

in Edenside has been interpreted as one of the progressive thinning or downmelting with little or no supply or forward movement from the Lake District valleys. If this view is accepted valley-head corrie-moraines may well represent a renewal of the local glaciers, a hypothesis which is not novel but is one to which it is hoped to give further study. A post-glacial phase of laminated clay formation suggestive of the recrudescence of glaciers appears to lend support to this view. Evidence of this phase has been obtained from core samples taken from the bottom of Lake Windermere by Miss Pennington (now Mrs. Tutin) of the Freshwater Biological Station at Wray Castle.

S. E. HOLLINGWORTH

CRYOPEDOLOGY: The study of Frozen Ground and Intensive Frost Action with Suggestions on Nomenclature. By KIRK BRYAN. *American Journal of Science*, Vol. 244, 1946, pp. 622-92

THE author sets out to introduce some order into the terminology of the study of frost action and permanently frozen ground. "Cryopedology" is his name for these studies. There is clearly a need for some rationalization, but the new words he introduces, derived largely from Greek and Latin roots, are in many cases rather cumbersome for every-day use. The ideas and phenomena associated with the new terms are very clearly conveyed and the paper renders a useful service in sorting out the various meanings given to the older words and phrases in the past.

Nevertheless it seems a pity to replace such a self-explanatory word as frost-heaving by the term "congeliturbation," although as the author points out there is no way of deriving from such verbal expressions corresponding nouns for the products of their action. Instead of frost-heaved silt the proposal is presumably "congeliturbate silt." Where the action of frost is merely to freeze the water in the rock voids and fissures without building up ice lenses, the splitting open of the rock due to the water-ice expansion is called "congelifraction." A few lines after introducing this word it appears that the author falls into his own trap by using the more familiar term "frost action."

The terminology of the movement of soil downhill as a result of frost-heaving and thawing on slopes is discussed at some length. In considering the terms that have been used in the past to describe the material moved by the above process it is surprising to find the word "warp." According to the *Shorter Oxford English Dictionary* this word as a noun dates from before 1700 and is an alluvial deposit laid down naturally or artificially by water and even to-day it is in common use amongst drainage engineers. The term "solifluction" introduced by Andersson (1906) is frequently used for the migration of weathered material downhill under the action of frost-heaving and thawing. Although Andersson himself may not have understood the mechanics of the process, his type localities are all in cold regions where the phenomenon is important. Bryan wishes to use the word "congeliturbation" in this sense, but there does not seem to be sufficient differentiation in his use of the word. Presumably, for example, an area of level ground subjected to annual frost-heaving and thawing would be called "congeliturbate ground," but in no sense will it be migrating downhill.

The widespread lowering of relief produced by "congeliturbation," which various authors have suggested as the origin of the smooth broad upland surfaces in Tibet, Iceland, and South East Alaska, is appropriately called "cryoplanation."

The active zone above permanently frozen ground, which seasonally freezes and thaws, is termed the "supragelisol"; the word "mollisol" appears to be synonymous. The combined actions of thawing and softening of the mollisol are known as "mollition," but it is often necessary to refer to these two actions individually. Several other words are introduced for the various zones in permanently frozen ground, but to use the author's summarizing phrase, they are "somewhat overpowering in number."

While it is always to be welcomed that scientific terminology should be set on a logical and systematic basis, the reviewer feels that many of the terms are too complicated in design and that this, coupled with the large number presented all at once, makes them a trifle overwhelming. The descriptive phrase and "adjectival" noun nomenclature in current use in the study of frozen ground are also readily understood by the layman; "surface zone of annual freeze and thaw" and "ground ice" are examples. The writer suggests that the rationalization of these and similar terms might be a better solution of this difficult problem.

W. H. WARD

ABSTRACTS

[In this section will appear abstracts which are too long to be included as annotations to the list of glaciological works which follows.]

SIMPSON, C. G. Possible Causes of Change in Climate and their Limitations. *Proc. Linnean Society, London*, 1940, pp. 190-219.

(a) The mean temperature and mean rainfall of zones are unaffected by the distribution of land and water, but large differences in local climate may be effected by redistribution of land and water, chiefly in the extremes of temperature and rainfall. The changes of climate during the Pleistocene period could not have been caused by changes in land and water.

(b) The effect of changes in the elements of the earth's orbit is so small that the mean annual temperatures cannot be affected by more than a fraction of a degree Centigrade, while the temperatures of the warmest and coldest months can only be affected by as much as 2° C. in extreme cases in high latitude.

"Generally speaking, the temperature of the warmest month is above 5° C. in non-glacierized regions and below 5° C. in glacierized regions; the temperature of the coldest month is of little importance."

(c) An increase in solar radiation produces an increase in temperature, in the amount of cloud and in precipitation, and a decrease produces the reverse. The large changes in climate during the Pleistocene period are probably due to changes in solar radiation; but it is not yet clear whether the glacial epochs were caused by an increase or decrease of solar radiation.

GLACIOLOGICAL LITERATURE

THE following list still includes many works published in the war years. It covers every aspect of glaciology in all parts of the world. Attention is drawn to the bibliographies in the *Polar Record* which concentrate mainly on polar exploration and literature.

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

AHLMANN, H. W:SON. Nutidens Antarktis och Istidens Skandinavien, Nagra Jämförelser. *Geologiska Föreningens i Stockholm Förhandlingar*, Bd. 66, Heft 3, 1944, pp. 653-54. [Compares Antarctica to-day with Scandinavia during the glacial period, from data collected by German Antarctic Expedition 1938-39.]

AHLMANN, H. W:SON. Researches on Snow and Ice, 1918-40. *Geog. Journ.*, Vol. 107, 1946, pp. 11-28. [Reviewed by F. E. Matthes, *Geog. Review*, Vol. 37, 1947, pp. 154-57.]

AHLMANN, H. W:SON. Glaciological Methods. *Polar Record*, Vol. 4, 1946, pp. 315-19. [Discusses various methods of measuring accumulation and ablation in snow fields; defines glacier regime and suggests regions where glacier regimes can be profitably investigated.]

BENTHAM, R. Structure and Glaciers of South Ellesmere Land. *Geog. Journ.*, Vol. 97, 1941, pp. 36-45.