CORRESPONDENCE

The Editor,

Journal of Glaciology

SIR,

Theory of glacier variations; reply to Dr. Nye's letter

In his letter Dr. Nye (1965) asked for examples of flow against the direction of the surface slope over a distance substantially greater than the ice thickness.

I observed areas with backward slope on many Arctic glaciers and in the 80 km. wide belt along the margin of the Antarctic Ice Sheet for a distance of more than 2,000 km. For instance, at long. 93° 26·5′ E., 55 km. in from the coast there is a centre of a wide depression of the surface of the Antarctic Ice Sheet with the bottom more than 150 m. below the northern edge of the depression. The ice thickness in the centre, measured by seismic shooting on 23 December 1957, was 840 m. The backward slope up to 2–3° was observed for a distance of almost 5 km. So the stress of more than $\rho gh \sin \alpha \simeq 3 \cdot 4$ bars is transferred there at a distance of not less than $5h$ from a higher area of at least the same length.

In the same letter Dr. Nye gave the function $a_0(x)$ for his "ideal glacier" that corresponds in his opinion to realistic function $h_0(x)$. But this latter function has the break point $x = \frac{1}{2}$ with dh_0/dx increasing by $C(4L^2-1)$. Between $x = \frac{1}{2}$ and $x = \frac{1}{2}+\cos^{-1}\phi$, where $\phi = \pi/3+\frac{1}{3}\cos^{-1}(2L^2-1)$, the thickness increasing by about $\frac{1}{8}$ of the one at the point $x = 0$, and then it diminishes rapidly down to zero at $x = L$. I believe that glaciers of such a shape cannot exist.

I did not find Dr. Nye's other replies met my points satisfactorily for reasons explained in my letter that is being published in *Materialy Glyatsiologicheskikh Issledovaniy. Khronika. Obsuzhdeniya* [*Materials of Glaciological Studies. News. Discussions*], No. 12, 1966.

Soviet Committee on Antarctic Research,
Moscow, U.S.S.R.
22 December 1964

P. A. SHUMSKIY

REFERENCE

Nye, J. F. 1965. Theory of glacier variations; reply to Dr. Shumskiy's letter. *Journal of Glaciology*, Vol. 5, No. 40, p. 517–21. [Letter.]

SIR,

Dielectric properties of ice at 30 Mc./sec.

Results of field work in Antarctica during the 1964–65 season provide new information concerning the relative permittivity of ice at frequencies between 1 and 1,000 Mc./sec., discussed by Evans (1965). Measurements of the velocity of radio waves at 30 Mc./sec. on the Skelton Glacier, where the estimated density (0·907 g./cm.^{3}), is close to that of pure ice (0·917 g./cm.^{3}), yield a value of $168 \cdot 5 \pm 1 \cdot 0$ m./μsec. The corresponding average relative permittivity value of 3·17 tends to confirm Evans' conclusion that significant V.H.F. dispersion does not exist, in the face of the contrary values reported by von Hippel and Yoshino.

Polarization changes, which had not previously been observed in the field, were noted in echoes through the Skelton Glacier and through 2,800 m. of ice at the South Pole station. These polarization shifts may be related to preferred crystal orientation in the basal part of the ice sheet, and suggest a possible means of obtaining further information about this critical part of the glacier.

Geophysical and Polar Research Center,
University of Wisconsin,
6021 South Highland Road,
Madison, Wisconsin, U.S.A., 53705
19 October 1965

G. R. JIRACEK
C. R. BENTLEY

REFERENCE

Evans, S. 1965. Dielectric properties of ice and snow—a review. *Journal of Glaciology*, Vol. 5, No. 42, p. 773–92.