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GEOLOGICAL SURVEY
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GEOLOGIC MAP OF THE MAMARONECK QUADRANGLE, NEW YORK - CONNECTICUT

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Control by USGS and USC & GS, and N. Y. Dept. of Transportation
Topography by photogrammetric methods from aerial photographs taken 1966. Field checked 1967.
Polyconic projection 1927 North American datum.

SCALE 1:24 000

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

CONTOUR INTERVAL 10 FEET
DATUM IS MEAN SEA LEVEL

UTM GRID AND 1967 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

NEW YORK
QUADRANGLE LOCATION

EXPLANATION

QUATERNARY

Q

Undifferentiated Deposits

Undifferentiated deposits of glacial origin; mapped only on Long Island where underlying bedrock is concealed.

ORDOVICIAN

Metamorphosed Intrusive Rocks

Os

Rye Serpentinite

Green, fine grained, massive rock; dark blackish green where fresh, light to medium green where weathered. Megascopic magnetite common, carbonate-filled veins present. Microscopic examination indicates porphyroblasts of enstatite in a matrix of chrysotile and antigorite. Limonite present locally.

CAMBRIAN–ORDOVICIAN

Ogge

Granitic Gneiss

Brown- to brownish tan-weathering, light gray or bluish gray, fine- to medium-grained, homogeneous biotite-muscovite-quartz-feldspar gneiss with rare garnet. Orthoclase and microcline strongly predominate over plagioclase. White, foliated and lineated pegmatites often found closely associated with the finer grained gneiss are mapped within this unit.

Stratigraphic Units

Harrison Gneiss

O€hrg — **Garnet Gneiss Member**

O€hrf — **Quartz Feldspar Gneiss Member**

O€hrg Light gray-weathering, locally rusty, medium-grained, medium gray garnet-biotite-and/or hornblende-quartz-feldspar gneiss. Plagioclase is the predominant feldspar. Commonly contains small prominent lenses of finer-grained mafic minerals. Rare sphene. Locally, porphyroblasts of microcline (p) are present near contact with Hartland Formation.

O€hrf Medium-grained, dark gray biotite-and/or hornblende-quartz-feldspar gneiss or biotite-hornblende-feldspar gneiss with subordinate quartz. Easily distinguished by large irregularly shaped quartz-feldspar segregations. Plagioclase is the predominant feldspar. Lenses of finer-grained mafic minerals common.

Hartland Formation

c am d O€hts — **Schist and Granulite Member**

O€htw — **White Gneiss Member**

O€htcp — **Carrington's Pond Member**

O€hts Brown or rusty-weathering, gray garnet-sillimanite-muscovite-biotite-quartz-feldspar schist and gray sillimanite-muscovite-biotite-quartz-feldspar schist with local garnet, interbedded with brownish-tan-weathering, gray, fine grained, biotite-quartz-feldspar granulite with local garnet, and coarser-grained, white quartz-feldspar layers; gray, rusty-weathering muscovite-biotite-quartz-feldspar gneiss or schistose gneiss and granulite. Lenses of kyanite and sillimanite are present locally. Commonly with quartz-hornblende-plagioclase amphibolite interbeds. Several amphibolite units have been mapped (am); those not mappable at this scale are indicated by the letter a. Locally, calcite-epidote-diopside-quartz-hornblende-plagioclase amphibolite (d) are interbedded with other amphibolites. Also mapped (c) are calc-silicate gneisses interbedded with rusty weathering, sulphidic, fine grained muscovite-biotite schist.

O€htw Light gray or white, medium-grained biotite-muscovite-quartz-feldspar gneiss with local garnet. Light gray or white garnet-biotite-muscovite gneiss.

O€tcp Interbedded white and gray biotite-muscovite-quartz-feldspar gneiss, rusty- or brown-weathering garnet-muscovite-biotite schist or gneiss with local amphibolites.

Area of closely spaced outcrops; small, individual outcrops are shown by isolated structural symbols.

MAP SYMBOLS

Planar - (strike and dip shown by each symbol; number indicates dip in degrees)

- foliation: inclined, vertical, generalized trend of crumpled foliation.
- generalized trace of axial plane of overturned, later-stage antiform
- generalized trace of axial plane of refolded early stage fold

Linear - (strike and plunge shown by each symbol; number indicates plunge in degrees)

- axis of fold; plunging, horizontal
- counterclockwise rotation } sense of rotation of minor folds
- clockwise rotation
- quartz rod
- mineral lineation
- boudin line
- geologic unit contact; solid where accurately located, dashed where approximate, dotted where inferred, and queried where questionable.
- normal fault, hachures on downthrown side. Inferred from topography, lack of outcrop, joint patterns and stratigraphic offset. Fault is hinged near shoreline with vertical displacement increasing northward to a maximum of approximately 430 meters.

GEOLOGICAL INTERPRETATION

The Hartland Formation is believed to be a metamorphosed assemblage of eugeosynclinal sedimentary, volcanic, and intrusive rocks. The Harrison Gneiss, previously considered a diorite or granodiorite intrusion, is interpreted here as a metamorphosed andesitic or dacitic volcanic. The members of this formation are believed to have formed contemporaneously. The larger bodies of the Granitic Gneiss are sill-like intrusions although numerous smaller bodies are clearly crosscutting. This crosscutting is most clearly displayed where such bodies occur within the Harrison Gneiss on the east limb of the later stage fold. The disrupted foliation of the Hartland Formation around the Serpentinite, together with genetic criteria, suggests a tectonic emplacement for the Serpentinite. Since similar serpentinite bodies throughout the northern Appalachians are generally of Ordovician age, the major rock units here are probably early or Pre-Ordovician. Furthermore, inasmuch as these units lie in succession eastward from the Proterozoic Fordham Gneiss, a Cambrian-Ordovician age is inferred.

At least two, and possibly three or more stages of deformation can be seen in this area (see map and structure section). The early stage folding formed the dominant foliation present in the major units. Although relative ages are uncertain, the sequence presented here suggests that the early fold was synclinal. This northeasterly plunging fold was later refolded into a northerly plunging antiform with northwesterly dipping limbs. The later stages of folding had little effect on these major structures. The Serpentinite body was emplaced prior to the second stage folding.

NOTE: For further details, see author's Masters' thesis, 1974, titled "Bedrock geology of the Mamaroneck Quadrangle" which is on file at The Museum Library, New York State Education Department, Albany, N. Y., 12234, and at Adelphi University, Garden City, N. Y., 11530.

Cross-section A-A' Heavy dashed line represents refolded axial plane of early stage reclined isoclinal fold. Subsequent deformation produced the antiform whose axial plane is shown by the heavy solid line. The Garnet Gneiss Member (O€hrg) of the Harrison Gneiss on the west limb of this later fold pinches out to the north, where the Quartz Feldspar Gneiss Member (O€hrf) occupies the same stratigraphic position.