of naturalist as well as medical adviser to the party. He was one of the original group of young naturalists which gathered around Professor Baird in the early days of the institution, who made up the Potomac-side Naturalists Club, and whose names are classic in the annals of zoology in this country. Although never robust, and for much of his life in delicate health, he survived all the others. Dr. Cooper was assigned to the western division of the survey, terminating at Puget Sound, under the superintendence of Geo. B. McClellan, of the Engineer Corps of the army. Jefferson Davis was Secretary of War; the regimental quartermaster who supplied the needs of the party on the Pacific coast was U. S. Grant. Co-laborers with Cooper in working up the collections were Baird, Torrey, Asa Gray, Hayden, George Gibbs, Meek, Le Conte, and Dr. Suckley, in cooperation with whom Cooper prepared a report on the birds of Washington Territory. As usual in those days, he collected in all branches, and made a particular study of the meteorology of the region. The following year he returned to Washington to prepare his report, but was soon obliged by lung trouble to return to the more favorable climate of the Pacific coast. For several years he devoted himself to making collections on the Pacific coast, much of the time at his private cost. During the latter part of the Civil War he was surgeon in the 2d Cavalry, California Volunteers, and served until the regiment was mustered out. In 1865 and 1866 he was naturalist to the Geological Survey of California, under Whitney, and his report on the birds of the state, after the close of the Survey, edited by Professor Baird, was published by Professor Whitney at the personal cost of the latter, though in form as one of the 'Reports of the State Geological Survey.' In 1866, Cooper married Miss Rosa M. Wells, and continued in the practice of his profession until the failure of his health in 1871, after which his work, though often interrupted, was still pursued as his strength permitted. He was long associated with the California Academy of Sciences, and also with the State Mining Bureau. Much of Dr. Cooper's early work was of great help and importance in developing knowledge of the fauna, flora and geology of the Pacific coast. Ornithology knows him as a valuable contributor, and his most extensive works were on that branch of science. Later he published many papers on the mollusks of the coast, and the number of titles in this line of research mounts up to forty-three. Many of the younger students of zoology on the Pacific coast have testified to their appreciation of his help in guiding and promoting their studies. The Cooper Ornithological Club of California was named in his honor, and the first number of its *Bulletin* contains a sketch of his life, up to 1899, and a portrait. To this summary we are indebted for many of the above facts. Dr. Cooper was tall and slender, rather reserved in manner, and his physical activity was held in check by ill health during much of his life, while for years he was dependent upon his medical practice for support. But in spite of these handicaps his work on the Pacific coast has been of primary importance, and by his death passes away the last member of a group of men to whom American zoology is permanently indebted.

WM. H. DALL.

SCIENTIFIC BOOKS.

The Principles of Inorganic Chemistry: WILHELM OSTWALD. Translated with the Author's Sanction by ALEXANDER FINDLAY. London, Macmillan & Co. 1902. 8vo. Pp. xxvii+785.

Professor Ostwald has played a most prominent part in the promulgation of modern physical chemistry. His pen has been so wonderfully prolific that astonishment is felt that he is able to produce so many books of large size

while he is at the same time performing laborious investigations, editing the *Zeitschrift für Physikalische Chemie,* and doing the large amount of teaching that falls to his lot.

The work under consideration appeared in Germany about two years ago, and the recent appearance of a good translation of it is to be heartily welcomed, for in many respects this is a noteworthy and useful book. The English edition does credit to the publishers in being a handsome book, which, as it happens, is more attractive than the German one.

We have here an attempt to introduce a good deal of physical chemistry into the teaching of elementary inorganic chemistry. While this aim is a praiseworthy one, to some extent at least it appears to the reviewer that Professor Ostwald has gone somewhat too far in this direction. The book seems to be too difficult for any but mature and highly talented beginners. However, for chemical students of considerable experience, and in fact for a very large number of chemical readers the work will undoubtedly be valuable, for it contains clear and simple explanations of the points of physics that every educated chemist should know. Many physical matters are treated in a very interesting and suggestive way.

So much has been said in praise of the book that a few adverse criticisms may be allowed. In the first place, one important reason why the work would be difficult for a beginner is the fact that the author, while admitting that the atomic hypothesis is of great value for the purposes of instruction and investigation, avoids the use of this and of the molecular hypothesis as far as 'the present usage of language will permit.' His reason for so doing is that these are hypotheses, not realities. If he were consistent he would not use the ionic hypothesis, but he employs the latter to the last degree, and even occasionally alludes to ions in solid substances. The question may well be asked, can ions be assumed to exist without the assumption that atoms and molecules exist? The attitude of certain physicists in abandoning the atomic and molecular theories must appear absurd to chemists until something better is brought forward to replace those theories, for, what could an organic chemist do, for example, if he gave up atoms and molecules?

Another fault of the book is the occurrence of too many inaccurate statements. The translator says that the mistakes that had crept into the German edition have been, as far as possible, corrected; but still many remain that have been noticed, and it may be inferred that there are others which the reviewer was not wise or diligent enough to detect. A few examples will suffice to show the character of the errors.

The statements in regard to the amounts of carbon in iron and steel are contradictory and incorrect (pp. 563, 564, 585). The erroneous statement is made that sulphur can be readily removed with carbon and silicon in the ordinary Bessemer process (p. 585). Talc, which contains water, is given as an example of an anhydrous silicate of magnesium (p. 537). It is stated that the most frequent types of the double salts of antimony trichloride and triiodide are M_3SbCl_6 and $MSbI_4$ (p. 700), whereas these are rather rare types in both cases. Lead tetracetate, which is white, is called yellow (p. 652).

The translator's work has been very well done. One typographical error, which is not copied from the original, is noticed (p. 463) where 42,400 c.c. instead of 22,400 c.c. are given, which makes the volume of gas produced by the explosion of gunpowder altogether too large. In the table showing the periodic arrangement of the elements the translator has corrected the atomic weights of krypton and xenon, according to recent determinations, from 45 and 65 to 82 and 128, but, curiously enough, he has left the new numbers in the old places instead of putting them in the places called for by their magnitudes. The translator has introduced some curious names for ions, such as potassion, lithion, triferrion, carbanion, sulphanion, etc. As long as these are self-explanatory there can be no serious objection to them, but without having mastered the nomenclature one might be in doubt whether the last, 'sulphanion,' referred to the sulphide, sulphite or sulphate ion.

H. L. Wells.