Geology Of New York State and NY City

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Before We Start-- It’s All in the PLATES!

Major tectonic plates of the world.

- Eurasian Plate
- Arabian Plate
- Philippine Plate
- Antarctic Plate
- African Plate
- Pacific Plate
- Caribbean Plate
- Nazca Plate
- South American Plate
- North American Plate
- Cocos Plate
- Juan de Fuca Plate
- Australian-Indian Plate
Geology of New York State including NYC

CA. Active Margin

A Passive Geologic Margin

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DEVONIAN - 400 Ma

PANTHALASSA

SIBERIA

EQUATOR

BALTICA

KAZAKHSTAN

ACADIAN COLLISION

LAURENTIA

GONDWANA

O.S.
The supercontinent as it looked more than 200 million years ago. SOURCE: USGS
Cretaceous Paleogeography  80 MYA
Tectonic Provinces of North America
Rift and Fault Block Basins
Remnants of the Breakup
of the Super Continent of
Pangea

Early Triassic  237 Ma

CA

PANTHALASSIC OCEAN

PALEO-TETHYS OCEAN

GONDWANA

TETHYS OCEAN

Proto-Andes Mt.

Ancient Landmass

Modern Landmass

Subduction Zone (triangles point in the direction of subduction)

Sea Floor Spreading Ridge
A Brief Geology Primer
ROCKS IN PLATE TECTONIC MODEL
Oldest Rock in NEW York STATE
Grenville Orogeny  Formation of Rodinia  Supercontinent

The subduction sequence terminated in a collision between the volcanic or magmatic arc and another continent, likely proto-South America (Dalziel, 1991), about 1020 Ma. This collision is the Grenville orogeny (Ottawan phase) and was a Himalayan type event (Windley, 1985). It also produced severe deformation and heating of the rocks at temperatures in excess of 700° C and pressures in excess of 6.5 kbars (Young and Cuthbertson, 1994). Anatexis occurred locally producing the migmatites, granite sheets...
What is a GEOLOGIC MAP????

The oldest Rocks

Geologic Map of New York State
I billion YO
Flat lying rocks
Folded
Appalachians

Flat lying rocks
Folded
Appalachians
Eastern NYS -- along US 84 towards Connecticut
GENERALIZED CROSS SECTION SKETCH FROM THE CATSKILLS TO THE HUDSON RIVER
Flat lying rocks
Folded Appalachians

1 billion YO
View from Hudson NY.  
107 Miles off Broadway  
Catskills  
Heldeberg Escarpment  

Photo by Gil Brenner
400 MYO Silurian
WEST CANADA CREEK
ONEIDA COUNTY
TRENTON FALLS
TRENTON FALLS, Trenton, NY
THE CATSKILLS
GENERALIZED CROSS SECTION SKETCH FROM THE CATSKILLS TO THE HUDSON RIVER
Acadian Orogeny

DEVPONIAN CA. 350MYA
Catskill Redbeds Near Phonecia, NY
West of Kingston, NY
KAATERSKILL FALLS NY
Closer to New York City
1 billion YO
Flat lying rocks
Folded
Appalachians
Fig. 2. Stratigraphic and structural relationships in the Manhattan Prong as described by Hall (1968, 1980) and Rodgers (1985).
Fordham Gneiss ------ One Billion YO
Bronx and Inwood Section
Manhattan Schist
Fault line

A rift in the crust runs along underneath this street and is known as the **125th Street Fault**. The fault line creates a fault valley deep enough to require the [IRT Broadway](https://en.wikipedia.org/wiki/IRT_Broadway%E2%80%93Seven_Avenue_Line) [Seventh Avenue Line](https://en.wikipedia.org/wiki/IRT_Broadway%E2%80%93Seven_Avenue_Line) to become a trestle bridge between 122nd and 135th Streets. The street in the 18th century was called The Hollow Way.
Van Cortlandt Park – 242nd Street

238th Street
231st Street
Marble Hill – 225th Street

215th Street

207th Street
Dyckman Street
191st Street
181st Street
168th Street
157th Street
145th Street

137th Street – City College
125th Street
116th Street – Columbia University
Cathedral Parkway – 110th Street
103rd Street
HUDSON STARTS HERE
Mount Marcy     Adirondacks
LAKE TEAR OF THE CLOUDS
The upper Hudson River flows swiftly down from its mountain sources. In the 160 miles between Lake Tear of the Clouds and the Troy Dam, the river drops more than 4,300 feet over natural rapids and man-made dams.
Hudson River Narrows
Cross-section of the Hudson, looking south from the Highlands
Basalt / Diabase - Igneous Rock formed when Pangea Began to split and Atlantic Formed Palisades
Imigrated to Boston 1846

LOUIS AGASSIZ

1840 Swiss
DISCOVERER OF THE ICE AGE
EVIDENCE FOR GLACIAL EPISODE LOUIS AGGAZIS 1840 ERRATICS
How to Become an Erratic! -in Alaska
THE ICE AGE AND BIOGRAPHY OF THE HUDSON
BEFORE THE GLACIAL AGE
Basalt / Diabase - Igneous Rock formed when Pangea Began to split and Atlantic Formed Palisades
QuickTime™ and a TIFF (Uncompressed) decompressor are needed to see this picture.
PERI-GLACIAL HUDSON
13MYA

HUDSON RIVER

SPARKILL GAP
"Wisconsin"
The Last Glacial Advance
Glacial Events

• Ca. 10,000 YO to Present - Warming
• 11,000 Younger Dryas (1200 Years)
• 13,350 Younger Dryas (150 Years), Lake Iriquois Cold event
• 21,000 YO Laurentian Ice reaches Long Island
Wisconsin Terminal Moraine

- Ice Age—the locus of the terminal moraine. Water poured in white tumult from the melting ice, carrying and sorting its freight of sands and gravels, building the outwash plain: Bensonhurst, Canarsie, the Flatlands, Coney Island.
• Glacial Lake Iroquois was a prehistoric proglacial lake that existed at the end of the last ice age approximately 13,000 years ago.[1] The lake was essentially an enlargement of the present Lake Ontario that formed because the St. Lawrence River downstream from the lake was blocked by the ice sheet near the present Thousand Islands. The level of the lake was approximately 30 m (~100 ft) above the present level of Lake Ontario.[2]

• The lake drained to the southeast, through a channel passing near present day Rome, New York. The Rome Sand Plains has several sand ridges that geologists think were formed at this time. The channel then followed the valley of the Mohawk River to the Hudson River.[2]

• The lake was fed by Early Lake Erie, as well as Glacial Lake Algonquin, an early partial manifestation of Lake Huron, that drained directly to Lake Iroquois across southern Ontario, along the southern edge of the ice sheet, bypassing Early Lake Erie.
Glacial Lake Iroquois
Ca. 13,350 YA
New York Bight

Hudson Valley Shelf

Exaggeration = 400
As the Wisconsin Ice Sheet melted back the Hudson River cut its old path across the Highland narrows to a headward source in the Adirondacks.
HUDSON STARTS HERE
But the Hudson River is still with us.