teacher in this way, each contributing his part to a common work, and the whole appearing almost simultaneously in two languages. In the American edition it is Dr. Winton with the collaboration of Professor Moeller, while in the German edition it is Professor Moeller with the collaboration of Dr. Winton. This is a beautiful acknowledgment of their confidence in each other, and we have seldom seen the work of two men that is so much alike in both drawings and descriptions as in this instance.

The work is divided into ten parts, as follows: (1) Equipment, methods and general principles; (2) grain, its products and impurities; (3) oil seeds and oil cakes; (4) legumes; (5) nuts; (6) fruit and fruit products; (7) vegetables; (8) alkaloidal products and their substitutes; (9) spices and condiments; (10) commercial starches. The work contains in addition a general bibliography, a useful glossary and a good index.

A careful examination of this book of Winton and Moeller's shows that in order to carry on analyses of vegetable food products successfully it is essential for the analyst to have special botanical training, and that with the knowledge gained by this training the determination of purity and the detection of adulterants is reduced to a degree of scientific accuracy hardly possible in any other kind of analytical work. The teachers of chemistry and those in the biological departments of colleges and technical schools should cooperate in arranging courses which would not only qualify their students to examine vegetable products, but also enable them to devise methods for their manufacture.

This book could be used as a text-book, and will be found an invaluable reference book for the food analyst, the agricultural chemist, the pharmacist and others engaged in the examination of foods, as well as the physician who may be called upon to identify vegetable substances in stomach contents and feces.

HENRY KRAEMER.

Essentials of Crystallography. By EDWARD HENRY KRAUS, Ph.D., Junior Professor of Mineralogy in the University of Michigan. Ann Arbor, Mich. 1906. Pp. 162; 427 figures.

Unlike some related sciences crystallography is not over-burdened with texts, certainly not with those printed in the English language. The appearance, therefore, of a new crystallography is an event of considerable importance to teachers of mineralogy. The author of 'Essentials of Crystallography' was trained in the laboratory of Professor Paul v. Groth, of Munich, and in the two brief years that he has been in the faculty of the University of Michigan, has developed a flourishing department which already requires the services of a professor, an instructor and two assistants.

Most writers of books upon crystallography appear to go out from the idea that the subject is adapted to study by a very limited number of persons, and those only who are to become thorough masters of the subject and advance it through original research upon general lines. Thus the texts published in England have laid stress upon mathematical theorems rather than upon the symmetry of crystals. The great development of organic chemistry in recent years, and the prominence which crystal symmetry and habit have acquired as means for identifying chemical compounds, has demonstrated that crystallography is a necessary part of the training of chemists as well as of mineralogists and geologists. For such students much must be eliminated from consideration in order that essential facts may be grasped, and the course be given a practical value.

The requirements of such students were singularly well met by the 'Elements of Crystallography' of the late George Huntington Williams, as was, perhaps, shown by the rather extensive use of the book by American teachers. Since the profound changes brought about by the acceptance and introduction of Gadolin's thirty-two classes of crystals, Williams's work has been no longer serviceable as a text, and its place has not been filled by any later work.

Professor Kraus apparently makes the fundamental assumption that crystallography can not be learned outside of a crystallographical laboratory or without the guidance of a

teacher. He has thus been able to cut down his text to 160 pages and to offer his book for sale at a price corresponding to one cent per page. The large number of figures for a book of such small compass, shows that so far as possible the training is to be through the eye, and the identification of models and crystals made easy.

The order of treatment is by systems and their subordinate classes, beginning with the forms of highest symmetry; and the holohedrism, hemihedrism and tetartohedrism of forms is indicated, though made secondary. The systems of nomenclature of Weiss, Naumann and Miller are used side by side. The relationships of the forms belonging to classes within the same system are indicated by tables and diagrams, in which the apparently holohedral forms and those which bring out in their development the real symmetry of the group, are sharply differentiated.

The six pages devoted to compound crystals will seem to many inadequate, in view of the great prominence of twins in the case of a large number of species. Not the least valuable part of the work is an appendix giving a tabular classification, which shows the symmetry elements and the simple forms of each of the thirty-two classes of crystals.

William Herbert Hobbs.

SCIENTIFIC JOURNALS AND ARTICLES.

The American Naturalist for November contains three long papers: 'Variation in the Number of Seeds of the (American) Lotus,' by Raymond Pearl; 'The Causes of Extinction of Mammalia,' by Henry F. Osborn; and 'A Preliminary Study of the Finer Structure of Arcella,' by Joseph A. Cushman and William P. Henderson. Professor Osborn's paper, which is to be continued, discusses seriatim the external causes, such as variations in climate, increasing cold, heat or moisture, with their concomitant changes in plant and insect life; and the relations of plants and insects to mammals, with their bearing on extinction. Discussion is desired and criticisms and suggestions will be welcomed. Messrs. Cushman and Henderson show that the generally accepted idea of the structure of the test of *Arcella* is incorrect, and that the framework instead of consisting of simple hexagons, touching one another at their sides, consist of hexagons touching at their angles and thus leaving triangular interspaces which permit the interpolation of new columns of hexagons as growth proceeds. There are many ichthyological notes, while those relating to botanical publications are, as usual, numerous.

The American Museum Journal for October is termed the Sponge Number, the principal article being 'A Guide to the Sponge Alcove in the American Museum of Natural History,' by Roy W. Miner. This is well written and well illustrated. Incidentally, it may be remarked that it is very difficult to find in any text-book a consecutive definition of a sponge; we are told all about the structure and embryology of sponges, but what a sponge really is and its position in the animal kingdom has to be gathered by much reading. The *Journal* contains brief reports of several of the Museum expeditions, including those to Tahiti, Colorado, North Carolina and East Africa.

The Museum News of the Brooklyn Institute for December has articles dealing with 'The Question of Common Names' and, in connection with a recently installed group, 'The Golden Eagle, its Haunts and Habits.' It is noted that the museum has acquired the Ward collection of sponges and corals, the former containing 150 specimens of siliceous sponges and 660 of horny sponges; the latter comprising 234 species of corals. The collection of sponges was brought together by the late Professor Henry A. Ward and is extremely valuable from both the scientific and the popular standpoint, comprising as it does selected specimens from many years of collecting. The leading article of the Children's Museum section, under the title of 'General and Mrs. Green,' deals with two bullfrogs that have lived in the museum for four years.

SOCIETIES AND ACADEMIES.

THE AMERICAN PHYSICAL SOCIETY.

The fall meeting of the Physical Society was held in Chicago on December 1. In the absence of President Barus, Past-president A.