The Editor,
The Journal of Glaciology

SIR,

Glaciers of the Baffin Type

In Vol. 2, No. 2, of the *Journal of Glaciology* I found a paper by P. D. Baird and his co-workers on glaciers of the Baffin type, which are characterized by the lack of *névé*, the nourishment of the lower parts being achieved by the super-imposition of ice derived from frozen melt water.

May I draw attention to an analogy in the Cordillera de San Juan. There the glaciers apparently are more or less stationary, and even at the end of the winter they are without *névé* cover owing to ablation by the wind. The glacier tongues end at high altitudes, 4000 m. and more, and the climate is cold, dry and windy. Precipitation nearly exclusively occurs in the form of light and dry snow which is transported by the wind into the concavities of the mountain relief. The alimentation of the lower parts seems to be almost entirely accomplished by this wind-borne snow accumulation.

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REVIEWS

A CLIMATOLOGICAL AND ASTRONOMICAL INTERPRETATION OF THE ICE AGES AND OF THE PAST VARIATIONS OF TERRESTRIAL CLIMATE. E J. ÖPIK. *Contributions from the Armagh Observatory*, No. 9 (Armagh, August 1952). Published by the Armagh Observatory, 1953. 79 pages, 23 diagrams.

CONTROVERSY on the cause of ice ages continues unabated, but the present swing is in the direction of attributing the major climatic changes directly to changes in the radiation emitted by the sun. The difficulties of this approach have been twofold: uncertainty about the effect of such changes on terrestrial weather, and ignorance of how changes in solar radiation could come about. In this paper Dr. Öpik attempts quantitative answers to both questions. He begins with an analysis of the climatic heat balance between incoming and outgoing radiation, allowing for the effects of water vapour and cloud. This is a very intricate matter, which is dealt with by fitting empirical constants to theoretical equations; the startling upshot is that a variation of the average world cloudiness from 0·4 to 0·6 would cause a change in the mean temperature of the Earth's surface from 21·4 to 9·0° C., sufficient to cover the whole range of geological climates. The present mean cloudiness is a little over 0·5. The increase of cloud with increase of solar radiation, as maintained by Sir George Simpson, could therefore be an important factor in climatic variations, but with present level of solar radiation or "luminosity" the actual changes of mean cloudiness are not likely to be anywhere near so great. The cooling effect of snow and ice surfaces is regarded as negligible—in fact the elevated surface of a continental ice sheet produces a *warming* effect on its edge at sea level! There is thus no impulse for a small ice cap to grow spontaneously. Other factors, such as variations of obliquity and eccentricity, and changes of land and sea distribution, are also found to be small. It is concluded that with the present solar luminosity, no possible combination of astronomical and geographical conditions could enable the polar ice cap to reach the low latitudes actually attained during the Quaternary. The glacial maximum requires a decrease of luminosity to 87 per cent of the present; against this a warm interglacial requires a luminosity of 102 per cent and the warm Tertiary 109 per cent. Anything less than 87 per cent persisting for more than 2000 years would result in the glaciation of the whole globe.

In Holmes' immortal dictum, when you have excluded the impossible, whatever remains, however improbable, must be the truth. Acting on the assumption, which not everyone will grant, that