R. HAEFELI, whose work on the mechanics of snow is well known to every student of glaciology, has been appointed Assistant Professor of Soil and Snow Mechanics at the Swiss Federal Institute of Technology, Zürich.

F. E. MATTHES has received the Honorary Degree of LL.D. from the University of California in recognition of his many valuable contributions to glacial geomorphology and glaciology. Mr. Matthes has now retired from the U.S. Geological Survey and has settled in California.

REVIEWS

L'HYPOTHESE DU DEPLACEMENT DES PÔLES ET LA CHRONOLOGIE DU QUATERNAIRE. JACQUES BLANCHARD. Le Mans: Monnoyer, 1942, pp. 168

KÖPPEN and Wegener [1] suggested that the main changes of climate during geological time were due to a movement of the poles relative to the main surface features of the globe, while the relatively small and quasi-periodic changes which gave rise to the glacial and interglacial epochs of the Quaternary Ice Age were due to changes in solar radiation caused by the main perturbations (the precession of the equinoxes, changes in eccentricity, etc.) of the earth's orbit. The new hypothesis of M. Jacques Blanchard makes a movement of the poles responsible for all the changes of climate, while the movement of the pole itself is controlled by the perturbations of the orbit. The kind of movement of the North Pole envisaged by Blanchard is shown on the diagram (see Fig. 1, p. 149) which is reproduced here from his paper.

The path of the pole takes the form of a circuit, called *la rotation principale*, round a centre situated in north-west Greenland, on which there are five loops, called *les boucles secondaires*. The principal rotation is said to be controlled by the rotation of the lines of the apsides of the orbit and therefore the whole circuit is completed in 115,000 years; each loop is controlled by the precession of the equinoxes, occupying 21,000 years, so that there are approximately $5\frac{1}{2}$ loops in each principal rotation. For simplicity the diagram shows 5 loops to a rotation and all the loops are drawn of the same size; but the lengths of the loops are supposed to be controlled by the changing eccentricity of the orbit—the greater the eccentricity the further the loops extend outwards. As the eccentricity varies in a period of approximately 92,000 years the lengths of successive loops increase and decrease in this period. On these lines Blanchard draws the path of the pole from 1,150,750 B.C. to A.D. 85,250; but exactly how he does it is not explained.

Now as the climate of any place is chiefly a function of its distance from the pole (latitude) it is clear that, knowing the path of the pole, the climate of any locality, at any time, can be determined. Blanchard does this for the region of the Somme in north-west France and compares the deduced changes of climate with the geological record in great detail. His conclusions can best be given in his own words:

> Toutes ces confrontations semblent faire apparaître une concordance complète des climats et des oscillations théoriques avec les faunes et les niveaux géologiques observés: dans les nombreuses coupes examinées, les plus complètes, aucune difficulté d'interprétion n'a surgi. Au contraire, quelques confirmations nouvelles semblent en être résultées (p. 102).

The climates of regions outside the Somme area are then considered. There are few data and Blanchard's discussion is very perfunctory and superficial; nevertheless he considers himself able to state:

> Ce rapide examen des rares données chronologiques obtenues en dehors de la Somme, permet, comme pour cette région, de constater que la théorie explique les faits, sans qu'aucune difficulté d'interprétation soit apparue (p. 128).

Every theory of this nature must be judged on two considerations: first, its physical basis must be sound, and secondly, there must be agreement between the theoretical deductions and the observed facts. As to the first, one can only say that while Blanchard devotes many pages to saying why we might expect the pole to react to the several perturbations of the orbit, he nowhere gives a convincing proof that it does so react. As to the agreement between the theory and the observations, no one but an authority on the prehistory of the Somme area could criticize the many pages of detailed discussion which Blanchard gives to this aspect of the problem. But even if we accept Blanchard's own conclusions quoted above, we must not forget that other com-

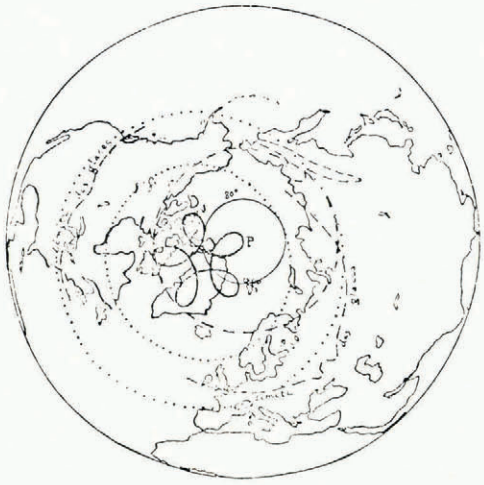

Fig. 1. Déplacements probables du Pôle Nord sur la globe, d'après les faunes

petent workers in this field[2] have shown equal skill in fitting the same evidence into Milankovitch's theory which, while being based on practically the same astronomical data, gives entirely different results both in time and space. G. C. S.

References

1. Köppen-Wegener. *Die Klimate der geologischen Vorzeit*. Berlin: Gebrüder Bornträger, 1924.
2. Zeuner, E. *The Pleistocene Period*. London: The Ray Society, 1945, Fig. 33, p. 99.

GLETSCHERKUNDE. E von Drygalski and F. Machatschek. Vienna: Frank Deuticke, 1942, 17×24 cm., pp. 261, Plates 11 pp.

The book is one of a series of an *Enzyklopaedie der Erdkunde*, just as was its forerunner, *Das Eis der Erde*, by H. Hess. The work may be regarded as a textbook of glacier science (*Gletscherkunde* has a less wide meaning than "Glaciology") and as such claims a considerable measure of success. But the authors wrote under the handicap of the war years, so that some of the more recent contributions to the subject are missing. Even the narrower *Gletscherkunde* embraces a big field and it seems desirable to give here the chapter headings into which the authors have divided it: I. The Region of Snow. The Snow Line. II. Glacier Forms. III. Glacier Economy. IV. The