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be obtained, and those tracts affected by drought send forth their thousands to work in the colonies and on the canal-irrigated lands, so that famine in the Punjab is almost a thing of the past. Owing to the fact that the colonists and their friends and relations pass to and fro between the various parts of the province and the colonies, the people generally have more intercourse with one another, and are becoming more open-minded. Factories are now quite numerous, and trade generally has rapidly improved, while the money circulation is much greater than heretofore, and I think I may truly state that the eyes of the masses have been opened to the great benefits they are receiving under British rule.

NATURAL MOUNDS IN CAPE COLONY.

By ERNEST H. L. SCHWARZ, Professor of Geology, Rhodes University College, Grahamstown.

THE interesting discussion that has been going on in the columns of *Science* with reference to the subject of Natural Mounds in the United States, which was noted in the Monthly Record for August, has prompted me to write the following note on a similar occurrence in the coastal districts of Cape Colony. It has long been a subject of interest to me, and I have several times tried to come to some conclusion in regard to their origin, but, like Mr. Veatch, have not been able to satisfy myself that any explanation brings us nearer the solution of the problem. The theory that they are disintegrated ant-hills, favoured by Prof. Hilgard, brings in the least amount of speculation, for ant-hills are very prevalent all over South Africa, and I have even seen them on Micham common, near London, distributed over the surface in the same manner as our natural mounds occur in South Africa. Mr. Purdue's objection that the ant-hills found in among the natural mounds are very much smaller than the latter is not of such weight in the Cape Colony, as the species of termites that formed the mounds—supposing for the moment that the ant-hill theory holds good—may very well have been the same as that which builds the huge ant-hills in Rhodesia, but which have died out in the south of the sub-continent. The bones of the eland and rhinoceros in the sand-dunes round Cape Agulhas show that these animals, now confined to the north of the Orange river, once lived in the country of the natural mounds, and as it is probable that climatic change, as well as the presence of the white man, has exterminated the larger animals in the south, so it is not unreasonable to suppose that the Rhodesian termites once lived in the south also.

In the colony the mounds may be seen in any sandy ground near the coast, covering the surface with bare patches; but the want of vegetation is due, I think, not to the nature of the soil, but to the

baking of the surface, after it has been wetted by the rain, by the intense heat of the sun. Where a wheel has gone over one of the mounds and broken the hard crust, bushes spring immediately. In cultivated land the farmers aver that these hillocks are more productive than the rest of the soil, and Mr. Juritz, senior analyst of the colony, mentioned in his address to the British Association in Cape Town, that a levelling of these hillocks results in an increase of the fertility of the soil all round.

The most accessible place for seeing these mounds is on the lower slopes of the hills of Bokkeveld and Witteberg beds on the top of the Hex river pass, on the main line to Johannesburg; they appear as red splotches on the bush-covered slopes. The elevation here is only a few inches, and the diameter some 5 or 6 yards. In the Malmesbury district they occur on the flats below the hills, and are formed of light yellow argillaceous sand. Here they have usually a depression in the centre, which is often occupied by a clump of arum lilies, although the surrounding country is far too dry for these moisture-loving plants to exist.

After seeing these Malmesbury mounds I went into the Ceres Karroo, and at Hartnek's kloof found an actual spring bubbling up from sandy ground, and round each of the eyes there was a perfect circle of grass, raised a few inches above the general surface. I afterwards saw many of these sand fountains, and for a time my mind veered round to an aqueous origin for the hillocks.

East of Worcester, however, near the station Over Hex, there is a large tract of country under the Langebergen, covered by a fine yellow alluvium, not unlike loess in texture, and a great portion of this is occupied by gigantic hillocks some 8 to 12 feet high and some 10 yards in diameter. In places these are so closely packed that the bases mutually impinge; the angle of slope varies, but often is as acute as in a volcanic cone. There are many good sections of the mounds available along the railway here and in the road-cutting, but nowhere is there any internal structure visible; the whole substance of the hillock is the same throughout, and consists of fine argillaceous sand like the surface soil, without the least sign of vegetable or animal remains included in it. The soil becomes so hard where it is allowed to dry quickly after being moistened, that square blocks can be dug out and sun-baked, and can then be built into walls, where they will stand unprotected for many years.

In the red-sand country of Bushmanland the mounds also occur, and the substance of the hillock is more argillaceous than that of the surface soil; the bushes grow closely packed together on these spots, which are perfectly circular, although the rest of the ground is sparsely covered except after rain, when the grass grows. I never noticed our donkeys feeding on these clumps, however, although the luxuriance of the bush ought to have attracted them.

Another possibly connected phenomenon is that of the small patches of poison veld that occur in among the ordinary veld with apparently no cause for the nature of the bush. I know two such patches in the colony, one high up under a krantz in the Nieuweveld, and the other in the open plains north of Matjesfontein. The areas are a few acres in extent, but there is no demarkation between the good and the bad veld; the bush is the same in both, and the farmers say that the plants absorb their poisonous properties from the soil. That these areas are very poisonous I had ample experience, for when I was outspanned near the Matjesfontein patch, a drove of slaughter-oxen came down from Sutherland and wandered into the poison area, and three or four were immediately stretched stiff on the ground. Similarly, a little blue iris that grows plentifully throughout the country in some places, Baviaan's Kloof, for instance, and at certain times of the year, becomes very poisonous to cattle, while at other places it is apparently harmless.

The opposite of the hillock veld is the Kommetje * veld, where the ground is honeycombed with little shallow depressions. I have not seen a typical spot, but on the flats to the north-east of Fort Beaufort there is a fair example of this kind of surface. The ground was cut level by marine denudation, and in the shelves at present awash with the tide there is a layer of calcareous sand, which becomes hardened into limestone by the deposition of calcium carbonate. The process by which this is brought about is probably that the sea-water, containing a certain amount of lime in solution by reason of a small amount of carbonic gas held in it also, becomes left behind at low tide, and becomes warmed by the heat of the sun; when this happens, the carbonic gas is driven off, and the lime is thereby precipitated, and goes to cement the sand-grains together. The limestone forms low reefs enclosing shallow pools, which are alive with shore-forms of marine life. It seems probable, then, that when the sea retreats from off such a shelf the hard rims of these pools will persist, and afterwards, when they become removed, together with all the other material deposited on the hard rock when it was awash, the lime of the rims will sink into the underlying surface and harden it; the flat surface will be thus parcelled out into areas within which the rock will be softer, and under the action of denudation will become covered with shallow depressions. The true kommetje veld, however, has been described to me as one succession of circular hollows in similar aggregation to that of the hillock, and thus the hillock and saucer may be related in origin. The discussion of depressions, however, includes that of the pans in South Africa generally, some of which are 20 miles in diameter, and the subject is too complicated to be referred to in this note.

* *Kommetje* = saucer.