An Introduction to the Geology of Virginia

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Topics to cover:

- Why is geology important?
- Physiography (physical geography)
- Geology – by province
Why is geology important?

It creates **topography**

It makes **soil**

It channels **water**

Geology + Climate = Ecology
Elklick Woods, Fairfax County

Northern hardpan basic oak-hickory forest
Why is geology important?

Geology influences human activity

Transportation    Industry
Population        Commerce
Land use          Hobbies
Green Springs Historic District, Louisa County
Green Springs Historic District, Louisa County
Rich Valley, Smyth County, VA

Geology – Limestone
Poor Valley, Bland County, VA

Geology – Black shale
The Virginia physiographic provinces you may have learned in school...

Chuck Bailey, College of William and Mary
...a more detailed look at these provinces

Acknowledgement to Chuck Bailey, William and Mary
Virginia’s physiography is controlled by geology.
Unconsolidated Sediments

Crystalline metamorphic and igneous rocks

We use the same province names for geologic provinces

Appalachian Plateau

Valley and Ridge

Mesozoic Basins

Sedimentary Rocks

Blue Ridge

Piedmont

Coastal Plain

Unconsolidated Sediments
Valley and Ridge

**Carbonate** and **clastic** sedimentary rocks (limestone, dolomite, shale, sandstone, chert) with rare igneous rocks (mostly basalt).

Age: Paleozoic (320 - 550 Ma)

-mostly marine (below sea level)
-steep dips, tight folds, and faults are common.
-fossiliferous
-rare coal in youngest part of section.
Vertical beds of limestone and dolomite, Elkton
Rainbow gap, near Clifton Forge

Fold in Martinsburg Formation, near Shenandoah
Fault breccia along Pulaski fault, near Marion
Appalachian Plateau

Mostly clastic sedimentary rocks (shale, sandstone, and siltstone, with lesser limestone and coal).

Age: Late Paleozoic (290 - 320 Ma)

- mostly terrestrial (above sea level).
- gentle dips and broad folds are common.
- fossiliferous, may contain coal beds.
Red colored beds are normally associated with terrestrial deposits.
Mesozoic Basins

Clastic sedimentary rocks (sandstone, conglomerate, siltstone, shale, coal).

Igneous rocks (basalt)

Age: Mesozoic (200 - 225 Ma)

Rocks are commonly:
- terrestrial (above sea level).
- gentle dips are common
- fossiliferous and may contain coal.
Fig. 5—Early Mesozoic rift basins of eastern North America. Names of basins mentioned in the text are bold-faced. Modified from Olsen et al. (1989).
Diabase (basalt) dike

Conglomerate
Appalachian Plateau  
Valley and Ridge  
Mesozoic Basins

Sedimentary Rocks

Crystalline metamorphic and igneous rocks

Blue Ridge  
Piedmont

Coastal Plain

Unconsolidated Sediments
Blue Ridge
Intrusive and extrusive **igneous** rocks (granite, charnockite, rhyolite);
**Metamorphic** rocks (granulite, gneiss, schist, phyllite, greenstone, quartzite)
**Clastic** sedimentary rocks (sandstone, conglomerate, siltstone, shale)

Age: Paleozoic to Proterozoic (550 - 1400 Ma)

- "basement" and "cover" rocks
- two major metamorphic events
- ductile faults in basement rocks
- brittle faults and folds in cover rocks
- separated from Valley and Ridge and Piedmont by faults in most places.
- trace fossils only in youngest rocks.
Blue Ridge basement rock, Amherst County, more than 1 billion years old
Catoctin greenstone (metamorphosed basalt) I-64 near Rockfish Gap
Antietam quartzite, youngest rock in Blue Ridge

Skolithos trace fossils
Piedmont

Intrusive and extrusive **igneous** rocks (granite, gabbro, basalt)

**Metamorphic** rocks (gneiss, schist, phyllite, quartzite, amphibolite)

Age: Paleozoic to Proterozoic (300 – 750 Ma, rare 900 – 1400 Ma)

-several distinct terranes
-high to low grade metamorphism
-younger intrusive rocks
-ductile faults and younger brittle faults
-complex folds are common
-fossils are rare.
Garnets in thin section of schist
Columbia granite

Petersburg granite with pegmatite
Mylonite (ductile fault rock)
Coastal Plain

**Unconsolidated** sediments

Sand-rich and clay-rich deposits

Age: Cenozoic (0 – 65 Ma)

- marine and terrestrial deposits
- flat or gently dipping seaward
- developed during several periods of sea-level change.
- some deposits are highly fossiliferous
Sand-rich stream deposits formed when sea level was lower.

Antietam quartzite cobbles with Skolithos in Coastal Plain sediments
Clay-rich marine deposits formed when sea level was higher.

Chesapecten Jeffersonius (state fossil)