and Rasmussen (*2*). Rabbits, partially immunized against and then challenged with herpes simplex virus, were maintained in an apparently healthy state for periods of 24 to 160 days and then placed upon a course of adrenalin injections: a fatal herpetic encephalitis developed within 2 weeks in six of ten rabbits so treated (*3*).

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3 January 1961

An Advancing Glacier in Canada

Abstract. The Commander Glacier, in the Purcell Range of interior British Columbia, advanced 810 ± 50 feet in the 6 years 1954–1960. The advance may be a response to a general cooling trend previously noted elsewhere in the Pacific Northwest.

The glaciers of the Canadian Cordillera have, at least until very recently, been following the world-wide pattern of very rapid shrinkage. The best recent evidence comes from a detailed study of eleven glaciers in the Canadian Rocky Mountains in 1953 (*1*, *2*). All had receded markedly between 1910 and 1950 and were continuing to retreat. In contrast, the Commander Glacier in British Columbia made a significant advance between 1954 and 1960. So far as is known this is the first glacier in interior Canada for which an advance has been noted.

The Commander Glacier lies west of the Canadian Rocky Mountains in the central Purcell Range of British Columbia, 100 miles north of the United States border. A brief glaciological study of this glacier was carried out by one of us in August 1954 (*3*), during the Harvard Mountaineering Club Purcell Range Expedition. The glacier is now primarily a cirque glacier, which occupies a northward-facing valley protected on the south and east by Mount Maye, Mount Commander, Mount Cleaver, and the Guardsmen, all peaks of 10,000 to 11,000 feet elevation. Its greatest length is 2½ miles, and the total area covered by ice is about 4 square miles. Tree-ring dating indicates that the glacier reached its maximum recent extent at about 1820–50, when it extended well into the valley beyond its present cirque basin. The total recession from the 1820–50 terminal moraine to the ice front in 1954 was 6180 ± 100 feet. Most of this recession took place between 1915 and 1947, since photographs taken in 1915 show that the glacier extended nearly to its terminal moraine. The glacier was photographed from the air in 1947 and again in 1953. Little net change in the area covered by ice took place between 1947 and 1954, but in 1954 the ice front was thickened and was quite active.

In August 1960 we remeasured the glacier by using fixed points established in the 1954 survey. The glacier has advanced 810 ± 50 feet since 1954, or an average of about 130 feet per year. Advance has taken place generally along the entire ice front, but is especially pronounced on the west, near the true left (west) lateral moraine. Most of the area underlying the recent advance now appears to be buried beneath at least 100 feet of ice. Blocks of ice were still tumbling from the front of the glacier in 1960, but the activity seemed less pronounced than it was in 1954.

Fig. 1. Commander Glacier in 1954. Dashed line shows approximate position of ice front in 1960.

Glaciers have been generally advancing throughout the Cascade and Olympic mountains of Washington state since 1950 (*4*), although advance may have slowed or ceased since 1958. Increased thickness of glaciers, indicating renewed alimentation, has been noted in the Sierra Nevada in California, in the Wind River Range in Wyoming, and in Glacier National Park in Montana (*5*). Glacier rejuvenation in Washington has been associated with a recent trend toward a cooler and wetter climate in that state (*4*, *6*). This trend is also apparent in Canada. Meteorological data from western Canada show increasing temperature and decreasing precipitation from 1910 to the early 1940's, but a reversal of these trends since about 1945 (*1*, *7*).

The advance of the Commander Glacier probably reflects this climatic change. Although the Commander Glacier is for the present a unique case, other glaciers in the interior ranges of British Columbia seem to show signs of incipient advance. An example is the Hermit Glacier in the Selkirk Range, which has become greatly thickened at the snout since 1950 and appeared to be advancing in 1959 (*8*).

The fragmentary data so far available suggest that glacial advances may be manifested first in interior British Columbia, and only later, if at all, in the more easily accessible glaciers of the Canadian Rockies. However, observations of glaciers throughout the Canadian Cordillera during the next few years should be of special significance.

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