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Der Salpausselkä.— Von I. Leiviskä. Mit 148 Abbildungen, 434 Profilen und xxvii. + 2 Karten. Helsinki [Helsingfors]. 1920. Pp. viii. + 388.

The Salpausselkä, outer and inner, are two lines of elevation in Finland, the former starting in the Hangö peninsula, and the latter in the Bromarf district, which is almost an island, being connected with the mainland by a narrow neck. The two ranges run parallel to one another throughout their course, at first in a north-easterly direction, and afterwards in great curves gradually turning from east to north-east and north. They present an interesting problem in glacial geology, which Dr. Leiviskä has studied with great care and thoroughness. With the help of his pupils he has examined the ranges and their structure in all parts, and in these pages records the results of his labours, illustrated by a map of the whole system, many sketch-maps of important sections, and very numerous photographs and profiles.

The forms are of great variety, broad-backed and flat-topped ridges being the most common, while plateaus are extremely characteristic of both Salpausselkä. Sometimes the range consists of two or more parallel ridges, sometimes it breaks up into hills and dales, and occasionally there are complete breaches of continuity. The ridges are of various heights, from a few dozen yards to 300 or 400 feet and more. With them are associated numerous åsar, especially between the ranges and within the inner Salpausselkä. Two main directions are noticeable, one parallel to the glacial striæ and at right angles to the range itself, and the other transverse to the direction of the movement of the inland ice. The material of which the ridges are composed is morainic débris and the fluvio-glacial deposits of the åsar are piled up on a structure of solid rock, which in some places rises up above these deposits.

It has for a long time been stated in geological literature that the Salpausselkä are marginal formations of the inland ice, and that they were built up during a prolonged period of rest on the retreat of the ice. Their origin, however, has not been treated as an independent problem, but has been explained by preconceived theories of the formation of åsar, the subglacial tunnel theory and the delta theory. It would take too long to set forth the arguments derived from his close observations by which Dr. Leiviskä shows that the Salpausselkä cannot have been built up by subglacial ground streams. His theory is that the material, or at least the greater part of it, has been transported in the ice, and when the ice thawed has been deposited or carried a short distance further by the water from the melted ice. Nor can the plateaus, which often extend unbroken for several miles, have been piled up by separate streams; in general they mark the upper limit to which effective action of the sea has reached.

Whatever climatic conditions prevailed when these accumulations were piled up, Dr. Leiviskä holds that they would not by themselves account for the long halt in the retreat of the ice. The varying heights of the uppermost terraces of the Salpausselkä indicate that the land was rising when these ridges were formed, and, as is well known, the upheaval was greater towards the north-west, so that at this period the rocky skeleton of the Salpausselkä was the boundary between the ascending slope from the basins of the Gulf of Finland and Ladoga and the almost horizontal plateau of the hinterland, and moreover between the sea and land, or, more precisely, between the deep and shallow water. From this configuration and the different character of the country on which the margin of the ice rested when it had retreated as far as the Salpausselkä Dr. Leiviskä infers that the ice must have made a long halt even if the climate remained unchanged. W. A. T.

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