carried in, since they are always accompanied by alluvial deposits. If the *Carnivora* alone had been the cause of such phenomena, they ought to be found in all ossiferous caves, whereas it is far from being so. A very great number of them offer, in fact, only herbivorous, without a trace of carnivorous animals.

On the other hand, the condition of the cave-bones proves that they had been deprived of their flesh and integuments before they were carried into the caves. The numerous fissures connected with them, and the red earth with which these are filled, even the narrowest of them, prove in the clearest manner that the bones must have been transported into their present position merely as bare bones, and not otherwise. If, therefore, there are in some caves some bones which have been gnawed, that may have happened before they were swept into the caves.

The excrements of Hyænas are in no wise a proof that these animals lived in the caves where they are discovered. Their solidity and their rounded form would render their transport easily effected. How otherwise can we suppose that carnivorous animals of very unequal strength should live in common, and with a good mutual understanding, as must have happened with the lions, bears, wolves, foxes, otters, beavers, and so many others, which are found in the caverns of Lunel-Viel.

It would be very easy to mention many other caves, even of less size, in which animals of habits not less dissimilar are met with; but the caves of the neighbourhood of Montpellier seem to us to suffice for the demonstration of a fact verified by so many observations.

I will end this note with an observation of the illustrious physicist so recently lost to science. Humboldt observes that, when a phenomenon is general and repeated under the same conditions, as has been the case in the filling of the longitudinal and vertical fissures of calcareous rocks, such a phenomenon must have been produced by a cause as general as the effects which group round it. According to this double condition, which is presented in all caves where remains of animals of geological date are found, it is impossible to attribute it to any other cause than to violent inundations.

2. On the PETROLEUM-SPRINGS in NORTH AMERICA.

By ABRAHAM GESNER, M.D., F.G.S.

[Abstract.]

THE ample information on this subject already published renders it desirable to make use only of the subjoined portion of Dr. Gesner's communication.

The petroleum is obtained by borings, to a depth of from 150 to 500 feet. No reliable record of these borings, or the strata through which they pass, has yet been kept. As a general rule the sections may, however, be represented as—1st. Soil, ferruginous clay, and boulders; 2nd. Sandstone and conglomerates; 3rd. Shale; 4th. Bituminous shale; and 5th. Oil, underlaid by an oil-bearing stratum

of fire-clay, containing fragments of *Stigmaria* and other coal-plants. In the deeper sinkings, sandstones and bituminous shales are brought up by the borers; but in every instance the petroleum appears to be underlaid with a tight stratum of fire-clay. As soon as the oil-bearing stratum is reached, there is usually an escape of carburetted hydrogen gas, and it is discharged with such force that the boring-rods are often blown into the air, as if they had been discharged from a piece of ordnance. The gas is followed by a mixture of oil and gas, and finally by the oil itself, which is thrown in a jet upwards, sometimes to the height of 100 feet. The bore of the well is usually about 4 inches in diameter, being an iron tube let down as the boring proceeds. When the oil appears, the workmen, as soon as they can approach the spot, drive a wooden plug into the iron pipe, and thus prevent the flow of oil, until they are prepared to receive it. Finally, when the natural flow ceases, a pump is applied, and the raising of the petroleum proceeds. Some wells at the outset have produced no less than 4000 gallons of oil in twenty-four hours. At some sites the shallow wells have run out or been exhausted; but by sinking them deeper still greater supplies have been obtained, and which at present appear to be inexhaustible. It seems very certain, therefore, that the reservoirs of oil are fissures penetrating certain oil-bearing strata and the intervening deposits.

The specific gravity of the petroleums varies from .795 to .881. In general they are of a dark-brown colour. A few wells have produced oils quite clear and transparent; and simple distillation renders them quite pure and suitable for lamps. The inflammability of the vapour of the mineral oil has given rise to accidents. In one case an oil, tapped by a bore at 330 feet, rose in a fountain 100 feet high, was soon afterwards ignited, and burned for two months before the workmen could plug the iron tube.

After some observations on the antiquity of the use of mineral oil in North America and elsewhere, and on the present condition of the oil- and gas-springs and the associated sulphur- and brine-springs in the United States, the author stated that 50,000 gallons of mineral oil are daily raised for home use and for exportation. The oil-region comprises parts of Lower and Upper Canada, Ohio, Pennsylvania, Kentucky, Virginia, Tennessee, Arkansas, Texas, New Mexico, and California. It reaches from the 65th to the 128th degree of longitude west of Greenwich; and there are outlying tracts besides.

The oil is said to be derived from Silurian, Devonian, and Carboniferous rocks. In some cases the oil may have originated during the slow and gradual passage of wood into coal, and in its final transformation into anthracite and graphite,—the hydrogen and some carbon and oxygen being disengaged, probably forming hydrocarbons including the oils. In other cases, animal matter may have been the source of the hydrocarbons.

Other native asphalts and petroleums were referred to by the author, who concluded by observing that these products were most probably being continually produced by slow chemical changes in fossiliferous rocks.