gives $\dot{\epsilon}$ parallel to the surface for each interval, and hence the difference $\Delta\dot{\epsilon}$ between successive intervals. Thus no transformation of coordinates appears to be necessary.

In short, I believe that my equations (which are the same for small slopes as those of Budd, but with the variables more precisely defined) *can* be applied directly to the field measurements. Indeed they have already been applied—by Robin and Budd.

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13 November 1969

SIR, *Glaciation of the north-western part of the Canadian Arctic Archipelago*

In a recent paper (Paterson, 1969), I stated that the islands in the north-western part of the Archipelago are marked "unglaciated" on the *Glacial map of Canada*. I am grateful to Dr W. Blake, Jr for pointing out that, whereas my statement is true for the 1958 edition of the map, it is not true for the latest (1968) edition. On the 1968 map, only Banks Island and a small part of southern Melville Island are marked "unglaciated". It is now believed that the remainder of the islands were covered by a large ice sheet during the last glaciation (Blake, 1970).

Polar Continental Shelf Project, W. S. B. Paterson
Department of Energy, Mines and Resources,
Ottawa, Ontario, Canada
17 December 1969

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SIR, *Distorted ice stalactites as indicators of glacier movement*

During August 1969 we were working in the Mt Castleguard locality, Alberta, Canada. The mountain stands at the eastern end of the Columbia Icefield and hosts a number of small temperate glaciers of its own. One of these terminates at an altitude of 8 200 ft (2 500 m) upon a broad gentle limestone bench. There was an ice cave at the snout which could be followed up the line of ice flow for approximately 100 m. A cross-section is given in Figure 1. Inside the cave, rock and glacier-ice surfaces were decorated with abundant sublimation ice deposits.

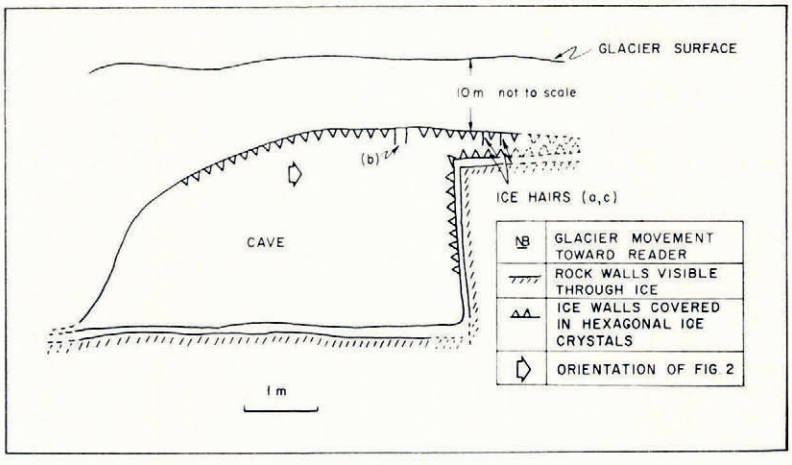

Fig. 1.

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At 70 m from the entrance a number of distorted ice stalactites were observed (Fig. 2). The extreme delicacy of these features unfortunately prevented the introduction of any scale to the photograph—three similar stalactites were shattered by body heat in the attempt. The longer stalactite ("a" in Fig. 2), is about 45 cm in length and was estimated to be <0.5 cm in diameter. It is attached to the cave roof (glacier ice) at the right-hand end and to the floor (rock shelf) at the left-hand end. Similar stalactites ("b") can be seen in the left foreground of the picture—they are not attached to the shelf and hang vertically. Distorted stalactite "c" has broken away from the shelf and then been re-attached by a thinner "hair" of ice.

Fig. 2.

Development of the distorted forms is apparent—ice stalactites grew downwards from the glacier base until they reached and became attached to the shelf and were then extended by a glacier movement which pulled them out of the vertical orientation. The resulting "stretched" stalactites were estimated to be 3–4 times longer than their former, vertical selves.

The only similar report known to the authors is that of Peterson and McKenzie (1968), which describes very much thicker pillars of ice deformed in the same manner. The Mt Castleguard ice stalactites evidence some 30 cm of glacier movement.

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6 October 1969

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REFERENCE

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