The Cliffs at Caumsett State Park

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Caumsett State Park is located in Lloyd Harbor, New York on the north shore of Long Island facing Long Island Sound and Connecticut. At present the Sound is a large body of salt water. However, some 20,000 years ago it was a fresh water glacial lake.

Pleistocene sediments in the cliffs were formed mainly in a Gilbert–type delta in a proglacial lake, whose shores bordered the glacier to the north and the Ronkonkoma moraine to the south. Cretaceous deposits of fine, brightly colored sands and clay underlie the lacustrine deposits of the Pleistocene. The erratics on the beach which are derived from the tills are mostly granites and gniesses with some basalt boulders and numerous cobbles of conglomerate

A self-guided walking tour of the cliffs and beach was developed to enhance understanding and appreciation of the area. This guide is on the web at
http://www.geo.sunysb.edu/esp/589_99/mandell/mandell_bio.htm

Gilbert deltas form where glacial streams meet the deep proglacial lake. They have horizontal topset beds and south-dipping foreset beds. In front of the foreset beds are shallow horizontal bottomset beds (Gilbert, 1885). The cliffs at Caumsett include the remains of a Gilbert delta.

There is evidence that this glacier advanced overrunning the delta and then stagnated, forming the hummocky terrain just south of the bluffs. The stratigraphy of the cliffs is consistent with this model.

Description

Approximately 1mile of the cliff face at Caumsett State Park was studied from May through August 1999. A complete description of the study is on the web at
http://www.geo.sunysb.edu/esp/589_99/mandell/mandell_bio.htm

Three sections were chosen for stratigraphic columns. They were chosen for their distinctly different geology. The westernmost section (Column 1), displays the large foreset beds of a classic Gilbert Delta (Gilbert, 1885). The intermediate column (Column 2) is located east of Inspiration point and does not have the prominent yellow gravel beds. This area is darker with more lacustrine deposits. A spectacular Cretaceous outcrop overlain by Pleistocene sands and gravel dominates Column 3, near the easternmost section. 1-2 meters of till and a layer of loess as much as 1 meter thick overlie all sections.

Interpretation

The Pleistocene sediments in this sequence were deposited in proglacial environments. Some subsequently underwent glaciotectonic deformation. A glacier north of the cliff face was impounding a glacial lake or pond in which laminated clays were deposited. Sub-glacial and englacial streams formed alluvial deposits as well as the delta deposits found in the western end of the cliffs. At the time, the delta would have been located some distance north of its present location. As the glacier advanced it shoved southwardward the underlying Cretaceous and the Pleistocene sediments. Interlayering and faulting of the sediments occurred as a result. The glacier then advanced over these sediments depositing the thin till layer. As the glacier retreated lake sediments are once again deposited, this time on top of the till. A subsequent advance moves the glacier over the area at which time it stagnates leaving the thicker layer of till (from which most of the erratics found along the beach have fallen). The area was then covered with a thin layer of wind blown silt or loess.

Walking west to east along the base of the bluffs, evidence for glacial tectonic deformation is clear. The abrupt changes in stratigraphy near Column 2 may represent a large-scale fault with the Cretaceous and Pleistocene lake sediments being uplifted on the eastern side. The lack of Gilbert delta deposits to the east may reflect deformation or different depositional glacial environments along the glacial face.

Due to glaciotectonic disturbance it is not clear when the Pleistocene sequences were deposited. The lake sequences may be part of the Smithtown Clay, a large tract of lake clays underlying the Smithtown district of Long Island east of the Manetto Hills Interlobate Zone and north of the Ronkonkoma Moraine (Sirkin, 1995) or they may be of separate origin

Currently

The bluffs are currently eroding. The soil layer is being undermined, roots are exposed and trees have fallen. Slumping and overburden obscures lower layers in most areas. To get a better look at the cliff behind the slump it would be best to come back after a powerful storm strips the slump from the bottom of the cliff.

Erratics along the beach have fallen from the eroding till layers. These boulders consist mostly of various types of granites and gneisses. Many of the boulders are augen gneisses. Many are pegmatites. Numerous examples of gray gneiss (Harrison Gneiss?) and many smaller cobble sized conglomerates (presumably Cretaceous) can be found as well.

There are several basalt boulders, some with quartz veining. One dark basalt erratic has granite attached to it.

Some of the erratics are quite rounded suggesting that they traveled some distance. Some are quite angular suggesting that they traveled a shorter distance or for some reason were not rounded by the glacier. Some are highly weathered and rotted.

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References Cited

G. M. Ashley - Menzies (1995) ch 13, Glaciolacustrine Environments, pp 417-444.

Gilbert, G. K. (1885) The topographic features of lake shores, p. 69-123 in U. S. Geological Survey, Annual Report, 5th (1883-1884), 469pp.

Menzies, J. (ed.) (1995) Modern Glacial Environments - Processes, Dynamics and Sediments. Oxford: Butterworth-Heineman

Menzies, John, ed. (1996) Past Glacial Environments (Sediments, Forms and Techniques); Butterworh-Heinemann Ltd.; Linacre House, Jordan Hill, Oxford p. 558.

Merguerian, C., Sanders, J. (June 1996) Trip NO. 39. Glacial Geology of Long Island 01& 02, pp132.

Sirkin, Les (1995) Eastern Long Island Geology with field trips. Book and Tackle Shop, Watch Hill, RI 02891, 220pp.

Sirkin, Les, (1996) Western Long Island Geology with field trips published by Book and Tackle Shop, Watch Hill, RI 02891 179pp.