

Lesson 5: Island of Many Hills

Background for Educators

[From Eric Sanderson's *Mannahatta: A Natural History of New York City*.]

The Hills

The Lenape called it the "island of many hills" and the British Headquarters Map shows, indeed, Manhattan was once a hilly place, of 573 hills in total. The maximum height on Manhattan is and was in Bennett Park where Fort Washington had once been located, at 270 feet. In lower Manhattan, where the Dutch first settled, the hills were low, hardly more than 30 feet, but enough to exercise the burghers' legs and to provide a venue for streams. Verlettenberg, which no longer exists, once provided enough of a snow slope for children to sled that merchants had to pass ordnance against reckless sledding. City Hall Park sits atop a small rise, and behind City Hall, a series of hills cradled the Collect Pond: the Calck Hoek to the west, named for the plentiful oyster shells which once decorated its slopes; Bayard's Mount, the highest hill in lower Manhattan at nearly 100 feet, and the gentle slopes that still arise to the east, leading to Corlear's Hook, a prominent nose of land jutting out into the East River. Extending from Tribeca along the edge of Greenwich Village and up to where Astor Place is today, was a string of hills known by the Dutch as the Zandtberge (the Sand Hills); these hills originally distinguished the rolling forests of the Village from the wetlands and stream courses of the eastern part of the island. Further north was the eponymous Murray Hill, a large, two tiered structure, from which springs flowed north, south, east and west. Dutch Hill was just north of Murray Hill, and north of that was a hill named "the Dove" in the east fifties.

Central Park was built over a rocky broken land, with numerous hills, some of which still exist today, including the Ramble and Vista Rock, and the Great Hill, in the northern part of the park. Standing at Central Park West about 103rd St., one can see where the Great Hill once extended into the Upper West Side and where the remaining marks of detonation indicate the hill was reduced. Interestingly prior to the great competition for the design of Central Park in 1857, Egbert Viele, the city engineer, had put forward a plan that would have retained much of the natural topography of Central Park. Instead the judges chose the Olmstead and Vaux plan, which prized looking "natural" along the pastoral lines of English parks, over the nature which existed on the site. Which is not to say that Central Park was entirely remade by the 19th century landscapers; rather that what changes they made, they made with pick and shovel, mule and TNT. They could take a hill away or dam a stream, but they couldn't pick up a hill and move it 30 yards to the right; hence when we see great hills in Central Park today, they are sourced in the original topography. Thus in a sense, the places with the least topography today, for example on the Great Lawn or where the Reservoir sits, indicates the places of greatest topographic change.

Mannahatta's most elevated locales were saved for the northern part of the island: Morningside Heights, Washington Heights, Laurel Hill and Inwood Hill. Small hills in the greater scheme of things, but New York after all is a coastal place and coasts tend to be low lying. The highest elevation on the entire Atlantic Coastal Plain, from Florida to Maine, is on Staten Island (Todt Hill at 409 feet.) Though Mannahatta can't compare in height to the Rocky Mountains does not diminish its wonder, especially given that these are hills descending into the deep blue sea.

The Geology beneath the Hills

Manhattan Island is the result of titanic forces played out in slow motion. Whereas Wall Street tracks the market minute by minute, to understand the monumental forces that have shaped the fundamental geology of Manhattan, we have to recalibrate our sense of time, to slow down to “rock time.” What we experience as centuries, rocks know as just seconds on the cosmic clock. Once we adjust our imaginations to rock time, then we can begin to understand the many lives of Manhattan. I won’t dwell in the distant geologic past, but let’s take a scamper through the millennia.

Once upon time, Manhattan was a hill beside a great fjord, the Hudson River canyon. That was 10,000 years ago. Before that, Manhattan was a doormat to ice – at least two times in the last 200,000 years glaciers have bloodied Manhattan’s nose and scraped off her skin. No big deal. Manhattan has also been part of the sea bed, and lain for millennia in the crust of the Earth, deformed by heat and pressure that would make even our stressful lives seem like a walk in the park (1,150,000,000 – 360,000,000 years ago, the Precambrian to Paleozoic Eras.) Manhattan has also been part of a mountain range, probably many mountain ranges, which over millions of years eroded away into rubble, without so much as a name. Manhattan has had pimply volcanoes, spent a dissolute youth in the tropics, known Europe and Africa on intimate terms, and crashed like a race car (geologically speaking) into North America. Earthquakes, floods, drownings and rebirths – Manhattan has known them all.

The result is laid down in the rock on which Manhattan is built. Most of Manhattan Island is underlain with schist, rock derived from sediments in the seabed, then metamorphosed by heat and pressure. Strong, sturdy and reliable, most of Manhattan’s skyscrapers rest their pilings on schist. Closely related is Fordham gneiss, a slightly more twisted, and for that, more lovely rock, noted for its curvy bands of lighter and darker minerals, originally sediments laid down over the sea floor – gneiss is part of what makes Roosevelt Island so nice. Small areas of pegamite, granodiorite and the basic dikes found in Inwood are all testament to volcanic activity, the result of molten rock, cooled underground. My favorite rock though is the Inwood marble, nearly pure white, and rarely seen above the surface because it erodes so easily, being softer than the other types. The result is the humbler parts of the Manhattan landscape – the Harlem Plains, the lowlands around Sherman Creek, the Lower Eastside salt marshes – all formed where marble was the predominant bedrock.

Most of the city’s bedrock lives unseen in the city’s sub-basement, though outcrops were a notable feature of Manhattan all over the island in the past and can still be found in the parks and scattered around town today, especially in Central Park. The reason we can’t see the bedrock is because of the untidy habits of ancient rivers and in more recent times, of glaciers. The same glaciers that scraped the bedrock clean, and gouged out the Inwood marble, on their entrance to the area, left in their wake dregs of scrambled, unconsolidated rocks, flotsam and jetsam gathered from all over New England and upstate New York and discarded when the ice melted away. Rocks, sands and silts deposited by the flowing ice are called glacial till – they fall out in a huge, unsorted mess. Outwash deposits are what came out of the melt waters of the retreating glaciers; huge, ice-blue rivers, which laid down horizontal beds of better sorted sediments. When the last glacier left, it melted away into a Glacial Lake Hudson, a lake that once extended all the way to Albany. The result is that the bedrock is more than 100 feet from the surface under most of lower Manhattan; in some places it is more than 260 feet.