THE GLACIAL PERIOD. Erom an Address Delivered by Sir Charles Lyell before the British Association. The more we examine the monuments of the ages which preceded the historical, the more decided become the proofs of a general alteration in the position, depth and height of seas, con inents and mountain-chains since the commencement of the giacial period. The meteorologist also has been learning of inte years that the quantity of ice and snow in certain latitudes depends not merely on the height of mountain-chains, but also on the distribution of the surrounding sea and land even to considerable distances. M. Eschen von den Linth gave it as his opinion in 1852, that, if it were true, as RITTER had suggested, that the great African desert, or Sahara, was submerged within modern or post-tertiary period, that same submergence might explain why the Alpine glaciers had attained so recently those colosdimensions which, reasoning on geologi-data, Venetz and Charpenties has asthem. Since Eschen first threw signed to this hint, the fact that the Sahara was really covered by the sea at no distant period has been confirmed by many new proofs. The distinguished Swiss geolog st himself has just returned from an exploring expedition through the eastern part of the Algerian desert, in which he was accompanied by M. Desor, of Neut-chatel, and Prof. MARTIN, of Montbellier. These three experier ced observers satisfied themselves during the last Winter that the Sahara was under water during the period of the living species of testaces. We had already learned in 1856, from a memoir by M. CHARLES LAUBENT, that sands identical with those of the nearest shores of the Mediterranean, and containing, among other recent shells, the common cockle, (Cardium eaule,) extend over a vast space from West to East in the desert, being not only found on the surface, but also brought up from depths of more than twenty feet by the Artesian auger. These shells have been met with at heights of more than nine hundred teet above the sea-level, and on ground sunk three hundred feet below it; for there are in Africa, as in Western Asia, depressions of land The same cockle has below the level of the sea. been observed still living in several salt lakes in the Sanara; and superficial incrustation of sait in many places seem to point to the drying up by evaporation of several inland seas in certain districts. Mr. TRIS-TRAM, in his travels in 1859, traced for many miles along the southern borders of the French possessions in Africa lines of inland sea-cliffs, with caves at their bases, and old sea-beaches forming successive terraces, in which recent shells and the cas's of them were agglutinated together with sand and pebbles, the whole having the form of a conglomerate. The ancient sea appears once to have stretched from the Gulf of Cabes, in Tunis, to the west coast of Africa north of Senegambia, having a width of several numbered (perhaps where greatest, according to Mr. TRISTRAM. 800) miles. The high lands of Barbary, including Morocco, Algeria and Tunis, must have been separated at this period from the rest of Africa by a sea. All that we have learnt from zoologists and botanists in regard to the present fauna and flora of Barbary favors this hypothesis, and seems at the same time to point to a former connection of that country with Spain, Sicily and South Italy. When speculating on these changes, we may call to mind that certain deposits, full of marine shells of living species, have long been known as fringing the borders of the Red Sea, and rising several hundred feet above its shores. Evidence has also been obtained that Egypt, placed between the Red Sea and the Sahara, participated in these great continental This may be inferred from the old movements. river terraces, lately described by Messrs. Adams and Murie, which skirt the modern alluvial platns of the Nile, and rise above them to various heights from thirty to one hundred feet and apwards. In whatever direction, therefore, we look, we see grounds for assuming that a map or Africa in the glacial period would no more resemble our present maps of that continent than Europe now resembles North America. If, then, argues Escher, the Sahara was a sea in post terriary times, we may understand why the Alpine glaciers formerly attained such gigaatic dimensions, and why they have left moraines of such magnitude on the plains of Northern Italy and the tower country of Switzerland. The Swiss peasants have a saying, when they talk of the metting of the snow, the sun could do nothing without the Föhn, a name which they give to the well-known strocco. This wind, after sweeping over a wide expanse of parched and burning sand in Africa, blows occasional. ly for days in succession across the Mediterranean, carrying with it the scorching heat of the ahara to meit the snows of the Apennines and Alps. M. DEN-ZLER, in a memoir on this subject, observes that the Fonn blew tempestuously at Algiers on the 17th of July, 1841, and then crossing the Mediterranean. reached Marseilles in six hours. In five more hours it was at Geneva and the Valais, throwing down a large extent of forest in the latter district, while in the cantons of Zurich and the Grisons-it suddenly turned the leaves of many trees from green to yellow. In a few hours new-mown grass was dried and ready for the haystack; for although in passing over the Alpine snows the sirocco absorbs much moisture, it is still far below the point of saturation when it reaches the sub-Aipine country to the north of the great chain. MM. Eschen and Denzlen have both of them observed on different occasions that a thickness of one foot of snow has disappeared in four hours during the prevalence of this wind. No wonder, therefore, that the Föhn is much dreaded for the sudden inundations which it sometimes causes. The snow line of the Alps was seen by Mr. Irscher, the astronomer from his observatory at Neufchatel, by aid of the telescope, to rise sensibly every day while this wind was blowing. Its influence s by no means confined to the summer season, for in the winter of 1852 it visited Zurich at Christmas, and in a few days all the surrounding country was stripped of its snow, even in the shadiest places and on the crests of high ridges. I feel the better able to appreciate the power of this wind from having myself witnessed in Sicily, in 1828, its effect in dissolving, in the month of November, the snows which then covered the summit and higher parts of Mount Etna. I had been told that I should be unable to ascend to the top of the highest cone till the following Spring; but in thirty six hours the hot breath of the sirocco stripped off from the mountain its white mantle of snow, and I ascended without difficulty. It is well known that the number of days during which peculiar winds prevail, year to year, varies considerably. tween the years 1812 and 1820 the Fönn was less tell in Switzerland than usual; and what was the cousequence? All the glaciers, during those eight or nine years, increased in height, and crept down their former limits in their respective valleys. Many similar examples might be cited of the sensitiveness of the ice to slight variations of temperature. Capt. Gop-WIN AUSTEN has lately given to us a description of the gigantic glaciers of the western flimalaya in those valleys where the sources of the Indus rise, between the latitudes 35° and 36° N. The highest peaks of the Karakorum range attain in that region an elevation of 28,000 feet above the sea. The glaciers, says Capt. Austen, have been advancing, within memory of the living inhabitants, so as greatly to encroach on the cultivated lands, and have so altered the climate of the adjoining valleys immediately below, that only one crop a year can now be reaped from fields which formerly yielded two crops. If such changes can be experienced in less than a century, without any perceptible modification in the physical geography of that part of Asia, what mighty effects may we not imagine the submergence of the Sahara to have produced in adding to the size of the Alpine glaciers? If between the years 1812 and 1820 a mere diminution of the number of days during which the sirocco blew could so much promote the growth and onward movement of the ice, how much greater a change would result from the total cessation of the same wind! But this would give no idea of what must have happened in the glacial period; for we cannot suppose the action of the south wind to have been suspended; it was not in abeyance, but its character was entirely different, and of an opposite nature, under the altered gaographical conditions above contemplated. For instead of passing over a parched and scorching desert between the twentieth and thirty-fifth parallels of latitude, it would plentifully absorb moisture from a sea many hundreds of miles wide. Next. in its course over the Mediterranean, it would take up still more aqueous vapor, and when, after complete saturation, it struck the Alps, it would be driven up into the higher and more rarified regions atmosphere. There are ærial rent, as fast as it was cooled, would discharge its aqueous burden in the form of snow, so that the same wind, which is now called "the devourer of ice," would become its principal feeder. If we thus embrace Esches's theory, as accounting in no small

degree for the vast size of the extinct glaciers of Switzerland and Northern Italy, we are by no means debarred from accepting, at the same time, CHARPEN-TIER's suggestion, that the Alps in the glacial period were 2,000 or 3,000 feet higher than they are now. Such a difference in altitude may have been an auxiliary cause of the extreme cold, and seems the more probable now that we have obtained unequivocal proofs of such great osciliations of level in Wates

within the period under consideration. We

history.

bave by no

also avail ourselves of another source of refrigeration, which may have coincided in time with the submergence of the Sahara-namely, the diver-

The shape of Europe and North America, or the boundaries of the sea and land, departed so widely in the glacial period from those now established, that we cannot suppose the Gulf-stream to have taken at. that period its present northwestern course across the Atlantic. If it took some other direction, the climate of the north of Scotland would, according to the cal culations of Mr. Hopkins, suffer a diminution in its average temperature of 12° F., while that of the Alps would lose 2° F. A combination of all the conditions above enumerated would certainly be attended with so great a revolution in climate as might go far to account for the exessive cold which was developed at so modern a period of the earth's

of the Gulf-stream from its present cource.

But even when we assume all three of

means exhausted all the resources

them to have been simultaneously in action, we

which a difference in the geographical condition of the globe might supply. Thus, for example, to name only one of them, we might suppose that the height and quantity of land near the North Pole was greater at the era in question than it is now. The vast mechanical force that ice exerted in the glacial period has been thought by some to demonstrate want of uniformity in the amount of energy which the same natural vause may put forth at two succes-

give epochs. But we must be careful, when thus reasoning, to bear in mind that the power of ice is here substituted for that of running water. The one becomes a mighty agent in transporting huge erratics, and in scoring, abraiding and polishing rocks; but meanwhile the other is in abeyance. When, for example, the ancient Rhone glacier conveyed its moraines from the upper to the lower end of the Lake of Geneva, there was no great river, as there now is, forming a delta many miles in extent, and several hundred feet in depth, at the upper end of the lake. The more we study and comprehend the geographical changes of the giacial period, and the migrations of animals and plants to which it gave rise, the higher our conceptions are raised of the duration of that subdivision of time, which, though vast when measured by the succession of events comprised in it, was brief, if estimated by the ordinary rules of geological classification.

The New York Times

Published: October 9, 1864 Copyright © The New York Times