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

GEOLOGIC MAP OF THE MANCHESTER QUADRANGLE, CARROLL COUNTY, MARYLAND

by
Jonathan Edwards, Jr.
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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 nonetheless present as a thin veneer overlying channeled bedrock.

Qt — **TERRACE GRAVEL** — Observed at only one location in the Manchester Quadrangle, about half a mile northeast of Melrose, approximately on the divide between the drainage basins of Big Pipe Creek and Big Gunpowder Falls. Unit is a thin veneer, less than 10 feet thick, of reddish-orange to light brown sandy clay with subrounded pebbles of quartz and local bedrock.

unconformity

EARLY CAMBRIAN TO EARLY ORDOVICIAN

GILLIS GROUP — The Gillis Group is an assemblage of phyllitic rocks that includes the Urbana, Ijamsville, and Marburg Formations. In the southeastern part of the quadrangle east of the Cranberry Fault, structural complexity and lack of distinguishing lithological characteristics between the individual units necessitates mapping them as an undivided group.

mf / mfq / mfl — **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 with thin interbeds of bluish-gray schistose limestone. Thickness not known; top of formation is not present. Unit is very similar in appearance to much of the Urbana Formation, and is distinguished primarily by the presence of the dark calcareous phyllite and limestone.

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 10 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 quartzite. Thickness unknown.

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

uf / ufq — **URBANA FORMATION** — Dark-gray-tan to gray-green chlorite-muscovite phyllite with thin interbeds of tan silty phyllite and some thin zones of pale purple phyllite. Weathers tan to orange-tan. Thin layers of quartzite occur throughout the unit. Locally contains numerous limonite pseudomorphs after pyrite in cubic crystals up to 1/2 inch in size. Thickness of unit unknown. Closely resembles the Marburg Formation but contains more quartzite layers, some of which are conglomeratic, and generally is more resistant to weathering. Best distinguished from the Marburg when the two units are separated by the purplish-red phyllite of the Ijamsville Formation.

ufq — Layers and lenses of gray, tan, and brown, fine- to medium-grained, thin- to thick-bedded quartzite and prominent layers of thick-bedded to massive, ridge-making conglomerate. Composed of well-sorted, round quartz grains in a matrix of fine-grained quartz. Grain size ranges up to approximately 1 inch in conglomerates. Thickness of individual layers ranges from 1 to 50 feet.

unconformity

LATE PRECAMBRIAN

scf — **SAMS CREEK FORMATION** — Predominantly lustrous green, purple, and gray phyllite but also contains abundant dark green to gray-green sheared phyllitic metabasalt and a few isolated lenses of marble. Adjacent to the Cranberry Fault, the formation is a massive and dense chlorite-actinolite fels or schist. 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. Metabasalt consists primarily of chlorite and epidote, and magnetite crystals up to 1/8 inch in size are commonly present. In places contains epidotized knots up to 2 inches across. Unit has been thoroughly deformed by cleavage and small-scale folds and the thickness cannot be determined.

overthrust fault

Rocks of the Linganore Nappe

gg / ggq — **GILLIS GROUP** (undivided) — 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. Limonite 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.

← **Stratigraphic relation uncertain** →

ps / psq — **PRETTYBOY SCHIST** — Greenish gray-tan to medium-gray, fine-grained quartz-muscovite-chlorite schist. Commonly contains small porphyroblasts of albite up to 1/16 inch in size. Magnetite crystals up to 1/16 inch may also be present. In places schist contains many lenses and pods of milky-white vein quartz. Thickness of unit not known. Contact with phyllitic rocks of the Gillis Group appears to be gradational.

psq — Lenses of light gray to tan, thinly laminated to slabby, fine-grained, schistose, muscovite-bearing quartzite. May range up to 20 feet in thickness.

SYMBOLS

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

NOTES ON STRATIGRAPHY, STRUCTURE, AND CORRELATION

The geologic formations present in the Maryland part of the Manchester 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 tight folding, foliation, and recrystallization. To a large extent, early-formed foliation and structures have been destroyed or modified by later episodes of tectonism.

The bedrock structure consists of two anticlines, both overturned to the Northwest, and part of a large nappe containing Upper Precambrian metavolcanic rocks. All of these have been displaced to the Northwest along thrust faults. These structures and the attendant metamorphism to greenschist grade, as well as the pervasive foliation, are presumably the result of Taconic deformation.

The Sams Creek Formation, the oldest unit in the Manchester Quadrangle, is the basal unit of the Linganore nappe. West of the Avondale fault the Sams Creek, where it has been thrust over the Marburg Formation on the southeast flank of the Dug Hill anticline, is preserved in synformal klippen. Between the Avondale and Cranberry faults, the Sams Creek is overlain by phyllites of the Gillis Group in the Linganore nappe, and is exposed only where it has been dragged up along steep reverse faults. The Sams Creek does not occur east of the Cranberry fault, but is believed to lie beneath the phyllites of the Gillis Group in the Linganore nappe. To the northeast in York County, Pennsylvania, the Sams Creek appears along strike within this wide expanse of the Gillis Group, probably exposed along similar reverse faults southeast of the Cranberry fault.

Fisher (1978) considered the Sams Creek to be Cambrian(?) or possibly as young as Ordovician(?) in age. Edwards (1984) equated the Sams Creek with the Late Precambrian Catoctin Formation in the Blue Ridge Region.

The Gillis Group consists of phyllites, from oldest to youngest, of the Urbana, Ijamsville, and Marburg Formations. Within the Linganore nappe this assemblage has been mapped as the Gillis Group, undivided. The Urbana and Marburg Formations are very similar in overall lithology and the complicated structure of these polydeformed rocks, along with poor exposures, makes it difficult to distinguish between them. In the Dug Hill anticline these three formations can be separately mapped because of the distinctive reddish colored phyllites of the Ijamsville lying between the Urbana and Marburg.

The Urbana Formation in Maryland is generally accepted as correlative with the Lower Cambrian (?) Harpers Formation in the Appalachian region to the west (Scotford, 1951; Thomas, 1952; Hopson, 1964). Schwab (1971) depicts the depositional environment of the shale-siltstone turbidite facies of the Harpers Formation in the Blue Ridge of Central Virginia as a deep-water marine basin marginal to the continent.

The Ijamsville Formation overlies the Urbana Formation in the Sugarloaf anticlinorium in southeastern Frederick County and correlates with the upper part of the Harpers Formation and the overlying Antietam Formation of the Appalachian region (Edwards, 1986). The purple, green, and tan phyllites and associated quartzites and sandy beds of the Ijamsville represent sediment derived from the erosion of weathered and oxidized surficial materials of the Early Paleozioc North American continent which were transported into the offshore deep-water marine basin during the Early Cambrian marine transgression (Edwards, 1986) and deposited as marine redbeds (Ziegler and McKerrow, 1975). Quartzite layers and sandy beds are more prevalent in the western part of the Ijamsville, close to the old shoreline. Farther west, the Ijamsville lithology is thin or absent on the Catoctin - South Mountain anticline.

Eastward across the western Piedmont, the Ijamsville Formation thins, loses its distinctive coloration, and becomes indistinguishable from the underlying Urbana and overlying Marburg. This may indicate the fingering-out of the Ijamsville redbed facies into the marine basin.

The Marburg Formation is a marine shale-siltstone sequence very similar in lithology to the Urbana Formation, which indicates a similar depositional environment in an offshore marine basin. Edwards (1984, 1986) proposed a Cambro-Ordovician age for the Marburg based on the lithologic similarity of some of its calcareous members, the Silver Run Limestone in particular, to the Frederick Formation in Maryland and to the Conestoga Formation in southeastern Pennsylvania. The Frederick bears a Late Cambrian fauna (Jonas and Stose, 1936; Stose and Stose, 1946; Rasetti, 1959, 1961; Reinhardt, 1974), and the Conestoga has been assigned an age range from Middle(?) Cambrian to Early Ordovician(?) based on tentative identification of fossils near York and from the eastern Chester Valley near Norristown (Stose and Jonas, 1939; Stose and Stose, 1944; Gohn, 1978).

In the New Windsor Quadrangle, Fisher (1978) mapped the phyllite lithology that here has been called Marburg as the Ijamsville Formation and correlated it with the Lower Cambrian Harpers Formation in the Appalachian region to the west. To the east, these rocks were correlated with the western or upper pelitic schist facies of the Wissahickon Formation (Fisher, 1978; Fisher, Higgins, and Zietz, 1979).

The age of the Gillis Group, therefore, encompasses the entire range from the Urbana through the Marburg, or from Early Cambrian through Early Ordovician.

The relation of the Prettyboy Schist to the Gillis Group is uncertain. In contrast to the phyllitic rocks of the Gillis, the Prettyboy is a fine-grained schist, which implies a higher degree of metamorphism and/or a greater degree of susceptibility to recrystallization. The contact between these two formations is gradational across an interval of several hundreds of feet (hundreds of meters), and a late, high-angle cleavage has all but destroyed the earlier foliation and original bedding. Muller (1991) mapped the Gillis as overlying the Prettyboy in northwestern Baltimore County. The Prettyboy, therefore, may represent a deep-water marine deposit upon which the younger distal continental margin deposits of the Gillis have prograded. Conversely, the Prettyboy may be a coeval easterly facies of the Gillis or younger than the Gillis and has been overridden by that formation along high-angle reverse faults parallel to the late high-angle cleavage. However, there is no volcanic rock unit equivalent to the Sams Creek Formation between the Gillis and the Prettyboy at what would be the base of the Gillis Group.

In the Manchester Quadrangle, the Blacks Corner anticline is represented only by its southeast limb. The youngest exposed unit on this anticline is the Marburg Formation, which has been overridden by the Dug Hill anticline along the Deep Run thrust fault. Conglomeratic quartzites of the Urbana Formation are exposed in small folds in the crest of the Deep Run anticline.

The Marburg Formation on the southeast limb of the Dug Hill anticlinorium has in turn been overridden by the Linganore nappe along the Linganore overthrust fault. Rock units in the nappe include the Upper Precambrian Sams Creek Formation and the overlying Lower Paleozoic phyllites of the Gillis Group.

Subsequent to emplacement of the Linganore nappe, all of the rock units present in the mapped area were deformed into tight folds with additional thrusting to the northwest and development of axial plane cleavage. The original foliation, parallel or sub-parallel to bedding, was nearly obliterated and only rarely can relict traces can be observed at noses of minor folds.

The youngest phase of Paleozoic deformation is represented by the high-angle, west-dipping, Cranberry and Avondale reverse faults which cut the rock units of the Linganore nappe. These faults are believed to have formed during the Alleghenian deformation, but may have occurred at the end of the Taconic. Southeast of the Avondale and Cranberry faults 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.

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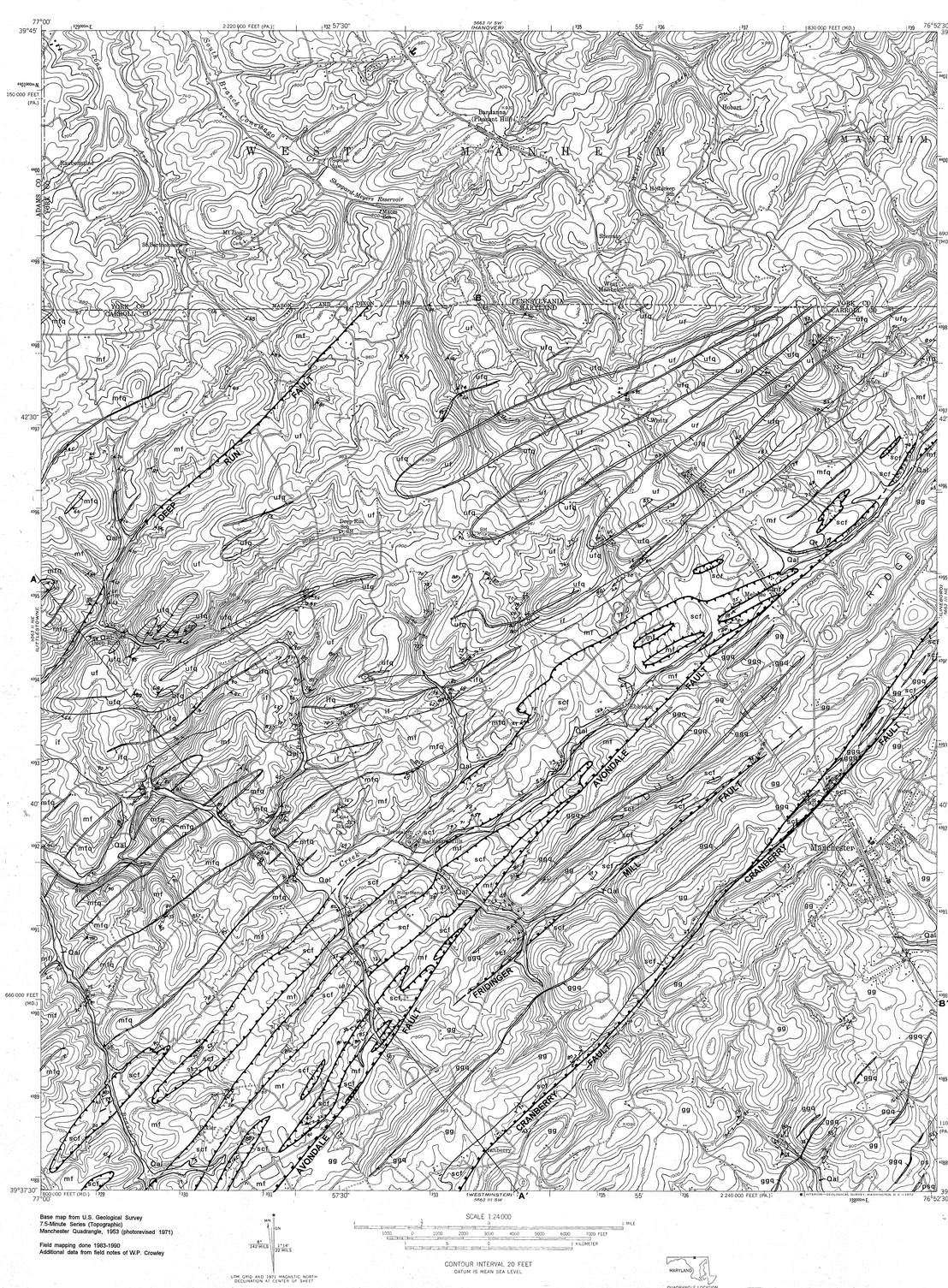
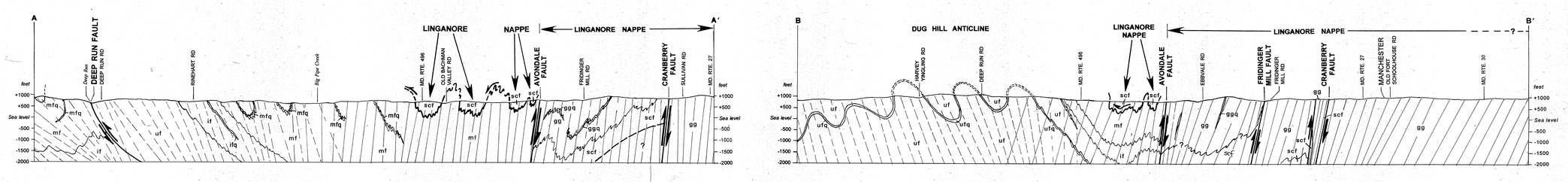


GEOLOGIC CROSS SECTIONS

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

foliation / slip cleavage



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2300 St. Paul Street
Baltimore, MD 21218-5210