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.

It may be convenient to scientists who have had dealings with the late firm of Hall & Benjamin, of 191 Greenwich street, New York, one of the largest dealers in chemical and physical apparatus in this country, to know that J. & H. Berge, of 95 John Street, New York, have purchased everything appertaining to that business.

The old friends of Mr. Hall will be glad to learn that he remains in the business, and may be communicated with as before.

The catalogue of these united firms has been placed before us, and shows the magnitude of the business they conduct, and the great facilities they offer scientific men in the production of every kind of philosophical apparatus. This catalogue is a handsome volume of over 200 pages, illustrated throughout, and we advise chemists and physicists to apply for a copy.