

Sanders, J. E.; and Merguerian, Charles, 1991a, Pleistocene tills in the New York City region: new evidence confirms multiple (three and possibly four) glaciations from two directions (NNE to SSE and NW to SE).

The Woodfordian, youngest of the Wisconsinan glaciers, flowed from NNE to SSW, down the Hudson Valley. At least two earlier glaciers, ages not yet known, flowed across the Hudson valley. New evidence, both stratigraphic and from ice sculpting of bedrock surfaces, indicates that a still-earlier glacier flowed from NNE to SSW.

Our new stratigraphic evidence is from (1) exposures at Teller's Point, Croton Point, Westchester County, NY, where a gray till containing indicator stones from the Cortlandt Complex of mafic igneous rocks [proof of flow from NNE to SSW underlies a lower red-brown till containing decayed indicator stones from the Newark Supergroup [proof of flow from NW to SE, and an upper red-brown till (with non-decayed pebbles), are overlain by a yellow-brown till that forms a drumlin having long axis oriented N-S (inferred to be the product of the Woodfordian glacier); and (2) from the subsurface in the Red Hook area of Brooklyn, where two red tills [indicating flow from NW to SE are separated by marsh/bay sediments, indicating two glacial advances and an intervening nonglacial episode.

In northern Manhattan and at Bear Mountain, rock drumlins shaped by a glacier flowing from NNE to SSW have been re-sculpted by glacier flow from NW to SE. We correlate the rock drumlins trending NNE-SSW with the oldest till at Teller's Point and the grooves and crescentic marks showing flow from NW to SE with one (or both) of the red-brown tills. The NW-trending grooves are overprinted by a second set of crescentic marks which resulted from glacial flow from the NNE to SSW.

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