be required, and the object of his tentative answer is, to bring this primary question to the fore. EDWARD W. MORLEY.

THE STUDY OF THE ATOM. BY F. P. VENABLE. Easton, Pa.: The Chemical Publishing Company, 1904. vi + 290 pp. Cloth. Price, $2.00, net.

This book appears to be an attempt to give a semi-popular account of the history, nature, and behavior of atoms. The opening chapters (75 pp.) deal with: "Ancient Views as to the Nature of Matter" and the atomic theory "from the Greek Philosophers to Dalton," and contain a résumé of the speculations on this subject. Then follows an account of the employment of the atomic theory by Dalton (34 pp.) and the advances which culminated in the adoption, at the suggestion of Cannizzaro (1858), of the criteria still used for determining atomic weights (43 pp.). On the ground that "The discovery of this Natural System has done so much to make clearer the nature of the atom * * *," the next chapter deals with the Periodic System (30 pp.). In Chapter VI, "Affinity, the Atomic Binding Force," the various views as to the nature of "the attraction between atom and atom" and the various methods of measuring it are discussed. The author has doubts about accepting the "theory of ions," but suggests no substitute. Apparently he does not think that the recent study of solutions has added to our knowledge of the atom. He likewise (Chap. VIII) questions the views of J. J. Thomson in regard to electrons and leaves unmentioned the most remarkable contribution that has recently been made to our knowledge of the atom.[1] In the chapter on "Valence." Werner's hypothesis is disposed of in a page and a half, and Richards' work in fifteen lines. Speaking of the changes in valence by light, heat, and other agencies, the following is the whole account of the effect of electricity: "Changes of valence due to electricity are not unusual. Thus we have the production of carbon monoxide from carbon dioxide by the passage of the electric spark, $CO_2 = CO + O$. In general such changes may be attributed to chemical action induced by the electricity serving as the direct agent. The change may be the result of changed vibration or to changes of electrical state." Surely the electrolytic oxidations and reductions would have offered far more instructive, not to say convincing, illustrations. Much of the book seems to lack force in the same

[1] J. J. Thomson: *Phil. Mag.*, March, 1904.

way that this passage does. A chapter on "Molecules and the Constitution of Matter" concludes the volume.

The reviewer does not feel that the author has shown that the atomic theory, as it was twenty-five years ago, is a satisfactory medium for conveying modern views on such parts "of chemical theory * * * as bear directly upon the question of the constitution of matter."—*Preface.*

The author does not seem to favor modern views in regard to the methodology of science, a fact which, in a work dealing with a subject like this, necessarily shows itself in almost every sentence.

A. S.

KRITISCHE STUDIEN ÜBER DIE VORGÄNGE DER AUTOXYDATION. By C. ENGLER AND J. WEISSBERG. Vieweg und Sohn, Braunschweig, 1904. 197 pp. Price, 6 marks.

The two sides of the great problem of autoxidation or slow combination of compounds with oxygen at ordinary temperatures, are first the study of the mechanism of the processes in a qualitative sense, and second, the study of the dynamics of the reactions in a quantitative way in definite mathematical terms. In regard to the first of these problems the numberless theories that have been presented may be called variations, modified in details only, of two fundamental theories, those of C. F. Schönbein and of Moritz Traube. Schönbein believed that he had shown that ordinary oxygen must break down before it can oxidize any substance, into two oppositely polarized active modifications of oxygen, "ozone" and "antozone". In its more modern garb, this theory is that of the dissociation of the oxygen molecule into oppositely charged atoms or ions, $\overset{+\,+}{O}$ and $\overset{-\,-}{O}$, van't Hoff being the most prominent supporter of this view. According to Traube, on the other hand, oxidation is effected by the addition of atoms or radicals to the unsaturated molecule of oxygen, without any preliminary complete dissociation of the oxygen molecule, peroxides, R_2O_2, invariably resulting as primary oxidation products. Professor Engler, of the Polytechnische Hochschule in Karlsruhe, has made important original contributions supporting and modifying in some details Traube's views, and the present book is intended chiefly to arrange and discuss systematically all the more important oxidation processes from the point of view of the addition of molecular oxygen.