with the author. It cannot fail to fascinate the youthful student in the kindergarten. It has long been maintained that the elements of some of the sciences might be taught with advantage in the kindergarten. It remained for the inventor of this system to show how readily this may be done. The expense is a mere trifle, and no preparation on the part of the teacher is required. We shall soon find our children making marsh-gas, or 'ethene dibromide,' or showing how nitrate of potassium and sulphuric acid are converted into nitric acid and hydric potassic sulphate; we shall hear them making the fine distinction between plain water and cracked-up water; and we shall be obliged to confess that the method by which we were taught the elements of chemistry was a very cumbersome one as compared with the simple method of Mr. Farmer.

While fully recognizing the humorous features in the kindergarten system of chemistry, we cannot avoid a feeling of depression when we regard it as evidence of a state of mind which is very prevalent. Too many teachers of chemistry, like Mr. Farmer, magnify the importance of formulas, and lose sight of the facts which they represent. This is the crying evil in chemical instruction at the present time. The teacher who 'knows the theory,' but doesn't 'know the practical side of the subject,' is still abroad in the land.

FONTAINE'S OLDER MESOZOIC FLORA OF VIRGINIA.

THIS work is one of the smallest of this series; but it is one of merit and importance. Although the number of fossil plants from Virginia strata here enumerated is not great, they are so thoroughly illustrated, and so critically discussed, that their diagnostic value is fully brought out. Professor Fontaine may fairly claim to have demonstrated, from evidence furnished by the plants alone, that these older mesozoic beds, which had not previously been clearly distinguished from the younger ones, and had been commonly grouped with the latter as the trias of Virginia, can scarcely extend so low as the extreme upper trias, and conform more closely to the rhaetic of Franconia, Bayreuth, and Palsjö, or even to the lias of Rajmahal.

This conclusion, of course, is derived from an analysis of the species discovered, and a study of their affinities with species obtained from strata in other parts of the world, whose geological position is fixed with some degree of accuracy. This subject is discussed at length. The substance of it can be given in a few words.

The whole number of distinct plants described is forty-five. Eight of these were already known from other localities under established names; four more of this class are referred to different genera or species: making twelve not confined to Virginia. Of the remaining thirty-three which are so confined, nine have close affinities with species already described. It thus appears that considerably over half of the entire number are peculiar to the locality, and have no weight in determining its horizon. The decision must therefore turn entirely upon the twenty-one species which are either themselves found outside of Virginia, or are nearly allied to such as are so found.

The author has made some errors in his table of distribution, such as the omission of Schizoneura planicostata, which he describes in the text, and the failure to assign Ctenophyllum Braunianum to its proper horizon (rhaetic). These corrections made, we find that while only one of the species (Asterocarpus platyrachis) has its nearest affinity with an exclusively triassic plant, and only seven have their nearest affinities with exclusively Jurassic plants, there are ten which have either been found in the rhaetic only, or are most closely allied to such as have only been so found. Thus thirteen species, or about five-eighths, may be classed as rhaetic plants; and only four, or less than one-fifth, can at best be set down as triassic. The seven Jurassic species are mostly from the lias, or lower oölite, which, while not negativing the rhaetic character of the Virginia beds, does seem, when coupled with the rest of the evidence, to negative their triassic character.

We have not space to go further into details, and will merely add, that, while our analysis of his facts differs slightly from that made by Professor Fontaine, the conclusion which flows from it is the same; viz., that in so far as fossil plants can be depended upon to correlate the deposits of different parts of the world, those of the Richmond coal-fields point to the rhaetic of Europe as the age to which they must be referred.

It is something to have even thus far fixed the geological position of this hitherto unsettled formation; but those who are specially interested in the progress which is taking place

Contributions to the knowledge of the older mesozoic flora of Virginia. By WILLIAM MORRIS FONTAINE. Washington, *Government*, 1883. 12 + 144 p., 54 pl. Monographs of the U. S. geological survey, vi.

in vegetable paleontology will perhaps regard as still more important the discovery and careful characterization of the twenty-eight forms which the author describes as wholly new to science, twenty-six of which receive the rank of species, and for the satisfactory classification of which he has found himself obliged to create the two new extinct genera, Mertensides and Pseudodanaeopsis. Of these twenty-six new species, eight are allied more or less closely to known forms, leaving eighteen species so distinct that the author has been unable to compare them with any thing that has been hitherto described. This is remarkable, in view of the great uniformity which is generally found to exist in the floras of the earlier geological formations at points the most widely separated geographically. It seems to indicate an unexpected divergence of the mesozoic flora of North America from that of Europe and other districts of the eastern hemisphere.

An important feature of the work, not indicated by its title, is a careful revision by Professor Fontaine of the researches in the same line of Dr. Ebenezer Emmons in North Carolina, made some thirty years ago, and published in part vi. of his 'American geology,' 1857. The fossil plants found by Dr. Emmons, and figured in this work, are described under the head of 'Fossils of the trias;' but Professor Fontaine thinks he has conclusively shown, from a study of his figures and descriptions (the fossils themselves having been destroyed during the war), that this 'trias' of Emmons in North Carolina is identical with his 'older mesozoic' of Virginia.

The work is copiously illustrated, there being, in all, fifty-four plates, the last six or seven of which are devoted to the reproduction of the figures of Emmons. The photo-engraving process is employed, and we have here a standard from which to judge of its applicability to the illustration of fossil plants. In some respects it proves quite satisfactory; at least, when we consider its cheapness, and the advantage it thus furnishes of allowing, at moderate cost, the ample illustration of species, which is so great a necessity in this branch of paleontology. But we do not think the most has been made of the process in the present work.

The index, which is otherwise good, contains one feature which cannot be too highly commended to authors of such works. This is the reference to plate and figure, as well as to page; which, in more than half the cases, saves the reader the labor of looking twice.

ANNALS OF THE NAVAL OBSERVATORY.

DURING the period covered by the observations contained in these two volumes, the naval observatory was under the superintendency of the late Rear-Admiral Rodgers. His general reports to the chief of the Bureau of navigation, on the work of the institution, were promptly issued in the latter part of the years to which they refer, and are reprinted, as customarily, in the annual volumes.

Pursuant to its policy, inaugurated some five years ago, of reducing the size of its bulky publications, — a policy which has met with universal commendation, — the observatory might now go farther, and expunge a good fraction of the protracted and annually reiterated introduction to the observations with the transit-circle. We seriously question whether disastrous ambiguity would ensue if we were not told, with every year, that the ridge of the roof covering the transit-circle extends east and west; and that the hole in the cube of the axis of the instrument is 2.3 inches in diameter; — to say nothing of the continued reprint of formulae and details of reduction, which every astronomer, who has occasion to consult the volume, keeps constantly in mind. This introduction now occupies about one-fourth of the entire volume, including observations with all the instruments of the establishment, and the several appendixes. We suspect, however, that the only sufficient remedy lies, not in excerption, but in rewriting *ab initio*, on the supposition that those who will read the introduction already know something.

The newly adopted form in which the observations with the transit-circle are published seems to have been very carefully studied, and is in every way a model. We should like to be able to write as strongly of the precision of the results of stellar and planetary observations with this instrument, the character of which is too well known to require characterization here. Presumably, no one is responsible for the fact that they are not better; but certainly the frequent change of observers, unavoidable in so far as the observatory itself is concerned, is not conducive to results of a high order of accuracy.

During the years 1879 and 1880, the transit-circle was under the charge of Professor Eastman, and was employed with customary

Astronomical and meteorological observations made during the years 1879 *and* 1880 *at the U. S. naval observatory.* 2 vols. Washington, *Government*, 1882–84.