accession to our data as well as to our outfit of useful tools for work of this kind.

R. H. Thurston.

The Story of Alchemy and the Beginnings of Chemistry. By M. M. Pattison Muir. New York, D. Appleton & Co. 1903. 12mo. Pp. 182. Ill.

The author of this little book, Matthew Moncrieff Pattison Muir, fellow and prælector in chemistry of Gonville and Caius College, Cambridge, is known to the scientific world as joint editor with Dr. Foster Morley of the new edition of Watts' 'Dictionary of Chemistry,' as the translator of Ostwald's 'Solutions,' and as author of several treatises on practical chemistry published in part with the cooperation of others. Besides these valued works he is the author of 'The Story of the Chemical Elements' (London, 1896), as well as of 'The Alchemical Essence and the Chemical Element' (London, 1894). In the latter Professor Muir showed the weakness of the pseudo-science of alchemy in the attempts of its advocates to explain natural facts by wit and reason, before they had ascertained what the facts were that required explanation, and he contrasted with this useless undertaking the well-grounded, suggestive and rational methods of modern chemistry.

In 'The Story of Alchemy' the author expands and elaborates this view of alchemy and points out that it regarded nature by emotional methods, and that they resulted in baseless speculations; the alchemist 'began the study of nature with introspection, and spins his universe from his own ideas of order, symmetry and simplicity, as the spider spins her web from her own substance.' One of the characteristic features of alchemical doctrine was a commingling of ethical and physical ideas; the alchemists attributed to natural things moral virtues and even vices, and remains of this survive in many expressions still in use, such as 'noble and base metals,' 'imperfect gases,' and 'good and bad conductors of electricity.' These are Muir's examples, but the reviewer suggests that in some of these cases the adjectives 'good and bad' signify 'successful and unsatisfactory' (or terms analogous thereto) without any idea of imputing moral qualities.

The transmutation of metals was a natural adjunct of alchemical theory, and was based in part on observation of nature's methods, but erroneously interpreted; philosophers regarded metals as living things, and since nature strove to bring other living things to a more perfect state, so too the noble metals had been evolved from the ignoble and less valuable ones by Nature herself in the bowels of the earth. Were not gold found in copper mines and silver in lead mines, proofs of this?

Conceptions of an orderly, material universe were so intimately associated with ideas of morality and with religious beliefs, that to disprove the possibility of the great transmutation would have undermined the basis of material things as well as of ethics. Plants are improved by appropriate culture, by loosening and enriching the soil, and by choice of seed; animals are improved by judicious breeding; metals by analogous processes should be helped toward perfection. Metals, the alchemists argued, have bodies, souls and spirits; each has specific bodily form, a metalline soul characteristic of a class, and a spirit, or inner immaterial potency, the very essence of all metals. They asserted that there is present in all things One Thing, the Primal Element, and the final aim of alchemy was to obtain this primal element, the soul of all things, so purified from all admixture of 'elements' and 'principles' as to make it available for any transmutation. To secure this essence required patient, prolonged study in the laboratory, and the quest was fraught with peril.

After stating that the words 'element' and 'transmutation' did not mean to the alchemist what they signify at the present time, the author remarks that our present knowledge makes such a change as lead into silver unthinkable, yet facts *may* be discovered which will make possible the separation from lead of things unlike itself, from which silver may be produced by the combination of some of these constituents.

The alchemical quest of the primal matter still goes on, but modern chemistry conducts it in a more rational manner; considerations

of the atomic weights of the elements, their grouping and classification, suggest that elements merely mark stable points in a process of change; but the investigations are still in a nebulous condition. The phenomena of Röntgen rays and Becquerel rays enter into this conception. After all, the modern chemical problem bears only a superficial resemblance to the alchemical quest for the 'One Thing.'

'The Story of Alchemy' is not a history of the pseudo-science, but rather a philosophical examination of its true significance and aims, told in an attractive, interesting manner by a competent scholar. The title of the book, which is necessary as one of a series, is misleading; the work makes no attempt to depict the sociological influence of alchemy by detailing its fortunes and misfortunes, but this does not detract from its value to students and the general reader.

It is interesting to note that 'sulfur' is spelled throughout in the manner recommended by the American Association for the Advancement of Science in 1891.

HENRY CARRINGTON BOLTON.

SCIENTIFIC JOURNALS AND ARTICLES.

THE *Botanical Gazette* for January contains the twenty-fourth installment of 'Undescribed Plants from Guatemala and other Central American Republics,' by John Donnell Smith, Thirteen new species are described by the author and the specialists to whom particular groups have been referred. *Zamia Tuerckheimii* is illustrated upon a double lithograph plate.—Professor J. C. Arthur, of Purdue University, reports upon the third series of 'Cultures of Uredineæ,' which were made during the season of 1902. One hundred and twenty-three collections of material were employed, and 327 cultures attempted, representing 43 species of rusts and using 102 species of hosts. In no case was success in connecting the generations of these puzzling plants attained where definite clues derived from field observation were lacking. Fourteen species tried by the guessing method were involved in these failures. Twelve that had been studied with success before were again successfully grown and the confirmatory results are recorded. Seven species of rusts were successfully cultivated and the connection between the æcidial and teleutosporic generations established. Three new names are proposed.—Arthur L. Dean, of Yale University, gives an account of his 'Experimental Studies on Inulase.' This enzyme, found in *Aspergillus* and *Penicillium*, does not diffuse into the culture medium. It acts most vigorously at a temperature of 55° C. and in a medium containing .0001 normal H_2SO_4; .01 normal destroying it.—Dr. B. E. Livingston discusses 'The Distribution of the Upland Plant Societies of Kent County, Michigan.' The climatology and geology of the county are described and the vegetation of the uplands classified into five societies, whose distribution is shown upon a map of the county. A list of the plants constituting these societies is given and the relative frequency of the different species is indicated. The writer holds that the controlling soil factor in distribution is one of drainage. While the present observations seem to justify the hypothesis that physiography determines vegetation, the writer thinks that the main question with which we have to deal lies still untouched, namely, 'What is it in the nature of the soil which determines the distribution of plant societies?' He offers the hypothesis that 'The decisive factor in plant distribution on a small upland area is in most cases the moisture-retaining property of the soil.' Of course the historic factor must also be taken into consideration.—Professor Albert Schneider, of Northwestern University, contributes a second paper on the 'Biology of *Rhizobia*' in which he corrects a previous statement that *Rhizobium mutabile* is absolutely non-motile, showing that while this is true of the species in most neutral media, espcially in solid ones, it is decidedly motile in acid media, the growths being grayish to light gray and brownish-gray in color, and the motile forms much smaller and more uniform in size than the non-motile ones.—The number closes with twenty-two pages of notices of current literature and news items.

C. R. B.