

For rubbings *in situ* it was necessary to leave the excavation exposed to radiation in warm weather for several days. This caused preferential melting along the crystal boundaries sufficiently deep to be recorded by the pencil. It was generally quicker, however, to detach a block of ice and to leave it exposed to the sun or even the heat of the kitchen until the whole mass was melting.

Later in the summer when the ice was bare, reliable rubbings could be made on excellent natural surfaces, requiring no preparation, found beneath surface stones near the edge of the ice cap. The crevasses were generally too narrow to be accessible and the walls of melt water channels were difficult to reach. Moreover, in both these places, one could never be certain whether the ice was not recently refrozen melt water.

Rubbings on the buried glacier ice were made on excavated lumps left to melt in the sun. It is evident from these experiences that "rubbings" can only be made satisfactorily on melting ice.

#### ACKNOWLEDGEMENTS

The generous assistance and advice given by numerous firms, individuals and technical organizations, as well as the efforts of Mr. P. D. Baird in selecting and collecting much of the equipment are gratefully acknowledged. Mr. J. D. C. Waller assisted in the use of the equipment in the field.

*MS. received 29 January 1952*

#### REFERENCES

1. Klein, G. J. Canadian survey of physical characteristics of snow-covers. *Geogr. Annaler*, Årg. 31, Ht. 1-4, 1949, p. 106-24.
2. Nizery, A. Electrothermic rig for the boring of glaciers. *Trans. Am. Geophys. Union.*, Vol. 32, No. 1, 1951, p. 66-72.
3. Penman, H. L., and Long, I. A portable thermistor bridge for micro-meteorology among growing crops. *Journ. Sci. Instr.*, Vol. 26, No. 3, 1949, p. 77-80.
4. Perutz, M. F. Direct measurement of the velocity distribution in a vertical profile through a glacier. *Journ. Glac.*, Vol. 1, No. 5, 1949, p. 249.
5. Seligman, G. The structure of a temperate glacier. *Geog. Journ.*, Vol. 97, No. 5, 1941, p. 295-317.
6. —. The growth of the glacier crystal. *Journ. Glac.*, Vol. 1, No. 5, 1949, p. 254-66.
7. Sharp, R. P. Thermal regimen of firn on upper Seward Glacier, Yukon Territory, Canada. *Journ. Glac.*, Vol. 1, No. 9, 1951, p. 476-87.

## FLUCTUATION OF THE ITALIAN GLACIERS, 1951

By MANFREDO VANNI

Secretary, Comitato Glaciologico Italiano

DURING the summer of 1951 the Comitato Glaciologico Italiano sent 22 observers into the Italian Alps and the Apennines.

One hundred and five glaciers were visited; of these 76 were in retreat, 11 were in advance, 5 uncertain, 3 stationary, and 10 were covered with snow and impossible to check.

In the winter of 1950-51 the snowfall had been very abundant even on the lower parts of the glaciers, many of which remained covered with snow for the whole summer. The temperature too was very low. As a result very little ablation of the glaciers took place and their recession was negligible, or very small.

There was an increase in the number of glaciers advancing. This is probably due to the above factors added to the occurrence of heavy snow storms during the winter of 1945-46, but this cannot be definitely confirmed since no measurements of the speed of the glaciers were made until 1951.