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THE BOUNDARY OF THE LATEST GLACIATION IN ARCTIC CANADA

By Dr. WILLIAM HERBERT HOBBS

UNIVERSITY OF MICHIGAN

THE northern boundary of the latest (Wisconsin) glaciation of the North American continent has never been mapped by glacialists;[1] and until the modern aviation era had opened, an exploring expedition was necessary even to gain access to the region.

As all glacialists are aware, the area covered by the latest glaciation is everywhere characterized by the occurrence of a peculiar type of glacial lake with many bays and islands, and these lakes are found in great numbers—in myriads wherever the relief is low and the glacial topography dominates the landscape.[2]

Lakes are features of short lives in a geological sense, and they have not survived from any of the three earlier glaciations of the Pleistocene (in case these glaciations have extended beyond the borders of the Wisconsin). The dividing line between lakes and lakeless country in arctic Canada may therefore be assumed to approximate the boundary of the latest

[1] See E. Antevs, "The Last Glaciation," *Amer. Geog. Soc., Research Series,* no. 17, p. 75, 1925. See also *Geol. Soc. Amer., Bul.,* vol. 40, pp. 631–720, 1929.

[2] See Map of the Northwest Territories and Yukon, by the Hydrographic and Map Service of Canada, Surveys and Engineering Branch, Dept. Mines and Resources, scale 80 miles to the inch, 1939. Also, Map of Canada, *Nat. Geog. Soc.,* scale 93 miles to the inch, 1936.

glaciation. There are of course other distinguishing marks of that glaciation: the glacial striæ on exposed rock surfaces, as well as glacial deposits—the moraines along or parallel to the boundary, and the serpentine eskers (and perhaps also local drumlins) perpendicular to it. These depositional features, unlike the striæ, can be often seen and mapped from the air; the eskers particularly, which appear widely distributed and stand out sharply on the air photographs.

Long held back by lack of roads, geologists are now able to enter the Canadian wilderness in planes, which can land on the lakes almost anywhere, using pontoons during the summer and skis on the snow-blanketed lakes in the winter season. A very considerable part of the Dominion has now been mapped from the air in photographs which have not been excelled for detail and clarity. For the entire domain sectional hydrographic maps have now been issued on a scale of eight miles to the inch, some based on air photographs, others on one or more canoe traverses only, but all revealing all the hydrography that is known. With these sectional maps as a guide it is now possible to draw a dividing line between lakes and lakeless country, and this affords us a first approximation to the northern border of the Wisconsin glaciation (see map of Fig. 1).

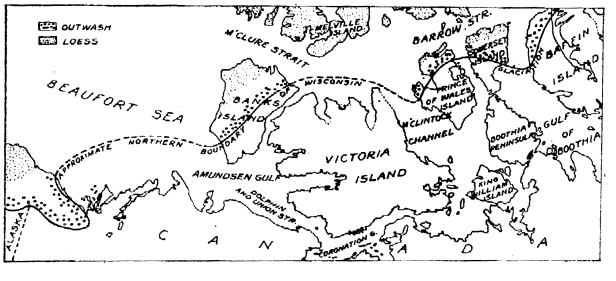

FIG. 1. Sketch-map to show the approximate northern boundary of the Wisconsin glaciation of North America in Canada and the distribution of the glacial loess of the periglacial area. Between, perhaps masked by a thin veneer of loess, is the zone of outwash gravel.

To a greater degree of approximation it should now be possible to fix this glacial boundary by a flight, using a plane with such photographing equipment as is extensively employed for patrols before the battle fronts. Flying at 10,000 feet altitude a zone twenty miles in width could be mapped, always keeping in view to the south the border of the lake country. This will be crucial where the border crosses Banks, Prince of Wales, Somerset and Baffin islands of the American archipelago.

Studies of the Greenland continental glacier have shown[3] that outside the outwash plain along its front, which is made up of gravel, sand, silt and clay with stranded boulders, there is a broad area of once airborne silt many tens of miles in width. Laid down by glacial meltwater during the summer, the outwash becomes during winter seasons a deflation area from which the silt is lifted by the outward-blowing storm winds of the glacial anticyclone and deposited outside, where lack of the flooding permits the growth of a tundra vegetation. These loess deposits of glacial origin are thickest at the margin of the outwash, and they thin out at greater distances.

Such deposits have been found surrounding the outwash of all the areas of Pleistocene glaciation (see, for example, map of Fig. 2). The loess deposits

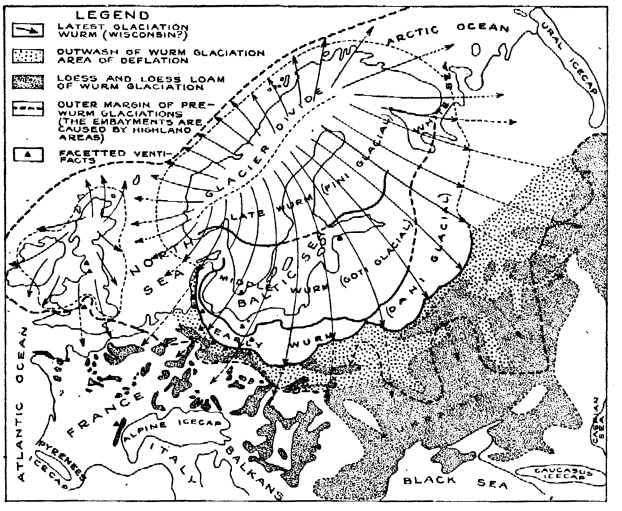

FIG. 2. Map of the outwash and loess deposits which surround the latest (Wurm) glaciation of Europe. The arrows show wind directions of glacial anticyclone (after *Amer. Jour. Sci.*, May, 1943).

which rest upon the pre-Wisconsin glacial formations of the Upper Mississippi and Missouri valleys have already been described.[4] The silt deposits of the arctic tundra in Canada are the loess deposits off the northern border of the glacier, as those of the United States are off the southern. The same fauna of air-breathing mammals of Pleistocene age is common to both, the elephants especially).

This silt, like deposits of loess throughout the world, is unleached and hence a rich soil.[5] Because of long hours of solar radiation during the arctic summer and despite the shortness of the season, a limited agricultural development is here possible, as lately has been proven in Alaska and in the Soviet arctic, where nearly identical conditions are found. This is supplemented by a reindeer (caribou) and in Canada by a possible musk-ox (ovibos) industry, for which the tundra vegetation supplies the browse.

[3] Wm. H. Hobbs, *Am. Philos. Soc., Proceedings*, vol. 86, no. 3, pp. 368–384, 1943.

[4] See footnote 3. Also SCIENCE of September, 10, 1943, pp. 227–230.

[5] *Scientific Monthly*, vol. 57, pp. 289–300, October, 1943.

Since the Wisconsin glacier advanced northward over richly mineralized crystalline rocks, the probability that the gravel of the arctic outwash zone is auriferous is very great. These conditions are those of the Alaskan "golden heart," except that in that mountainous country there has been a further concentration in the bottoms of deep valleys.

It is already foreshadowed that in the postwar period the polar basin is to be crossed by flight-routes from North America to the Far East. Refueling stations must be set up on the coast of arctic Canada and in the American archipelago as far north as possible. The outwash belt will supply the gravel for the highways which must enter the area from the Mackenzie and Alcan routes, since the pack-ice off the arctic coast has thus far made sea communication difficult. Radio and airplane stations at close intervals and icebreakers may however later transform it into a "Northern Sea Route" like that of the Soviet arctic. Baffin and Somerset Islands at the east can be reached by sea from the Lancaster Sound west of Baffin Bay.

SAM WOODLEY

Executive Assistant of the American Association for the Advancement of Science

By Dr. BURTON E. LIVINGSTON

THIS note is to mark the recent completion of Sam Woodley's first quarter century of service to the American Association. Although relatively few members have had the good fortune to work with Mr. Woodley for long periods, yet the many thousands who have attended our meetings in the last twenty-five years recall with pleasure how he has arranged and directed registration, how he has provided the very convenient "visible directory" of registrants, how he has cared for a general information service to answer all manner of questions, how he has arranged to provide lanterns, screens and microscopes for the numerous scientific sessions. He has been most widely known, or known of, through his genius for such details, but his long service to science and to the American Association has been much farther-reaching than observation at our meetings might indicate. I propose to present here a brief outline of Woodley's background and to mention some of the services he has been giving to the association.

Sam Woodley was born on May 25, 1889, in Coal City, Illinois. His father, William Henry Palmer Woodley, had come to this country from England, and his mother, née Ann Cooper, had come from Scotland. Attending the public schools through the grammar grades, the boy became first acquainted with commercial and office work by helping in his father's grocery and by aiding his uncle in the office of a coal company. When he was fourteen years old the family moved to Kewanee, where he worked about two years in machine shop and boiler factory, devoting much of his free time to the study of bookkeeping through a correspondence-school course. He then became bookkeeper for a drayage company, later for a grain elevator. Meanwhile, his evenings were largely given over to the study of stenography and typing at a local school. His eighteenth year found him employed in cost accounting at the Kewanee works of the National Tube Company, where he remained, with several promotions, till 1915.

Having been enrolled in the U. S. Civil Service after passing the official examination for stenographers, Woodley received an appointment in the Division of Publications of the U. S. Department of Commerce and moved to Washington, D. C., in that year. After three more years, he was placed in charge of the bookkeeping section of the division. He must have gained a great deal of valuable experience in cost accounting, budget estimating and the like, in connection with the many publications of the Department of Commerce, and by the end of 1919 he seems to have felt ready to seek some new field of employment, hoping to find opportunity for broadening his education and for further growth. So he placed an advertisement in the personal column of the *Washington Star* for January 31, 1920, stating some of his qualifications and asking consideration by any one who might possibly employ him. It was through that advertisement that I first became acquainted with Sam Woodley and he came within the ken of the American Association for the Advancement of Science.

It will be remembered by many that Dr. L. O. Howard was elected president of the association on January 1, 1920, when he had completed his twenty-seventh year of able and devoted service as permanent secretary, and that I was elected to succeed him in the Washington office. As the new permanent secretary, I was to devote about half-time to association affairs and I found that my first job was to try to secure a competent assistant. By good fortune, I read Mr. Woodley's advertisement, answered it and asked him for a conference. By March 1 he had become executive assistant and office manager for the association.

We began at once to revise and plan arrangements for handling association affairs. We had the benefit of advice and suggestions from such experienced men as President L. O. Howard, Treasurer R. S. Woodward, General Secretary D. T. MacDougal and Editor J. McKeen Cattell. Additional clerical help was soon