautiful collection of gold, silver and copper objects from Peru. Mr. W. Curtis James donated a collection from the

Aino of Japan. Mr. Morris K. Jesup gave the means for a collection illustrating the domestic life of the Japanese. The Museum is indebted to Mr. James Douglas for an excellent collection of Apache basketry. Mr. Jacob Schiff gave to the Museum a collection illustrating the development of the iron industry among African negroes. A number of beautiful old pieces collected in the early part of our century among North American Indian tribes were given to the Museum, prominent among which is a donation made by Miss E. H. Cotheal.

A rather remarkable addition to the collections of the Anthropological Department was made by the transfer of the missionary exhibit arranged at the time of the 'Ecumenical Council' in April of this year. This collection gives an excellent start for the development of special exhibits illustrating the religions of primitive people. Among the purchases made by the Museum a large archeological collection from Illinois, the valuable Stahl connection from Porto Rico, the Gibbs collection from Turk's Island, and the Finsch collection from Melanesia, are worthy of special mention.

The new exhibits, just made accessible to the public, are proof of lively activity, and of a genuine interest taken by liberal patrons of science in the development of one of the most important scientific institutions of the City.

SCIENTIFIC BOOKS.

Grundlinien der anorganischen Chemie. By W. OSTWALD. 14 x 22 cm., pp. xix + 795. Leipzig, Wilhelm Engelmann, 1900. Price, linen bound, 16; half leather, 18 marks.

The educational importance of this book is so great that it will not be amiss to paraphrase certain portions of the preface, the quotation marks referring to the ideas and not to the words.

"The object was to present the newer theories and their consequences at the beginning

of the educational course so that the student should not be forced to master antiquated ways of looking at things, only to discard them later. While it was necessary in doing this to remodel the conventional type of text-book, as much as possible of the time-honored form of presentation has been kept. * * *

"One might perhaps teach chemistry as a deductive science, starting from a few general principles and introducing the properties of the different substances as illustrations of the general laws. This plan has not been followed, partly from an interest in the historical development and partly from a feeling that there were too many important details to make such a method satisfactory pedagogically. I have therefore kept the traditional arrangement according to elements and compounds, and have worked in the general laws as best I could. * * *

"Special pains have been taken with the development of the conception of ions. Sufficient attention has, perhaps, not been paid to the fact that it is possible and necessary to introduce this conception as a purely chemical and not as an electrical one. Although this idea was actually developed to explain the electrical phenomena, its importance in chemistry lies in its accounting for the chemical facts of reactions, characteristic of the constituents of salts. This is the point upon which stress has been laid. The electrolytic phenomena and Faraday's law serve, then, to widen and deepen the conception already deduced from the chemical phenomena."

The first three chapters form an introduction in which we find a brief but very lucid exposition of our fundamental concepts in regard to matter; a statement of the facts from which we deduce the laws of the conservation of mass and of energy; a discussion of combustion phenomena, with special reference to the changes of weight involved, and to the dissociation of mercuric oxide. The epistemological standpoint taken in the first chapter is very much more satisfactory than the materialistic one usually adopted. It is difficult to see any pedagogical advantage in postulating 'matter,' and it is certainly better, from a scientific point of view, to state what we know than to start with an assumption, however plausible.

The besetting sin of most chemists is to substitute hypotheses and analogies for facts, and to believe that an analogy is an identity. The chemist is very ready to reason that, since Brown acts like Jones under certain circumstances, Brown must therefore be Jones.

In the fourth chapter, Ostwald gives a brief sketch of the different elements, and is then able to refer to any element at any time as a substance with which the student is already familiar. Probably every chemist has tried his hand at an arrangement of the subject which should require no use of, nor reference to, anything unknown, except the one point or substance under discussion. The difficulties in the way of such a task are enormous, and it is by no means certain that the problem can be solved without sacrificing other points of vastly more importance. The method followed by Ostwald, and before him by Bunsen, eliminates these difficulties and leaves one free to treat the subject in any desired way. It is a method to be defended along other lines. The student has a speaking acquaintance, at any rate, with zinc, iron, lead, mercury, silver, gold and other elements before he begins the study of chemistry. If this previous knowledge is not to be ignored, there is no reason why it should not be extended in an equally superficial way to include all the other elements.

The chemistry proper is divided into two parts, the non-metallic elements and the metals. Successive chapters are devoted to oxygen, hydrogen, water, hydrogen peroxide, chlorine, the oxygen compounds of chlorine, the remaining three halogens, sulphur and its compounds, selenium and tellurium, nitrogen, phosphorus, carbon, silicon, boron, and the gases argon, helium, etc. Under the metals, the order is: potassium, sodium, rubidium etc., calcium, magnesium, strontium etc., aluminum and the rare earths, iron, manganese, chromium, cobalt and nickel, zinc and cadmium, copper, lead, mercury, silver, tellurium, bismuth, antimony, arsenic, vanadium etc., tin and the allied metals, uranium etc., gold and the platinum metals. The book closes with a chapter on the choice of combining weights and on the periodic law.

The treatment is excellent throughout. In

addition to the orthodox chemistry the student learns about many things which are ordinarily included in a special course on physical chemistry: rate of diffusion, reversible equilibrium, mass action, catalysis, phase rule, thermochemical relations, dissociation theory, electrolysis and Faraday's law, free energy, theorem of LeChatelier, strength of acids, relation of monotropic and enantiotropic forms, hydrolysis, reaction velocity.

The dissociation theory is introduced in a very natural way. It is first shown that the hydrogen of an acid differs from the hydrogen of other compounds in that it always shows the same reactions quite irrespective of the nature of the acid radical. Certain other properties are characteristic only of the hydroxyl of bases and are further independent of the basic radical. All soluble chlorides react with silver nitrate to form silver chloride. The radical whose reactions are independent of the other radical forming the salt is defined as an ion, and the characteristic properties of these ions are then discussed. It is then shown that salts are electrolytes, and that the ions of chemistry are also the ions of electrolysis.

There is no question but that this book is the official sign of the beginning of a new era in teaching introductory chemistry. Hitherto physical chemistry has been an independent branch of chemistry rather than the science of chemistry. While physical chemistry has exerted an influence upon elementary, analytic, inorganic, and organic chemistry, this has been an influence from without. An occasional fact has been worked into the frame here, an opening for a new view has been made there; but this has been a case of patching old garments in a vain attempt to keep them decently presentable. It is evident that the whole teaching of chemistry must be put on a new basis and carried on along scientific lines. This has been done for elementary chemistry in the book now under discussion, and it is now possible for those teaching introductory chemistry to present their subject in a satisfactory way, even though they may not themselves have been trained in physical chemistry.

The time is ripe for such a change. Ostwald has been working up to it for years. In this

country, as well as in Europe, there are universities and colleges where lectures on elementary chemistry are now being given by physical chemists along similar, though not identical, lines. Holleman has recently published a text-book which may be looked upon as a forerunner of Ostwald's volume. While the reviewer is not so sanguine as to expect that Ostwald's book will be adopted at once throughout the length and breadth of the scientific world, yet the time is surely coming when the right way of teaching the subject will be the general way.

The fact that this book will revolutionize the whole teaching of introductory chemistry is a striking illustration of Ostwald's ability as an expounder. Ostwald has done much brilliant scientific work; but his real strength is as a teacher. It is not an exaggeration to say that the first edition of his *Lehrbuch* created the science of physical chemistry. Horstmann had had a glimpse of the promised land; but it was Ostwald who led the chemists into it. Van't Hoff originated the modern theory of solutions, Arrhenius the theory of electrolytic dissociation, and Nernst the osmotic theory of the voltaic cell; but it is Ostwald who has developed these theories and who has forced their acceptance. It is to Ostwald that we owe the rejuvenation of analytical chemistry and we now owe to Ostwald by far the best text-book on introductory chemistry.

WILDER D. BANCROFT.

Twelfth Annual Report on the Railways of the United States, for the year ending June 30, 1899. By the Statistician to the Interstate Commerce Commission. Washington, Gov't Print. 1900. 8vo. Pp. 712.

It is unfortunate that some such system as is employed by the Census Bureau, adapted to this special line of work, cannot reduce the period of waiting for these reports. The Commission dates its report for the year ending June, 1899, precisely one year later than that date and the shortening of this delay and waiting would have value in high ratio with the proportion by which the period of delay might be reduced. Undoubtedly the Commission and its employees do their best, however, and we must hope for some later Hollerith to