COMMENTS ON PROFESSOR HAEFELI'S PAPER

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Professor Haefeli's beautiful results are interesting both in themselves and as a corollary to our own measurements in the field[1] and in the laboratory.[2] We have found in both cases a rapid increase in the rate of shearing as a function of increasing stress, somewhat like that shown in the full curve of Haefeli's Fig. 1 (p. 95). In the field experiment the ice was at the pressure melting point, whereas in the laboratory pressure melting was excluded by carrying out the experiments at −1·5° C. Nevertheless, the dependence of the rate of shearing on shear stress was similar in the two cases, and possibly differed by no more than a scale factor due to the different temperatures at which the two experiments were done.

Haefeli rightly stresses the importance of distinguishing between the intrinsic effect of the shear component of the stress and the effect of hydrostatic pressure, and suggests that the latter should not be left out of consideration. Our experience rather seems to indicate that the first factor is overwhelming in cases like the one investigated by Haefeli, and that thermo-dynamic effects, *i.e.* pressure melting leading to the presence of a liquid phase at the grain boundaries, may only have a secondary influence.

In conclusion, we should like to make a plea that the time has come to abandon the term "viscosity" in discussions of glacier flow, because it has little value in relation to plastic materials showing the kind of behaviour that ice does.[2] In cases where complicated stress systems are involved, such as the closing of a tunnel or the penetration of a ball, a curve of deformation rate against depth or load might be more informative and be more easily applied to other cases.

REFERENCES

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2. Glen, J. W. Experiments on the deformation of ice. *Journal of Glaciology*, Vol. 2, No. 12, 1952, p. 111–14.

SHEAR-STRESS FABRICS OF ICE AND QUARTZ

SOME COMMENTS ON A PAPER BY DR. H. BADER*

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Dr. Bader's purely glaciological paper, based in part on studies of the Malaspina Piedmont Glacier in Alaska, should prove of great interest to those concerned with petrofabric work on ice and on metamorphic rocks, and to non-specialist glaciologists and metamorphic petrologists. The author deals with (1) the size, shape and mutually interlocked nature of Malaspina ice crystals, and (2) preferred orientations of the principal crystallographic axes of such crystals. These ice characteristics are dealt with in relation to (*a*) so-called "dead" ice (of the glacier fringe) that was flowing to some extent owing to deformation under the stress of its own weight, and (*b*) "living bubbly ice" near the outer edge of the glacier. In addition, the author gives a valuable account of ice-fabric research methods, including both field and laboratory techniques, and provides descriptions and photographs of the instruments employed.

* Introduction to ice petrofabrics. *Journal of Geology*, Vol. 59, No. 6, 1951, p. 519–36.