Assuming, as he does, that these crania are all pre-glacial, and finding among them both long and short skulls, Dr. Kollmann arrives inevitably at the conclusion that already in pre-glacial times the men of America had cranial and facial forms widely differentiated into varieties which have persisted until the present time, in spite of lapse of time, and change of environment. The persistence of type leads him further to question the probability of an alteration of race-characters from change of environment, or the possibility of the development of another, more perfect race.

A KINDERGARTEN SYSTEM OF CHEMISTRY.

IT appears to be a law, that, whenever a hypothesis of fundamental importance is introduced into a science, it is utilized for all sorts of purposes for which it was never intended. This is certainly true of the valence hypothesis in chemistry. The conception that the smallest particles or atoms of the elements differ from each other in regard to the number of other atoms with which they can enter into combination, is the result of a profound consideration of the facts of chemistry, and its significance can be comprehended only by those who have made a deep study of these facts. The valence hypothesis is utterly meaningless to those who do not know considerable about chemical substances and their action upon each other. Notwithstanding this, the mere mechanical considerations involved in it are so simple, and can be so readily illustrated, that we find incompetent teachers thrusting them upon the attention of beginners even before any sort of notion has been conveyed in regard to the nature of chemical action, or of the distinction between elementary and compound bodies. We need only pick up any one of the small text-books in common use, and, ten chances to one, we shall find an example of the kind of treatment referred to.

It would be difficult, however, to find any thing to equal "The chemists' and students' assistant, or, Kindergarten system of chemistry," which has recently been brought to our attention. The author or inventor of this system evidently thinks that the essential things in chemistry are not compounds, but formulas; that, if one can manipulate formulas with sufficient skill, he knows chemistry. Now, in order to deal with the formulas, it is not at all necessary to know any thing about the compounds represented. A very few simple principles, which a child can thoroughly comprehend, are alone required. We are therefore at last in a position to study chemistry without any reference to chemical phenomena. The odor of chlorine and of sulphuretted hydrogen, the activity of oxygen, the conduct of acids towards bases, need no longer be known to the student of chemistry. Laboratories for instruction are superfluous. All we need is 'The chemists' assistant.' This wonderful thing consists of a box containing a number of blocks of different shapes. The simplest blocks, which represent the simplest atoms, have but one angle: others have two, three, four, five, or six angles, and represent respectively the bivalent, trivalent, quadrivalent, etc., elements. A collection of such blocks by itself is not a very harmful thing, and we can conceive of the blocks being used in connection with a course of instruction in chemistry without leading to an entirely false notion concerning the things represented. Their use, however, would require the greatest care, as they would be more likely to do harm than good. When we read the author's explanatory words, we first recognize the enormity of the system with which he has presented us. After stating in general terms how the blocks are to be used, he says, "For lectures or class illustrations, this system will be exceedingly useful; for the illustrations on the charts and blackboard will address the eye as well as the mind of the student, and consequently will lead to a quicker conception of the subject lectured upon.

"As this system is identical with that of the kindergarten, the young students will be charmed with the various forms which can be made by the elements, some of which are exhibited in the following illustrations."

We then find some illustrations of chemical reactions which certainly do charm the eye of even the old student. The first one represents what takes place when water acts upon calcium oxide. Oxygen, with its two points, joins two single-pointed hydrogen blocks, and we have water. Calcium (two-pointed) fits close to oxygen (also two-pointed), and we have lime. The change to the hydrate, or, as common people call it, slaked lime, is too abrupt: we therefore have an intermediate stage represented. This is called the 'cracked-up' stage, though, from the general appearance of the formulas, we are inclined to think that it might better be called the 'exploded' stage. Finally order is restored, and we have a peaceful, symmetrical-looking group, which, we are glad to be told, is 'calcic hydrate.' The idea of including in chemical equations the intermediate 'cracked-up' stage, is, we believe, original

The chemists' and students' assistant; or, Kindergarten system of chemistry. By WILLIAM FARMER. New York, *Author*, 1884.

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.