of the inoculation. This latter was sometimes performed with a knife, sometimes with a needle, always with careful precautions and close subsequent examination. Such experimental limbs as permitted it were cut and preserved like herbarium specimens, and are exhibited with the paper."

The organism found answers fairly to the description of Pasteur's butyric *vibrion*. They are usually oblong, rounded at the ends, mostly connected, two together. Their motions are not rapid, consisting of turning in every direction, and sliding irregularly forward. They are found within closed cells, in the open spaces, and in immense numbers in the viscid exudations from the diseased bark and leaves. The most conspicuous alteration observed in the tissues is the disappearance of the starch grains from the cells. The cell walls are left intact, and the protoplasmic portions remain until after the starch is mostly absorbed and appears to suffer little change until death ensues. The disease is, *par excellence*, one of the bark. The leaves die in consequence of this, or are themselves invaded, either primarily or secondarily, by the destroyer. The progress of the disease is always slow, but the leaves of an affected limb often turn black quite suddenly, perhaps according to meteorologic conditions. In diseased bark, before change has taken place visible from without, and while the leaves are still green and fresh, an active fermentation occurs. This continues until desiccation or the exhaustion of the fermentable substances puts an end to the process. The products of this fermentation are Carbon dioxide and Butyric acid, or a closely similar substance. From the fact that virus from the Pear affects the Apple tree, and vice versa, the speaker argued that the disease was similar in each. The experiments tended to show that the virus is harmless upon the epidermis of healthy plants, nor does it penetrate through the breathing pores. The speaker exhibited drawings of the cells of a healthy plant and a diseased one, showing that the starch in the latter was gradually absorbed. He obtained the virus from diseased trees, where it is exuded, and placed it in distilled water. Upon the dead leaves and branches the virus dried and looked like varnish. When redissolved it retains its vitality. The simple puncture of a bark of a tree with a needle which had been dipped in the virus would be sufficient to cause its death. Prof. Burrill exhibited a small vial containing about a teaspoonful of the virus in solution, which he said was sufficient to destroy a whole orchard.

The Griffith Award.

The committee appointed to examine the specimens of adulterations of commercial articles, and to award the prize, a fine objective, offered by Mr. E. H. Griffith, for the best mounted specimens, reported that C. M. Vorce was the only contestant and that his exhibits of coffee and butter were fine ones. He was therefore entitled to the prize.

President Smith presented it to him in a brief speech, and he accepted, regretting that there had been no other contestants.

A resolution offered by Prof. Burrill, that the president and vice-presidents elect of the society be appointed a committee to report upon some plan for uniformity in size and naming of eye-pieces and tubes, was adopted.

The report of the treasurer Mr. George E. Fell, showed $266.06 on hand, and $450.75 due the society, of which the treasurer regarded $114.69 as being very certain of being paid, making total assets $380.81. The report was adopted.

Prof. Griffith renewed his offer of a ½ inch objective or its equivalent for the best mounted slides showing adulterations in commercial articles, accompanied with the best Thesis upon the specimens submitted. His offer was accepted with thanks.

The Society then adjourned to meet at such time and place as the Executive Committee may determine upon.

The Soiree, which was given in the evening at Merrill Hall, by the members of the American Society and the local microscopists, was in every way successful, and gave great satisfaction.

PRESERVATION OF FOSSIL INSECTS AND PLANTS ON MAZON CREEK.

By J. W. Pike, Vineland, N. J.

Mazon Creek is a branch of the Illinois River, which it joins at Morris, Grundy Co., Ill. It has carved its channel down into the blue shale, which lies above the Morris coal seam, and exposed the ironstone nodules which contain the fossil plants and insects.

Scientific interpretation rests upon comparison. We compare this coalbed with other deposits of carbon, and with those now forming, and ascribe it to an ancient swamp or wet land surface. The shale above is compared with other clay-beds and with the mud of bays and lakes, and we conclude that it is the product of a subsidence and of deeper water. The fringing swamp had advanced upon higher ground, and from it floated the fern leaves and insects that were buried in the accumulating clay of the deeper basins. Leaves that sink upon the mud of a lake will rest flat upon the upper layer, and are buried under the layers that follow. So, too, the leaves in the Mazon shale are conformable to its lines of stratification. Over the shale are beds of sandrock. Compare them with beds of sand and clay now being formed over the peat and clay of the sinking Atlantic coast. It becomes clear that the beds of coal, shale, and sandstone on the Mazon are the product and record of a subsidence in the carboniferous period.

Metamorphism.—The shale immediately around the fossils was transformed into clay-ironstone nodules by the deposition of ferrous carbonate. The concreting force has emanated from the fossils, because the nodules take their general shape. The iron deposit has not merely filled the spaces between the particles of clay, but has crowded them apart and thickened the strata, making them concavo-convex above and below the fossils. Specimens exhibited show the continuity of the strata from the soft outlying shale through the nodules, their thickening and resulting convexity, the conformability of the leaves, etc.

These biological records, like primitive human inscrpitions, were written in nature's picture-language, only they are incomparably more perfect. Like the cuneiform of the Assyrian tablets it was done upon soft clay, but the clay was hardened automatically by the writing itself, and not by baking. Like the castings of the founder who surrounds his models with moist sand, these are casts; but they are casts of the delicate structure of ferns and insects, moulded in fine clay by the gentle touch of moving water. These inscriptions were not carved on the exposed and crumbling surface of monuments, but were sealed up in the concretions, and lay buried in the clay, beyond the reach of wear and decay, during the incalculable periods of the Permian, Triassic, Jurassic, Cretaceous and Teritiary. After the ages of ice and prairie lakes, the waters of the Mazon dug their channel through lake deposits, ice drift, carboniferous sandstone, and into the blue shale. The fossil bearing nodules were washed out of the softer shale, mingled with granitic gravel and strewn in the river bed. Exposure to the air changed the blue ferrous compound to ferric or red oxide. These nodules spontaneously divided into halves, disclosing these exquisite pictures of the ferns, insects and creeping things of the carboniferous lowlands. Per-oxidation continues till the iron separates from the clay. Thus the half of a nodule, with a fern pictured on its surface, may become a geode—a hard red brown shell of iron enclosing the clay in an ochery form in its interior; or it may, in the process, crack and crumble into flakes and fragments. The collector, therefore, must now anticipate the denuding forces, and dig the concretions out of the shale of the river's banks and bottom, and crack them for himself.

CAVES IN JAPAN.

By Prof. Edw. S. Morse.

Mr. Morse described a number of artificially-constructed caves which he had examined in various parts of Japan, giving sketches of them upon the black board.

These caves varied considerably in their design, but agreed in their general proportions, and were evidently intended as receptacles for the dead. They were excavated

in soft rock on the sides of hills—the apertures small and in some cases showing grooves for the adjustment of slabs of rock or other material to close them. The absence of remains in these caves could be explained from the fact that in earlier times outlaws and refugees often used them as places of shelter and residence, and laws had finally been passed by the governors of some of the districts causing the caves to be filled up, or their entrances obstructed, to prevent their being used in this manner.

THE IRON ORES OF THE BRANDON PERIOD*

By Henry Carroll Lewis.

The theory that a great portion of the iron ores of our lower Silurian limestone valleys are of a tertiary age was first proposed by Prof. E. Hitchkock, but has been rejected by many geologists. The present paper describes in full recent discoveries, made by the writer, of lignite associated with limonite iron ores in the limestone valley of Montgomery County, Penn., and shows their relation to the deposit at Brandon, Vt., and their bearing upon a theory of the age of iron ores in similar positions in the Atlantic States. The lignite of Brandon, lying within beds of plastic clay, kaolin and iron ore, was shown by Lesquereaux to be of tertiary age. Lesley afterwards described strata of lignite in a similar position at Chambersburg, Penn., but regarded them as local deposits of late date. More recently Prime has found lignite in a plastic clay at Ironton, Penn., and supposed it to have been transported by a glacier. The present paper shows that in each of these cases the lignite lies far below the surface drift, and that, as at Brandon, the latter lies unconformably upon the plastic clays containing the lignite.

The occurrence of lignite in connection with limonite iron ore, plastic clay, kaolin and firesand in a number of places in Montgomery County, Penn., is described, and it is shown that these localities lie in a line corresponding to the line of strike of all the iron ores of the valley. Overlying the plastic clay which contains the lignite is what appears to be a decomposed lower Silurian hydromica slate, and for this reason the iron ores had been supposed to be of primal age. It is shown that this decomposed material and the underlying iron ores have been originally derived from lower Silurian slates, and have been re-stratified in an age intermediate between Triassic and Upper Tertiary.

The iron ores of this region may be divided into four classes: (1) Gneissic Ore; (2) Primal Ore; (3) Tertiary (Brandon) Ore; (4) Drift Ore. The last two classes of ore are often found at the same locality; the latter lying unconformably upon the former. The paper discusses at length the age of the drifts containing the latter. Notwithstanding the fact that a region of triassic red shale lies north and east of the valley, not a single fragment of such rock occurs in this drift. The pebbles are composed almost wholly of Potsdam sandstone,—a material now in great part eroded away in this vicinity. The evidence is strong that this drift was not caused by any flood from the north. That it is older than the Glacial Epoch is also shown both by the great amount of erosion it has suffered, and by the fact that in the adjoining triassic region no trace of drift occurs. It seems to have been formed at a time when hills of Potsdam sandstone, since eroded, stood as a barrrier between the limestone valley and the triassic rocks to the north. It is of interest to find that the pebbles of the sub-cretaceous clays of New Jersey are also formed of Potsdam. The four gravels of different ages of the Delaware valley are described, and it is shown that the drift ore of the Montgomery County valley belongs to the oldest of these, and is of Tertiary age.

It follows that the strata containing iron ore and lignite, which underlie unconformably to this drift, are yet older. Some facts point to a Wealden age, but the identity of the deposits with that at Brandon, in which Tertiary plants are found, indicates a middle Tertiary, perhaps *Oligocene* age. Since an exact geological age cannot at present be assigned to these deposits, it is thought best to group them together under the name of the *Brandon Period.*

* Read before the A. A. A. S., Boston, 1880.

Attention was directed to another deposit of lignite and iron ore near Augusta, Ga., recently found by N. A. Bibikov. Its geological situation and the section given is remarkably similar to those of Brandon, Chambersburg, Ironton and the Montgomery County Valley, and with them indicates the existence of a great inland fresh-water formation of Eastern America, during the Brandon Period, once fifty miles broad and nearly a thousand miles long.

AMERICAN SOCIETY OF MECHANICAL ENGINEERS.

We have received the first publication of this Society, which was organized on the 7th of April last. The objects of this Society are to promote the Arts and Sciences connected with Engineering and Mechanical construction, by means of meetings for social intercourse and the reading and discussion of professional papers, and to circulate, by means of publications, the information thus obtained.

Mechanical, civil, military, mining, metallurgical and naval engineers and architects may be candidates for membership to this Society, the initiation fee of members and associates being $15 and their dues $10—payable in advance.

The first President is Professor Robert R. Thurston, of the Stevens Institute, Hoboken. The Society starts with two life members—Thomas A. Edison, of Menlo Park, and George H. Norman, of Boston, and 189 ordinary members of different grades. We wish this Society success, and shall chronicle the work it performs. Those who desire to become members should address Lycurgus B. Moore, 96 Fulton street, New York city.

PHYSICAL NOTES.

The beautiful proof that a constant current of electricity flowing through a thin gold plate can be deflected by a magnet, was exhibited by E. H. Hall on the 28th of last October, at Johns Hopkins University, and already we see how fruitful it is in suggestion to other scientists. Bolzmann, in a paper read before the Academy of Sciences in Vienna, calls attention to the fact that is possible to calculate the absolute velocity with which the electricity flows through the gold plate, and gives a formula.

A. von Ettinghausen also verifies Hall's observations and deductions, in a thorough article containing plates of original apparatus. (Carl's Reportorium, Vol. xvi., No 9, p. 574.)

Dr. Hall himself, in the September number of *American Journal of Science*, gives another paper on the subject, with detail of additional experiments, in which, besides gold, he uses silver, platinum, iron, nickel and tin, as thin conductors. For further information on this most instructive and interesting subject references should be made to the above-mentioned articles.