STRATIGRAPHY, STRUCTURE AND PETROLOGY

OF THE NEW YORK CITY GROUP

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ROAD LOG

Cumulative Miles	Miles from last point	Description
0.0	0.0	Assembly point: Hofstra University. Route is indicated on Figure 1. Proceed west on Fulton Avenue (Hempstead Turnpike, NY 24 West) leaving Hofstra campus.
1.2	1.2	Right turn (north) onto Clinton Street (avenue, road) in town of Hempstead.
1.9	0.7	Pass through Garden City.
2.5	0.6	Pass Stewart Avenue.
2.9	0.4	Clinton Water Works on east side of road.
3.5	0.6	Cross Old Country Road, town of Carle Place. Clinton Road becomes Glen Cove Road. Proceed north on Glen Cove Road.
4.4	0.9	Pass under Northern State Parkway, village of Old Westbury. Glen Cove Road becomes Guinea Woods Road. Proceed north on Guinea Woods Road.
6.3	1.9	Right turn. Entrance onto Long Island Expressway (I-495 West). Proceed west towards New York City.
7.6	1.3	Proceed west on Long Island Expressway. Pass Willis Avenue exit. Terminal moraine occurs directly to the right (north). The moraine is either the Ronkonkoma capped by the Harbor Hill or an undifferentiated mixture of both.
7.8	0.2	Proceed west on Long Island Expressway. Terminal moraine on left (south) with Port Washington delta on right (north). The latter feature formed as a result of a periglacial lake forming behind moraine and fronting the ice.
11.3	3.5	Proceed west on Long Island Expressway. Pass onto top of moraine. Typical glacial knob and kettle, hummocky-type topography.

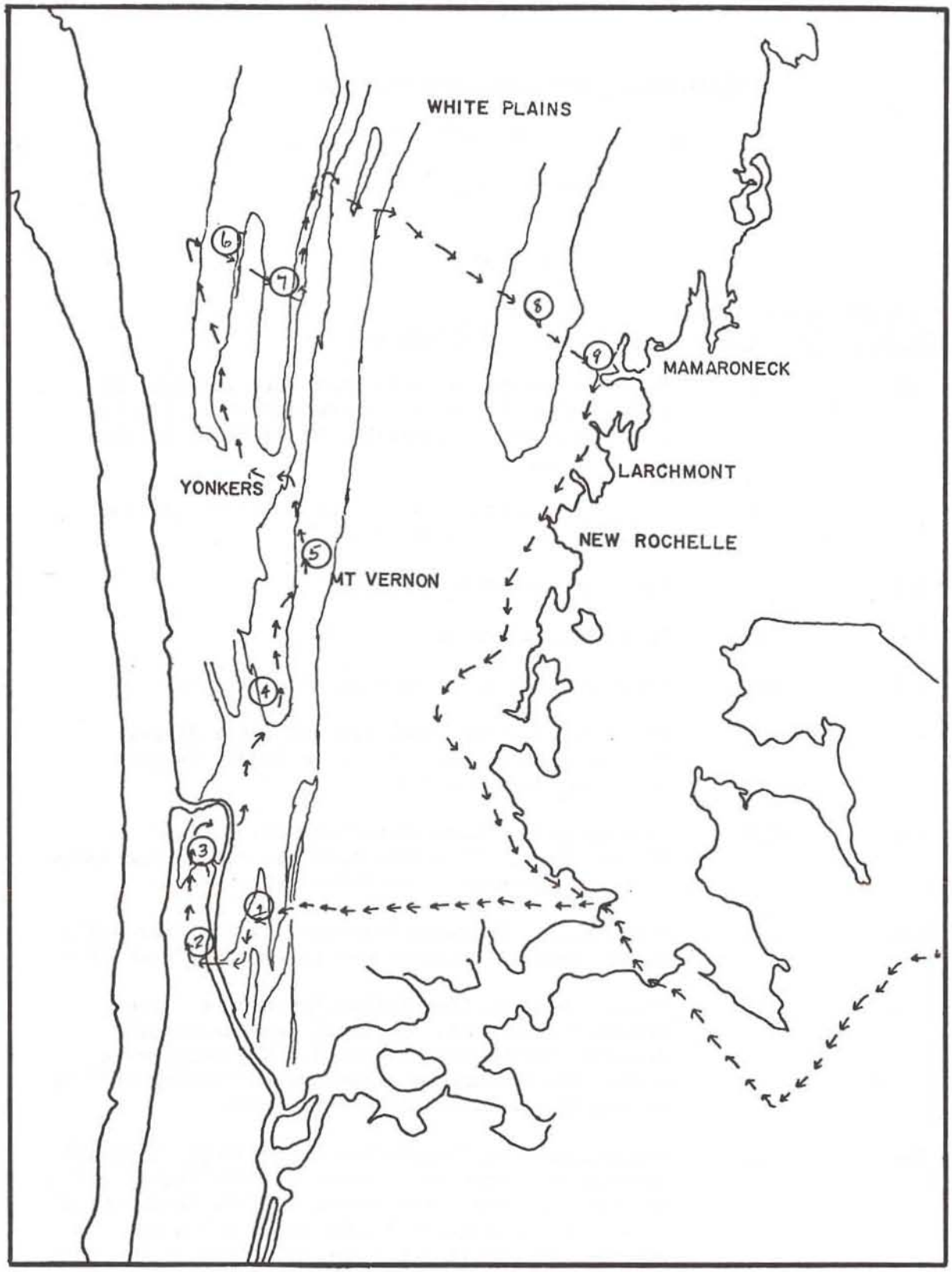

Figure 1. Map indicating stops and route to be followed on field trip. 1" = approximately 5.3 miles.

13.3	2.0	Proceed west on Long Island Expressway. Pass through valley of Little Neck Bay, which lies north-south of the expressway. This valley, although covered with a veneer of glacial till represents an initial preglacial valley. It is one of several north-south trending valleys which occur along the north shore of Long Island and undoubtedly represent obsequent valleys to the subsequent valley occupied by Long Island Sound. Pass Cross Island Parkway.
14.0	0.7	Pass Springfield Boulevard.
15.0	1.0	Bear right onto exit 27-28. Entrance onto Clearview Express (I-295 North) to Throgs Neck Bridge.
18.0	3.0	Approach ramp onto Throgs Neck Bridge.
20.6	2.6	Toll station exit of Throgs Neck Bridge (Bronx). Proceed north bearing left.
22.1	1.5	Bruckner traffic circle. Junction of I-95 and I-278. Bear left onto I-95 West (Cross-Bronx Expressway) toward George Washington Bridge.
23.6	1.5	Pass Westchester Avenue. Continuous exposures on both sides of expressway. Lithology composed of mica schists with subordinate amounts of sillimanite schists and biotite-quartz gneisses. Minor folds common exhibiting chevron pattern. Fold axes and other linear elements plunge northward (15 - 50°). These units have been designated as "undifferentiated schists and gneisses" on the 1961 edition of the New York State Geological Map. Hall (1968b) referred to them as Hartland-Manhattan undivided. Seyfert and Leveson (1969) placed them in their own coined "Hutchinson River Group."
24.3	0.7	Pass exit for Bronx River Parkway.
24.8	0.5	Bronx River valley. Boundary between the eastern undifferentiated schists and gneisses and the New York City Group to the west. Boundary is believed to be a major stratigraphic-structural break.
25.1	0.3	Continuous exposure of Manhattan schist on both sides of expressway forming Crotona Park synclinal ridge (Figure 2).

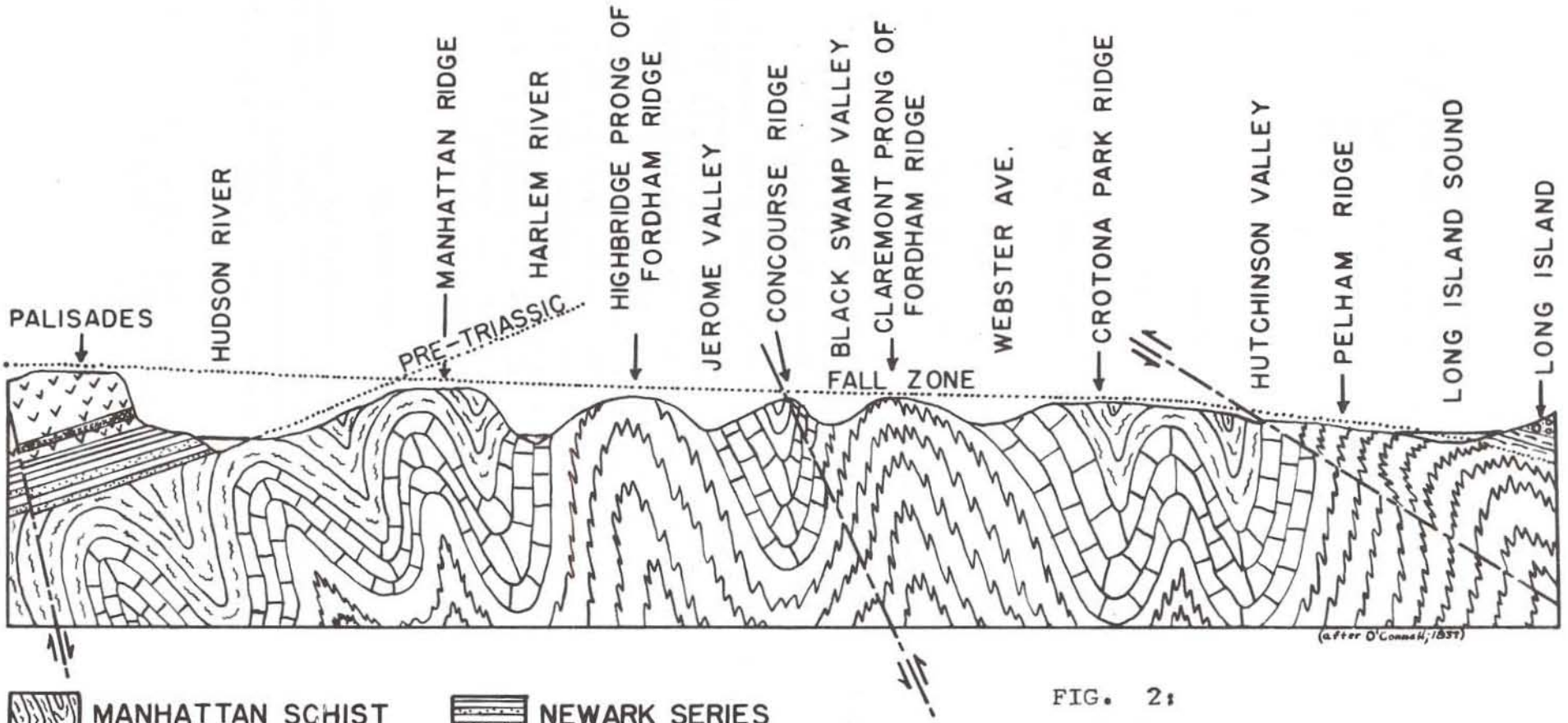

FIG. 2:

GENERALIZED GEOLOGIC CROSS—SECTION OF NEW YORK CITY

THE CITY COLLEGE—DEPARTMENT OF GEOLOGY

25.8	0.7	Third Avenue exit. Leave expressway and continue ahead paralleling expressway. Cross Park-Webster Avenue valley. The valley is underlain by Inwood marble. This north-south low is the former valley of the Bronx River. The stream was evicted from its original course further north into its present valley.
26.1	0.3	Left turn onto Webster Avenue.
26.2	0.1	Right turn onto entrance ramp to Cross Bronx Expressway (I-95 West). Anticline of amphibolite member of Manhattan schist immediately to right. This unit is approximately 20-30 feet thick and about 50-60 feet above the Inwood-Manhattan contact.
26.6	0.4	Exit onto Jerome Avenue. Bear left for turn onto Jerome Avenue.
26.7	0.1	Left turn onto 174th Street.

STOP #1: GRAND CONCOURSE SYNCLINAL RIDGE

Manhattan schist occurs along the north-south trending Grand Concourse forming a ridge while the lesser resistant Inwood marble forms the valleys on both sides of the ridge. Manhattan schist-Inwood marble contact is present along south side (east bound lane) of Cross-Bronx Expressway. Typical interbedding of Inwood and Manhattan along west ridge slope can be seen.

Inwood marble is a gray to buff-colored, medium to coarse textured marble and dolomitic marble. Bed thickness varies from 1/2" to 6 feet. Minor amounts of graphite, pyrite, phlogopite, tremolite and diopside have been found. Thickness of the formation varies but here it occupies the entire Jerome Avenue valley - approximately 1000 feet. Repetition of beds by folding is possible.

26.8	0.1	Return to bus. Right turn onto Jerome Avenue and right turn onto Cross-Bronx Expressway (I-95 West). Proceed west, keep right.
27.2	0.4	Continuous exposure on south and north side of expressway. FORDHAM GNEISS forming Highbridge prong of Fordham ridge. This ridge is one of the type localities for the Fordham in New York City. The ridge is an overturned anticline to the west. Lithologically the unit is a biotite-feldspar-quartz gneiss. The three minerals form

		alternating bands which vary from inches to three feet. Band is very uniform and consistent. Plagioclase feldspar is common but subordinate to the potash feldspar. Intercalated bands of granite pegmatites, amphibolites, and marbles occur. Bands (layers) are steeply dipping (60-90°) to the east. Small minor folds are common. Larger isoclinal and asymmetrical folds can be detected with axial planes overturned toward the west. All fold axes plus other linear elements plunge south at approximately 15°.
		Exit onto ramp of Major Deegan Expressway (I-87 South) toward Triborough Bridge.
28.2	1.0	Junction of ramp and Major Deegan Expressway (I-87 South). Keep right.
29.1	0.9	Exit onto ramp for West 155th Street Bridge.
29.2	0.1	Right turn onto bridge, proceeding west. Cross Harlem River, separating Manhattan and Bronx. The Harlem is not a river but a strait. The entire valley is underlain by steeply dipping, tightly folded beds of Inwood marble.
29.4	0.2	Oblique right turn onto 155th Street ramp. Proceed west.
29.7	0.3	Intersection, St. Nicholas Avenue and 155th Street. Right turn onto St. Nicholas Avenue. Proceed northward downhill. Coogan's Bluff on left.

STOP #2: BASE OF COOGAN'S BLUFF NEAR JUNCTION WITH HARLEM RIVER SPEEDWAY

Carefully cross the highway to base of cliff and walk north to fresh exposure of Manhattan schist, Amphibolite (Hornblende schist), and Pegmatites.

Merrill et al. (1902) cites this as a type locality for the Manhattan schist. The principal lithology is a coarse textured light to dark-grey biotite muscovite quartz schist with sporadic high concentrations of garnet. Other minor minerals in order of abundance include plagioclase (oligoclase), potash feldspar (orthoclase), magnetite, pyrite, and sillimanite. Pods (augens) of quartz and feldspar, where quantitatively significant, may develop a gneissoid appearance. Axes of minor and major folds within the schist as well as other linear elements plunge south about 15°.

The Amphibolite (Hornblende schist) here is a dark grey to black

medium texture rock. Principal minerals include hornblende and plagioclase (andesine) feldspar with local high concentrations of epidote. A rhombohedral-type jointing is the result of the dense and close parallel arrangement of the prismatic shaped hornblende crystals. This jointing contrasts with the block type peculiar to the Manhattan schist and Fordham gneiss. The Amphibolite bed here is approximately 30-60 feet from the Manhattan-Inwood contact and is believed to be the same bed viewed at Mile 26.2 earlier. This Amphibolite appears to be an excellent horizon marker for locating the Manhattan-Inwood contact in the region.

The "Pegmatites" found in the New York City Group are composed of granites, granite pegmatites, graphic granites, aplites, and quartz veins. These concordant and discordant bodies occur in all formations with varying widths up to 10 feet. Quartz, pink microcline feldspar, greenish oligoclase plus moscovite are the common principal minerals. Biotite, hornblende, magnetite, garnet, black tourmaline are some of the minor constituents.

31.9	1.9	Left turn onto Dyckman Street. Dyckman Street fault. One of the few cross faults found in New York City resulting in an east-west cross valley.
32.5	0.6	Right turn onto Seaman Avenue. Proceed north on Seaman Avenue four blocks.

STOP #3: INWOOD PARK-ISHAM PARK

Proceed west into Inwood Park. The canoe-shaped valley underlain by Inwood marble is an anticline while the two adjacent Manhattan schist ridges are synclines (Figure 3). Amphibolite exposure occurs along the path leading to the western ridge. Spuyten Duyvil, the water body immediately to the north is at present a strait connecting the Hudson River (an estuary) with the Harlem River (a strait). Prior to being modified by glaciation and subsequently by man, a true stream flowed here controlled by the existing lithology and structure. A fuller discussion will be presented.

Return to Isham Street and Isham Park.

The marble here and in this area is the type locality named after the village of Inwood. The marble is gray to buff-colored medium to coarse textured marble and dolomitic marble. Essentially the same lithology as the Inwood found at Stop #1. Graphite, pyrite, phlogopite, tremolite and diopside (malacolite) may be found here and elsewhere in the neighborhood. Quartzite, interbedded with the marble, indicates original sandy beds. These quartzite layers plus aplites often occur as disconnected boudins. An occasional thin schistose layer suggests original mud or limey mud sedimentation. Folding and plastic deformation are present. Possibly the only example of a residual soil in New York City is present at this stop.

Return to bus. Proceed east on Isham Street.

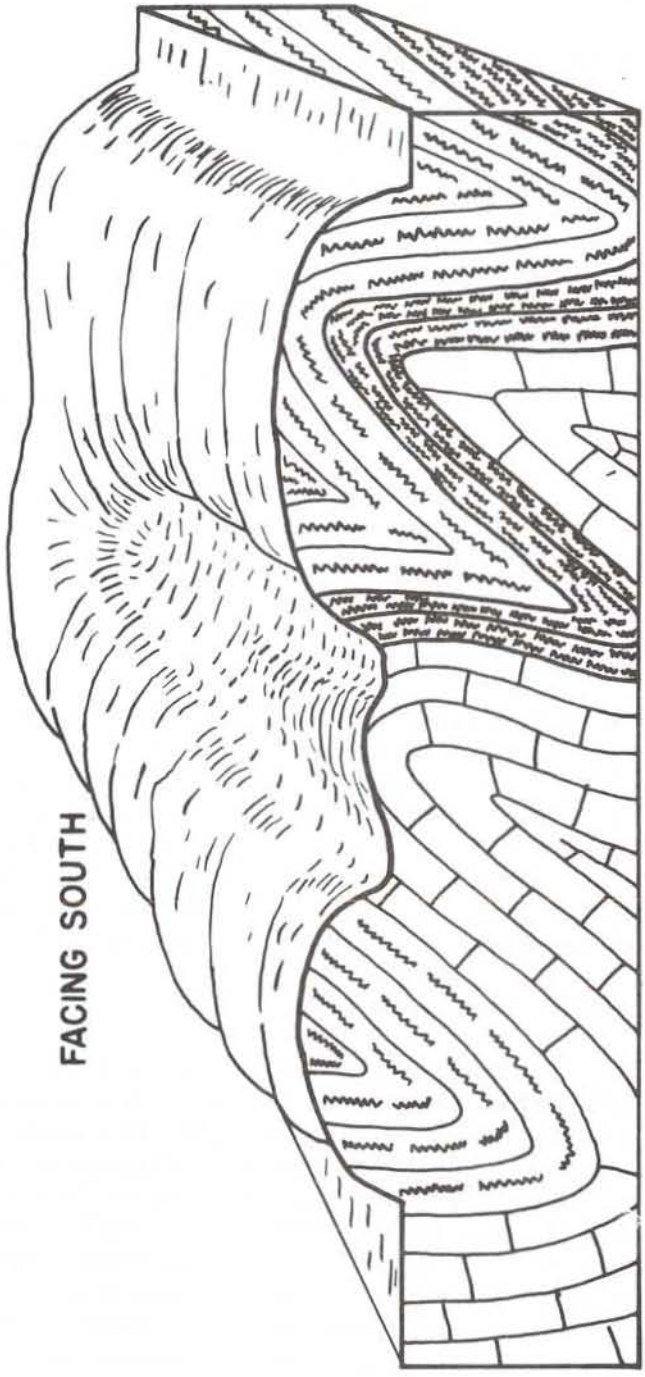

Figure 3A: Cross-section at Inwood Park showing canoe valley

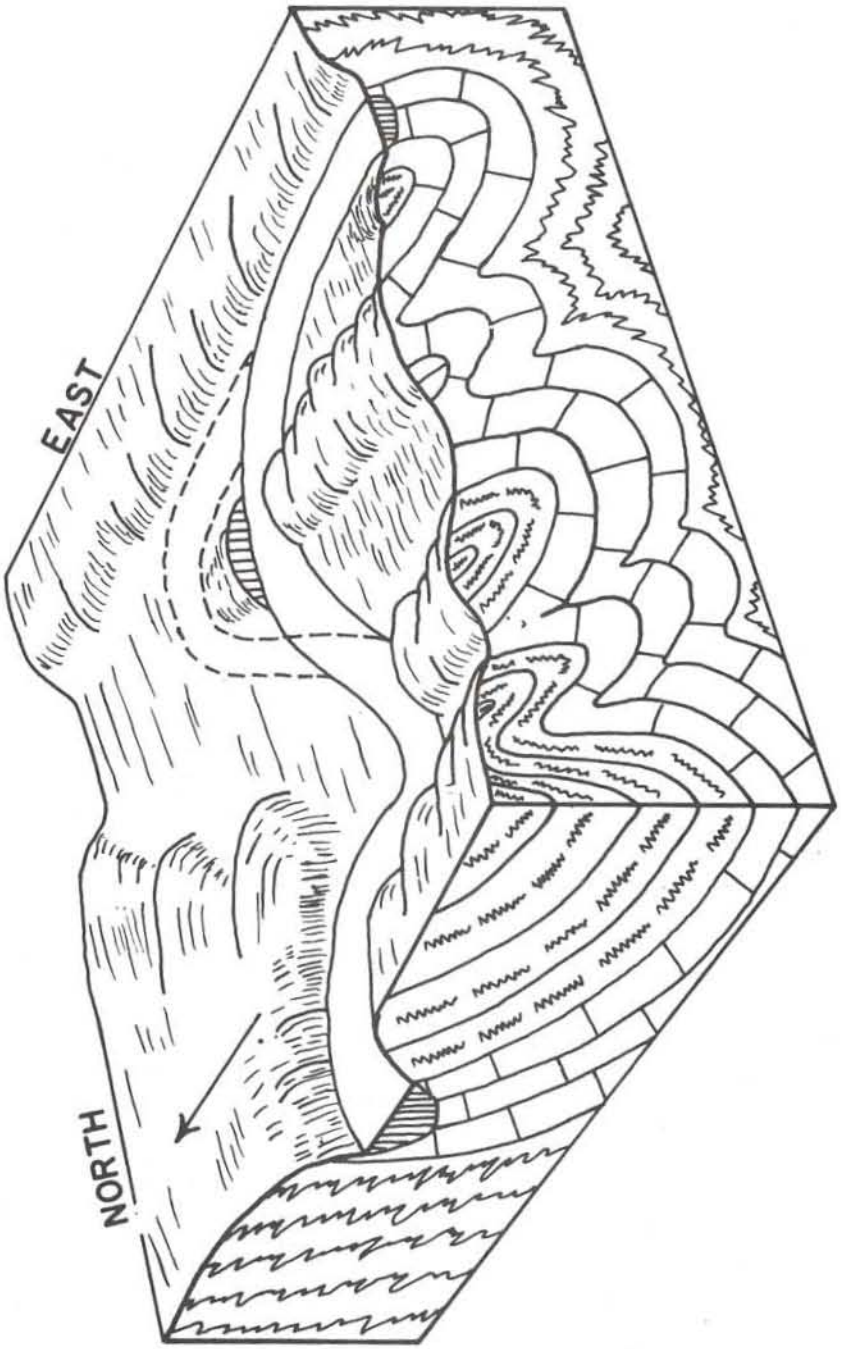

Figure 3B: Spuyten Duyvil and the Inwood Section.

33.2	0.3	Right turn onto 10th Avenue. Proceed south to 207th Street.
33.3	0.1	Left turn onto 207th Street. Proceed east crossing Harlem River and entering the Bronx. 207th Street becomes Fordham Road. Proceed to Major Deegan Expressway (I-87 North).
33.7	0.4	Left turn onto Major Deegan Expressway (I-87 North). Proceed north to exit 5 of the New York State Thruway.
39.8	6.1	Bear right and exit at exit 5. Keep right.
39.9	0.1	Right turn onto curving ramp immediately after underpass.
40.0	0.1	Right turn onto Midland Avenue. Proceed west on Midland Avenue passing over New York State Thruway.
40.3	0.3	Right turn onto Fullerton Avenue. Proceed north on Fullerton Avenue.
40.5	0.2	Dead end.

STOP #4: DI RIENZO STONE QUARRY

Yonkers granite gneiss.

PLEASE BE CAREFUL IN THIS QUARRY. DO NOT COLLECT ANY SPECIMENS FROM THE TRIMMED AND STACKED ROCKS. THESE ARE THE FINISHED PRODUCTS OF THIS QUARRY AND THE LABOR OF THOSE WHO WORK HERE.

Collect specimens from floor and walls of quarry.

Merrill et al. (1902) states that the Yonkers is "technically a gneissoid granite." The rock is composed of quartz and microcline feldspar with lesser amounts of orthoclase. The feldspars are responsible for the striking pink-red color. Although not obvious, foliation, caused by the presence of biotite, is present. The biotite occurs as clumps, which are usually discoidal but occasionally spindle shaped. When the latter phenomenon occurs a lineation is also present. The foliation here is at a high angle (vertical) and is normal to the close-spaced horizontal sheeting. Minor amounts of hornblende, apatite, and zircon are also found. A single amphibolite layer occurs in the quarry. The Yonkers is invariably associated with the Fordham and almost without exception occurs as central masses surrounded by the Fordham. Contacts between both are sharply defined and gradational.

LUNCH STOP.

Return to buses. Proceed south on Fullerton Avenue.

40.7	0.2	Left turn onto Midland Avenue. Proceed east on Midland Avenue passing over New York State Thruway.
41.1	0.4	Left turn onto curving ramp leading to service road of New York State Thruway and NY 100 (Central Avenue).
41.3	0.2	Bear right onto NY 100 North.

STOP #5: FORDHAM GNEISS

Almost 1000 feet of Fordham is exposed on both sides of the highway. The Fordham here exhibits great variation and the lithologic divisions of this formation as advanced by Hall (1968a, 1968b) is appropriate.

Return to bus. Proceed north on NY 100.

42.0	0.5	Overpass Sprain Brook Parkway. Keep right.
42.3	0.3	Bear right onto ramp leading toward Tuckahoe Road.
42.6	0.3	Left Turn onto Tuckahoe Road. Proceed west on Tuckahoe Road.
43.1	0.5	Overpass Grassy Sprain Parkway. Continue west on Tuckahoe Road.
43.5	0.4	Pass entrance and underpass of New York State Thruway. Continue west on Tuckahoe Road.
43.9	0.4	Bridge overpass over railroad tracks. Proceed west on Tuckahoe Road.
44.2	0.3	Right turn onto service road of Saw Mill River Parkway. Service road is NY 9A and Saw Mill River Road. Proceed north on service road. The service road follows the contact between the Inwood marble which underlies the valley to the west and the Manhattan schist which forms the ridge on the right (east). Exposures of the Manhattan can be seen periodically.
46.3	2.1	Mt. Hope Cemetery. Intersection of NY 9A and Jackson Avenue. Right turn onto Jackson Avenue proceeding east.

STOP #6: FORDHAM GNEISS

Three subdivisions of the Fordham were tentatively identified by Hall

(1968a) at this site. The Fordham body occurs as a northward plunging anticline. Sprain Lake valley immediately to the east contains Inwood marble. Numerous exposures of the marble are found along the east side of the valley paralleling the parkway.

Return to bus. Proceed east on Jackson Avenue. The ridge which we cross between Sprain Lake valley and NY 100 to the east is underlain by Manhattan schist which forms a north plunging anticline.

47.6	0.9	

STOP #7: MANHATTAN SCHIST

Manhattan schist plus Amphibolite layer near contact with Inwood marble in valley of NY 100.

Return to bus. Left turn onto NY 100 North. Continuous exposures of Manhattan schist on west side of road.

47.9	0.3	Exposure of Inwood marble on east side of road. Proceed north on NY 100.
48.6	0.7	Right turn onto Ardsley Road toward Scarsdale. Proceed east on Ardsley Road.
48.7	0.1	Core of Yonker granite occupying center of hill.
48.9	0.2	Intersection with Old Army Road. Proceed east on Ardsley Road. Continuous outcrop of Yonkers granite on crest of hill.
49.1	0.2	Fordham gneiss outcrops occupying side of hill.
49.3	0.2	Cross over Bronx River Parkway. Intersection with Garth Road. Proceed east on Ardsley Road.
49.4	0.1	Railroad station, Scarsdale. Ardsley Road becomes Popham Road. Proceed east on Popham Road.
50.0	0.6	Intersection, left turn onto Post Road (White Plains Road). Proceed north.
50.1	0.1	Intersection, oblique right turn onto Heathcote Road. Proceed east on Heathcote Road.
50.9	0.8	Intersection with Morris Lane. Continue east and south on Heathcote Road.
51.3	0.4	Pass Scarsdale Medical Center on left.

51.5	0.2	Intersection Heathcote Road and Palmer Avenue. Oblique right onto NY 125 South (Weaver Street). Pass to right of gas station.
52.5	1.0	Overpass on Hutchinson River Parkway. Proceed south on NY 125.
53.3	0.8	Pass Quaker Ridge Road. Continue on NY 125 South.
53.5	0.2	Pass Bonnie Briar Country Club on left. Proceed on NY 125 South.
54.0	0.5	

STOP #8: HARRISON DIORITE

Merrill et al. (1902) lists quartz, hornblende, feldspar and biotite as the principal constituents in this unit. Feldspar includes orthoclase and plagioclase (oligoclase-andesine). An igneous origin is indicated for the unit. Merrill further suggests that the Ravenswood granodiorite found in Queens County to the south may be a correlative equivalent.

Return to bus. Continue on NY 125 South.

54.3	0.3	Road fork. Bear left, continue on NY 125 South (Weaver Street).
54.5	0.2	Intersection, Forest Avenue and NY 125 South. Continue on NY 125 South.
55.1	0.6	Overpass New York State Thruway, Westchester spur.
55.2	0.1	Cross Palmer Avenue.
55.5	0.3	

STOP #9: EASTERN UNDIFFERENTIATED SEQUENCE

Intersection of NY 125 South and US 1. Park in bank parking lot. Freshly exposed schist along rear of parking lot. The unit here is part of the larger area of undifferentiated schists and gneisses first mentioned at Mile 23.6 on the Cross-Bronx Expressway.

Return to bus. Proceed south on US 1.

56.0	0.5	Pass Larchmont Road. Proceed south on US 1.
56.8	0.8	Enter New Rochelle. Proceed south on US 1 (Main Street, New Rochelle).

57.4	0.6	Road fork, bear right on US 1.
57.7	0.3	Right turn onto Echo Avenue-River Street, New Rochelle.
57.8	0.1	Road fork, bear left onto I-95 South entrance.
58.0	0.2	Right turn onto I-95 South.
64.8	6.8	Road fork, bear left onto I-295 South toward Throgs Neck Bridge and New York City.
66.7	1.9	Toll gate, Throgs Neck Bridge.
88.3	21.6	Return to Hofstra University.
		End of Trip

REFERENCES CITED

Hall, L. M. (1968a), Bedrock geology in the vicinity of White Plains, N. Y., N.Y.S.G.A. 40th Annual Meeting Guidebook, Trip A, 1968, pp. 7-31.

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Seyfert, C. K., and Leveson, D. J. (1969), Speculations on the relation between the Hutchinson River Group and the New York City Group in Symposium on the New York City Group of Formations, Bulletin #3, Queens College Press, Flushing, N. Y., pp. 33-42.

Additional information is available in the 1958 (Peekskill) and 1968 (Queens) N.Y.S.G.A. Guidebooks.