

once been there. The only place where the shells were found at a similar elevation above the water was on the Ottawa, where Sir W. Logan had found them at 410 feet above the water level. This level corresponded very accurately with the highest sea beaches found on Lake Ontario, showing that formerly there had probably been a connection between the sea of the St. Lawrence valley and that of Ontario, unbroken by rapids, &c., as far as the falls of Niagara at least. This sea had probably not had any direct communication with the Hudson's Bay. There was another old sea shore on the Montreal mountain, at the height of only a hundred feet above the St. Lawrence. Below this was clay, without shells, which had evidently been deposited in deep water. These formations indicate a subsidence of the land, and then an elevation. Mr. Dawson said he found the sea-beds on the mountain corresponded in height with the deposit of shells at Beauport, and that on the Ottawa, where fossil fishes were found. The sea basin which it indicated had been comparatively limited; apparently nothing more than an extension upwards of the Gulf of St. Lawrence.

#### FLUCTUATIONS OF LEVEL IN THE NORTH AMERICAN LAKES.

Prof. WHITTLESEY (Cleveland) read a paper with the above title. He had been observing the fluctuations of level in Erie and Huron since 1836. He had procured daily information as to the level of the water—and sometimes even tri-daily. Three different and distinct kinds of fluctuations had been observed—secular, annual, and local or temporary. The secular variations were those which took place in the mean level of the lakes during a series of years. It was owing probably to the difference in the mere amount of rain-fall during the period; for the lakes might be regarded as a great river, which took years to rise and fall—just as the Orinoco or the Mississippi took months. The greatest range of secular fluctuations was four feet six inches, taking the yearly mean as a datum of calculation. Then as to the amount of fluctuation from temporary causes—the greatest in Lake Erie, between June, 1818, and August, 1819, was seven feet. On Lake Huron there were indications on timber now growing that the variation had been twelve feet, but since 1839 the difference had been only nine feet. On Superior, since 1845, it had been three feet. On Ontario the greatest range was four feet nine inches. He could find no indications that the popular belief was correct that all lakes rose periodically in a term of five, seven or nine years. (In confirmation he read from the register of Detroit and Cleveland.) The annual variation did not reach its maximum and minimum at the same time in different lakes. Superior was highest in September, lowest in February and March. Erie and Ontario were highest in June, lowest in February and March. The lateness of the thaw in Superior and neighbouring streams was perhaps the cause of the lateness of its filling up. He would next speak of the irregular, temporary and fitful pulsations which so frequently occurred, and which had attracted the notice even of the earliest explorers. They were certainly remarkable, for sometimes on a calm day they would be found to rise suddenly and beat regularly upon the shore. This occurred in all conditions of the atmosphere, by night as well as by day, in calm and in stormy weather, and lasted but from four to ten hours at a time. They occurred in all the great lakes, and even in the small lakes of New York, and for aught that was known they might even occur on the sea coast. They occurred in summer, spring and autumn, and possibly in winter, although on account of the ice they had not been observed. There was no apparent connection between the waves and the northern lights, although he thought they probably were connected with electric (rather than barometric) causes. They were now frequent in Superior, perhaps on account of the proximity of that lake to mountain ranges.

#### PHYSICAL BREAK IN BRITISH ROCKS.

Mr. RAMSAY (England) read a paper on the Physical Break, and the Break as the occasion of the destruction of life, in the British Rocks. He wished to do away with the old idea that there had been violent changes, destroying all life, and followed by new creations. But between various strata in Britain there was such an extraordinary break in the species and genera of organic remains, that he hoped to receive suggestions which would tend to explain it. He exhibited some very fine diagrams. It appeared that Britain had not been entirely submerged during the glacial period, as Canada seemed to have been. But it was evident that in Britain the climate had at one time been so cold that glaciers had descended to the level of the sea; and the amelioration had evidently been gradual.

#### FIFTH DAY.

Prof. C. WHITTLESEY read a paper on the Ancient Mining Operations of Lake Superior. On the southern coast is a promontory and behind this lies the principal mining region. The copper is found as native metal in pieces weighing from one to five hundred tons. There is abundant evidence that these mines have been worked by an ancient people, and that all the instruments they used were beat out cold. They did not seem to have any idea of melting them, indeed we cannot

find any trace that these ancients knew anything of melting copper. In examining these works, we find large cavities, about 30 feet deep, which these ancient people have worked. They are now occupied by wild beasts. Some of the instruments used by those people in their operations were made of cedar wood, and others of copper. He believed there was abundant evidence that upwards of one thousand years ago the mines of Lake Superior were worked, and that the people who did so had the same amount of civilization as the people who at that time inhabited the State of Ohio, as we find they used the same implements as the inhabitants on Lake Superior.

#### INDIAN PAINTINGS AND ANTIQUITIES.

Prof. WILSON read a very interesting paper on the collection of Indian Paintings and Antiquities exhibited by Mr. Paul Kane, at the request of the Local Committee. The collection he stated was extremely valuable and interesting. The tribes of the several important divisions of the North American Indians were faithfully portrayed in their manners and customs here. Of the Chippawas, Assiniboines, Flat-heads and Esquimaux, they had many and curious remains. There were also specimens of sculptured pipes belonging to the Babene Indians of Vancouver's Island. They were most elaborately executed, and some five or six feet long. One of these pipes contained representations of ships, rigging, &c., evidently sculptured by some native artist, on returning from a visit to Europe. It is highly interesting as showing the great powers and love of imitation of the native. Yet though so proficient in this art, this tribe is said to be more ignorant and degraded than many around it. The tribe of Babeens differ remarkably from others in their mode of sepulture, of male and female. The remains of the former are scaffolded while those of the latter are burnt. As respects the Flat-heads it is worthy of note that they are superior to the other tribes, and have them in subjection. The Flat-head is as it were a sign of peerage, and no slave is allowed to flatten the head of his children. The process does not at all seem to injure the intellect.

#### LAWS OF DESCENT AMONG THE IROQUOIS INDIANS.

Mr. L. H. MORGAN read a paper on this subject, describing the singular and complicated method of the descent of property and titles among the North American Indians, the inheritance always passing by the female instead of the male line. He mentioned several causes which might be considered to account for this peculiar institution; but one was probably paramount—the desire for independence, and the wish to prevent any family from becoming strong enough to obtain sovereignty—a thing altogether alien to the manners of the hunter state of mankind, and which had never in fact been discovered among the Indian inhabitants of the continent, all of which were governed by oligarchies maintained, but limited in power by means of this form of inheritance, and by the confederacy of several tribes—a form of policy which existed everywhere in North America. Mexico might be cited as an exception; but if the institutions of the Mexicans had been thoroughly investigated it would probably be found that they were identical with those of the Iroquois. Institutions of this kind were remarkably permanent, and it would be very useful, in order to determine questions in ethnology, to ascertain what other sections had had institutions of the same kind. He had ascertained that they existed in South America, and in parts at least of the islands of the South Pacific.

#### FORMATION OF CONTINENTS.

Prof. PIERCE read a note on the formation of Continents by the action of the Sun. He remarked that the principal lines of the continent were great circles, tangent to the polar circle. This was especially the case with the coast of the Pacific ocean. He illustrated this on the terrestrial globe. He then pointed out the same fact as regarded the eastern coast of Africa, the eastern coast of Hindostan, the eastern coast of Asia, the eastern coast of South America, the western coast of Hindostan, the line of the Eastern Archipelago, the western coast of America, and (perhaps) the western coast of Africa. Any one may perceive the remarkable facts by elevating the pole of the terrestrial globe 2½ degrees above the horizon and then causing the globe to revolve. The northern line of South America, a portion of the coast of Africa, a portion of the Central American coast, most of the Pacific Islands, &c., were portions of great circles, tangent to the tropics. Professor Pierce said this seemed to indicate that the sun had something to do with the formation of continents. Indeed the sun had very great influence even now, and when, at the formation of the earth, the mass was in a fluid state, the difference of one or two degrees might make all the difference whether congelation should take place at one time during the day or not. And the action of the sun, in allowing the mass to cool or grow warm, to congeal or solidify, would cause a tendency to the formation of lines of cleavage in the mass of the earth. These lines of cleavage were all that geologists required to enable them to account for the formation of chains of mountains and lines of coasts. The solidifying of certain portions of certain continents would account for the formation of currents. This would proba-