riboflavin, nicotinic acid, pantothenic acid, pyridoxine and choline, in adequate amounts by stomach tube twice weekly. Many of the animals in both groups developed necrotic erosions beginning around the teeth and sometimes becoming so severe as to extend almost entirely around the lower jaw. Most of these lesions showed a thin mucopurulent discharge and a mildly fetid odor. We had supposed that these lesions, when they occurred in animals on the diet of Goodsell, were produced by the failure of the animals to eat the B complex vitamins contained in the autoclaved yeast, since it is well known that B_1 avitaminotic animals have little appetite. However, when, with the diet of Schaefer *et al.*, B complex vitamins were supplied by stomach tube, the lesions still occurred.

Although dogs normally synthesize their own vitamin C, the work of Sure *et al.*[5] suggested to us that perhaps, under the experimental conditions named above, they were unable to do so. These workers showed that various members of the vitamin B complex, including thiamin, were necessary for synthesis of vitamin C in the rat, another animal normally synthesizing its own ascorbic acid.

On this basis all the dogs were given 10 mg of ascorbic acid twice weekly with the other vitamins by stomach tube. Those animals showing the oral lesions promptly healed, and no more lesions appeared in the other dogs.

WM. M. GOVIER
MARGARET E. GREIG
DEPARTMENT OF PHARMACOLOGY,
SCHOOL OF MEDICINE,
VANDERBILT UNIVERSITY

THE GROWTH OF AN ICE SHEET

A REVIEW

IN a convocation address at Chicago Professor Flint announced a new theory of the growth of the ice sheet that had spread itself over most of North America that lies to the north of the Ohio and Missouri rivers.

This theory has now been published *in extenso* in both of the two most authoritative geological journals,[1] and, four months later, in the most authoritative and widely circulated journal of geography.[2] It is thus to have a publicity altogether exceptional for a technical discussion.

After picturing the development of an ice sheet from mountain glaciers in the highlands of Labrador, Flint proceeds to explain the manner of its expansion until its western boundaries had reached to what is now Wisconsin and Illinois. This had been brought about, claims Flint, by a process which is simplicity itself. The migrating low pressure areas of the atmosphere (cyclones) were presumably then as now charged with moisture and moving in an east northeasterly direction. They arrived at the western margin of the ice sheet where with the greatest of ease they advanced over the glacier to drop their moisture as snow a good part of the way in to the boss of the central ice dome. By processes generally understood for mountain glaciers this snow was transformed into glacier ice and by internal glacier flow it expanded the glacier boundaries westward and southward into the mid-Mississippi valley.

This theory thus takes full account of the studies of mountain glaciers made in the Alps by Agassiz during the early 1840's, but it ignores completely what has since been learned, particularly during the last quarter century, from studies of the existing continental glaciers of Greenland and the Antarctic.

The glacial anticyclone, a system of fierce outward-blowing storm winds which is fixed in position over a continental glacier, renders the cyclones powerless to invade it save in a waning stage of glaciation. The glacial anticyclone is nowhere discussed in Flint's theory and the extensive literature of the subject is not included in his three-page bibliography.

Those who read the exposition of Flint's amazing theory should be advised that studies made in Greenland by the German and American expeditions during the last decade have traced the paths of the cyclones which approach the glacier. These studies have shown that the cyclones are powerless to advance over the glacier more than a few tens of miles, and then only during the brief summer season and in south Greenland alone. As the cyclones approach the glacier they are shunted northward along its border and pass up Davis Strait and Baffin Bay. Where they impinge upon the glacier they deposit their moisture, not as snow to nourish it, but as rain to bring about its wastage. In fact, it now appears that this is the principal way in which the dissolution of an ice sheet is accomplished.

Of course during an advancing hemicycle of glaciation when ice sheets were growing, the vigor of the glacial anticyclone must have been much greater and cyclones, instead of being shunted away along the glacier margin, must have been repelled farther out during the near approach. This is the period to which Flint's theory applies.

WM. H. HOBBS
ANN ARBOR, MICHIGAN

[5] B. Sure, R. M. Theis and R. T. Harrelson, *Jour. Biol. Chem.*, 129: 245, 1939.

[1] Richard Foster Flint, "Progress and Problems in the North American Pleistocene," *Journal of Geology*, 50: 575–578, Aug.–Sept., 1942. "Growth of North American Ice Sheet during the Wisconsin Age," *Bulletin of the Geological Society of America*, 54: 325–362, March 1, 1943. 1 plate, 5 figures, 3 pages of bibliography.

[2] Richard Foster Flint, *The Geographical Review*, 33: 3, 479–481, July, 1943.