

method occasionally upsets the conventional sense of proportion. Some of the things that we had supposed really mattered are treated with indifference; a new sense of values is introduced. Whether these will bear closer examination remains to be seen, but in any case we may warmly congratulate the author on the successful completion of an arduous undertaking.

J. A. G.

ATOMIC DYNAMICS.

Prinzipien der Atomdynamik. By Prof. J. Stark. I. Teil: "Die elektrischen Quanten." Pp. x + 124. (Leipzig: S. Hirzel, 1910.) Price 3.20 marks. II. Teil: "Die elementare Strahlung." Pp. xv + 286. (Leipzig: S. Hirzel, 1911.) Price 7.80 marks.

IN this work Prof. Stark gives a systematic account of the experimental facts which throw light on the constitution of the atom, and develops a theory of the structure of the atom, mainly on the basis of optical phenomena. The work is divided into three parts. Part i. is intended as an introduction, and deals with our knowledge of the nature and properties of electrons, and of the energy and structure of the electromagnetic field. Little space is devoted to the description of the methods by which the experimental results were obtained, and more prominence is given to the discussion of the validity of the experiments and their value in elucidating the internal structure of the atom.

In chapter iii. the constitution of the atom on Stark's theory is described. It is assumed that electrons and positively charged entities (archions) which are endowed with mass form the constituent parts of an atom. On account of magnetic forces, the archions form a definite configuration in the atom, and cannot be separated without causing its disruption. On the other hand, the electrons which are attached to the archions can be separated without causing the atom to decay. This atomic system, which is more fully developed in part ii., is capable of explaining and systematising many of the experimental facts.

The second part is mainly concerned with electromagnetic radiation. After a discussion of the theoretical principles of radiation, the grouping of spectrum lines into series and the relations existing between the frequencies of the lines are considered. A detailed discussion of line and band spectra and similar phenomena exhibited by Röntgen rays is also given. The archion theory is then worked out more fully, and hypotheses are put forward to account for the origin of spectra. The band spectra are ascribed to the vibrations of the electrons which are attached to the archions,

while the archion itself, after losing the electron attached to it, is the elementary oscillator responsible for the line spectrum. The continuous spectrum is ascribed to the vibrations of the free electrons. These by frequent collisions suffer irregular accelerations, and thus give rise to a continuous succession of frequencies. A full and interesting account of the bearing of the author's theory on such problems as the Doppler effect in canal rays, the Zeeman effect, fluorescence, and allied phenomena is given. Also the results obtained with Röntgen and γ -rays are considered in relation to the theory.

The third part, which has not yet appeared, is, according to a statement in the preface, mainly intended for the chemist. It will deal with the structure of the electromagnetic field on the surface of chemical atoms, and with the forces which hold the atoms together in chemical combinations.

A work of this nature, which aims at a discussion of the principles of atomic dynamics, must to a large extent be of a speculative character. In this connection, however, it is important to remember that the work always distinguishes very clearly between experimental facts and speculative theory. Also, the reader who does not agree with the speculations put forward in the work will find in it a very useful record of all researches which contribute to the elucidation of the internal structure of the atom. Perhaps one misses a fuller discussion of radioactive phenomena, which are intimately connected with the problems discussed in this work. Stark's book, which deals with such a fascinating subject in an interesting manner, will prove very useful as a guide to further research.

H. G.

MODERN ROAD CONSTRUCTION.

Modern Road Construction: a Practical Treatise for the Use of Engineers, Students, Members of Local Authorities, &c. By Francis Wood. Pp. xi + 137; illustrated. (London: Charles Griffin and Co., Ltd., 1912.) Price 4s. 6d. net.

THE conditions relating to the maintenance of roads during the last few years have undergone so much alteration, owing to the introduction of motor vehicles, that the publication of a practical treatise on the subject is fully justified.

The book now under notice cannot fail to be of great service to those having charge of urban roads. The author, who has the supervision of the roads in the Borough of Fulham, appears to have devoted a great deal of attention to observing and recording the wear and tear of different kinds of material used; and in obtaining statistics as to their cost and endurance. The book gives,