THE HUDSON-CHAMPLAIN LOBE OF THE LAURENT1DE ICE SHEET AND TUE MORAINES OF WESTERN LONG ISLAND

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The late Wisconsinan, Hudson-Champlain Lobe of the Laurentide Ice Sheet was defined in 1973 by Connally and Sirkin (1: GSA Memoir 136). That paper contained a comprehensive report on the glacial geomorphology and the glacial and enviromnental history of this region, combining new data and summarizing previously published material on individual sequences. Subsequent research filled in the moraines of the mid-Hudson and western Long Island regions, and summary papers were published in 1986 (2: NYS Museum Bull. *455).* More recent work, mainly in western Long island, has been sununarized by Sirkin in 1996 (3; Figure 1). Mapping of glacial sequences and ice margins between the terminal moraine of western Long Island and Staten Island and the ultimate recessional moraine of the northern Champlain Valley established the framework and chronology for glaciation and the emplacement of moraines, south to north, thereby creating a complex record for a region that had previously received little attention. As such, the Hudson-Champlain Valley provides the only continuous, north-south lowland conducive to development of a major glacial lobe and consistent recessional sequences between the well-studied, late Wisconsinan glacial lobes of the Midwest and eastern New England.

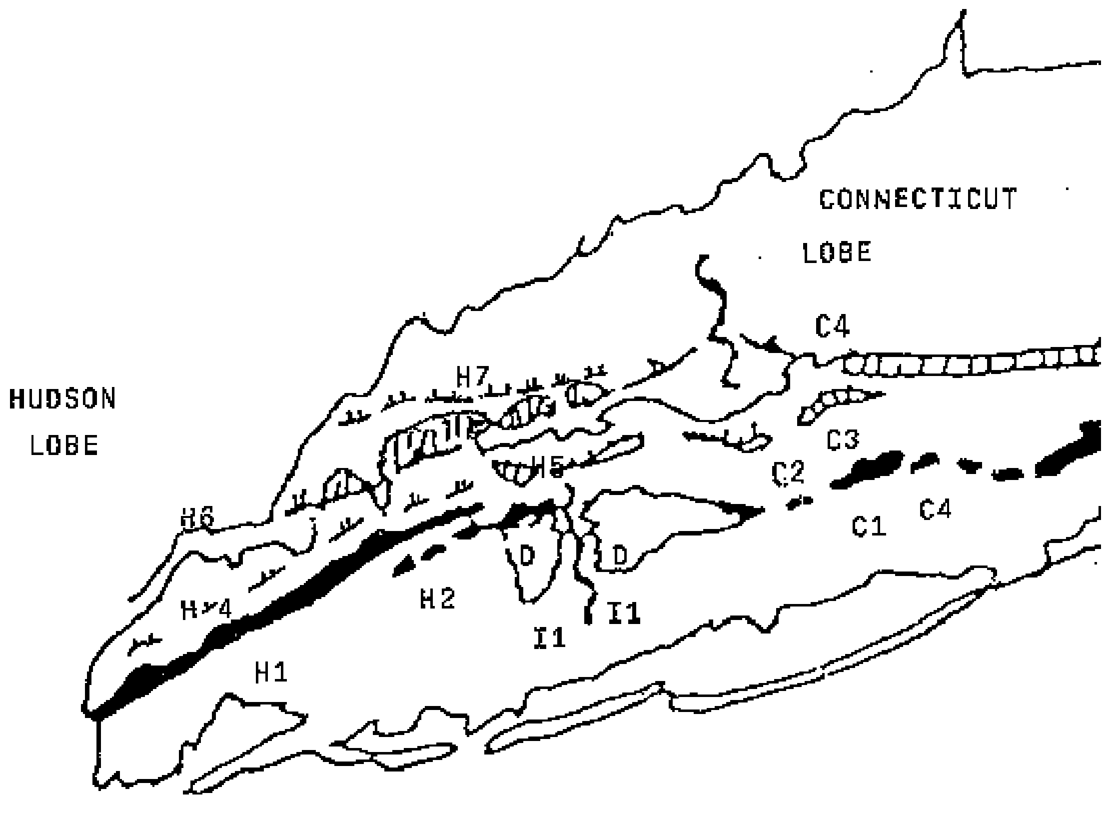

Fig. 1. Late Wisconsinan Moraines of Western Long Island

Long Island end and recessional moraines:

Hudson Lobe		Connecticut Lobe
H1 Harbor Hill H2 Jericho H4 Oyster Bay H5 Northport H6 Sands Point H7 City Island	Interlobate Zone Ii D Deltas	Cl Ronkonkoma C2 Stony Brook C3 Mount Sinai C4 Roanoke Point

This study was one of the first to integrate glacial geomorphology with pollen stratigraphy and radiocarbon dating in a synthesis of data that brought forth several important revelations or conclusions, as summarized here. This approach is referred to as the 'geomorphic methed.' In most pollen studies in glaciated regions, the emphasis was on defining and dating pollen zones, thereby attempting to reconstruct forest migration over time and infer changing climate. In this approach, which could be called the 'botanical method.' the pollen record, taken from the most appealing or seemingly complete and undisturbed lake or bog, became a regional snapshot of these phenomena and the main source of stratigraphic data. Whether or not the site was on mappable glacial deposits was not a concern. Often, radiocarbon dates from the base of the organic-rich sediments of the bog (bog-bottom dates)were interpreted as appropriate ages for regional glacial events, as well. In actuality, these dates were too young, as generally confirmed by the pollen zones from which they came. In the geomorphic method, the site selected for pollen studies was located on the geomorphic feature to be evaluated, for example, the distal slope of the terminal moraine. The method also required that the bog be located in a closed depositional system with exclusively internal drainage. Furthermore, the bog should be resting on and directly related to that geomorphic event as established through detailed field mapping. And finally, the base of the stratigraphic section was set at the contact with glacial deposits, thus including all of the lake sediment below the base of the organics. Constraints on core retrieval from the site required sampling of the glacial substrate, along with the usual high quality core extraction techniques. The method also required pollen stratigraphy for each glacial sequence, wherever feasible or conveniently possible. Bog bottom ages in the geomorphic method were obtained from whole sediment samples taken at the glacial contact, and ages were calculated from bog or lake sediment deposition rates (2a, b, c). It should be noted that radiocarbon dating throughout most of this region was by the conventional method; AMS dating not being generally available.

Thus, it was revealed that:

1) The established ages for glacial events in southern New England and regions bordering the Hudson-Champlain lowland to the west were based on radiocarbon dates that were stratigraphically too young. These were mainly the misnamed 'bog-bottom' dates.

Consequently, the chronology from the pollen record as applied to glacial events was a few thousand years too young (Figure 2).

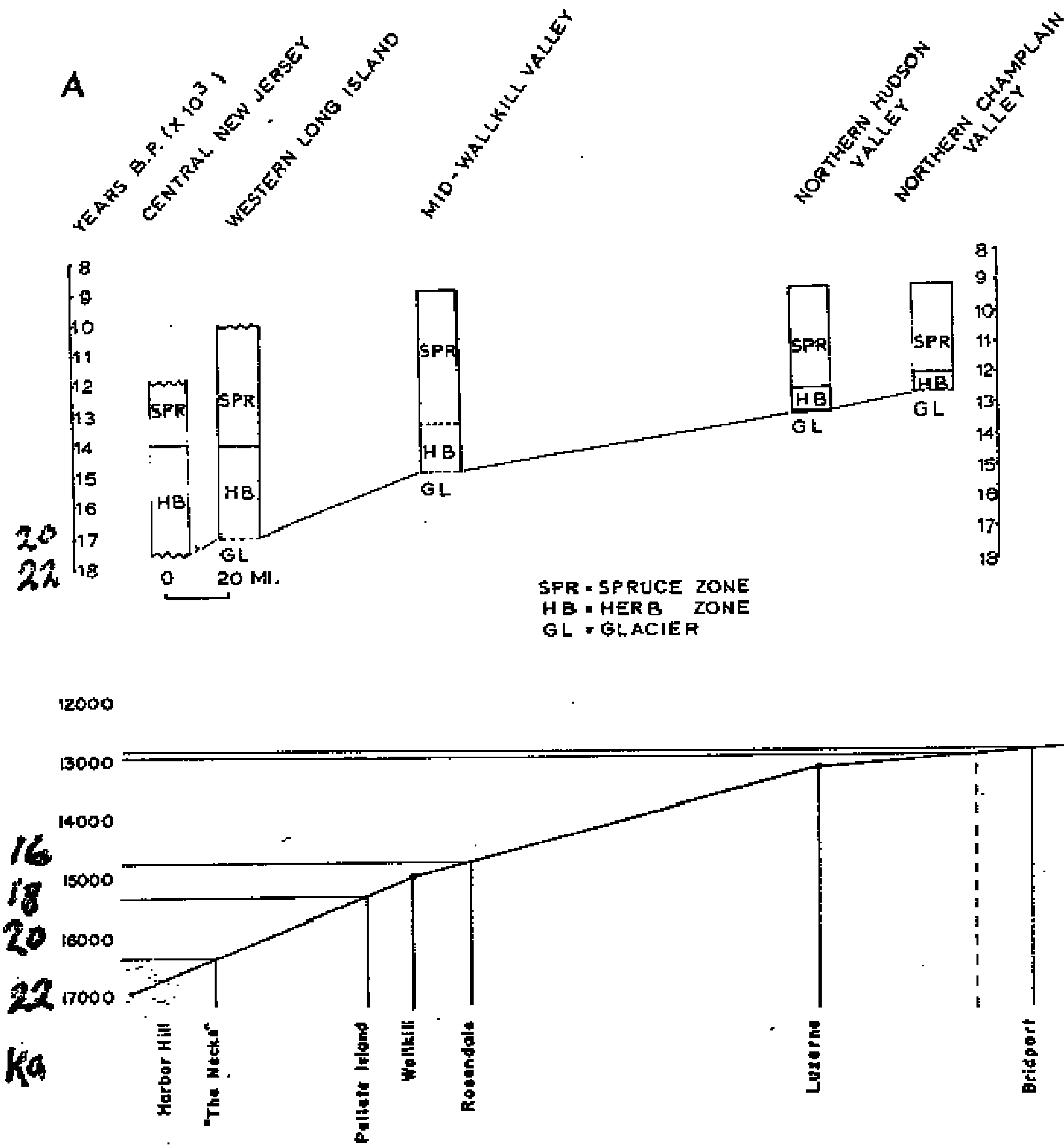

Figure 2. Time-distance relationships during deglaciation of the Hudson-Champlain Valley.
A. Migration of spruce and herb pollen zones following deglaciation.
B. Ages for deglacial events. Note corrected ages in the left column. "The Necks" is short for "The ice stand on the Necks" = now the Sands Point Moraine.

2) A few 'too old' ages also emerged. These were rejected because they did not fit the 'too young' curve. With the Hudson-Champlain work in hand, cross correlation of pollen zones showed that some of these ages were probably appropriate (2c).

3) Correlation of pollen strat.igraphies showed that the surficial deposits of the tenninal and recessional moraines. especially the glacial surfaces of western Long Island were all late Wisconsinan in age. It also supported field evidence of recessional moraines in western Long Island, and the morphostratigraphic base for restricting the Harbor Hill Moraine to the terminal moraine of the Hudson-Champlain Lobe. The 22.000 year old terminal moraine of western Long Island could hardly be contemporaneous with the 20.000 year old recessional moraine (the Roanoke Point Moraine) along the north shore of eastern Long Island (Figure 2).

4) Field evidence also showed the existence of contiguous glacial lobes and comparable glacial deposits east of the Hudson-Champlain Lobe sequences with discrete interlobate zones and interlobate deposits. For example, the Manetto Hills-Dix Hills interlobate deltaic complex separates the Hudson-Champlain Lobe and Connecticut Lobe glacial sequences in west central Long Island. The Ronkonkoma Moraine is restricted as the terminal moraine of the Connecticut Lobe (4). While of the same age, each lobe of the ice front generated a distinct terminal moraine segment and sets of recessional moraines (3, 4).

5) Subsequent detailed correlations of radiocarbon-dated glacial sequences and pollen stratigraphies, both east and west of the Hudson-Champlain Lobe confinned the revised chronology for late Wisconsinan glaciation and recession of the ice (2c, 4). Similarly, data from full and late glacial age sites in the unglaciated terrain south of the late Wisconsinan ice margin are consistent in age and pollen stratigraphy with those of the Hudson-Champlain Lobe (5).

6) Glacial tectonics in the zone of the terminal moraine and radiometric dating of mid-Wisconsinan fossiliferous sediments restricts the position of the contact between the late Wisconsinan glacial deposits and those of the earlier, lllinoian glaciation (the lower drift of Sirkin, *1995,* 19%). The contact is logicaly placed at the top of undisturbed deposits of the earlier glaciation. Thrusted masses of older sediment engulfed in younger outwash are included as clasts in the younger unit. The upper till, referred to in the literature as the Roslyn Till, caps the zone of deformation and is attributed to the development of the recessional sequence of deposition of the late Wisconsinan ice.

In summary, the Hudson-Champlain Lobe of the Laurentide glacier has yielded a detailed history of advance and recession between the terminal moraine and the northern

Champlain Valley. It includes for western Long Island, the advance of the Lobe to the terminal moraine position nearly 22.000 years ago, recession of the ice from Long Island around 20,000 years ago, and deposition of a series of recessional moraines.

References. Refer also to the supporting bibliographies of the papers cited.

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Figures:

Figurc 1. Late Wisconsinan Moraines of Western long Island.

Figure 2. Time-distance relationships during deglaciation of the Hudson-Champlain Valley.