

REVIEWS

THE TREND OF MODERN GLACIOLOGY

*Glaciers and climate. Geophysical and geomorphological essays dedicated to Hans W:son Ahlmann, 14 November 1949. Chief editor Carl M:son Mannerfelt. Stockholm, Svenska Sällskapet för Antropologi och Geografi, 1949. [Special reprint of *Geografiska Annaler*, Årg. 31, Häfte 1-4, 1949, p. 1-383.]*

Pleistocene research. A review by members of the Committee on Interrelations of Pleistocene Research, National Research Council [U.S.A.]. *Bulletin of the Geological Society of America*, Vol. 60, No. 9, 1949, p. 1305-1525.

[Papers on permafrost and periglacial phenomena by various authors.] *Journal of Geology*, Vol. 57, No. 2, 1949, p. 101-231.

DURING 1949 three collections of glaciological works were published: the Ahlmann "*Festschrift*," the *Bulletin of the Geological Society of America* (Vol. 60, No. 9) and the *Journal of Geology* (Vol. 57, No. 2). They contain between them fifty-four articles and mark a period in research which merits comment in this *Journal*.

First, the Ahlmann "*Festschrift*," a group of studies on modern geophysical, glaciological and climatological research under a general title *Glaciers and Climate*. The first impression is that most of those invited to contribute articles have written each exactly on what one would have expected; the band has played all the well-known tunes: past climate—Pleistocene deposits—glacials and pluvials—glacier movement. When one looks closer, however, one finds that the music is scored for modern instruments: the recorder of regelation has given place to the saxophone of plastic deformation. The plain fact is that the study of snow, ice and glacier mechanics is a matter for theoretical and practical physics; travellers' observations and speculation can and must be replaced by the treatment of snowfield and glacier as physical laboratories, *i.e.* the study of ice needs first-rate physicists who are accomplished travellers. That new generation has already grown up in circumpolar lands and in the high places of the earth.

Glaciology is scarcely separable from climatology: Ahlmann's own work and the "*Festschrift*" bear ample record of the fact. Once more one notices a precision and an objective use of data which give the reader a sense of confidence; snow surveys have assumed a new importance.

Where, then, does glaciology set its boundaries? If it is a study of ice, is it also the study of ice long since disappeared and of the climates that created, maintained and dispelled that ice? The writer of these notes thinks that an answer should be found, and found quickly. Is glaciology to be involved in the welter of Pleistocene geology and palaeoclimatic argument deriving its material from the sea floor, from palaeontology, palaeobotany (including pollen analysis), glacial geology, geomorphology and stratigraphy, from human implements, caves and cave art, and who knows what else? The "*Festschrift*" contains several notable contributions on some, but by no means all, of these subjects, and all of them have something new to say.

Now let us turn to the *Bulletin of the Geological Society of America*: the problems treated here include glaciology—the study of snow and ice—Pleistocene palaeontology and biogeography, palaeolithic archaeology, past glaciation, glacial geology and stratigraphy, palaeoclimatology, soils, submarine geology. The papers are stimulating and contribute new outlooks and new data on old problems. The study of the present—including present snow and ice—is, as ever with geologists, the key to the past; but the symposium is chiefly about the past and has a true and correct title, *Pleistocene Research*. The evidence and the techniques deal with relics of the past, and the members of several sciences can read that evidence in a factual manner; the rest is speculation by themselves or others. In some degree these trends of thought are philosophical and empirical, and precision, such as that of physics applied to ice, may not be attainable.

To the writer, then, it would seem wise that the glaciologist should limit his subject to snow and ice and the conditions of every sort, including climatic and geomorphological, which are attendant upon them; and that he should regard *past* snow and ice, and matters arising therefrom, as the undefined frontier of his subject with several other sciences.

How does such a conception tally with the contents of the third publication (published first in time), namely the symposium in the *Journal of Geology* on frost action, consisting of papers on "permafrost" and periglacial phenomena? Most of the contributors are, or were, students of Professor Kirk Bryan, who introduces the papers with a review of cryopedology, or the study of the effect of frozen ground and intensive frost action. The communications, which are limited to North America, fall into two classes: the first records studies made in the Arctic—orientated lakes, thaw lakes and thaw sinks—in which, in a word, sub-surface freezing and thawing play a dominant part. The second class describes and interprets phenomena "in areas of temperate climate formed by processes now current in arctic areas"—fossil ice wedges, stone nets, stone stripes and soil stripes, periglacial features, Pleistocene wind erosion, some observations in the south Wisconsin driftless area; this group applies the mechanisms known in high latitudes and high mountains to-day to explain phenomena in other regions.

It might be maintained that the first class comes within the terms of reference of the glaciologist, and that the second is more properly the business of the glacial geologist and the student of Pleistocene geology and chronology. So clear-cut a distinction is qualified by the inclusion in the symposium of a study of frost-moved rubbles and their significance in the Pleistocene chronology of Alaska, in which the processes of past and present are contrasted in the same region. Moreover, the reviews which accompany these contributions call attention to yet another symposium: "Strukturböden, Solifluktion und Frostklimate der Erde" by Carl Troll (*Geologische Rundschau*, Bd. 34, Ht. 7/8, 1944, p. 545-694, which covers a wide range of subjects.

To conclude, then, the writer sees a pressing need for glaciology to define itself, lest energy is dissipated over immense fields which are in fact being well surveyed by qualified investigators. Glaciology might do well to deal with snow and ice in all forms, and the conditions which control them, and it may then best benefit from several allied sciences, and contribute to them.

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DILUVIAL-GEOLOGIE UND KLIMA (KLIMAEHEFT DER GEOLOGISCHEN RUND-SCHAU). *Geologische Rundschau*, Band 34, Heft 7/8, 1944, p. 307-787. Stuttgart: Ferdinand Enke Verlag. 20 Marks.

THIS contribution to Pleistocene geology and climate is published by the Geologische Vereinigung of Bonn under a single cover with the above title. The introduction, in effect a survey of knowledge to date, is written by the editor, Professor Carl Troll, whose work is well known in this country.

The rest of the papers are grouped into six sections—a convenient arrangement. It would be impossible in the space available to review each paper individually but as many of the articles in this war-time publication cannot have been available in this country, at least until recently, it is desirable to record them briefly.

Section I on the Ice Age and the pre-glacial period consists of an article by F. Machatschek on the Pleistocene uplift. In Section II (the Pleistocene geology of the Mediterranean area) there are three papers by Max Pfannenstiel, Dimitri Jaranoff and Herbert Louis respectively. Section III dealing with periglacial regions contains papers by Julius Büdel, Albert Steeger and L. Weinberger on the effects of glacial and ice age conditions on ground now free of ice. There is also a paper by Carl Troll on several aspects of cryopedology (Strukturböden, Solifluktion u. Frostklimate der Erde) which has already received notice in this country. Section IV consists of a paper