acetate solution by adding petroleum spirit. It explodes when heated on platinum foil. The composition corresponds to $(C_{10}H_{16}O_6)_x$, the value of x being uncertain, probably 2 or 3. When thoroughly extracted with water, the extract was chiefly levulinic acid; oxalic acid was not detected, but it is thought to be a product of secondary oxidation of the rubber. Fendler (*Gummi-Ztg.*, 1904 (19), 41) has examined the reaction of solvents on rubber, using some twenty-six varieties in all. He fails to confirm Weber as to the insolubility of rubber in ether, but finds it, on the whole, a fairly good solvent for some varieties. Some rubbers contain substances insoluble in all solvents tried; these are supposed to be oxidation products, or substances formed by the sulphurous acid produced in coagulating the rubber in the smoke of Urikuri nuts. Petroleum spirit extracts the lower oxidation products, while the portions dissolved by benzene contain more oxygen. The author holds that Harries' "nitrosit" method estimates the partially oxidized products as pure rubber, and should be used only for vulcanized rubber.

NEW BOOKS.

AVOGADRO AND DALTON THE STANDING IN CHEMISTRY OF THEIR HYPOTHESES BY ANDREW N. MELDRUM, D.SC. Edinburgh William F. Clay 1904 Price, 3 shillings.

The chemist has to do with so overwhelming a multitude of facts that sufficient consideration of the principles and assumptions at the basis of the superstructure is not easy. The present interesting essay, whose preparation and printing have been aided by a grant from the Carnegie trustees, will be sure of a welcome. The author's purpose may be stated in his own words: "The theoretical basis of Nernst's system of chemistry is Avogadro's hypothesis. Nernst's book is a comprehensive one, suitable for the student of research. It goes as far as the debatable ground between the known and the unknown. It was doubtless far from Nernst's purpose to expatiate on the rudiments of chemistry. There is reason to believe that it would be of interest, and even of value, to trace the development, in logical order, of the cardinal doctrines of chemistry on the basis of Avogadro's hypothesis."

The first part of the essay contains seven chapters and treats of "the standing in chemistry of Avogadro's hypothesis." The second part, in the same number of chapters, treats of "the standing in chemistry of Dalton's atomic hypothesis." The conclusion of the first part is (1) "that Avogadro's hypothesis may not be regarded as a well established truth," (2) "that Avogadro's hypothesis being almost universally accepted by chemists has so many fruitful issues that it is the 'very basis and cornerstone' of chemistry." "The chief issues of the hypothesis are: The molecular theory, including the modern theory of solutions, the atomic hypothesis, the doctrine of valency and the periodic system." The conclusion of the second part, if it can be fairly stated by citing a few lines, is as follows: "The idea of atoms was not due to Dalton. What he originated was a persistent attempt to arrive at atomic weights....... The truth is, that in the form which Dalton gave to the atomic theory there never was any certainty about atoms and atomic weights." "Those who maintain that Dalton's conception of the atom is not outworn, but is still with us, have much to answer for."

Of the principles which have led to such a judgment, the essayist says: "In considering scientific doctrine, some definite conception or other of science must be kept in view. In the course of the argument, as a guiding principle or touchstone, I use the dictum that 'science is measurement.'" But this is far from being a definite and true conception of science; it rules out discovery, it excludes the establishment of the development theory from the list of great scientific achievements. This is important in the present case, for there are two questions: (1) Who first discovered what we now believe about the atomic and molecular structure of matter, and (2) who found a method of successfully weighing atoms and molecules? Now Dalton's postulates may be stated as follows: (1) Every element consists of particles which remain undivided in all chemical reactions. (2) All the particles of a given element are equal in weight, but the particles of different elements differ in weight. (3) Every compound consists of particles, all alike and equal in weight, which remain undivided in most physical processes, though divided in some chemical processes, and which are made up of a finite number of the undivided particles of two or more elements. To the particles of the elements he gave the ancient name of atom; to the particles of compounds he gave the name of compound atom; we retain the name atom, but replace the name compound atom with the name molecule.

Whatever we may concede about the first proposition, the second and the third indubitably belong to Dalton, and they are accepted now. To discern them was work of discovery, and there are many who think discovery not less important than measurement.

The 113 pages of this essay contain some 150 quotations; some are of merely literary interest, like those from Pater or from Cardinal Newman. Most of them are from the original literature of the subject, and show that the essayist has in mind the material required for the formation of independent opinions, and for their defense. Sometimes the style is not quite so clear as the nature of the subject requires, and the frequent study of a single sentence or passage does not escape giving to the whole something which suggests the schoolmen. This kind of study also demands a good deal of skill in interpretation in order to avoid pitfalls, so that many who carefully consider the argument of the essay will often differ from its understanding of opinions. An instance of this is in the assertion that Faraday was an agnostic in regard to the atomic theory, when he himself is quoted as saying that he believed in atoms, but was agnostic in regard to attaching to the atomic theory the notion of little solid particles existing independently of the forces of matter.

It should be said that the essayist is well aware that he is not, at present, on the side with the majority of chemists. The essay is cordially commended as a valuable contribution to the easier understanding of the growth of atomic and molecular conceptions.

EDWARD W. MORLEY.

THE FOLLIES OF SCIENCE AT THE COURT OF RUDOLPH II, 1576-1612. BY HENRY CARRINGTON BOLTON. Milwaukee: Pharmaceutical Review Publishing Co. 1904. 8vo., 217 pp. Price, $2.00.

This posthumous volume, by the late H. Carrington Bolton, furnishes an interesting picture of the period when true science was emerging from mediaeval philosophy, and from the snares set in its pathway by the beliefs in magic, witchcraft, alchemy and astrology. In all of these vagaries the Emperor Rudolph was a firm believer, but while he surrounded himself with charlatans of every description, a few real investigators, among them Tycho Brahe and Kepler, were given his help and patronage. Therein the Emperor "builded better than he knew."

To the preparation of this work Dr. Bolton brought all of his remarkable knowledge of early scientific history to bear. The story is told in narrative form and wanders far afield from the Bohemia in which its main scenes are laid. Dr. Dee and his