

AN EXTRAORDINARY DEPOSIT OF VERY COARSE STRATIFIED DRIFT,  
COLD SPRING HARBOR, NY

Herbert C. Mills  
(Nassau Community College)  
33 Beacon Drive  
Port Washington, NY 11050

In 2006, an excavation for a new library building on the campus of the Cold Spring Harbor Laboratory revealed an extraordinary deposit of stratified drift consisting primarily of quartz cobbles and large pebbles. In over 45 years of observing outcrops of glacial and pre-glacial (Cretaceous) sediments on Long Island this author has never seen any strata like those found at the Cold Spring Harbor site; nor do references such as Fuller (1914) or Isbister (1966) describe any similar deposits. The purpose of this report is to spread knowledge of the site and to stimulate ideas on how this unusual glacial stratigraphy might have formed.

Report

Digging for the foundation began about 180 feet above MSL on the east-facing hillside overlooking the lab grounds and the southern end of Cold Spring Harbor. It was located about 200 yards north of Route 25A, just north of the proximal slope of the Harbor Hill Moraine. The work area covered roughly 1 acre, and the deepest excavation extended some 30 feet below the original land surface. The glacial till that forms the surface layer in this area was mostly stripped away and piled in mounds surrounding the excavation. There was equipment on-site that was sorting the stratified drift beneath the till into piles of sand and gravel, presumably for sale. There was also a huge pile (20' high) of cobble-size rocks that was mined from the coarse drift strata.

Horizontal layers of sand and gravel, typical of most outwash deposits on Long Island, were exposed to a depth of 20 feet below the level of the working surface. Above this level there is a sudden transition to clearly stratified layers of coarse gravel and cobbles, a few of which approach small boulder size. The stones are all rounded to well-rounded and the long axes lie parallel to the bedding planes. The maximum thickness of the cobble layer is about 8 feet, but the lower portion was mostly obscured by talus. Thinner cobble layers (2-3') were also seen interbedded with coarse gravel and/or sandy strata. Many of the cobbles are coated with a bluish/purplish coating presumed to be iron/manganese oxide. Some beds are stained a red-brown color typical of iron oxide, while adjacent beds are not. Towards the surface in one outcrop the stratified drift is overlain by an unstratified sandy unit containing some random cobbles that might be interpreted as a till. However, as stated above, most of the surface till had already been removed. In the unexcavated woods near the site, the land surface was dotted with small to medium boulders of various compositions commonly associated with a recessional ground moraine.

So what happened here and why is it so unusual? The outcrops at CSH can be attributed to an advancing ice front spreading layers of sand and gravel on an outwash surface that eventually is overridden by the ice. As the ice-margin approached the eventual Harbor Hill Moraine stationary position, melting increased and meltwater streams gained in volume and energy. This resulted in the deposition of larger and larger size particles. However, this straightforward explanation raises several questions.

The vast number (hundreds of thousands) of cobble-size rocks found in the top ten feet of this small excavation is unprecedented on Long Island. The accumulation of large particles in a glacial outwash might be expected in a fluvial environment just downstream from the toe of a valley glacier where rock debris is abundant, but there is no obvious source for the CSH sediments. Why haven't similar deposits been observed elsewhere on Long Island, and why do they occur here adjacent to the proximal slope of an end moraine? Coarse beds could more easily be explained on distal slopes due to summer melting cycles. And why is quartz and quartzite so dominant? The stratified drift contains some granitic rocks but hardly any dark erratics or Cretaceous redbeds. How did this coarse material travel within the ice and where was its source? Tunnel valleys criss-cross the north shore peninsulas and there is a nearby outwash channel that cuts through the Harbor Hill Moraine at the south end of Cold Spring Harbor, but the elevation of the cobble units makes it hard to reconstruct how the two could be related. And then there is the blue coating on so many of the rocks, what environment caused it to be so prevalent in this deposit, and not elsewhere? More questions than answers, all ideas are welcome.

#### Conclusions (subject to change)

The fact that the cobble strata consists mainly of quartz and quartzite suggests a Cretaceous, rather than mainland, source for this outwash. Evidence for a possible source comes from quartz ventifacts, ranging in size from pebbles to small boulders (see exhibit at Garvies Point Museum, Glen Cove, NY), that have been found in Cretaceous beds that were apparently sculpted by katabatic winds coming from a nearby glacier. On the other hand, concretions, conglomerates and other rocks cemented by iron oxide often associated with the local Cretaceous formations were not found in the coarse outwash. Perhaps the high energy of the meltwater streams caused them to be broken down during transport. If the source of the cobbles was in, or near, the LI Sound Valley how were they moved to the present location; in englacial or subglacial tunnels, or frozen in the ice until they neared the ice-margin? It is interesting how one unique deposit can raise so many interesting questions.

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## References

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