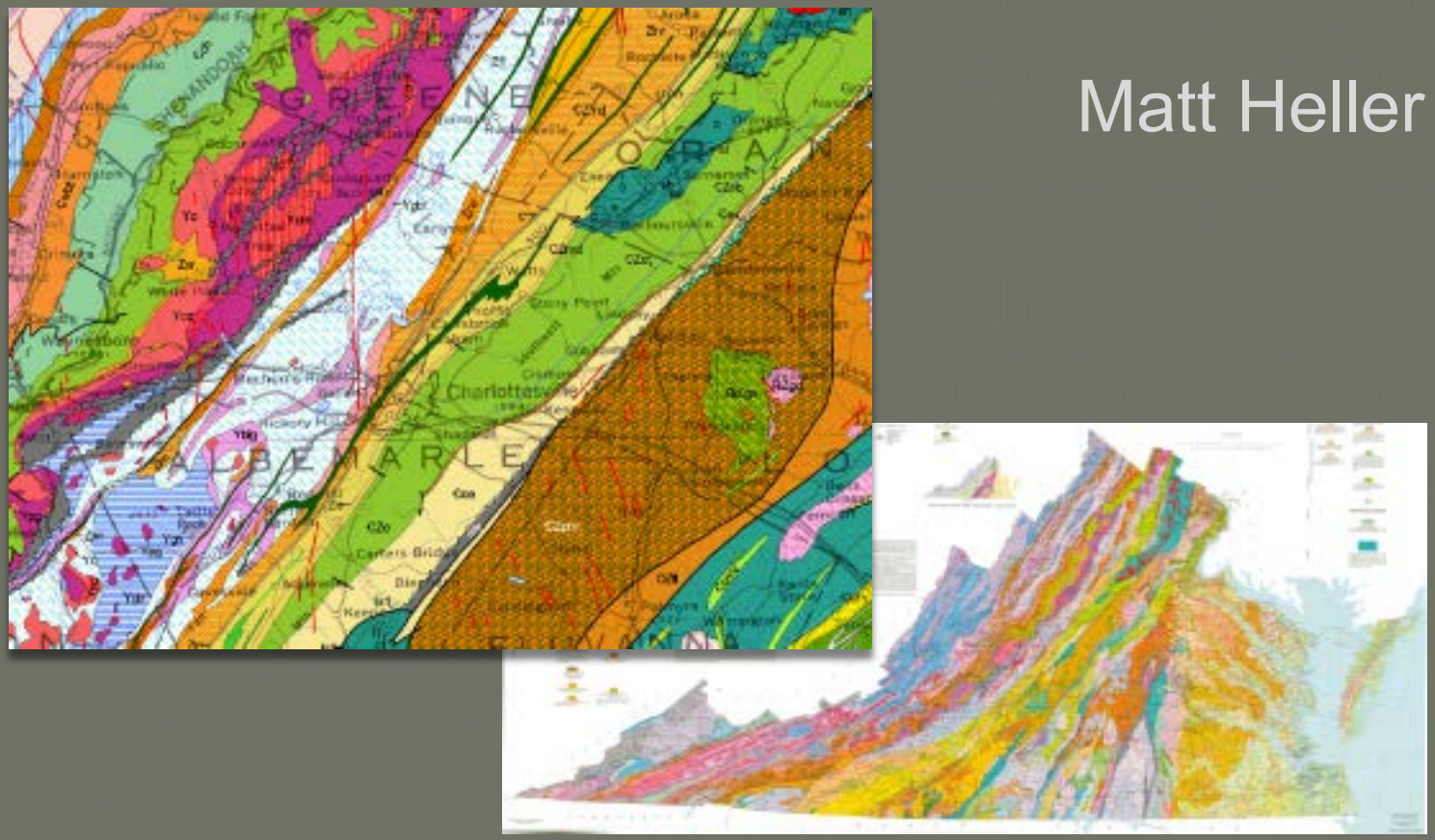
An Introduction to the Geology of Virginia



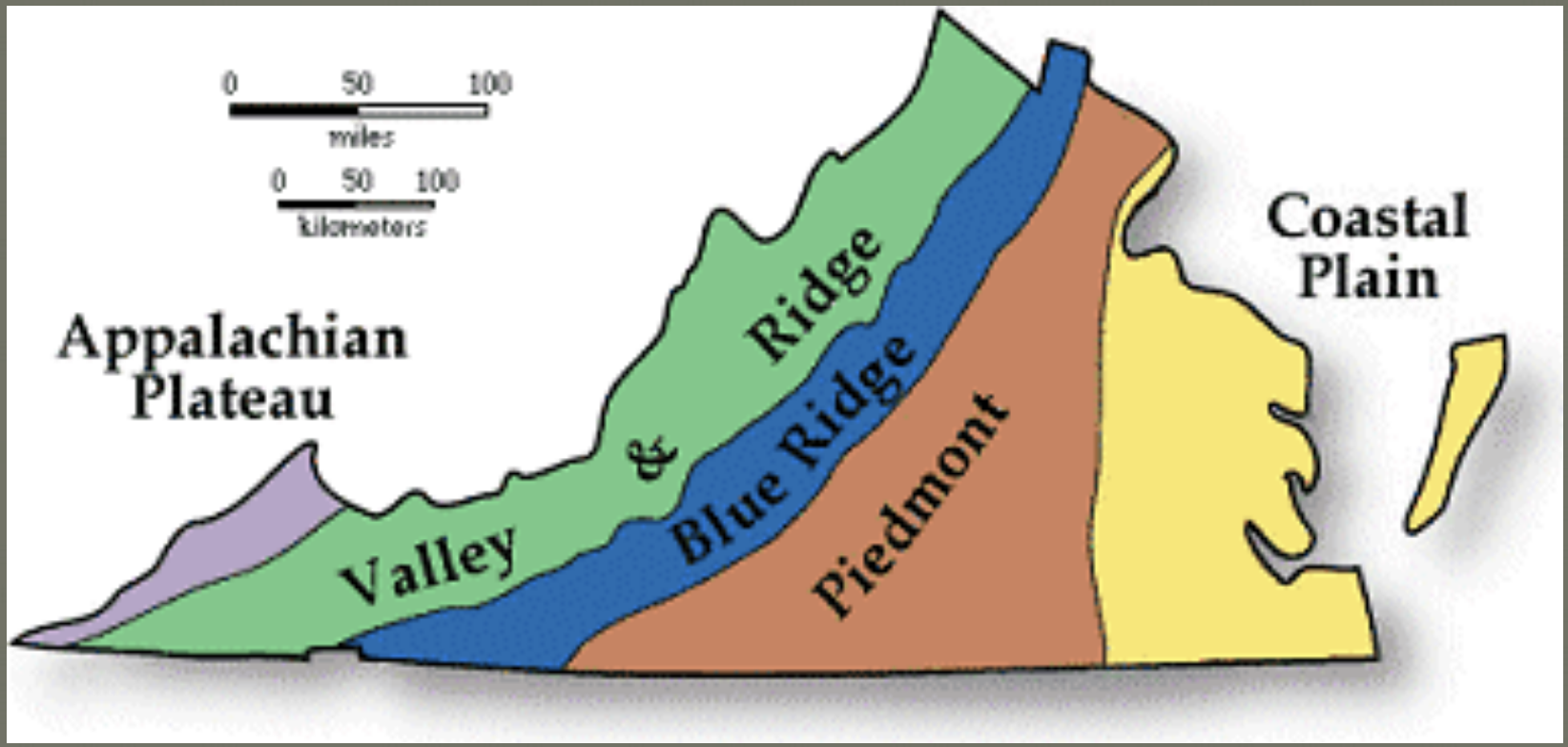
Matt Heller

Topics to cover:

Physiography

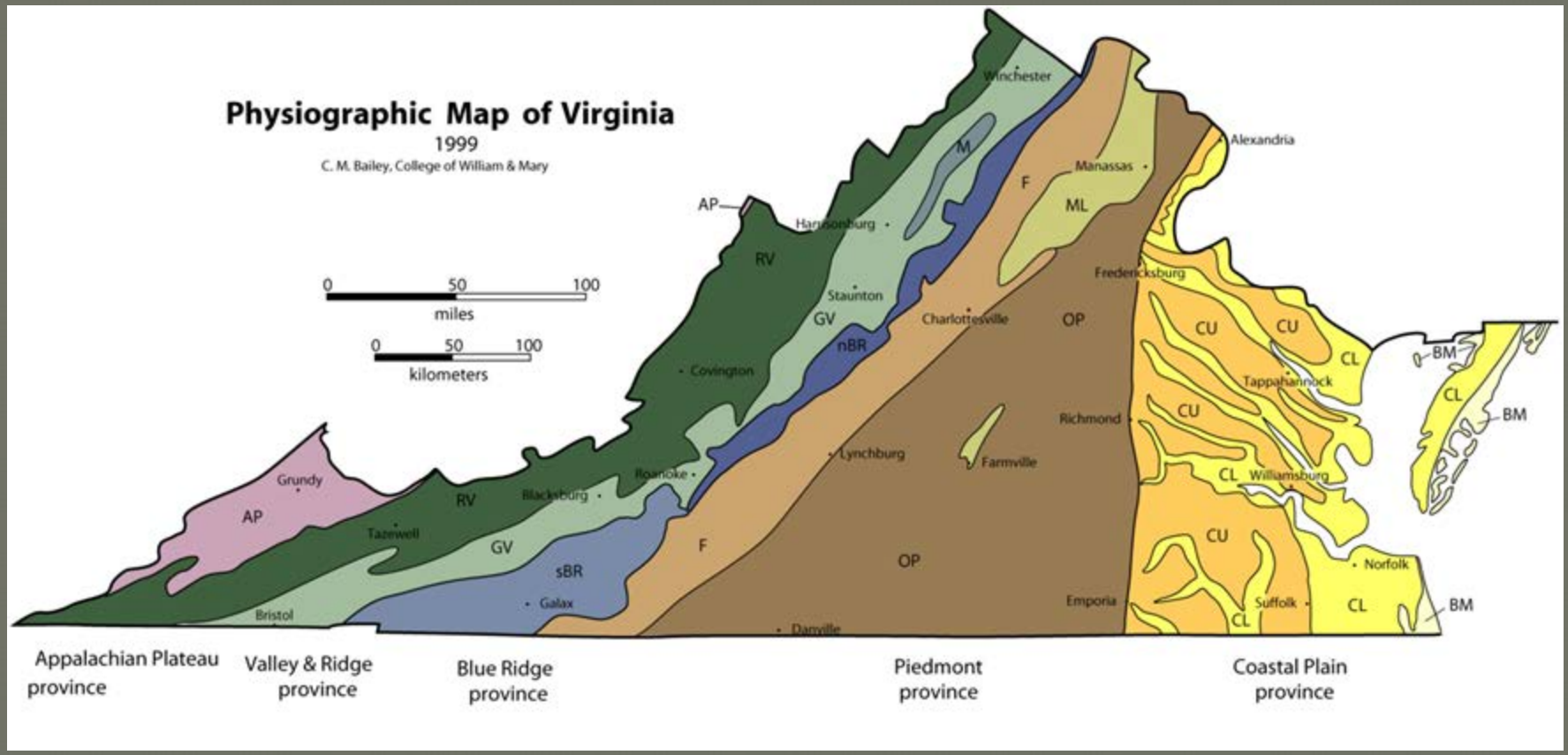
Geology – by province

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

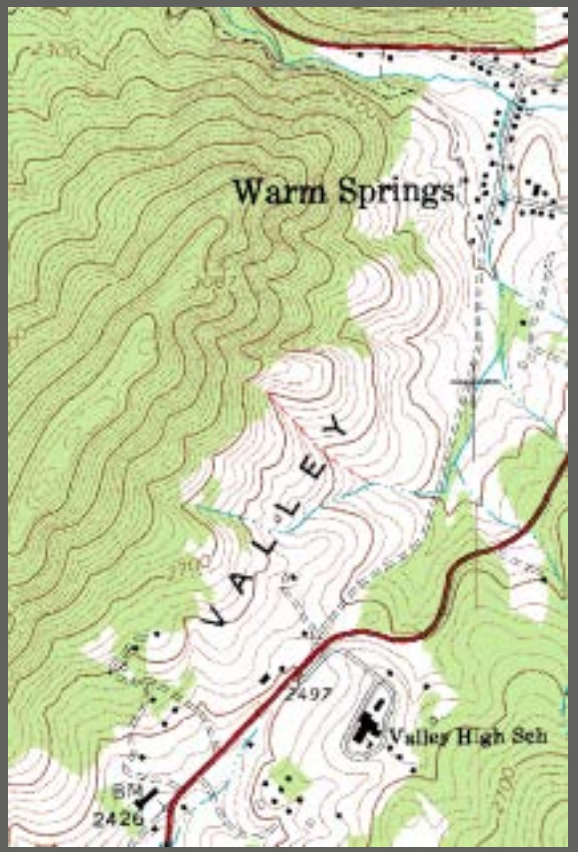
Appalachian Plateau

The Breaks Interstate Park

Grundy quadrangle
40 foot contour interval

Ridge and Valley

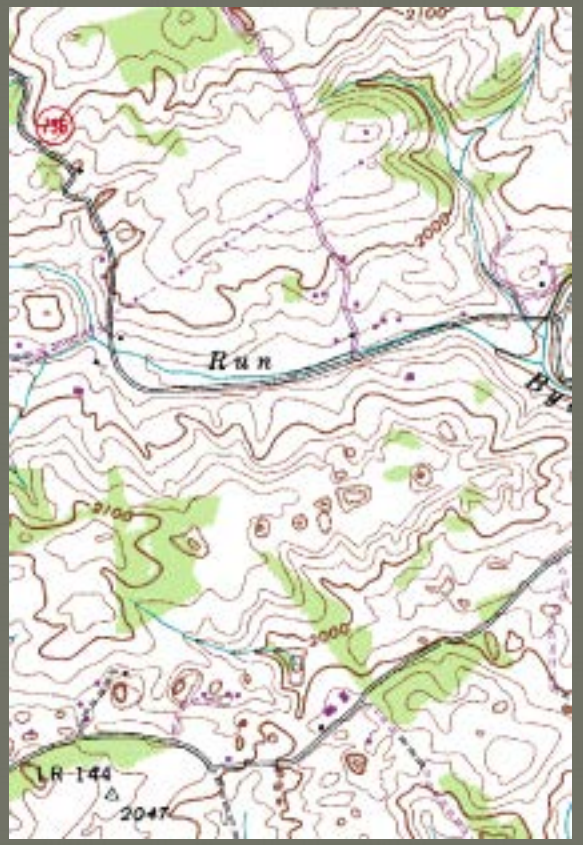
Hightown Valley, Highland County



Warm Springs quadrangle
20 foot contour interval

Great Valley

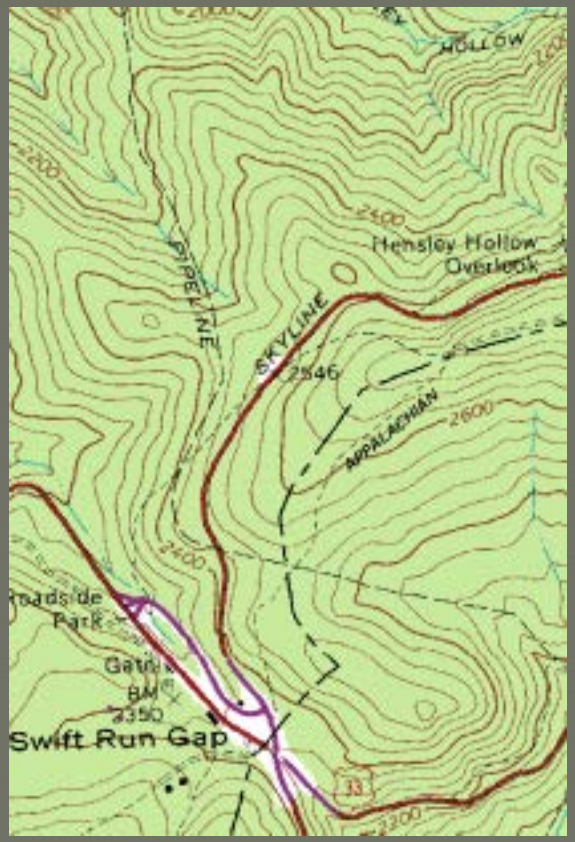
Shenandoah Valley, Rockingham County



Damascus quadrangle
20 foot contour interval

Northern Blue Ridge

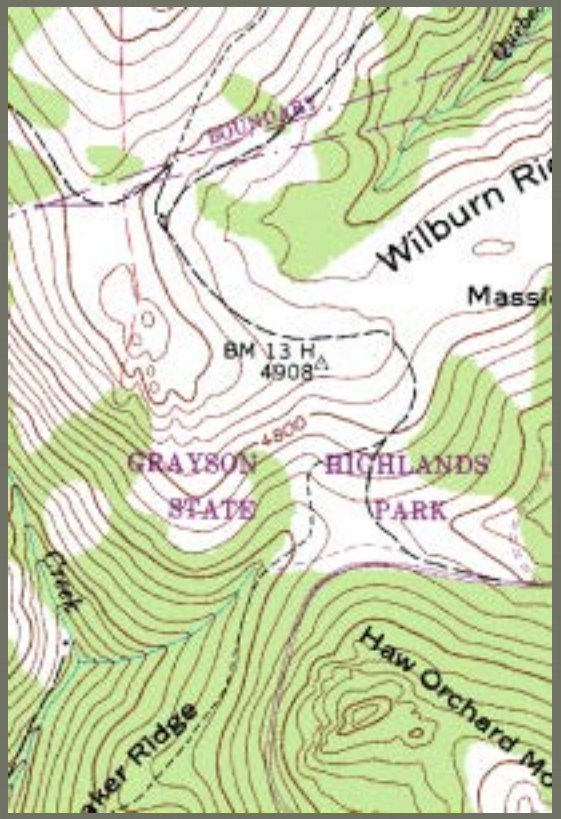
Blue Ridge Mountains seen from the Page Valley



Swift Run Gap quadrangle
40 foot contour interval

Southern Blue Ridge

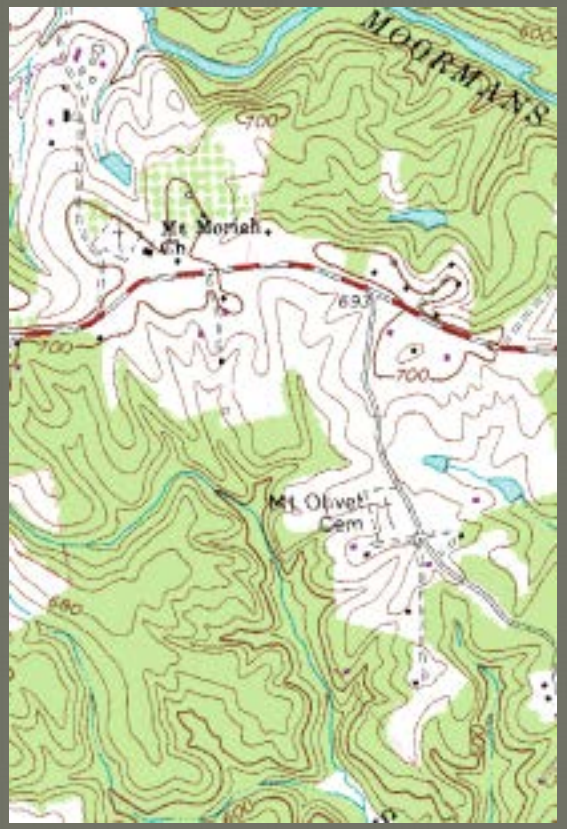
Along the Blue Ridge Parkway south of Roanoke



Grayson quadrangle
40 foot contour interval

Foothills

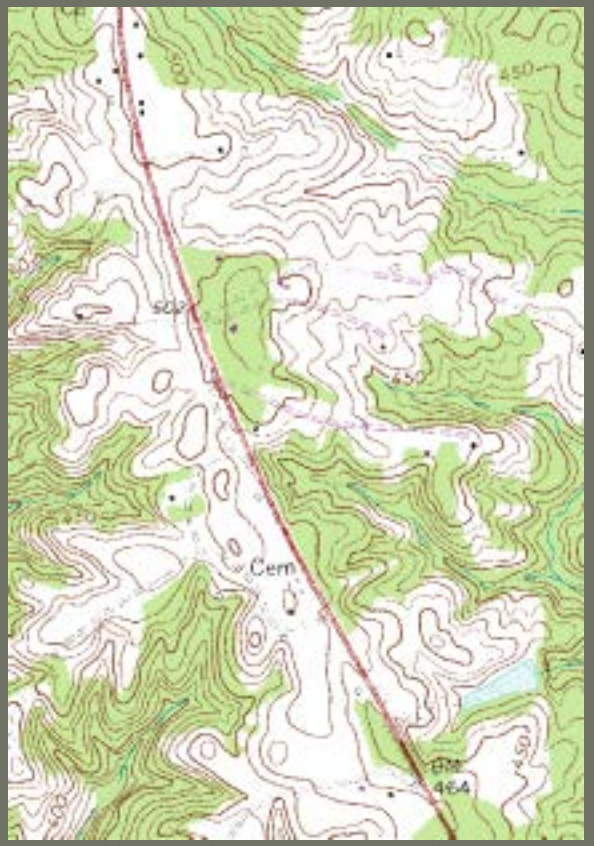
Foothills of Western Albemarle County



Crozet quadrangle
20 foot contour interval

Outer Piedmont

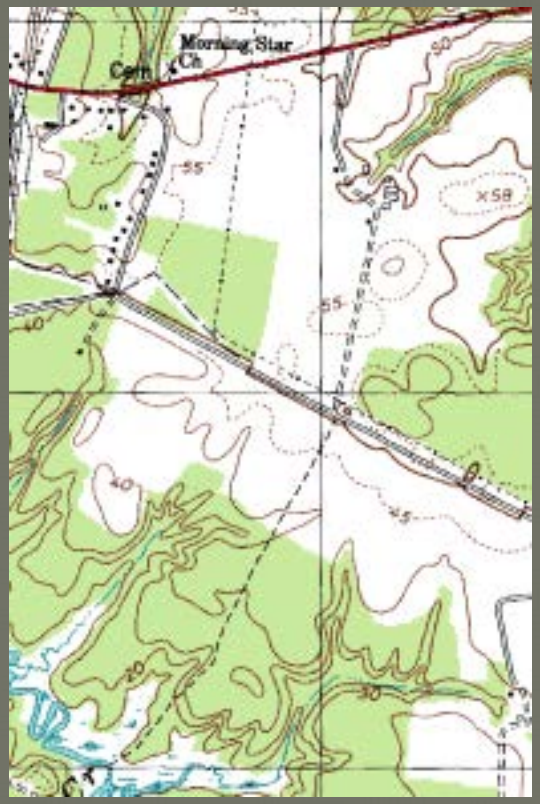
Typical outer Piedmont



Farmville quadrangle
10 foot contour interval

Upper Coastal Plain

Upland Coastal Plain



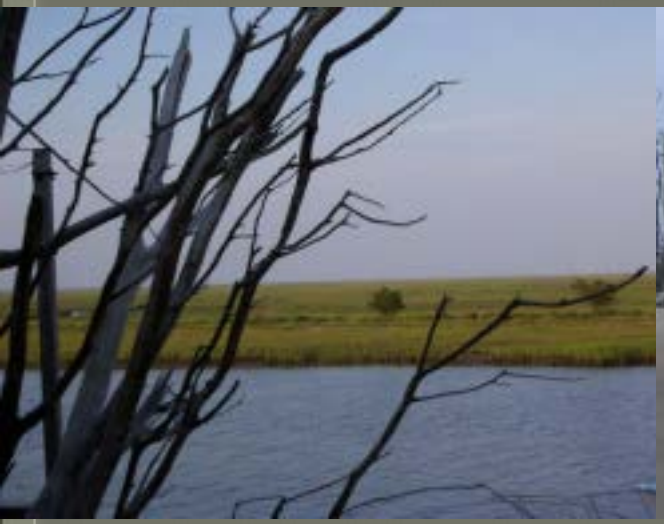
Yorktown quadrangle
10 foot contour interval

Lower Coastal Plain

Lowland swamp near Jamestown

Franklin quadrangle
5 foot contour interval

Beaches and Marshes

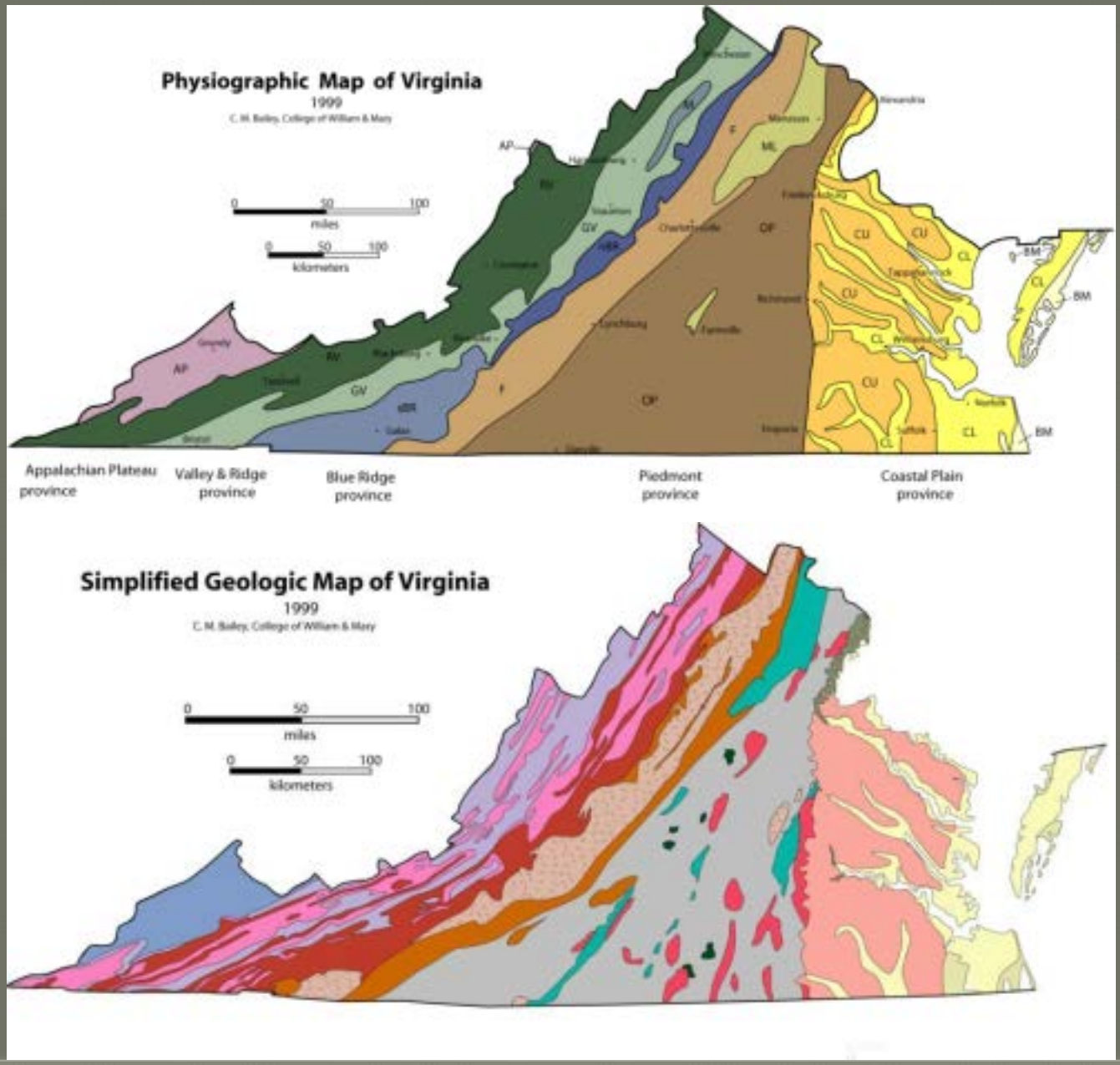


Salt marsh near Wachapreague, Eastern Shore

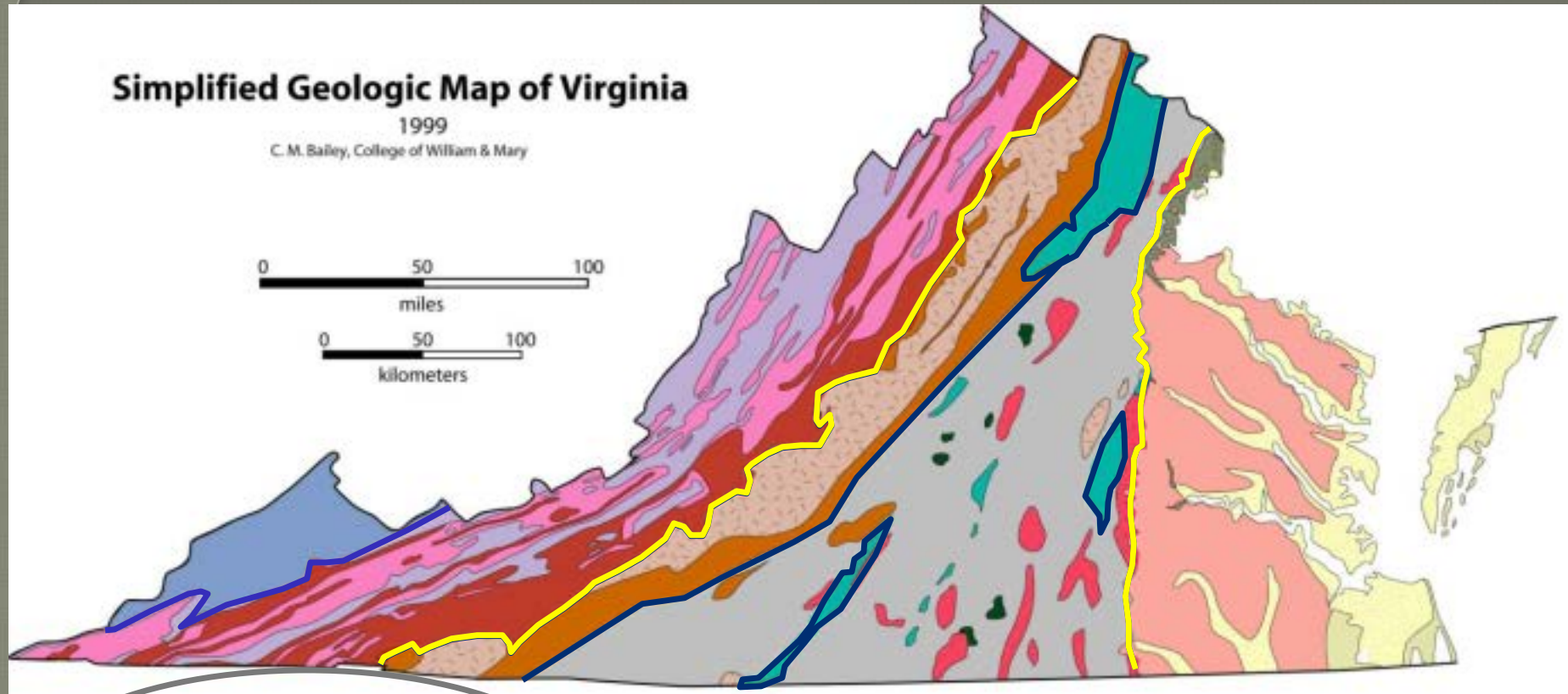
Beach on Paramour Island

Chincoteague East quadrangle
5 foot contour interval

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: 320 - 550 Ma

-mostly **marine** (below sea level) deposits.

-steeply dipping, tightly folded, and faulted.

-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: 290 - 320 Ma

-mostly **terrestrial** (above sea level) deposits.

-gently dipping and broadly folded.

-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)

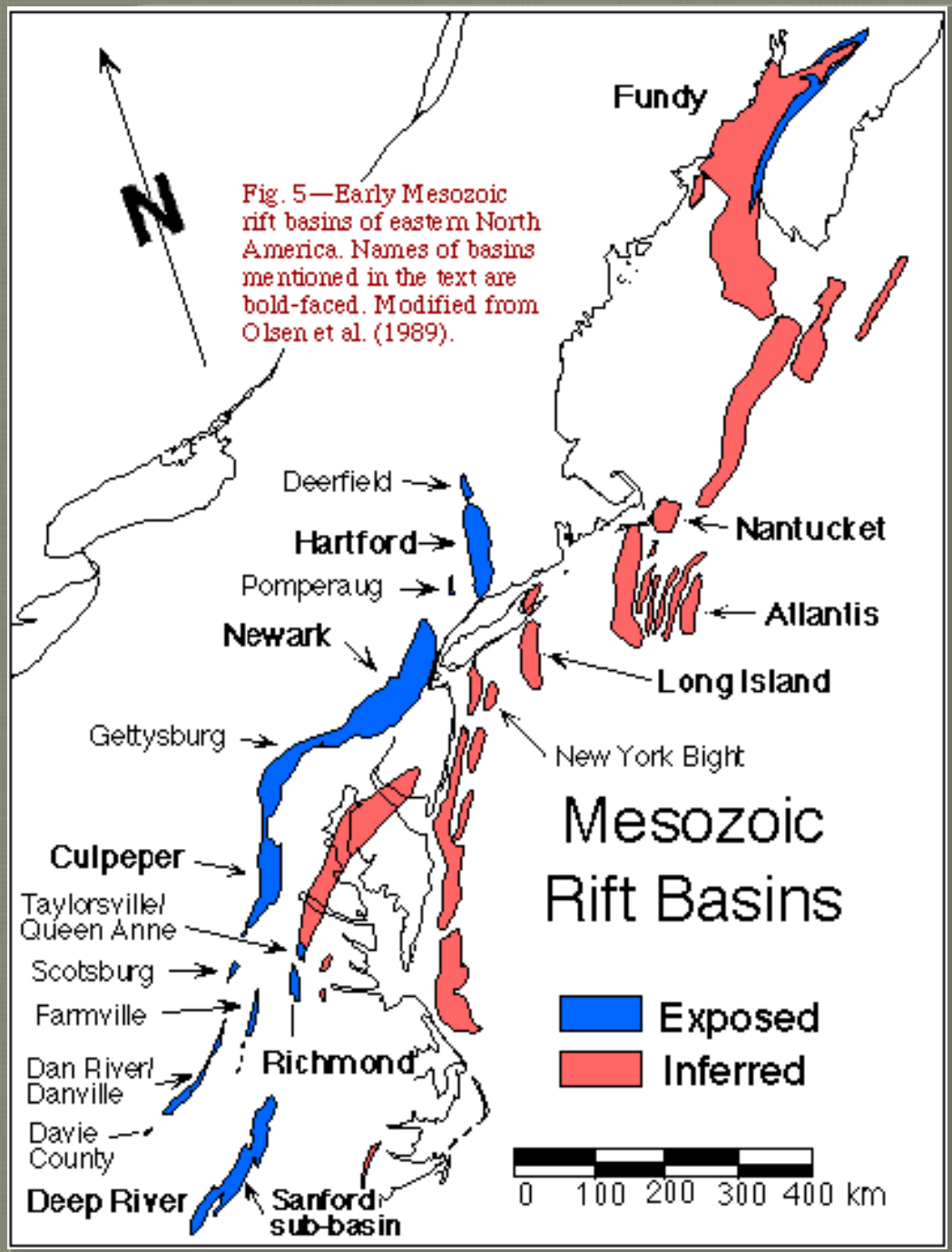
Age: 200 - 225 Ma

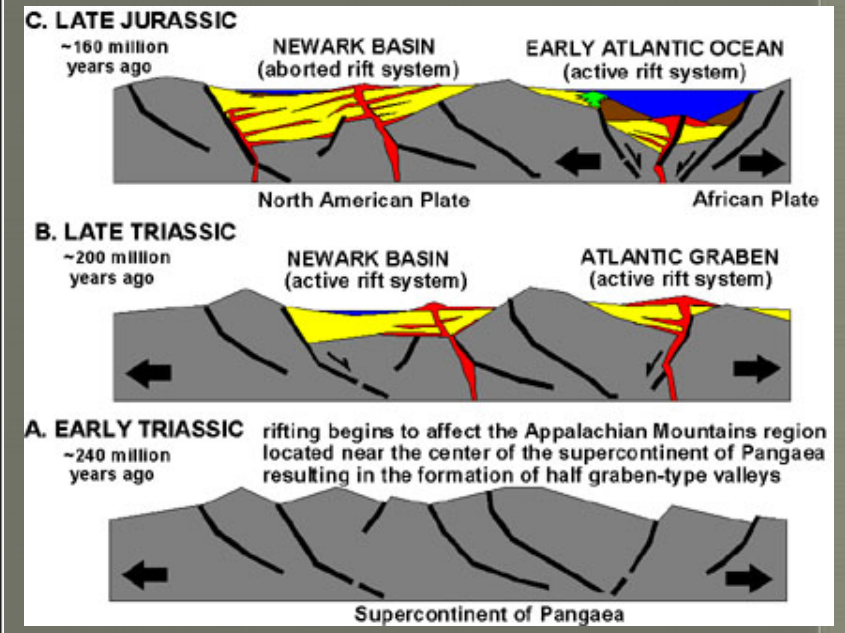
Rocks are commonly:

-**terrestrial** (above sea level) deposits.

-gently dipping

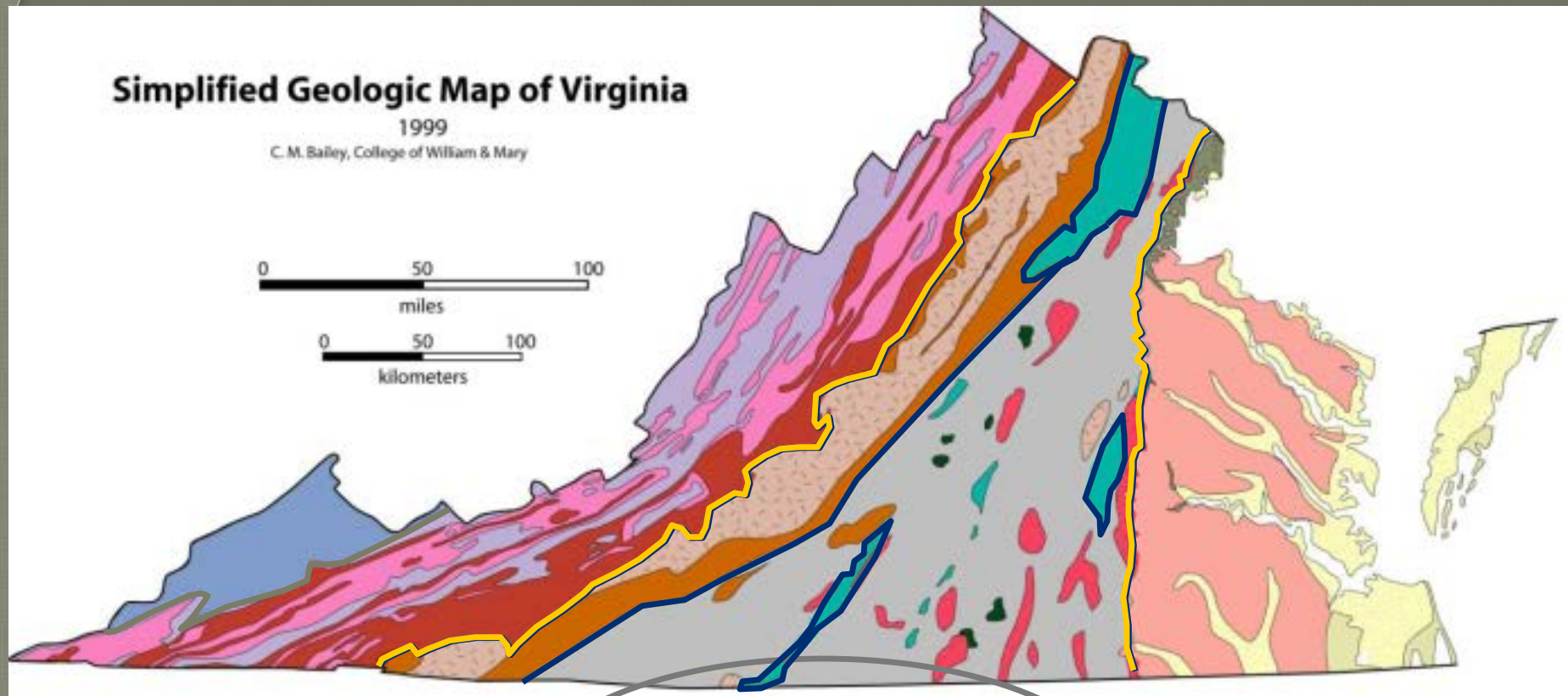
-fossiliferous and may contain coal beds.


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



Appalachian Plateau

Valley and Ridge

Mesozoic Basins

Sedimentary Rocks

Blue Ridge

Piedmont

Crystalline metamorphic and igneous rocks

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: 550 - 1400 Ma

-"basement" and "cover" rocks

-two major metamorphic events

-ductile faulting in basement rocks

-brittle faulting and folding 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: 300 – 750 Ma, isolated
900 – 1400 Ma

-several distinct terranes

-high to low grade metamorphism

-younger intrusive rocks

-ductile faulting and younger brittle faulting

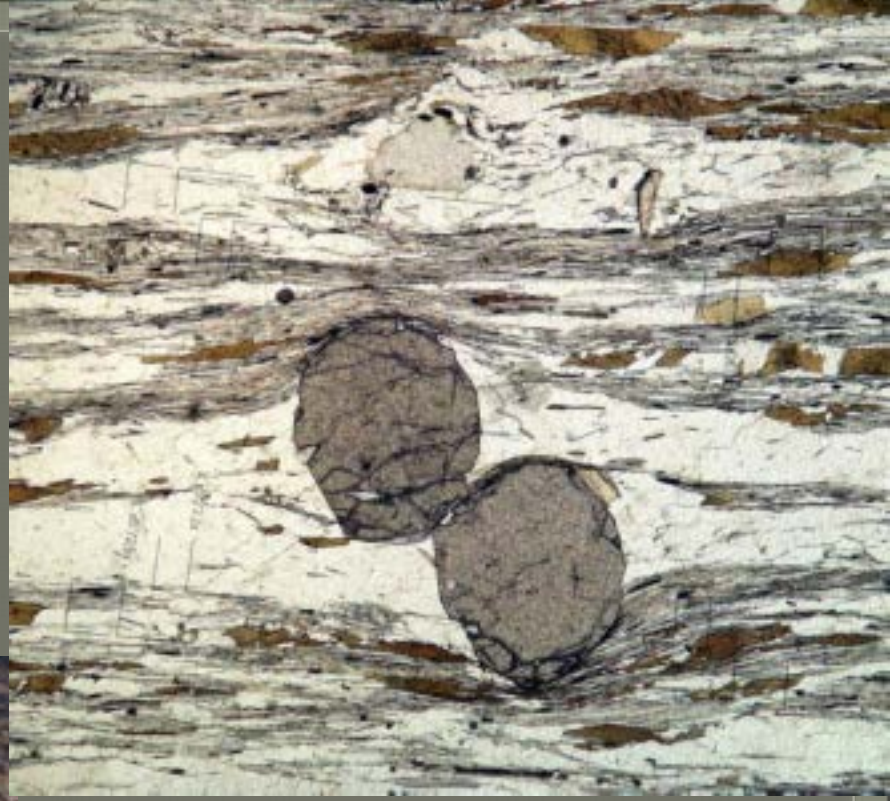
-complex folding is common

-fossils are rare.

Amphibolite

Gneiss

Garnets in thin section of schist

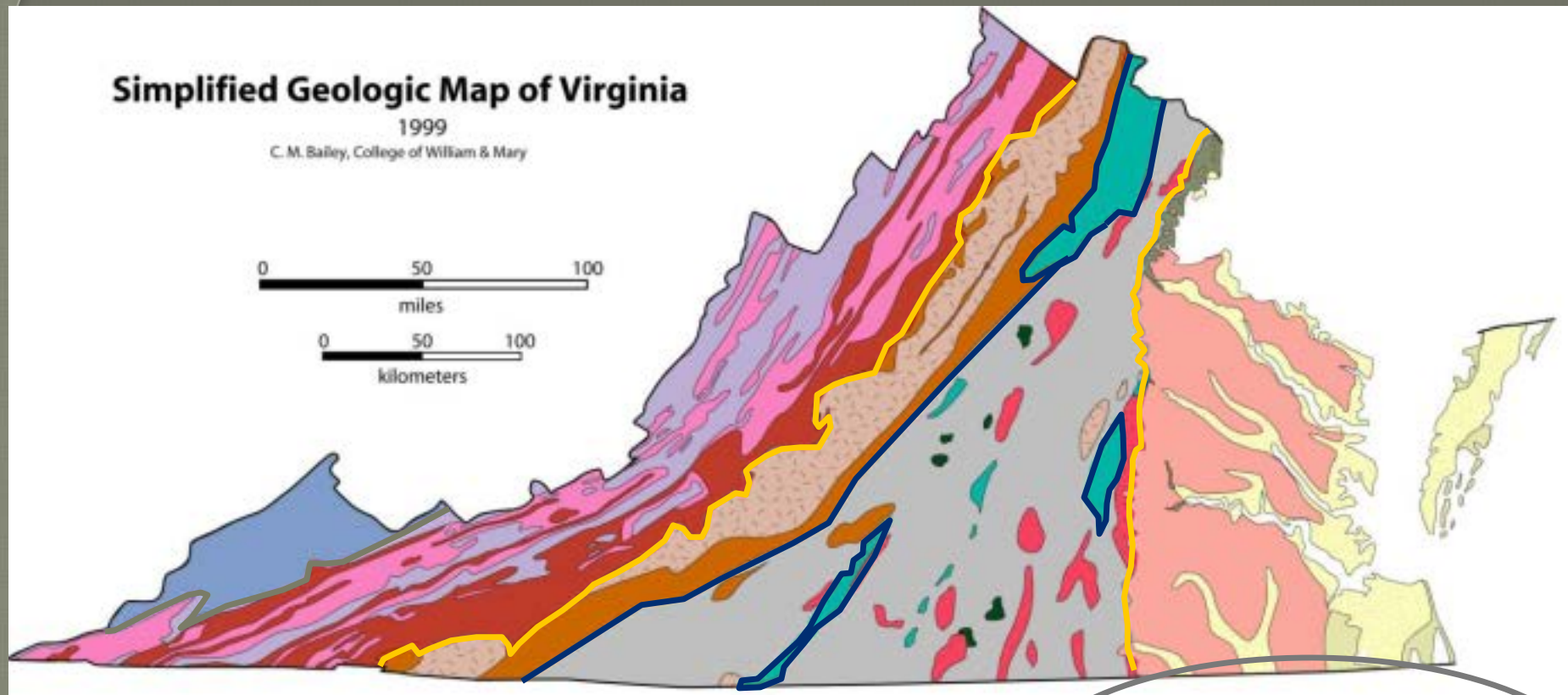


Schist

Columbia granite

Petersburg granite with pegmatite

Mylonite (ductile fault rock)



Appalachian Plateau

Valley and Ridge

Mesozoic Basins

Sedimentary Rocks

Blue Ridge

Piedmont

Crystalline metamorphic and igneous rocks

Coastal Plain

Unconsolidated Sediments

Coastal Plain

Unconsolidated sediments

Sand-rich and clay-rich deposits

Age: 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?