

that the meteorological causes for the shrinkage have been increased temperature during the summer and, particularly in July, increased humidity and a prolonged ablation season.

Wallén's investigations have been criticized so far as the theoretical chapter on convection is concerned, but the agreement between calculated and observed values is so good that one must admit that the results support his assumptions. Wallén's investigations represent a most valuable complement to, and development of, the pioneer works on the importance of meteorological factors in the ablation process initiated by Ahlmann and Sverdrup. It is highly desirable that such investigations should be undertaken on other glaciers, particularly on those to which other climatic conditions apply. In addition to the meteorological and glaciological knowledge resulting from such investigations, they will help us to understand climatic variations as a whole and in the long run probably also the causes of ice ages.

*Dept. of Physical Geography,  
University of Stockholm.*

O. HARALD JOHNSON

#### BEITRAG ZU DEN THEORETISCHEN GRUNDLAGEN DES LAWINENVERBAUS.

EDWIN BUCHER. *Beiträge zur Geologie der Schweiz—Geotechnische Serie—Hydrologie*, Lieferung 6. Bern: Kommissionsverlag Kümmerly & Frey, 1948, 113 pages, diagrams, illus. In German, English summary.

THE results of the scientific study of snow and avalanches begun at the Weissfluhjoch, Davos, under the direction of the Swiss Commission for the Study of Snow and Avalanches (Schw. Schnee- und Lawinenforschungskommission) were first summarized in the publication *Der Schnee und Seine Metamorphose* in 1938 by H. Bader, R. Haefeli, E. Bucher, J. Neher, O. Eckel, and Chr. Thams.\*

In 1948, after ten more years of research, Dr. E. Bucher, now Director at the Weissfluhjoch, published a new treatise on snow for his Doctor's thesis. In this he studies snow as a structural material and finds that this mixture of air and ice is a plastic and compressible substance which, within certain limits, obeys Newton's law of viscosity. For each type of snow a coefficient of viscosity can be determined and this enables the engineer to make most of the calculations necessary for the construction of avalanche defences.

The viscosities, which vary within wide limits according to the different kinds of snow, clearly explain nearly all the observed phenomena of the snow cover, such as the varying degree of solidity of different kinds of snow deposits, the pressures and tensile stresses of inclined snow strata, the factors governing the release of avalanches and the like.

Thus, for example, since new snow is highly plastic, a deep snowfall becomes a very compact deposit, because it settles under its own weight. On the other hand a thin layer, formed in early winter and lying for a long time unprotected by a new fall, undergoes metamorphosis; the needles and stars become grains. This granular snow has little plasticity and does not settle when new strata of snow are deposited on it. On the contrary it is brittle and breaks up at the slightest jolt, so that it may at any time cause an avalanche.

The study of the slow creep of inclined snow strata has enabled the author to solve the problem of the pressure of snow against barriers and to draw simple and logical conclusions for the proper construction of avalanche defences. In the case of snow without cohesion the layers can be rendered more stable by reducing the gradient of the surface by means of walls and fences of sufficient height, behind which the snow can accumulate to form a slope of less steepness than the underlying ground. In the case of slab avalanches the downhill tensile stress can be neutralized by barriers built along the contour lines at places where the gradients increase.

In addition to excellent photographs and a large number of clear diagrams there is a very full

\* Kümmerly & Frey, Bern. 1939.

bibliography containing no less than 236 references. Dr. Bucher's work marks important progress in the study of snow. It indicates numerous practical applications and opens up a vast field for further research.

ANDRÉ ROCH (Davos)

Received 27 December 1948

ZEITSCHRIFT FÜR GLETSCHERKUNDE UND GLAZIALGEOLOGIE. [Ed. R. von Klebelsberg.] Universitäts-Verlag Wagner, Innsbruck, Band 1, Heft 1, 1949, p. 1-148. 55 sch.

THE original *Zeitschrift für Gletscherkunde* commenced publication in 1907 under the editorship of Eduard Brückner. It is interesting to note that he had the assistance of such well-known authorities as Sebastian Finsterwalder, F-A. Forel, Sir James Geikie, F. Nansen and H. F. Reid of Baltimore, as well as glaciologists from France, Italy, Russia and Argentina.

Its purpose, as mentioned in the first editorial, was to deal with every subject connected with the study of glaciers, including the physics of solid H<sub>2</sub>O, climatology and the geomorphological effects of glaciers and glacial streams. This aim was amply fulfilled in the years that followed and the *Zeitschrift für Gletscherkunde* remained unchallenged as the sole glaciological journal.

Brückner died in 1927 and Professor R. von Klebelsberg presided in his stead, a worthy successor who continued the work until 1943, when publication ceased.

Now, overcoming many difficulties, von Klebelsberg has succeeded in reviving the journal and we suspect that it will differ little from its former self except in name, for it will be difficult to broaden its basis unless perhaps more emphasis than formerly is laid on glacial drifts and similar subjects. It would certainly be good if it could cover every aspect of Pleistocene research, for no such journal exists at present and there is an insistent demand for one both in this country and in America, and doubtless elsewhere.

The issue under review contains a noteworthy paper by H. Kinzl on the glaciers in the southern part of the Cordillera Blanca of Peru, one of the most important glacierized regions of the tropics and one which possesses the highest peak in the tropics, Huascarán, 6768 m. (22,205 ft.). This paper, which is accompanied by an excellent map to a scale of 1 : 100,000, is on somewhat similar lines to one which appeared in the *Zeitschrift für Gletscherkunde* for 1942 with the same map; this, however, could not have received wide circulation at that time. There are papers by H. Pillewizer on seasonal glacier fluctuation, V. Paschinger on the Pasterzenkees, the largest glacier in the eastern Alps, and S. Morawetz on post-glacial climatology. Shorter communications include one from Kurt Wegener, written from Buenos Aires in 1942.

Several pages are devoted to glacier fluctuation, mostly recession, in the years 1940 to 1946 in the Austrian Alps, and a summary of Swiss glacier fluctuations from the writings of P. L. Mercanton in *Die Alpen*. There are reviews of some recently, and some distinctly less recently, published glaciological works. Finally nine pages are devoted to a bibliography of pollen analysis, which, as the editor remarks in an able review of V. Vareschi's work of 1942, promises to be of great help in glaciological research.

The printing is in roman type and the illustrations are fairly well produced. The format is slightly smaller than that of the former publication.

It has been suggested that this journal would be a competitor of the *Journal of Glaciology* and as such would be unwelcome to us. We do not agree. The field is so large and the interest in glaciology is growing so fast that there is plenty of room for more than one journal, as Professor von Klebelsberg himself has written to the reviewer. Moreover the scope and aim of the two publications are not identical.

We congratulate Professor von Klebelsberg on this courageous revival of his work which is bound soon to recover its former high stature. Our attitude is an entirely friendly one—indeed we believe that, provided there is harmonious co-operation, two journals will the better contribute to advance the sciences they serve.

GERALD SELIGMAN