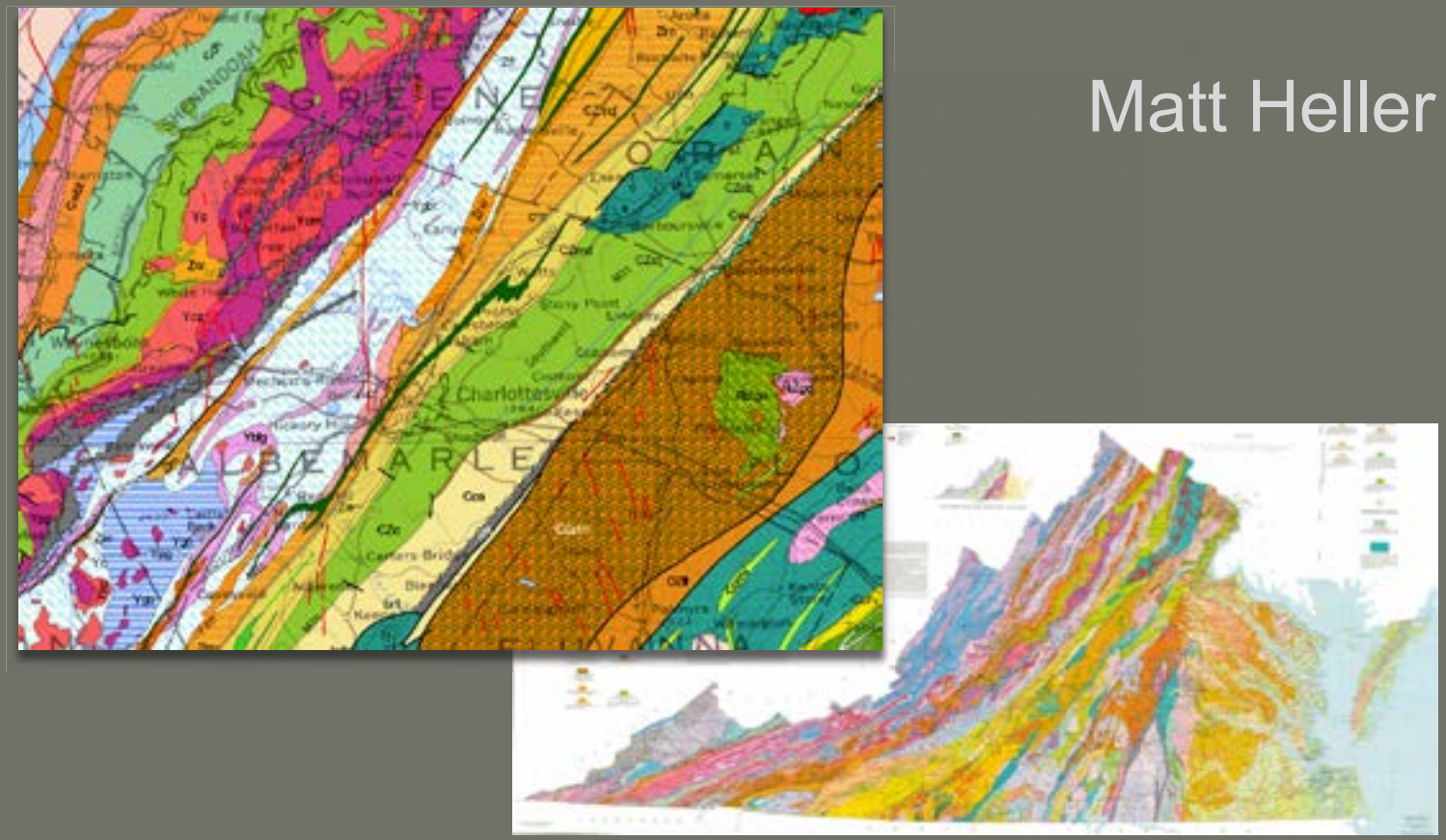
# An Introduction to the Geology of Virginia




Matt Heller

## 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

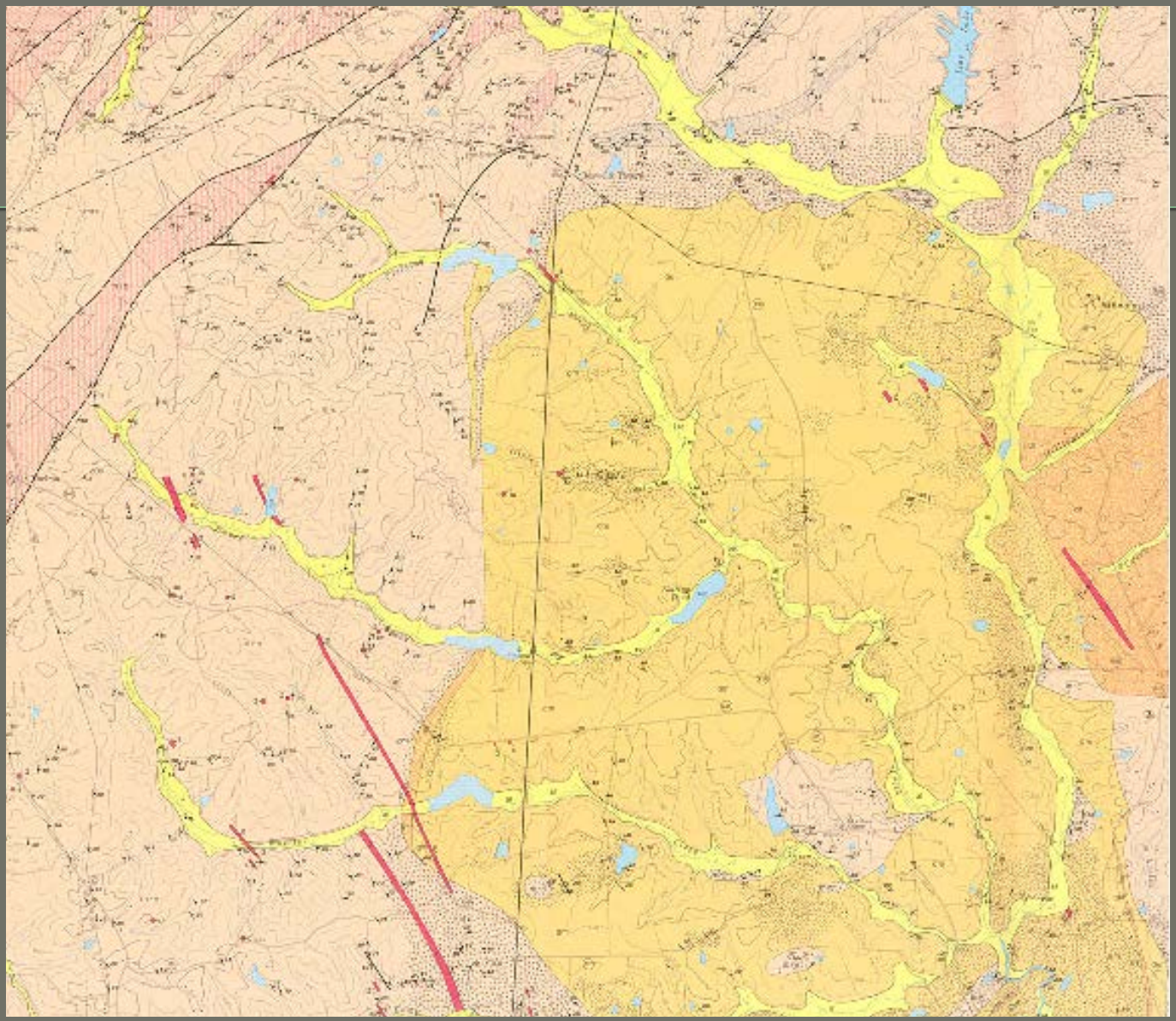
Population

Commerce

Land use

Hobbies

# Green Springs Historic District, Louisa County



Green Springs Historic District, Louisa County

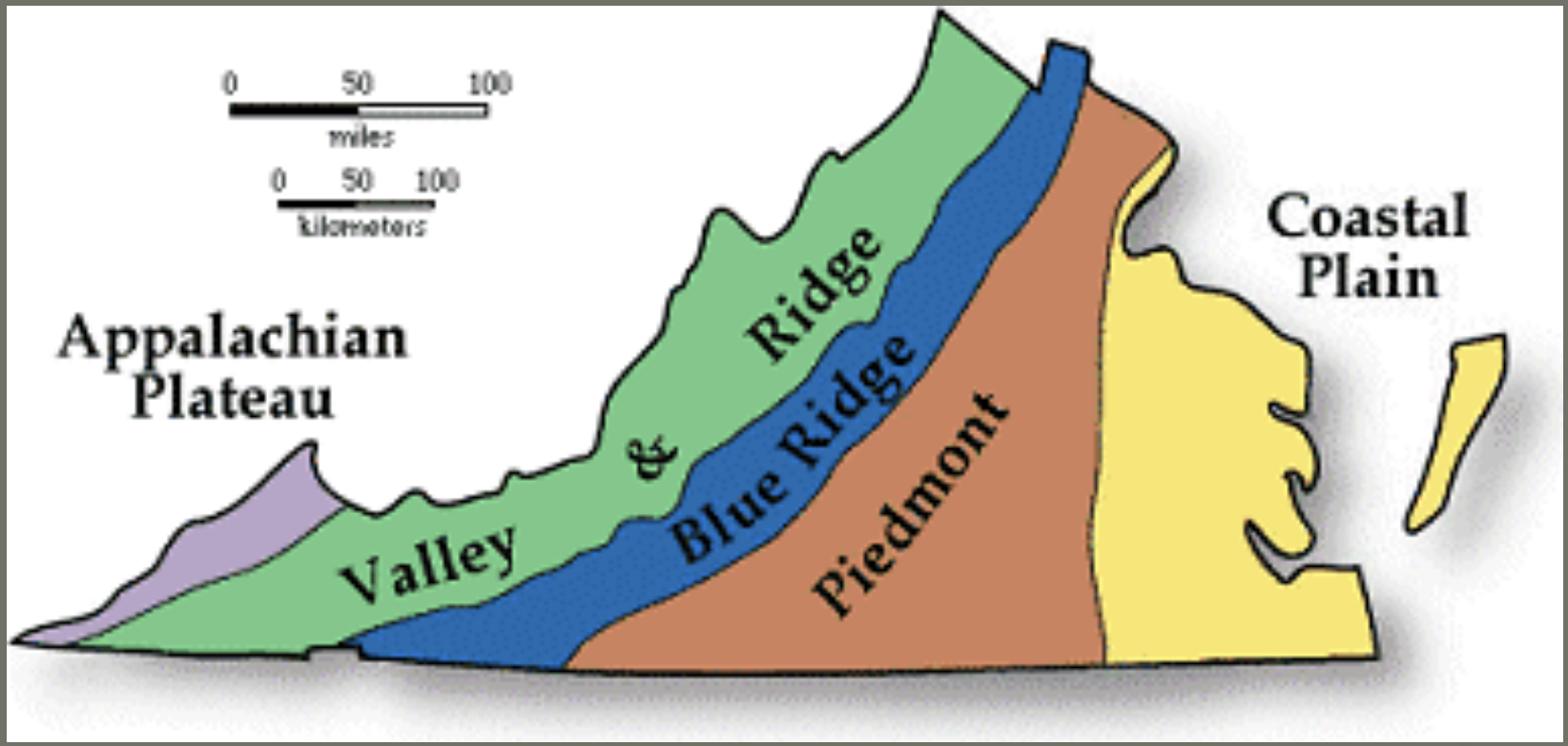
# Rich Valley, Smyth County, VA


Geology – Limestone

# Poor Valley, Bland County, VA

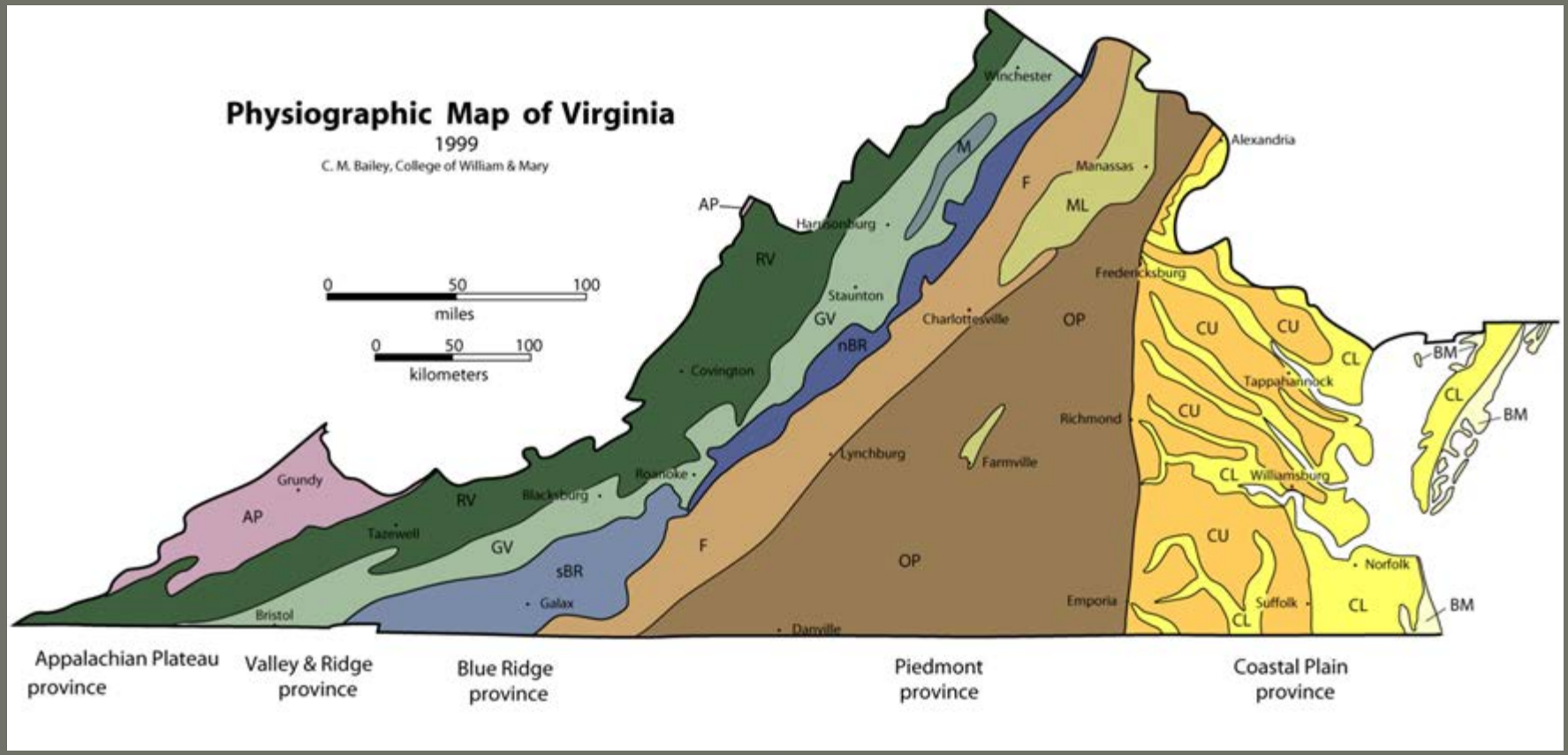

Geology – Black shale

# The Virginia physiographic provinces you may have learned in school…



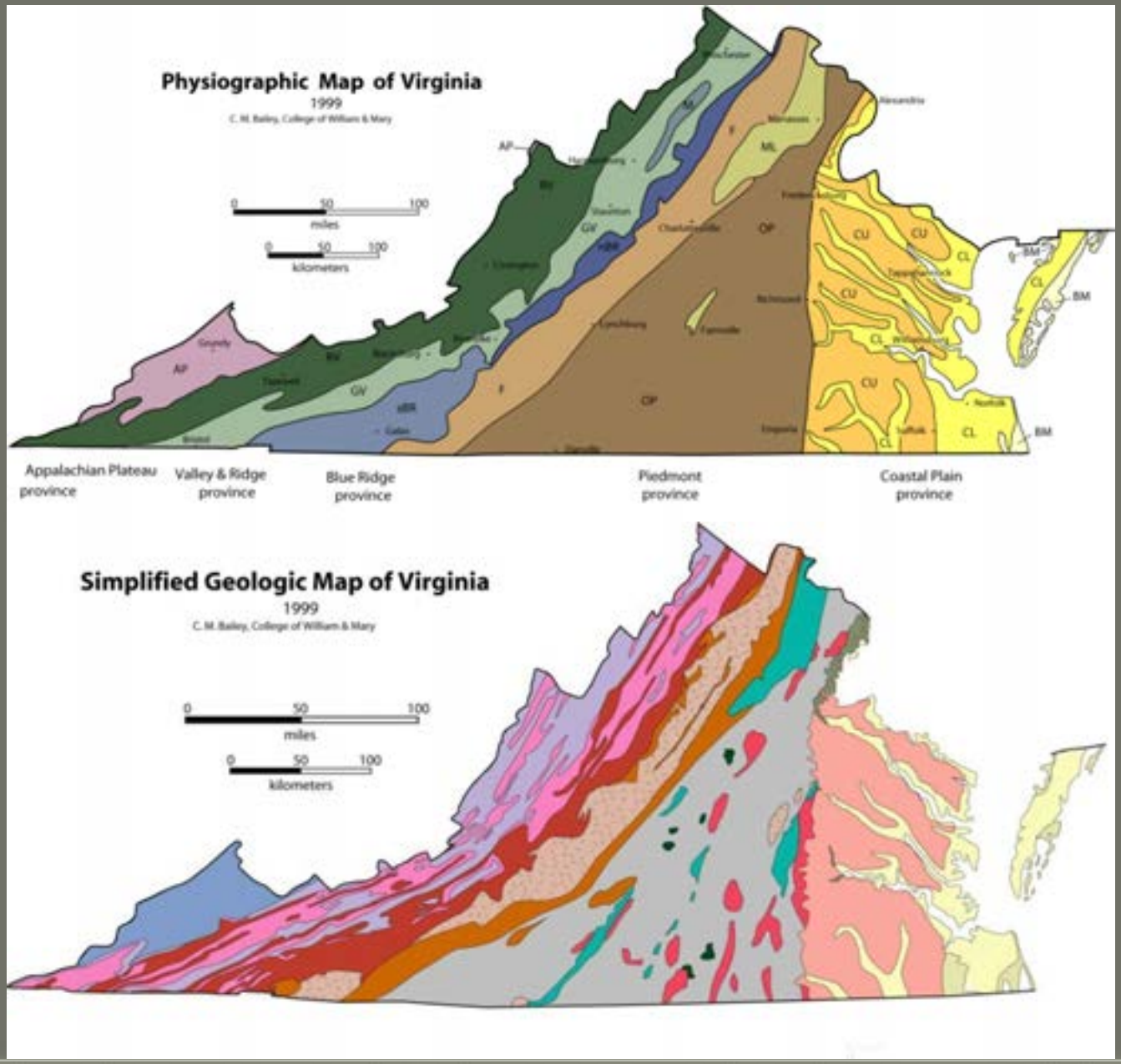

Chuck Bailey, College of William and Mary

# ...a more detailed look at these provinces

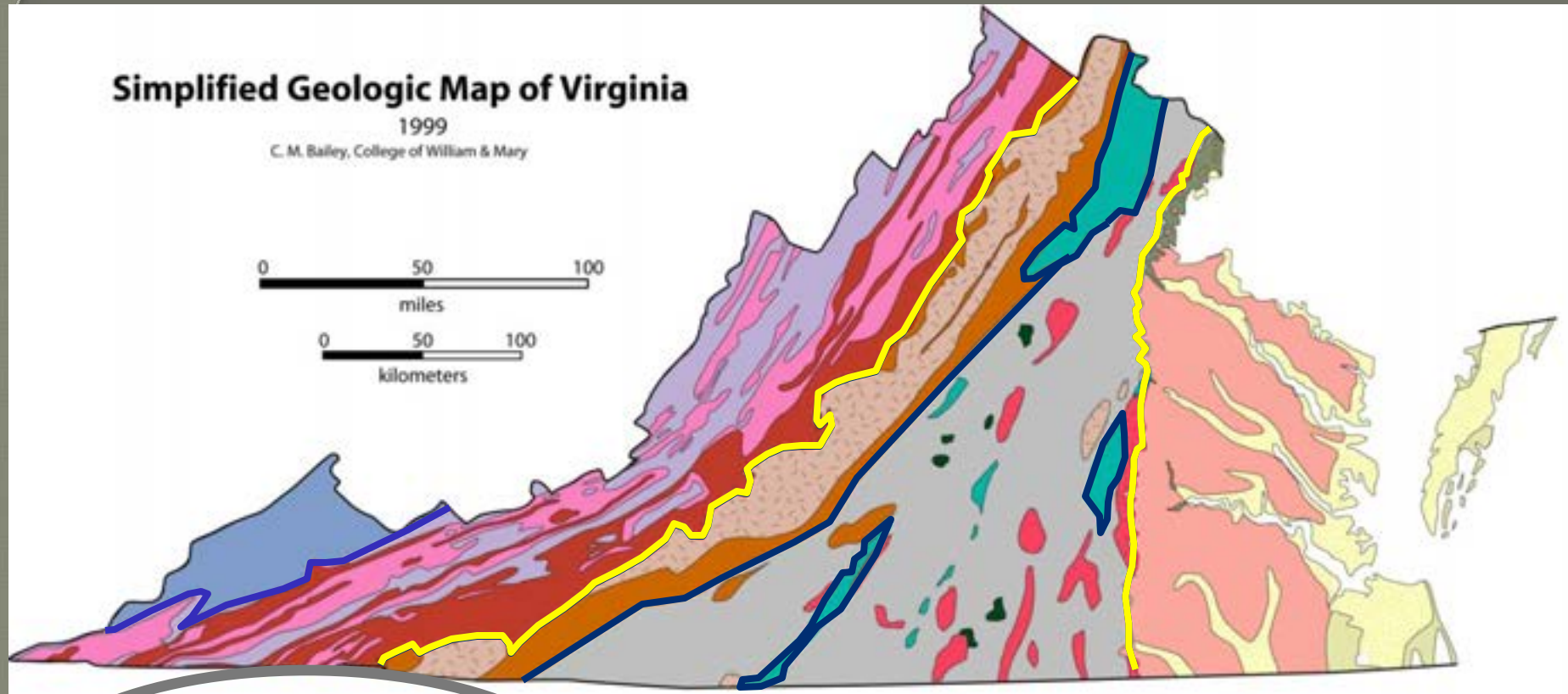



Acknowledgement to Chuck Bailey, William and Mary

# Virginia's physiography is controlled by geology



# We use the same province names for geologic provinces




***Appalachian Plateau***

***Valley and Ridge***

***Mesozoic Basins***

**Sedimentary Rocks**

***Blue Ridge***

***Piedmont***

**Crystalline metamorphic and igneous rocks**

***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

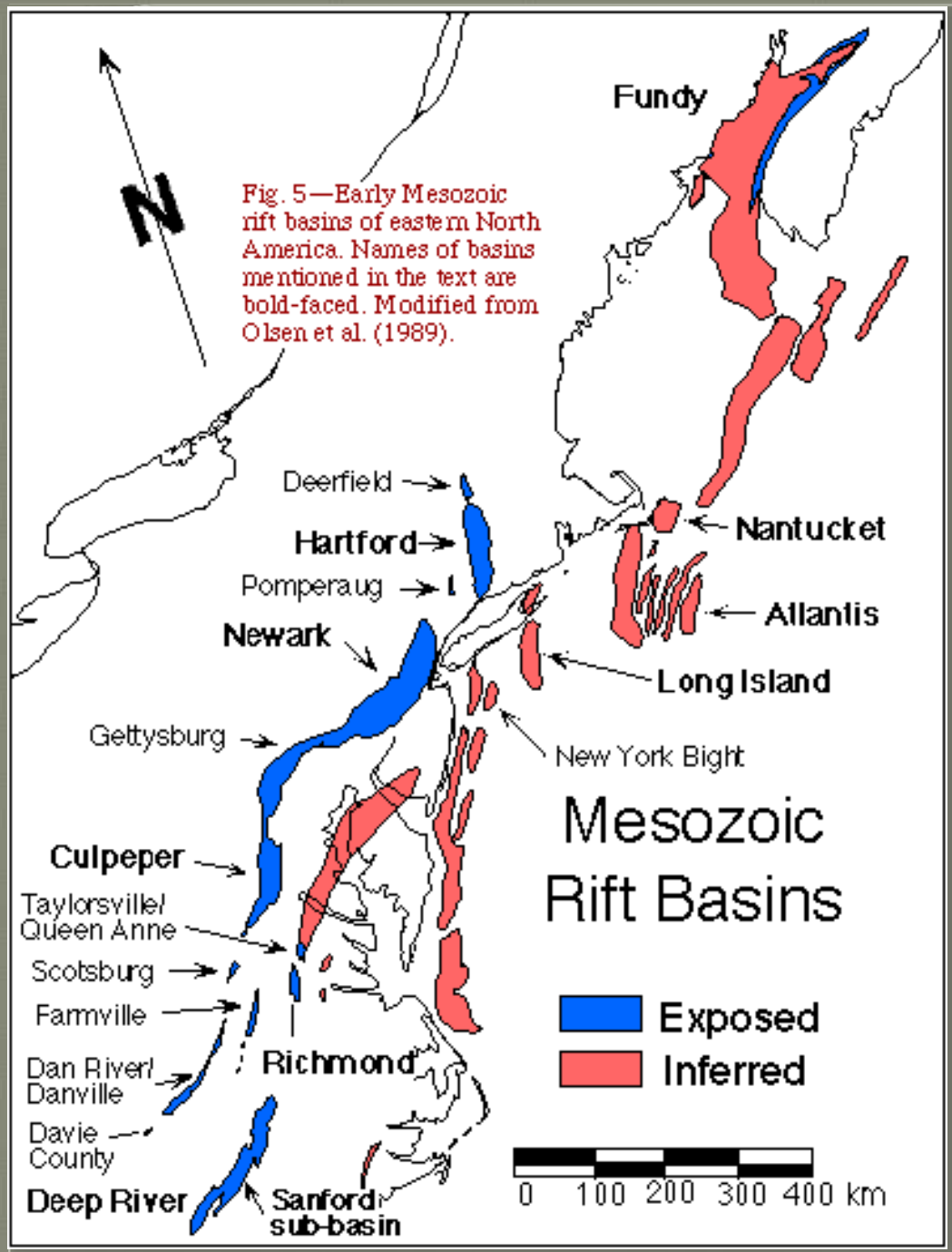
**Clastic** sedimentary rocks (sandstone, conglomerate, siltstone, shale, coal).

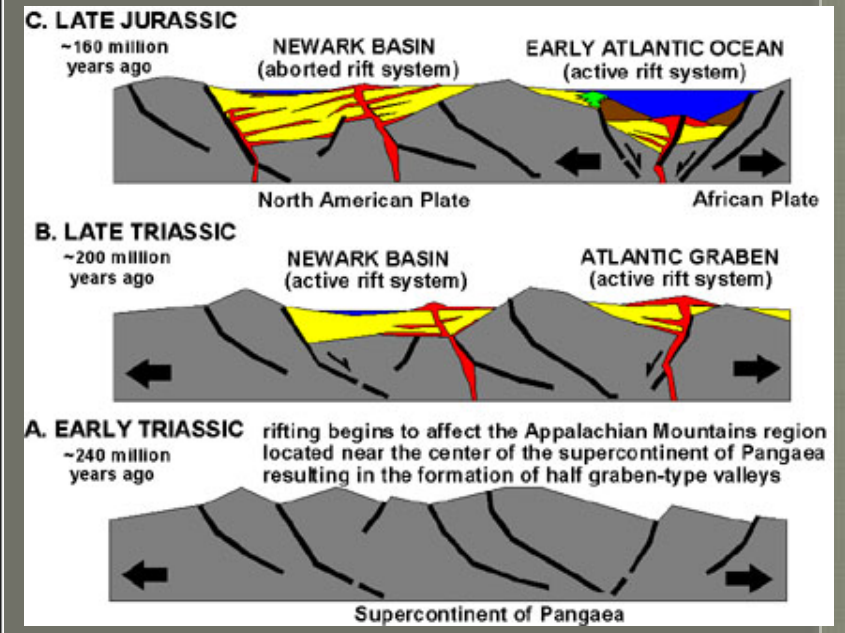
Igneous rocks (basalt)

Age: Mesozoic (200 - 225 Ma)

**Rocks are commonly:**

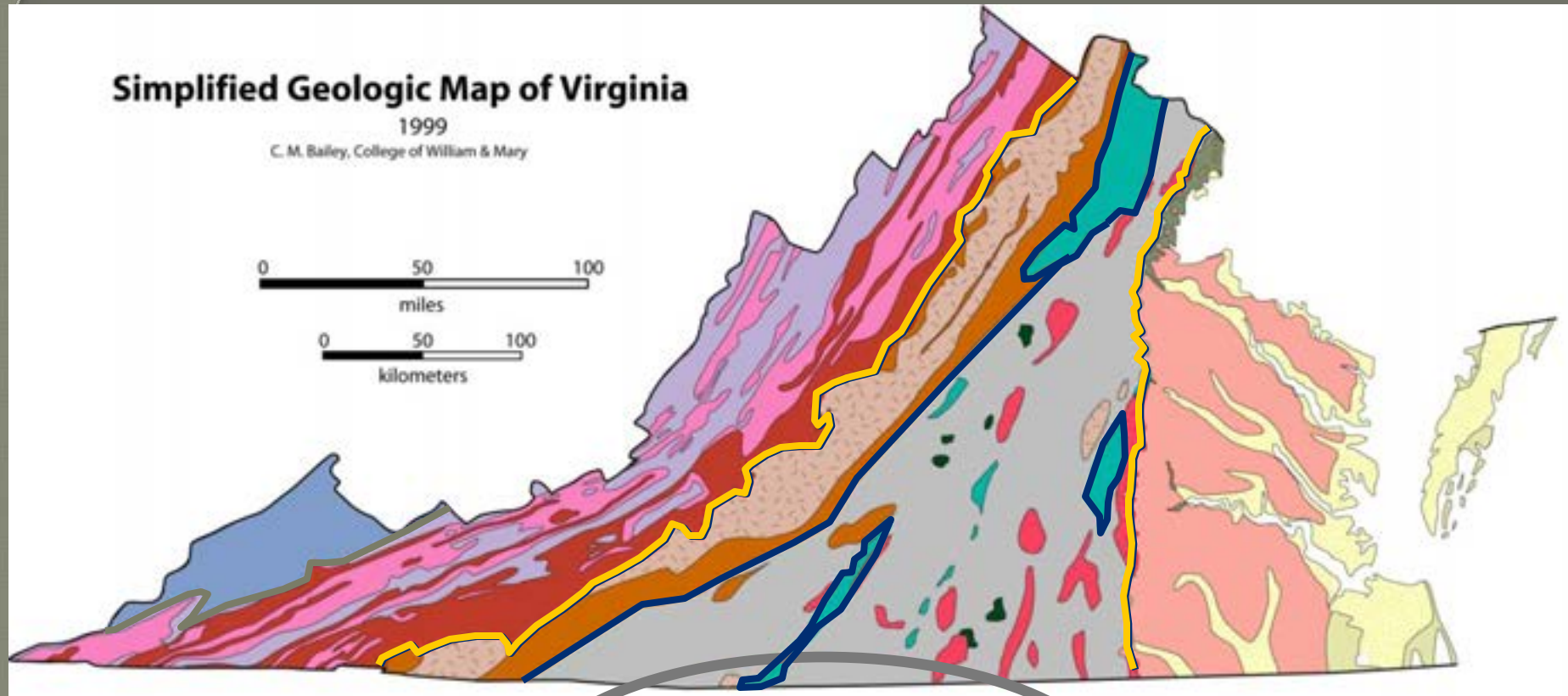
-**terrestrial** (above sea level).
-gentle dips are common
-fossiliferous and may contain coal.


N
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).
Fundy
Deerfield
Hartford
Pomperaug
Newark
Nantucket
Atlantis
Long Island
New York Bight
Gettysburg
Culpeper
Taylorsville/ Queen Anne
Scotsburg
Farmville
Dan River/ Danville
Davie County
Deep River
Sanford sub-basin
Richmond
Mesozoic Rift Basins
Exposed
Inferred
0 100 200 300 400 km


C. LATE JURASSIC
~160 million years ago
NEWARK BASIN (aborted rift system)
EARLY ATLANTIC OCEAN (active rift system)
North American Plate
African Plate
B. LATE TRIASSIC
~200 million years ago
NEWARK BASIN (active rift system)
ATLANTIC GRABEN (active rift system)
A. EARLY TRIASSIC
~240 million years ago
rifting begins to affect the Appalachian Mountains region located near the center of the supercontinent of Pangaea resulting in the formation of half graben-type valleys
Supercontinent of Pangaea


*Conglomerate*

*Diabase (basalt) dike*

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## 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 schist, phyllite, quartzite, amphibolite)

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

-several distinct terranes

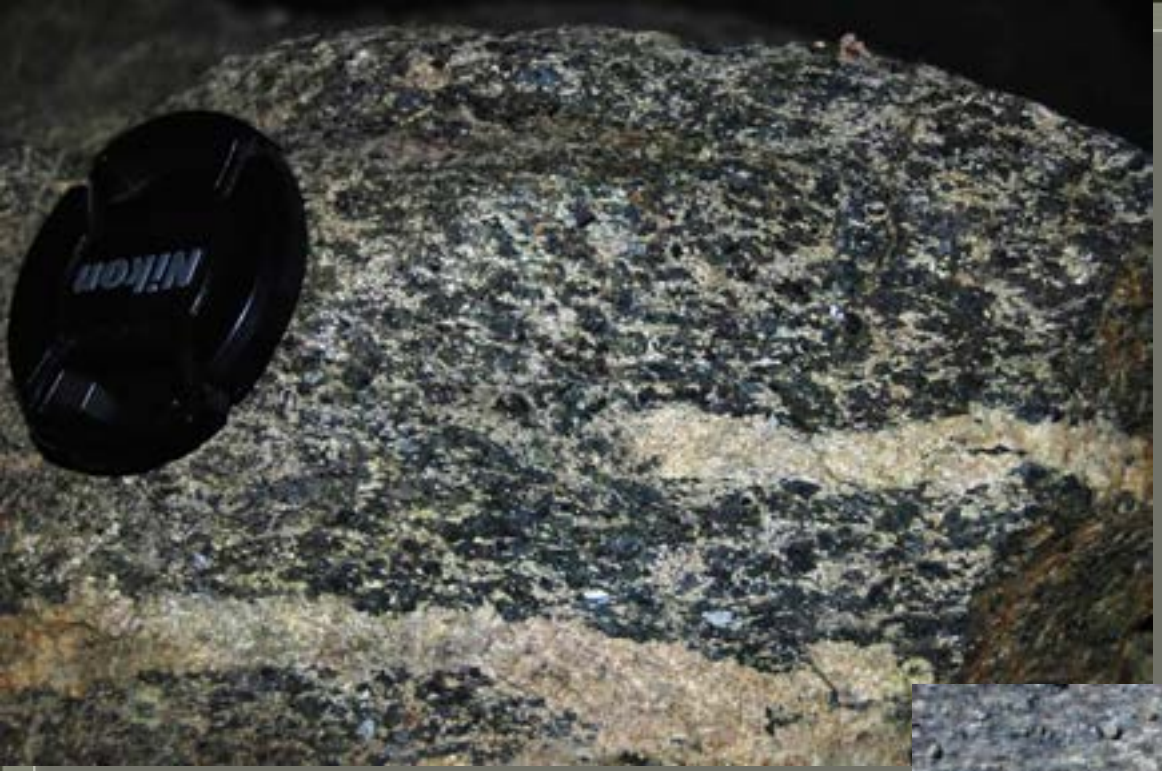
-high to low grade metamorphism

-younger intrusive rocks

-ductile faults and younger brittle faults

-complex folds are common

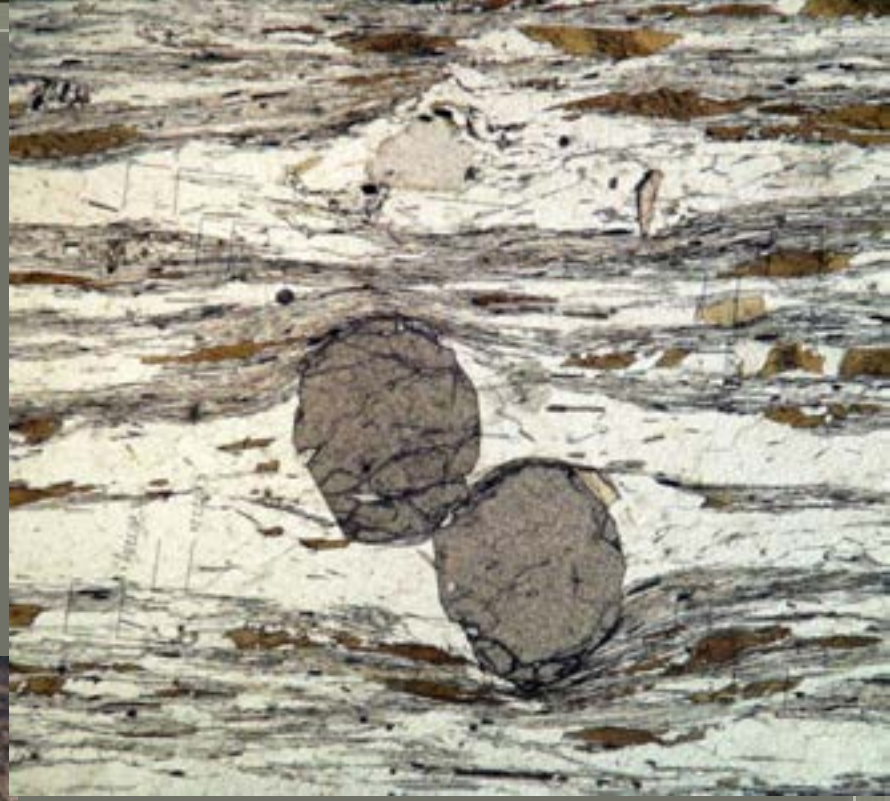
-fossils are rare.




*Amphibolite*

*Gneiss*

*Garnets in thin section of schist*

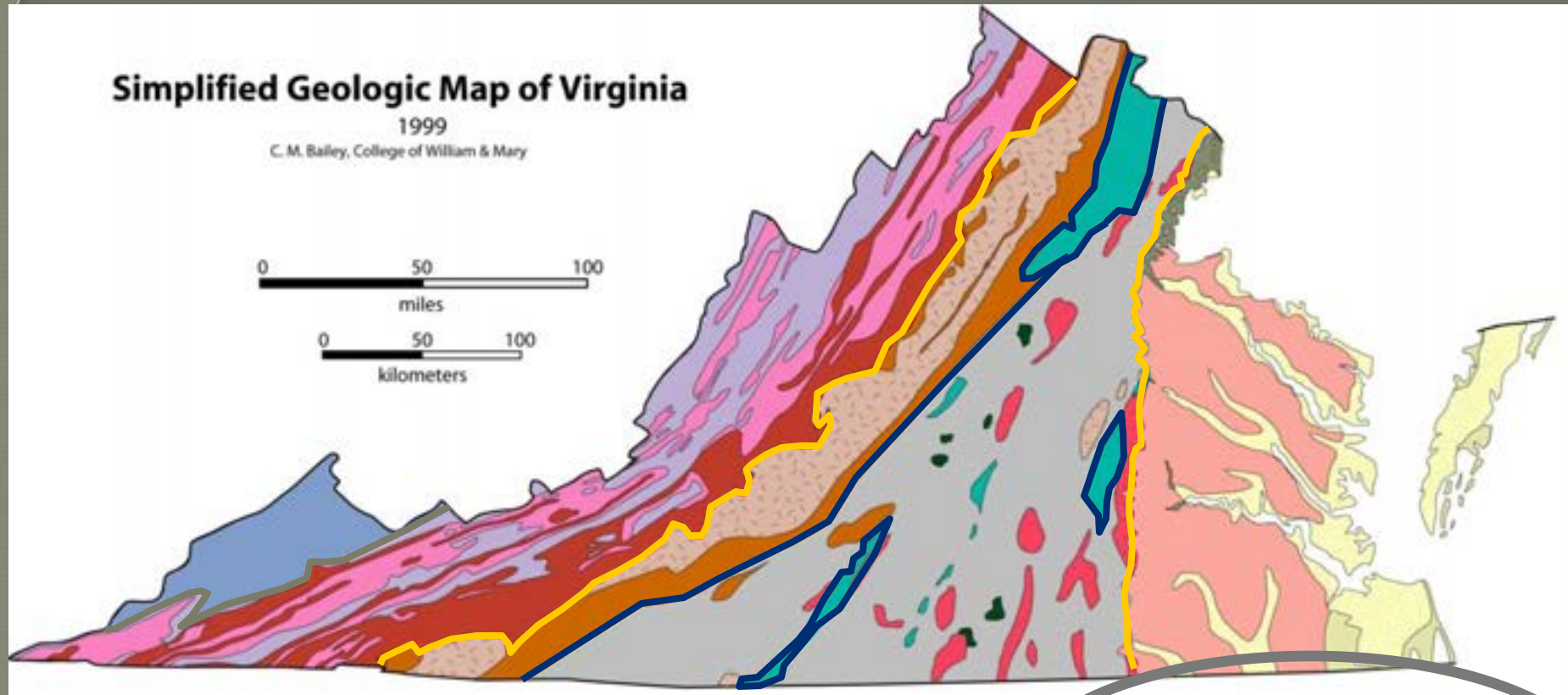


*Schist*

*Columbia granite*

*Petersburg granite with pegmatite*


*Mylonite (ductile fault rock)*

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# 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)*

# Questions?