Physics of Ice. V. Temperature in Glaciers and in the Inland Ice. VI. The Structure of Ice and of Glaciers. VII. The Movement of Glaciers and Inland Ice. VIII. Moraines, Drumlins and Glaciofluvial Formations. IX. The Geographical Distribution of Glaciers. X. Glacier Fluctuations.

The general impression given is that the treatment, with perhaps the exception of the climatological section, is severely factual and that it omits discussion of the causes and mechanism of glacier phenomena. For example the chapter on Banding makes little attempt to account for the way in which the various glacier bands are formed. Forbes' Bands are mentioned practically without comment. It must be conceded, however, that to discuss the many theories and suggestions that have been put forward to account for glacier structures would fill a very large book indeed and might even be out of place in a textbook.

The index is not very full, a failing which is accentuated by the paucity of paragraph headings in the text. This is particularly unfortunate in a book which should assist reference. For the same reason the list of authors would have been more useful if arranged in alphabetical order. On the other hand, the bibliographies are good with the limitations mentioned earlier in this review. The photographs are excellent but all too few in number. The printing is clear and fortunately forsakes the Gothic.

In other respects, too, the work is excellent. No one has greater practical experience of glaciers in many parts of the world than von Drygalski and he has conceived his task on a broad geographical basis, neglecting no glacierized area, and has lent his ripe knowledge and great scholarship to produce a work of real importance.

G. S.

ABSTRACTS

SHARP, ROBERT P. Soil Structures in the St. Elias Range, Yukon Territory. *Journ. of Geomorphology*, Vol. 5, No. 4, 1942, pp. 274–301.

The various soil structures in Wolf Creek are attributed to vigorous frost action supplemented by solifluction. Stone nets, stone garlands, stone stripes and earth hummocks are dealt with. Some of the soil structures are in process of development, others are thought to be of 100 to 4000 years old.

KLEBELSBERG, R. VON. Die Heutige Schneegrenze in den Ostalpen. *Berichte des Naturwissenschaftlich-medizinischen Vereins in Innsbruck*, Bd. 47, 1939–46.

The height of the snow line (*Schneegrenze*) is given as 2600 to 3100 m. in the eastern Alps, the lowest figure being in the Lechtal ranges and reaching its highest level in the Oetztal and the Litzner group. In a review of this work, the Editor of *Die Alpen*, Dr. Max Oechslin,* comments that there should be a clear distinction between snow line (*Schneegrenze*) and firn line (*Firngrenze*) since the former may change from day to day, while the latter only varies at fastest from year to year. The firn line has little influence on the glacier economy.

SCHAEFER, VINCENT J. Properties of Particles of Snow and the Electrical Effects they Produce in Storms. *Trans. Am. Geophysical Union*, Vol. 28, No. 4, 1947, pp. 587–614.

Two types of atmospheric electricity were found to occur during storms. These have been related to specific forms of snow crystals and other properties which can be observed at ground stations. Measurement of velocity of fall, quantity and sign of electric charge, mass, range in quiet air, variety of crystal forms and other properties of single crystals are given. The fragmentation which results when snow crystals hit a solid at high velocity is described and illustrated with photomicrographs. The frictional electricity produced when crystals are broken as they hit a metal surface, when compared to the charge carried by falling crystals, is found to be more than a hundred times greater in some instances. Unusual amounts of atmospheric electricity recorded in fair weather are described and shown to be related to the passage of frontal systems and other meteorological phenomena. A

* *Die Alpen*, Vol. xxiii, 1947, No. 7, II, p. 165.

method is described for preparing snow-crystal replicas and for measuring the size and distribution of cloud particles.

GATTY, O., FLEMING, W. L. S., and EDMONDS, J. M. Some Types of Polygonal Surface Markings in Spitsbergen. *Am. Journ. Sci.*, Vol. 240, 1942, pp. 81–92.

A number of measurements of surface polygons in Spitsbergen is recorded and analysed statistically and several new features of polygonal systems are described. A tentative hypothesis of origin of these polygons is put forward to account for the new features. It is not very different from older hypotheses, but throws increased emphasis on the importance of solifluction and vegetation. It is pointed out that deformation of the surface in general occurs when part of the surface is rigid and part of it plastic, and this is the special significance of the freezing point in producing polygonal markings.

OPPENHEIM, VICTOR. Glaciaciones en el Peru. *Revista de la Academia Colombiana de Ciencias Exactas, Fisico-Quimicas y Naturales*, Vol. 6, Nos. 22 and 23, 1945, pp. 319–21, illustrations.

Observations made in various high ranges of Peru indicate that there are evident remains of three to four glaciations in the Andes of Peru. These vary from levels of 2800 m. which is the lowest, to 4800 m. In this manner the ice from the Pleistocene epoch to the present has retreated approximately 2000 m.

The lowest level of an actual glacier observed, Tullpa Raju, in the Cordillera Blanca, is 4300 m. Remains of human buildings prove that more than 500 years ago man inhabited the same region at higher altitudes, which indicates the unequal and sporadic movement of the ice, depending not only on climatic conditions but also on certain factors yet little known to modern geology and climatology.

ROGSTAD, OLAF. Jostedalsbreens Tilbakegang. *Norsk Geografisk Tidsskrift*, Bind 8, Hefte 8, 1941, pp. 273–93.

In this paper an attempt has been made to determine the decrease of the glacier volume of Jostedalsbreen during the last forty years, as based on a comparison of the hydrographic researches in some watercourses and the published measurements of the length of glacier tongues. There is an English summary of three pages.

ROGSTAD, OLAF. Väre Breers Tilbakegang. *Norsk Geografisk Tidsskrift*, Bind 9, Hefte 4, 1942, pp. 129–57.

This paper sets out to determine the decrease of the glacier volume of Svartisen and Folgefonnen in a similar way to that for Jostedalsbreen. In this connection an investigation has been made of the effects upon the regulated water supply in Glomfjord Power Station by the decrease of Svartisen. There is an English summary of five pages.

GLACIOLOGICAL LITERATURE

THIS bi-annual list of glaciological literature aims to cover the *scientific* aspects of snow and ice in all parts of the world. Attention is drawn to the bibliographies in each number of *The Polar Record* (Cambridge), which aim to cover the significant work dealing with expeditions, research, equipment and conditions of living in the Polar regions. Both journals, however, deal with Polar literature having specific glaciological interest and with general matters of a practical nature such as snowcraft.

A few copies of some of the works marked with an asterisk in Vol. 1, No. 1, 1947, are still available for distribution.

AHLMANN, H. W:son. The Styggedal Glacier in Norway. *Geografiska Annaler*, Årg. 22, Häft 3–4, 1940, pp. 95–130. [Climatological aspects, regime, etc., 1919 to 1939.]

AHLMANN, H. W:SON and ERIKSSON, BACKA E. Revet Station and the Fröya Glacier, North-east Greenland, in 1939–40. *Geografiska Annaler*, Årg. 28, Häft 3–4, 1946, pp. 227–57. [Detailed account of the glacier regime: general conclusions on the influence of deposited water upon a glacier regime.]

ANDRADE, E. N. DA C. Metal Crystals and Metal Strength. *Proc. Royal Institution of Gt. Britain*, Vol. 33, Part 2, 1947, pp. 237–50. [Characteristics of metal crystals, some of which are of glaciological interest.]

BARNES, LYNN C. Permafrost ; a Challenge to Engineers. *Military Engineer* (Washington, D.C.), Vol. 38, No. 243, 1946, pp. 9–11.

BILLWILLER, R. Der Firnzuwachs pro 1945–46 in einigen schweizerischen Firngebieten. XXXIII Bericht der Zürcher Gletscherkommission. *Vierteljahrschrift der Naturf. Gessellschaft in Zürich*, Jahrg. 91, 1946, pp. 268–71. [Firn economy in some Swiss glaciers.]