

(Heidelberg); Schenk (Berne); Siedentopf (Wurzburg); Streit (Berne); Westien (Rosstock); Zimmerman (Leipzig).

CURRENT NOTES ON PHYSIOGRAPHY (XXI).

THE MOORS OF NORTHWEST GERMANY.

At the eleventh session of the German Geographical Congress, held at Bremen in Easter week, last spring, Dr. Tacke gave an account of the moors of northwest Germany, their utilization and their economic importance. He described two classes: the low marshy moors, of grassy growth, and the upland moors, of peaty and heathery growth; the first rich and the second poor in calcareous and nitrogenous matter. When sufficiently drained, spread over with sand, and enriched with artificial potash- and phosphate-bearing fertilizers, the low-lying marshy moors well repay cultivation. In the last thirty years extensive areas of waste land have thus been brought into productiveness. The more extensive upland moors are less easily redeemed. An old but ill-advised method consists in burning off the peaty surface at the end of a dry season, producing wide-spread smoky skies. An improved method, introduced from Holland, requires the stripping of the peat, which may be sold for fuel, and the mixture of the bottom soil with the underlying sand. Then after sufficient fertilizing, the surface becomes fruitful. Extensive undertakings for colonizing the moors have been successfully carried out in recent years. (Geogr Blätter, Bremen, xviii, 1895, 198-202.)

THE ISLANDS OF EAST FRIESLAND.

THE islands of East Friesland, lying along the low German coast between the estuaries of the Ems and the Weser, are described by Buchenau (Geogr. Blätter, Bremen, xviii, 1895, 202-204) as the last fragments of a formerly continuous coastal margin, built of sand drifted by waves and

winds. Dunes cover much of the surface. Behind the coastal barrier, at first grassy moors, then fresh-water reed-marshes and finally salt-water fens were formed on the slowly sinking mainland, the rate of depression being estimated as certainly less than the figure usually quoted, or three-fourths of a foot per hundred years; but in the eleventh century a more rapid sinking probably took place, as great losses of land followed that date. When first formed, the fens behind the sandy coastal barrier must have had but a small run of tide; it is presumed that the English Channel had not then been worn through, and that, the tides entered the North Sea only around Scotland. After the southern Channel was at last opened—about 1000 B. C., as estimated by some geologists—the tides gained greatly in strength; the coastal barrier was overflowed and repeatedly broken through; the fenland, flooded at high tide, bare at low, was gradually washed away. From the time when the Channel was opened, the people waged an unceasing battle with the sea, and as continually suffered defeat; until at last, driven by necessity, they planned a systematic defense against storm and wave, thus rescuing about half of what had before been lost. The vegetation of the islands is well adjusted to its exposed situation. The grass on the open meadows is kept very short by the action of the winds. Bushes are found only in the valleys between the dunes. There are no trees, except when planted near sheltering houses or dunes; any branch which rises above its shelter is soon killed by the storm winds.

PHYSIOGRAPHIC NOTES FROM ICELAND.

JOHNSTON LAVIS, well known from his studies on Vesuvius, went to Iceland in 1890, and contributes an entertaining account of his expedition to the Scottish Geographical Journal for September of this year. Interesting topographic features are

the *gjas*, or rifts in the great lava beds, one to three meters wide and of unknown depth, fairly straight over large areas and explained by the traveller as the result of laccolitic accumulations beneath, by which the surface flows are somewhat raised, arched and cracked. The more fertile districts are covered with alluvial detritus brought down by streams from the various Jökulls; but in some cases the wash of gravel and boulders carried by floods from snow melted rapidly by volcanic heat has been so tumultuous as to devastate the surface over which it is spread. The rivers here subdivide into numerous distributaries, across which the traveller has to wade repeatedly. One of the greatest of these stony deserts is the Myrdals-sandr, caused by the eruption of the Kötlugja; the tremendous force of the inundation is shown by the large boulders which have been transported dozens of kilometers from the foot of the highlands down a slope of, for the most part, very small inclination. The Skapter eruption of 1783, "the greatest outflow of lava known to have occurred in historic times," filled the valley of the Eldvatn and thereby displaced a river which now flows on the lava surface; but so nearly level is this surface that the river is subdivided into many channels—sixteen, where the author traversed it—no one channel having yet grown to be the master of the whole. Thingvall Lake appears to have had a curious origin; a prehistoric lava flood filled a valley, rising to a considerable depth above some barrier, and freezing a surface layer 32 metres thick; then a vent was opened by which the still molten under lava was drained away, and the surface layer settled down in a basin-like depression, some 8 km. wide by 35 km. long, in the bottom of which the lake now stands among the disjointed fragments of the lava crust. Wind action is very noticeable; much of the older rock surface about Cape

Reykjanes is rounded and polished by the sand blast; sand dunes are numerous on this peninsula, where 'the most dreadful dust storms' occur. Much of the pasture soil is wind-blown, collected at first among lichens and gradually coming to support a growth of turf; where the grass happens to be worn away, the wind blows away the soil; thus a farm may be made or marred in a few years. The careful farmer keeps his turf in good repair.

SABLE ISLAND.

THIS lonesome and dangerous island off the coast of Nova Scotia is recently described by G. Patterson (Trans. Roy. Soc. Canada, xii, 1894, 2°, 3-48). A bank that measures about 200 by 90 miles culminates in the island, now twenty miles long and one mile wide. It consists of two parallel ridges of loose gray sand, stretching east and west, and somewhat convex to the south. Between the ridges lies a long narrow 'lake' that is sometimes connected with the sea by inlets on the south, but these are often closed by storms, and then there are no harbors even for small vessels, and landing is generally difficult. Shoals extend far beyond the ends of the island, east and west, producing a terrible line of breakers with a total length of fifty miles. Strong, conflicting and irregular currents run about the island; floating wreckage sometimes makes a circuit around it. Fogs and storms are frequent; 190 wrecks have been recorded since 1801. The island is rapidly wasting under the attack of the waves, having been 40 miles long by two and a-half wide in 1700. About 1814 the rate of wear was nearly a mile a year. In 1881-82 much ground was lost at the western point during violent storms. In one severe gale, a strip seventy feet wide and a quarter mile long was removed; in another, a strip of the same length and forty-eight feet wide; at one time thirty feet of the land margin

sank down in a few hours. A lighthouse built in 1873 at a cost of \$40,000 was undermined and fell in 1882; it was rebuilt a mile inland, but in 1888 was removed two miles further east. The winds cause a continual change in the form of the sand dunes. Landmarks are thus blown away; hollows and ponds replace hills, and breaches in the sod near the few houses are carefully repaired to prevent the thin soil from being blown away. Wild horses of a small and hardy breed roam over the island in separate herds, each led by an old male. They numbered about 300 in 1828; 400 in 1864; 150 to 250 now. Their numbers have sometimes decreased by starvation caused by the burial of pasturage under the drifting sand; and they have not infrequently been eaten by the inhabitants. The unbalanced condition of the smaller imported fauna is curiously illustrated. English rabbits were introduced at one time and soon overran the island; but they were exterminated by rats that came ashore from some vessel. The government then sent cats to the island, and these, after extinguishing the rats, became so numerous that dogs and shot guns were brought to destroy them. Rabbits were then imported once more, and again became numerous; but were exterminated a second time by snowy owls.

The absence of ledges and boulders suggests that this strip of loose sand is only the vanishing remnant of a long bar, formed by wash from some larger island of glacial drift, now destroyed.

THE PHYSICAL FEATURES OF MAURITIUS.

'The physical features and geology of Mauritius' are described by H. deH. Haig (Quart. Journ. Geol. Soc., London, li, 1895, 463-471). In crossing the lava slopes of the island, one comes without warning on immense ravines, worn to depths of over a thousand feet by the rapid streams, fed by

the moist trade winds. There are few lakes; two occur in old craters, besides various shore lagoons and many marshes and pools among the newer lava beds. Long caves leading underground streams are very common in the fresh lavas. One extensive tubular cavern in solid lava, like a great railway tunnel, measured thirty feet in width and height, and was followed for a mile and a half without reaching its end; bubbly lava drops remain on its roof and walls. The writer accepts the current explanation that these caves are caused by the continued flow of the still molten central part of a lava stream after the surface has hardened and after the supply from above has ceased. Where cavern roofs have partly fallen in, the remnants form natural bridges, of which there are many examples. The most remarkable old cavern now appears as a strange dry ravine, a mile and a half in length, with vertical walls eighty feet high; the roof, having for the most part fallen in bodily, now lies on the floor of the ravine, where the ripple-marked lava surface may still be seen; but every few hundred yards parts of the roof still remain as bridges. In one case a cavern roof was burst upward by the rise of its torrent, fed by the heavy rainfall of the hurricane of February, 1876.

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CURRENT NOTES ON ANTHROPOLOGY (XVII.).

THE CRADLE OF MAYAN CULTURE.

THE results of Mr. Mercer's explorations of the caves of Yucatan (see SCIENCE, p. 766) corroborate in a noteworthy manner the studies of the Mayan MSS. and art relics. The cave-hunters discovered no trace of a culture lower than that of the historic Mayas. These, therefore, came into the peninsula already semi-civilized. The acute analyst of Mayan art, Dr. P. Schellhas reached some years ago the same