

alluvium." The glaciers still occupied for a long time the deepest valleys, and prevented their being filled with alluvial deposits; then they melted, and the Lakes Maggiore, Como, and Lecco, Orta and Iseo were formed. This was the *fourth and last part* of the glacial epoch, which gradually merged into the present period.

NOTES AND QUERIES.

CONVERSION OF CHALK INTO MARBLE.—Gustav Rose has been making new experiments on the department of carbonate of lime at high temperatures, both with and without fluxes;* and, from their results, he has arrived at the conclusion that rhombohedral carbonate of lime is never a direct product.

According to the experiments of Sir James Hall, made in 1804, this has been directly produced when chalk and compact limestone were exposed to a high temperature under great pressure.

Hall's experiment has therefore been repeated by MM. Rose and Siemans. A gun-barrel was charged with dry elutriated chalk, rammed into a compact mass, and the gun-barrel then hermetically sealed at both ends, and exposed to the heat of one of M. Siemans' gas-furnaces. During the experiment the gun-barrel sprung, and in the crack there appeared a faint blue flame, evidently of carbonic oxide. The gun-barrel was then removed from the furnace, and on opening it the chalk was found converted into a light bluish-white coherent mass, slightly lustrous on the fracture, and with cracks running through the whole. The surface was covered with a snow-white, earthy, well-defined crust, and the cracks were lined with white earthy particles; these, as well as the crust, were composed of caustic lime. The compact mass, however, proved, on examination, to be unchanged in chemical properties; and in physical properties, though seemingly changed, when examined under the microscope, it showed the same small globules, and identically the same properties, as the unignited amorphous chalk. Although somewhat more coherent, the chalk was not materially altered, and in no wise converted into crystalline calcite. Another experiment was made with fragments of rhombohedral calc-spar, but was also interrupted by the rupture of the gun-barrel.

M. Rose considers, from these experiments, that chalk or compact limestone cannot be converted into crystalline limestone or calc-spar by exposure to a high temperature in closed vessels; and, as a general fact, that rhombohedral carbonate of lime is not formed in the dry way. He also observes that, on comparing accurately the description of Hall's experiments and Bucholz's observations incidentally made in the production of caustic lime from chalk, probably they obtained results similar to his own, and that the slightly coherent, but otherwise unaltered mass, was erroneously considered to be crystalline marble. But what is most singular is, that notwithstanding Hall's experiment has been quoted and used as the foundation of theories, it was *never repeated* or confirmed; and the experiments of M. Rose show it at least to have been hasty, although we do not think M. Rose's have been as complete nor as *long continued* as

* For an account of Herr Rose's experiments, see Transactions of the Berlin Academy; Poggendorf, *Annalen*, c. xi. 156; and Silliman's *Journal*, xxxii. 112.

they ought to have been. It is not to be disputed that at the junction with granite and basalt, compact limestone and chalk are often converted into marble, as in Paradies-backen, near Drammen, in Norway, and near Belfast, in Ireland; but, in the case of granite, the *dry* method of conversion cannot be any longer tenable, since the experiments of Sorby, Delesse, and others, have altered our conviction of its origin. Such changes, then, cannot be regarded as due to heat alone, and that they were assisted by other agencies is a conclusion arrived at also by Bischof in a different manner.

In the Anniversary Address to the Geological Society, the President, Mr. Leonard Horner, commented on these experiments in the following manner:—"With every respect for my friend the Professor, I think that I may turn round upon him and say that *he* has been somewhat hasty in considering that his experiments prove that mistakes were made by Hall in his descriptions of the results of his numerous experiments, all agreeing while obtained in so many different ways; for the Professor states that in both of his experiments the gun-barrel burst (at what stage of the experiment, he does not say) and thus one of the essential conditions in Hall's experiments was wanting, viz. continued great pressure. I consider therefore that these experiments of Professor Rose in no degree invalidate those of Hall, so long considered to support, in no inconsiderable degree, the hypothesis of Hutton."

Saurian Remains in the Lower Liass.—Some remains of Enaliosauria, recently found in the shales at the top of the Rhætic series, zone of *Ammonites planorbis* (Wright), exposed near Droitwich, are of more than ordinary interest. One, unfortunately much distorted, skeleton of *Ichthyosaurus intermedius* still holds, in the space between the ribs, the contents of the stomach, which, however, do not present any different features from the example described and figured by Dr. Buckland, being chiefly scales of *Pholidophorus leptcephalus* and some indeterminate fragments of Echinidæ, probably of *Cidaris Edwardsii*, the spines of which occur very abundantly in these shales. Jaws of *Ichthyosaurus tenuirostris* have also been met with in fine condition in this little-known locality. The specimens have been carefully collected, and are now in the cabinet of Richard Smith, Esq., of Westacre, near Droitwich.

Fish-remains in these Lower Liassic beds should be more attentively searched for. I have just received a letter from a noted microscopist, relating to the otolithic bone of *Pholidophorus*, which makes a fine object in the microscope.—GEORGE E. ROBERTS.

Origin of Species.—At the Zoological Society, on the 28th January, Professor Owen read a paper on the anatomy of the Aye-Aye (*Cheiromys Madagascariensis*). The only point of interest to geological and paleontological readers was the part of the paper in which Professor Owen entered into the evidence afforded by the peculiarities of this animal on the question of the origin of species; after showing the arguments in favour of the derivative hypothesis, and those against its mode of operation as propounded by Buffon, Lamarck, and Darwin, he came to the conclusion that, whilst the general evidence on this subject was in favour of creation by law, he was compelled to acknowledge ignorance as to the mode in which such secondary causes might have operated in the origin of *Cheiromys*. At the same time Professor Owen fully admitted that the attempts to dissipate the mystery which environed the origin of species, whether successful or not, could not but be fraught with great collateral advantages to zoological science.