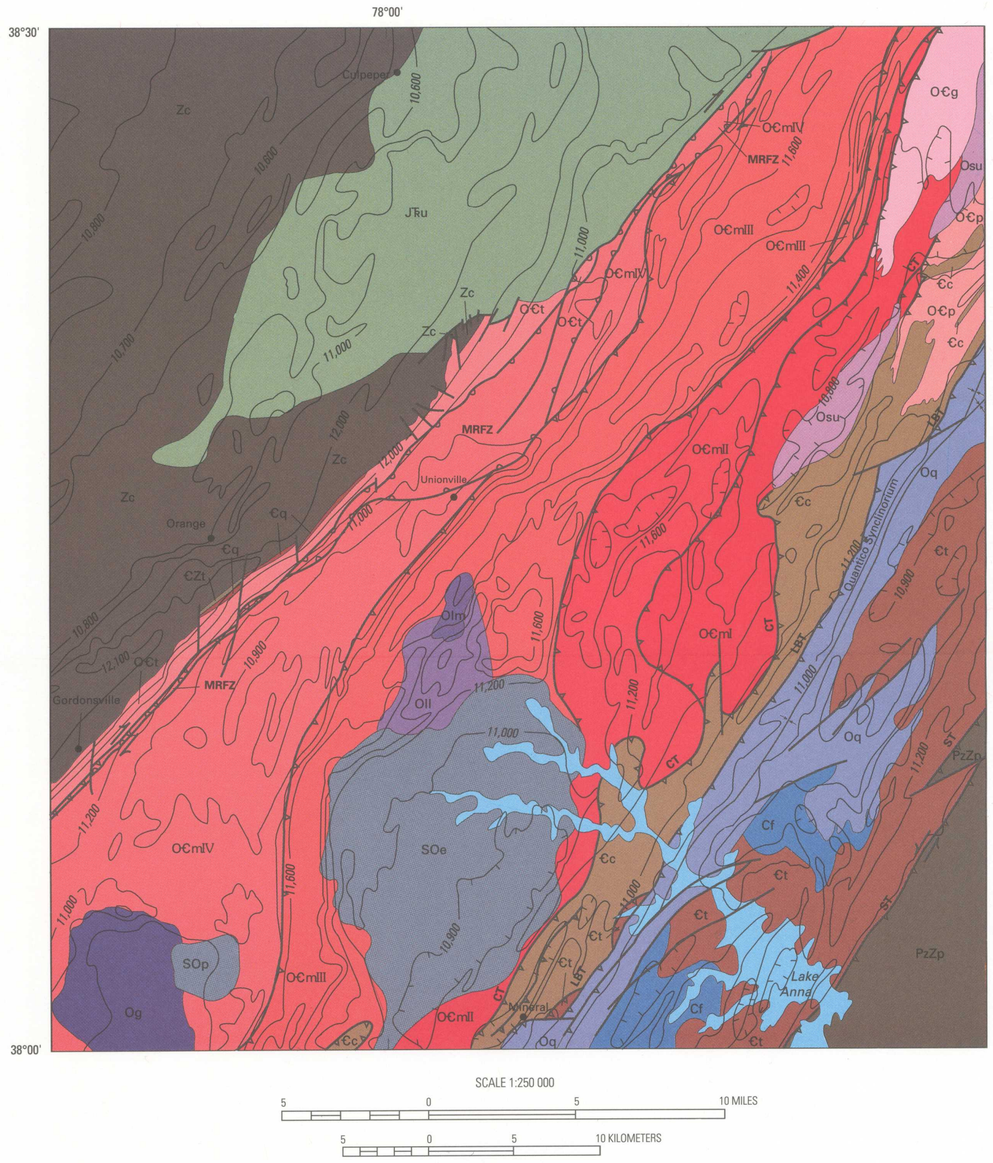
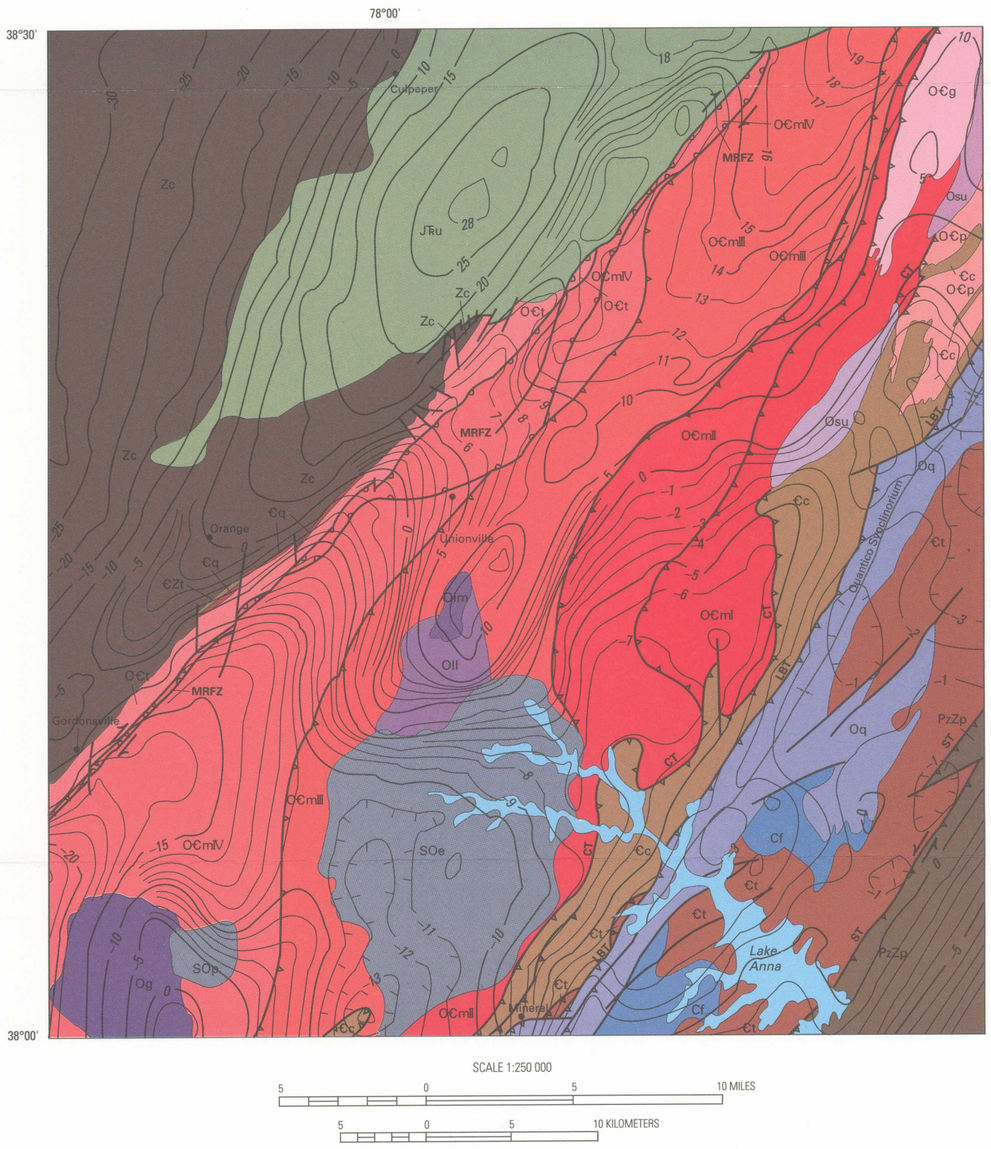
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

PROFESSIONAL PAPER 1529
PLATE 1

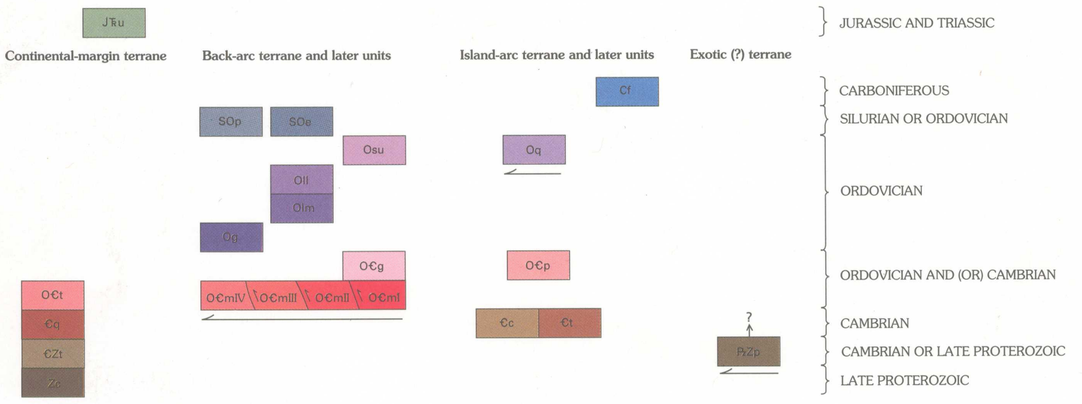



*A*—Simplified geologic map of a part of the Piedmont, Blue Ridge, and Mesozoic basin terranes of north-central Virginia with superposed total intensity aeromagnetic contours modified from Zeitz and others (1978). Contours, in gammas, are at variable intervals.




*B*—Simplified geologic map of a part of the Piedmont, Blue Ridge, and Mesozoic basin terranes of north-central Virginia with superposed gravity contours modified from the Bouguer anomaly map of Daniels and Leo (1985). Contours, in milligals, are at variable intervals.

## CORRELATION OF MAP UNITS




## DESCRIPTION OF MAP UNITS

JTru **Culpeper basin rocks, undivided (Jurassic and Triassic)**—Reddish-colored conglomerate, sandstone, siltstone, and shale (Triassic) with gray to black basaltic intrusives (Jurassic)

### CONTINENTAL-MARGIN TERRANE

O€t **True Blue Formation of Pavlides (1990) (Ordovician and (or) Cambrian)**—Consists primarily of calcareous and noncalcareous slate and siltstone and lesser amounts of argillite. Limestone and quartzite are common lenticular units. Minor amounts of chert and ironstone are also present locally

€q **Quartzite-siltstone-granule conglomerate (Cambrian)**—Siliciclastic metasedimentary rocks that form discontinuous lenses unconformably above the Catoctin Formation (Zc). Some of the metasiltstones and fine-grained quartzites show crossbedding and channel structures. Other quartzites have well-rounded quartz grains

€Zt **Tomahawk Creek Formation of Pavlides (1990) (Cambrian or Late Proterozoic)**—Green and gray phyllite and graywacke

Zc **Catoctin Formation (Late Proterozoic)**—Greenstone, green phyllitic tuff, and greenschist-facies fragmental rocks (brecciated pillows?)

### BACK-ARC TERRANE AND LATER UNITS

SOp **Granitoid of the Poore Creek pluton (Silurian or Ordovician)**—Leucocratic to mesocratic, massive, anhedral, medium-grained granitoids. Composed predominantly of amphibole-biotite quartz monzodiorite. Less abundant dioritic rocks also occur in the pluton and include amphibole granodiorite, amphibole quartz diorite, and amphibole monzodiorite

SOe **Biotite granodiorite of the Ellisville pluton (Silurian or Ordovician)**—The Ellisville pluton is composed almost exclusively of biotite granodiorite that typically is coarse to medium grained, commonly mesocratic, equigranular to porphyritic in texture, and massive to strongly foliated

Osu **Metasedimentary rocks, undivided (Ordovician)**—Gray to green silty phyllite, gray to white metasiltstone and fine-grained quartzite, fine-grained mica schist or semi-schist, green slate and phyllite, and sparse granule quartzite and graywacke layers

**Lahore Complex (Ordovician)**

Oll Monzonite of the Lahore pluton—Dark-gray to black, fine- to medium-grained, massive to faintly foliated pyroxene-bearing monzonite occurs along the eastern side of the granitoid mass and grades westward into mesocratic, fine- to medium-grained, generally strongly foliated, amphibole-rich monzonite that comprises the bulk of the pluton. Described in text

Olm Rocks of the mafic pluton—A composite mass that contains partially serpentinized pyroxenite consisting of well-formed diopside that is rimmed by antigorite as well as amphibole; diopside metapyroxenite present as a medium-grained rock with cores of diopside enclosed by tremolite that apparently has replaced it marginally. Described in text

Og **Rocks of the Green Springs pluton (Ordovician)**—Composed of coarse- to medium-grained, melanocratic metamorphosed mafic rocks along part of the eastern margin of the pluton. Includes a variety of rocks such as metadiorite, amphibolite, metagabbro, mafic augen gneiss, and hornblendite

O€g **Metamonzogranite of the Goldvein pluton (Ordovician and (or) Cambrian)**—Coarse- to medium-grained, mesocratic, weakly to strongly foliated metamonzogranite. Pink and green altered feldspars color parts of the pluton

**Mine Run Complex (Ordovician and (or) Cambrian)**—The four thrust slices that comprise the Mine Run Complex are numbered from east to west as I through IV. In general, the matrix rocks of these four melange zones in fresh outcrop are various shades of gray or green, and many of the matrix rocks are metagraywackes

O€mlV Melange zone IV—Fine-grained, gray-green to green metavolcanic phyllites are intercalated with metavolcaniclastic phyllites and other metasedimentary rocks. These metavolcanic and intercalated metasedimentary rocks pass gradationally across strike to the west into mostly fine-grained metasandstone and metasiltstone. Melange zone IV locally contains pebble-sized exotic material. Thin diamictic lenses that contain phyllite and other fragments occur just east of the Green Springs pluton. Some large mafic-ultramafic masses south of the mapped area are interpreted as exotic blocks within this melange zone. Deformation is demonstrated by microfolds; shearing is common in such folds. Fine-grained quartzites near the Mountain Run fault zone gradually develop anastomosing foliation planes, and layering and folds are disrupted by shearing. Quartzites locally grade into and become indistinguishable from the phyllonites and mylonites of the Mountain Run fault zone

O€mlII Melange zone III—Phyllite and schist are the matrix lithologies of this melange zone. One of its major features is the abundance of euhedral magnetite. This magnetite invariably truncates or crosscuts rock foliation and is believed to be a late metamorphic mineral. Many of the matrix rocks are highly deformed on a mesoscopic and microscopic scale. Polydeformation of the matrix phyllites and schist is evident from the folding of early foliation. Coarse-grained metasandstone and metaconglomerate beds are sparse, local-matrix lithologies. Mafic and undivided ultramafic blocks and a few blocks of felsic and mafic metavolcanic rocks, biotite gneiss, and mylonitic metatonalite are present locally as are sparse blocks of gneiss. Amphibolitic rocks are common as exotic blocks. Massive as well as foliated talc forms sparse exotic blocks. Chlorite rock, possibly blackwall formed with serpentinite, is a rare monomineralic exotic block. Many blocks are composite and are composed of various amounts and combinations of serpentinite, amphibolite, talc, or mafic rocks

O€mlII Melange zone II—This thrust slice contains felsic and mafic metavolcanic blocks and mylonitic granitoid blocks. The matrix of this melange zone consists of schist or phyllite that is more complexly deformed than the matrix rocks of melange zone I and that generally has crenulation cleavage

O€mlI Melange zone I—The easternmost melange zone contains a few widely scattered exotic blocks. The matrix rocks of this melange zone are fine-grained schist and phyllite locally enclosing coarse-grained metasandstone beds. Two types of exotic blocks in this melange zone are felsic and mafic metavolcanic blocks similiar to those in melange zone II and mylonitic granitoid blocks that contrast in size and composition with those of melange zone II

### ISLAND-ARC TERRANE AND LATER UNITS

Cf **Falmouth Intrusive Suite (Carboniferous)**—Fine-grained monzogranite and pegmatitic granite, fine-grained granodiorite, and tonalite (less common)

Oq **Quantico Formation (Upper Ordovician)**—A dark-gray, micaceous, fine- to medium-grained staurolitic schist and biotite-muscovite garnetiferous schist that locally contains kyanite. Quartzite forms thin discontinuous lenses within the formation and locally at the base of the Quantico. Calc-silicate layers are present locally

O€p **Plagiogranite tonalite (Ordovician and (or) Cambrian)**—Plagiogranites and related rocks; normally leucocratic to mesocratic, quartz-rich, metaintrusive rocks. Typically plagioclase rich, having minor or no potassic feldspar. The degree of alteration is variable in the pluton. In places, plagioclase is slightly altered to epidote, white mica, and chlorite. Elsewhere, feldspar is highly or completely altered to these minerals. Quartz, generally blue in color, forms granoblastic-textured aggregates that locally have a core of coarse-grained quartz having wavy extinction. Garnet is present locally. Hornblende varies from a minor to an abundant constituent, particularly in the southwestern part of the pluton. Many of the plagiogranite rocks have undergone cataclasis to varying degrees and locally are protomylonitic to mylonitic

€c **Chopawamsic Formation (Cambrian)**—Consists of lenses and tongues of metavolcanic and metasedimentary rocks and does not contain single units that have great lateral extent. The metavolcanic rocks include silicic, intermediate, and mafic varieties, some of which probably were flows, as suggested by their highly vesicular character. Fragmental rocks are mainly breccias and tuffs. Many fine-grained feldspathic schists and phyllites without identifiable fragments are similar mineralogically and chemically to the more distinctive volcanic rocks and may be tuffaceous. Schists, meta-arenites, and locally, amphibole-free gneisses of probable sedimentary origin are interlayered with the clearly metavolcanic rocks, and the proportion of such metasedimentary rocks varies from place to place along the formation. Silicic metavolcanic rocks typically are light gray, and some have small phenocrysts of quartz and (or) feldspar. Some felsic metavolcanic rocks contain albitic plagioclase and quartz in a finer grained quartzofeldspathic groundmass and are keratophyres. The intermediate metavolcanic rocks are dark to light green and commonly have a nematoblastic groundmass texture formed by aligned prismatic amphibole intergrown with fine-grained quartz and feldspar. Mafic rocks of the Chopawamsic Formation include amphibolite greenstone and various dark schists

€t **Ta River Metamorphic Suite (Cambrian)**—In the northern part of its outcrop belt, the Ta River Metamorphic Suite is chiefly amphibolite gneiss associated with conformable granitoid rocks and smaller amounts of biotite gneiss and schist. To the southwest along strike, the Ta River contains more biotite gneiss and schist and smaller amounts of amphibolite gneiss. An increase in regional metamorphic grade also occurs in the southwestern part of the Ta River, and the associated granitoid bodies include more felsic types than does the northeastern part of the Ta River. The characteristic amphibolitic rocks of the Ta River are generally dark-gray to black, well-foliated gneiss units that are rarely layered. The gneiss ranges from amphibolite through various types of amphibolite gneiss to biotite gneiss. Some of the amphibolite in the southern part of the outcrop belt contains pyroxene, which may reflect higher grade regional metamorphism here than in the Ta River terrane to the northwest

### EXOTIC (?) TERRANE

PzZp **Po River Metamorphic Suite (lower Paleozoic and (or) Late Proterozoic)**—Biotite gneiss and schist; the most common lithology is biotite gneiss. Characteristically, the gneiss is a dark-colored, layered, and foliated rock; micaceous minerals are concentrated in the dark layers and quartz and feldspar are concentrated in the light layers. However, all gradations in the relative proportions of mica, quartz, and feldspar are found in the various layers that constitute the gneiss. Feldspar occurs both as a groundmass constituent and very commonly in large augen-shaped grains. Hornblende-bearing gneiss is also present in the Po River Metamorphic Suite but in subordinate amounts as compared with the biotite gneiss. Physically, it resembles the biotite gneiss in color and texture but contains varying amounts of hornblende, as well as biotite. Garnetiferous two-mica schist is found locally in the Po River Metamorphic Suite and has a foliation conformable with the adjacent gneisses. Many foliated gneissic granitoid rocks, including pegmatoids, are found as tabular bodies, as well as nontabular masses, in the Po River Metamorphic Suite. The tabular granitoid and pegmatoid bodies form concordant, sill-like layers. They range from less than 2.5 cm wide to as much as about 7.6 m wide. Locally, thinner granitoid layers about 0.5–1.0 cm wide are conformable with the foliation in the gneiss. The nontabular, irregularly shaped granitoid bodies generally form relatively large masses that may be parts of plugs and plutons of various sizes. Well-defined lenticular units include coarse-grained, strongly foliated, strongly layered (0.5 cm–0.3 m) garnet-muscovitic quartzofeldspathic gneiss that locally grades into biotite gneiss

## EXPLANATION OF MAP SYMBOLS

**Contact**

**Fault**

**Thrust fault**—Sawteeth on upper plate. Arrows show direction of possible late strike-slip movement. CT, Chopawamsic thrust fault; LBT, Long Branch thrust fault; ST, Spotsylvania thrust fault

**Limits of Mountain Run fault zone** (MRFZ)

# SIMPLIFIED GEOLOGIC MAP OF A PART OF THE CENTRAL VIRGINIA PIEDMONT, BLUE RIDGE, AND MESOZOIC BASIN TERRANES WITH (*A*) SUPERPOSED AEROMAGNETIC CONTOURS AND (*B*) SUPERPOSED GRAVITY CONTOURS

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Pavlides, Louis, Arth, J.G., Sutter, J.F., Stern, T.W., and Cortesini, Henry, Jr., 1994, Early Paleozoic alkalic and calc-alkalic plutonism and associated contact metamorphism, central Virginia Piedmont: U.S. Geological Survey Professional Paper 1529