different ice advances or merely two stages of one advance, the evidence is not so positive, yet it seems to show that the two moraines represent two distinct glacial epochs separated by an epoch of retreat and presumable warmth. The rock floor of the main valley which the older moraine enters seems to have been normally eroded several hundred feet after the deposition of the moraine upon it, and the open valley in the older moraine grades into the newly eroded floor of the main valley. During the normal erosion of the main valley by its stream the glacier of the side valley can not have stood in a position to deposit the younger moraine, for the open valley cut in the old moraine extends farther upstream than that position, and the young moraine lies *in* the open valley worn in its predecessor, which forms a terrace above it. Therefore we seem obliged to conclude that after the first glacial advance the ice retreated above the position of the second moraine and only after a long lapse of time again advanced to deposit the younger moraine.

FIVE GLACIAL EPOCHS.

Let us now examine some of the more complicated cases in which there seems to be evidence of five glacial epochs separated by warmer interglacial epochs. It is only in those valleys where glaciers still persist that we can be certain that the whole series of ancient moraines is or has been represented. Eight examples of this sort were examined, of which two were seen imperfectly. The other six are distinguished by asterisks in Table III, page 184, where the name and locality of the valleys and the number of moraines in each are indicated.

(1) *Moraines of the Jukuchak Valley.*—The simplest case here, as in the previous examples, is one in which the moraines lie in a series one above the other in a narrow valley which has not greatly changed its form since the first glacial epoch. An almost perfect example of this type is found in the Jukuchak Valley (No. 7 of Table III), which may be ascended southward from an elevation of 5,000 feet at Issik Kul to an elevation of over 13,000 feet on the northern edge of the Tian Shan plateau. The lowest moraine lies at a height of about 8,600 feet. At this point the valley ceases to be the narrow steep-sided gorge which can be ascended with difficulty through its lower part, and becomes broad and easy to follow, although there is no accompanying change of rock structure and no apparent cause for the widening unless it be due to glacial erosion. On the floor of the widened valley a strong terrace is composed chiefly of large bowlders of granite, which could have come only from far up the valley and which are of such size that they could have been brought only by a glacier. The terrace is therefore interpreted as the remnant of a moraine so old that all traces of morainic topography have disappeared. Above the terrace the valley is unincumbered for a short distance; then it is clogged by another moraine which is well weathered and worn, but which still preserves in a subdued condition the characteristic glacial hillocks and hollows. Still further upstream a larger space of open valley is floored with gravel, on which the stream wanders somewhat; next comes another fresher moraine and another open space. Twice more these features are repeated before we reach the modern moraine at a height of 11,600 feet. Thus we have five old moraines and five interspaces. The