State of Maryland
Department of Natural Resources
MARYLAND GEOLOGICAL SURVEY
Emery T. Cleaves, Director

GEOLOGIC MAP OF THE LIBERTYTOWN QUADRANGLE, CARROLL AND FREDERICK COUNTIES, MARYLAND

by
Jonathan Edwards, Jr.
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NOTES ON STRATIGRAPHY, STRUCTURE, AND CORRELATION

The geologic formations present in the Libertytown Quadrangle are part of the extensive western Piedmont terrane of polydeformed sedimentary and volcanic rocks. Stratigraphic interpretation and correlation of the rock units are hampered by poor exposure and structural complexity, as well as by the lack of fossils. Most primary sedimentary and volcanic structures in the rock units have been obscured or obliterated by close folding, foliation, and recrystallization. To a large extent, early-formed foliation and structures have been destroyed or modified by later episodes of tectonism.

The Gillis Group consists, from oldest to youngest, of phyllites of the Urbana, Ijamsville, and Marburg Formations. In Maryland, the Urbana is generally accepted as correlative with the Lower Cambrian(?) Harpers Formation in the Appalachian region to the west (Stose and Stose, 1946; Stose and Jonas, 1939; Stose and Stose, 1944; Gohn, 1978). These thin limestones in the Marburg, the best developed of which is the Silver Run Limestone Member in the New Windsor (Fisher, 1978) and Union Bridge Quadrangles (Edwards, 1986), may represent tongues of the western shelf carbonates that extended eastward into the marine basin. Fisher (1978) also interpreted the Silver Run Limestone to be of Cambrian(?) to possibly Early Ordovician age.

In the New Windsor Quadrangle, which adjoins this quadrangle on the northeast, Fisher (1978) mapped the lithology that here has been called Marburg as part of his Ijamsville Formation, which he considered to be of Cambrian(?) age, based on chemical and lithologic similarities to Lower to Middle Cambrian Harpers, Antietam, and Araby Formations. The Ijamsville was also equated with the western or upper pelitic schist facies of the Wissahickon Wissahickon Formation of the Eastern Piedmont (Fisher, 1978; Fisher and others, 1979).

The Gillis Group, therefore, includes units which range in age from Early Cambrian through Early Ordovician.

In the western part of the Libertytown Quadrangle, west of the Hyattstown Fault zone, phyllite units of the Gillis Group can be separately mapped because of the distinctive reddish lithology of the Ijamsville Formation. However, as the Ijamsville is traced eastward across the western Piedmont, it thins, gradually loses its distinctive coloration, and becomes indistinguishable from the underlying Urbana and overlying Marburg. This may indicate the eastward fingering-out of the redbed facies into the marine basin. Within the Linganore Nappe, the disappearance of the Ijamsville as a distinct unit between the Urbana and Marburg, the complicated structure of these polydeformed rocks, and the poor exposure, makes it difficult to separate these phyllite units in the field. Therefore, in this area this entire assemblage has been mapped as Gillis Group, undivided.

The Sams Creek Formation is the oldest lithologic unit in the Libertytown Quadrangle. Edwards (1984) equated the Sams Creek with the Late Precambrian Catoctin Formation in the Blue Ridge Region of Maryland and Virginia not only on the basis of similarity of these metabasalts, but also because of the included lithologies of marble and volcanic phyllite. However, Fisher (1978) considered the Sams Creek to be Cambrian(?) or possibly as young as Ordovician(?) in age because of its axial position in a synclinal setting in the Westminster - New Windsor area, lying above his Ijamsville Formation of Lower Cambrian age (Fisher, 1978; Fisher, Higgins, and Zietz, 1979).

The most notable feature on the geologic map of the Libertytown Quadrangle is the curvilinear outcrop pattern displayed by the Sams Creek Formation. In the area west of the Hyattstown fault zone, areas occupied by the Sams Creek are in contact with both the Ijamsville and Marburg Formations and also cut across folded quartzite beds in the underlying phyllite lithologies. All of these features suggest that the Sams Creek Formation overlies the Marburg and Ijamsville Formations in a large overthrust sheet called the Linganore Nappe (Edwards, 1984).

The Sams Creek Formation is the basal unit of the Linganore Nappe. East of the Hyattstown Fault, the only rock units exposed in the nappe are the undivided phyllites of the Gillis Group which stratigraphically overlie the Sams Creek. In the complexly-deformed area in the northeastern corner of the quadrangle, north of Weldon Creek, small areas of sheared Sams Creek and marble have been dragged up and exposed along steep reverse faults in the Linganore Nappe.

Following deposition of the Marburg Formation with its limestone member of probable Cambro-Ordovician Frederick Formation affinity, the sub-nappe terrane of the Gillis Group sediments was folded and eroded before emplacement of the Linganore Nappe. The thrusting of the nappe and the development of foliation parallel to layering may have been a late phase of this same deformation, but the basal unit of the nappe, the Sams Creek Formation, lies across formational contacts and eroded folds. Subsequent to emplacement of the Linganore Nappe, all of the rock units present in the mapped area were again deformed into tight folds with additional thrusting to the northwest and development of axial plane cleavage. The original foliation, parallel or sub-parallel to layering, has been nearly obliterated and only rarely can relict traces can be observed at noses of minor folds. Partial removal of the Sams Creek by erosion has exposed the underlying rock units of the Gillis Group in fensters and re-entrants and the remnants of the nappe are preserved as large and small klippen.

The youngest phase of Paleozoic deformation is represented by the high-angle, west-dipping reverse faults of the Hyattstown fault zone, which cut the rock units of the Linganore Nappe. These faults are believed to have formed during the Allegheneian deformation, but may have occurred at the end of the Taconic. Throughout the area east of the Hyattstown fault zone, a late, steeply northwest-dipping slip cleavage, parallel to and possibly related to these faults, gradually becomes the dominant structural feature in the rocks, and obliterates all older foliations.

Tensional deformation associated with Early Mesozoic rifting is represented by the emplacement of diabase dikes of Early Jurassic age across the southeastern corner of the quadrangle.

EXPLANATION

QUATERNARY

Qal — **ALLUVIUM** — Gray-brown to light-brown, poorly sorted, coarse to fine sand, silt, and clay with sporadic lenses of subrounded quartz cobble gravel. In places includes chips and cobbles of local bedrock. May range up to as much as 15 feet in thickness. In smaller tributary streams, alluvium has not been mapped, but is present nonetheless as a thin veneer overlying channeled bedrock.

unconformity

JURASSIC

Jd — **DIABASE** — Dark greenish-gray to black, dense, fine-grained intrusive basalt with ophitic (diabasic) texure. Occurs in steeply dipping to vertical dikes which range between 1 and 10 feet in thickness. Weathers to orange-red clayey soil with rounded residual boulders.

intrusive igneous contact

EARLY CAMBRIAN TO EARLY ORDOVICIAN

GILLIS GROUP — The Gillis Group is an assemblage of phyllitic rocks that includes, from oldest to youngest, the Urbana, Ijamsville, and Marburg Formations. East of the Hyattstville Fault Zone in the eastern part of the quadrangle, structural complexity and lack of distinguishing lithological characteristics between the individual units necessitates mapping them as an undivided group. West of the Hyattstville Fault Zone, the Urbana Formation is not present as a separate unit within this quadrangle.

mf / mfl / mfq — **MARBURG FORMATION** — Silvery gray-tan, pale olive-tan, and waxy, pale bluish-green quartz-chlorite-muscovite phyllite with abundant thin, silty beds or laminae and thin zones of pale-reddish-purple phyllite. Weathers to gray-tan chips. Locally contains limonite pseudomorphs after pyrite in cubic crystals up to 1/2 inch in size. Includes thin to thick and massive beds of quartzite and also contains a few thin zones of poorly exposed, dark gray, calcareous muscovite phyllite. Thickness not known; top of formation is not present. Unit is very similar in appearance to much of the Urbana Formation.

mfq — Lenses of light-gray to tan, medium-grained, thin- to medium-bedded, phyllitic quartzite and subordinate brown to black or dark greenish-gray, medium-grained, thick-bedded quartzite. Phyllitic quartzite is composed of round grains of quartz in a very fine-grained matrix of sericite and quartz. Thick-bedded quartzite is composed of round quartz grains tightly bound by fine-grained quartz and quartz cement. Thickness of individual lenses ranges up to 10 feet.

mfl — Medium to dark-bluish-gray to black, thin-bedded limestone interbedded with thin layers of gray to dark-gray muscovite phyllite. Contains many calcite-filled fractures and joints. Occurs as lenses or layers ranging from 0 to 15 feet in thickness.

if / ifq — **IJAMSVILLE FORMATION** — Lustrous to dull, purple to reddish-gray hematitic muscovite phyllite interlayered with lesser amounts of tan to green chlorite-muscovite phyllite. Includes sporadic thin layers and lenses of gray, tan, and brown quartzite. Thickness unknown.

ifq — Sporadic thin layers and lenses of gray, tan, and brown, medium-grained quartzite. Thickness of individual layers ranges from 1 to 10 feet.

Rocks of the Linganore Nappe

unconformity

LATE PRECAMBRIAN

gg / ggg — **GILLIS GROUP** (undivided) — (East of Hyattstown Fault zone) Dark to light silvery-gray, tan, and greenish-gray quartz-chlorite-muscovite phyllite, some with thin interbeds of white to pale green or tan quartz silt. Zones of bluish-green muscovite-chlorite phyllite and reddish-purple to pale purplish-gray muscovite phyllite are also prominent. Limzoid pseudomorphs after pyrite in cubic crystals up to 1/2 inch in size occur locally within the gray and tan phyllites. Quartzites and quartzitic phyllites occur sporadically within the assemblage but are more common in the eastern part of the quadrangle. Thickness of the Gillis Group is unknown because the rocks have been thoroughly deformed by close folding and cleavage.

ggq — Medium gray, gray-tan, and brown fine- to medium-grained quartzite composed of rounded grains of quartz up to 1/16 inch in size, and phyllitic quartzite with interlayered phyllite. Thickness ranges from approximately 3 feet to greater than 20 feet.

unconformity

scf / scm — **SAMS CREEK FORMATION** — Dark green to gray-green sheared phyllitic metabasalt and lustrous green, purple, and gray phyllite. Occurrences of marble that range in size from small pods to large lenses also are common within this unit. Metabasalt consists primarily of chlorite and epidote and has been strongly sheared. Magnetite crystals up to 1/8 inch in size are commonly present. In places contains epidotized knots up to 2 inches across. Green phyllite contains chlorite and muscovite. Purple and gray phyllites are composed primarily of sericite and muscovite with small amounts of magnetite and hematite and locally may contain thin calcite laminae. Unit has been thoroughly deformed by cleavage and small-scale folds and the thickness cannot be determined. Within the Hyattstown fault zone the metabasalt appears as slivers of sheared and completely phyllitized rock.

scm — White to gray and reddish-purple calcite-dolomite marble. Occurs as lenses and small pods within the Sams Creek Formation, but these appear to be located primarily at or near the base of the unit. Thickness ranges from less than 3 feet to greater than 100 feet. Copper-bearing minerals occur sporadically within the marble, and small deposits have been mined near Unionville and Libertytown.

overthrust fault

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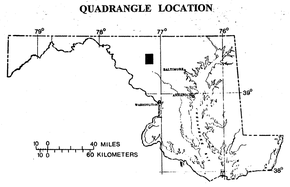
SYMBOLS

- Geologic contact — generally inferred or approximate
- Strike and dip of foliation
- Strike and dip of cremulation cleavage or slip cleavage
- Strike and dip of joints
- Plunge of minor fold axes; Dextral rotation
- Sinistral rotation
- Overthrust fault — teeth on upper plate
- High-angle reverse fault — bars on hanging wall

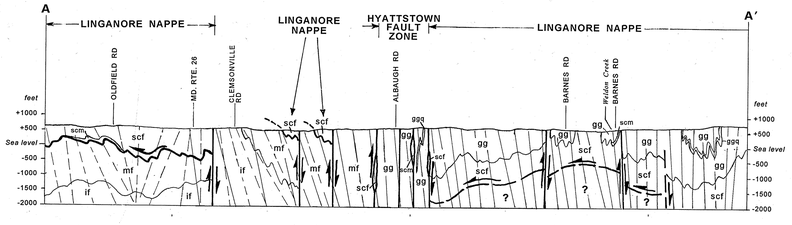
QUADRANGLE LOCATION

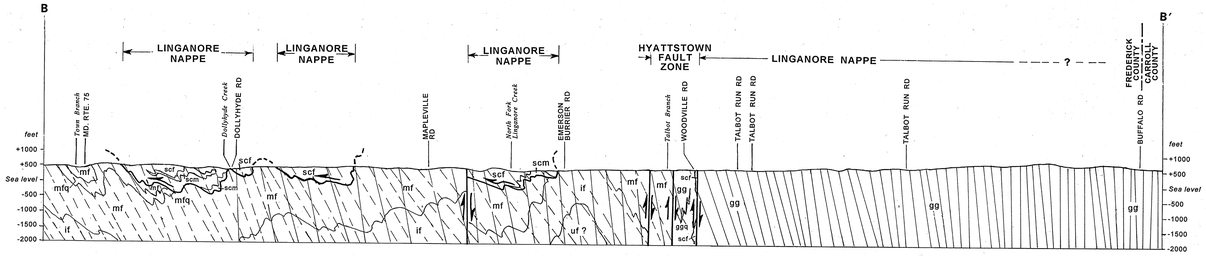


GEOLOGIC CROSS SECTIONS

Horizontal scale same as map scale; no vertical exaggeration.
Alluvial deposits not shown

foliation — slip cleavage





Base from U.S. Geological Survey
7½-minute topographic map series
Libertytown Quadrangle, 1944
(photorevised 1971)

Field mapping done
1967-68, 1973-75, 1991-92

UTM GRID AND 1971 MAGNETIC NORTH DECLINATION AT CENTER OF SHEET

SCALE 1:24 000

CONTOUR INTERVAL 20 FEET
DATUM IS MEAN SEA LEVEL

Copies of this map available from
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2300 St. Paul Street
Baltimore, MD 21218-5210