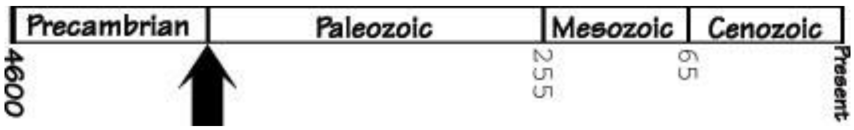
Rocks of the Blue Ridge & Piedmont: Region 1, con't

Late Precambrian - Early Cambrian Rocks



In the late Precambrian and early Cambrian, when North America began to break away from the supercontinent and the Iapetus Ocean opened up, cracks in the crust formed that were similar to the younger Triassic rifts during break-up of Pangea. Some of these rifts enlarged and became basins that eventually filled in with sediment (of varying sizes) being eroded from the Grenville Mountains. Remnants of these ancient rift basins are found in the rocks at Mt. Rogers, VA, Great Smoky Mountains, TN, Reelfoot Lake, TN, Grandfather Mountain, NC and Lynchburg, VA. The last sediment filling the rift basins, known as the Chilhowee Group, were deposited in the early Cambrian (Figure 2.12). The rift basin sediment over time was compacted and cemented together to become the sedimentary rocks conglomerate, sandstone, siltstone and shale. These rocks were metamorphosed to slate, phyllite and quartzite during later mountain building events. These rocks are often referred to as "metasedimentary" due to the fact that their sedimentary structures are often well preserved.

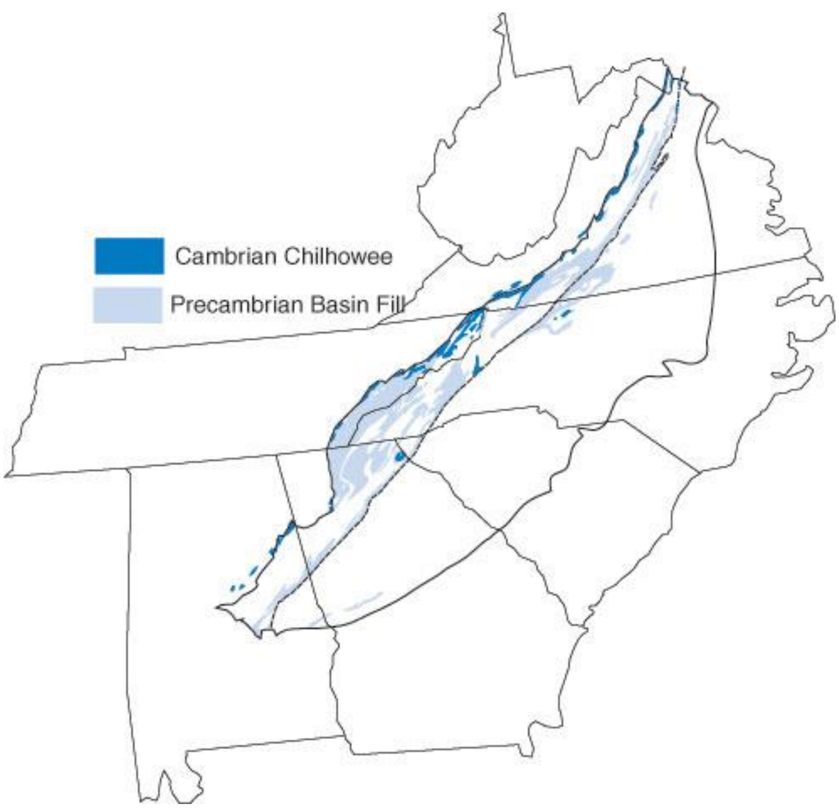
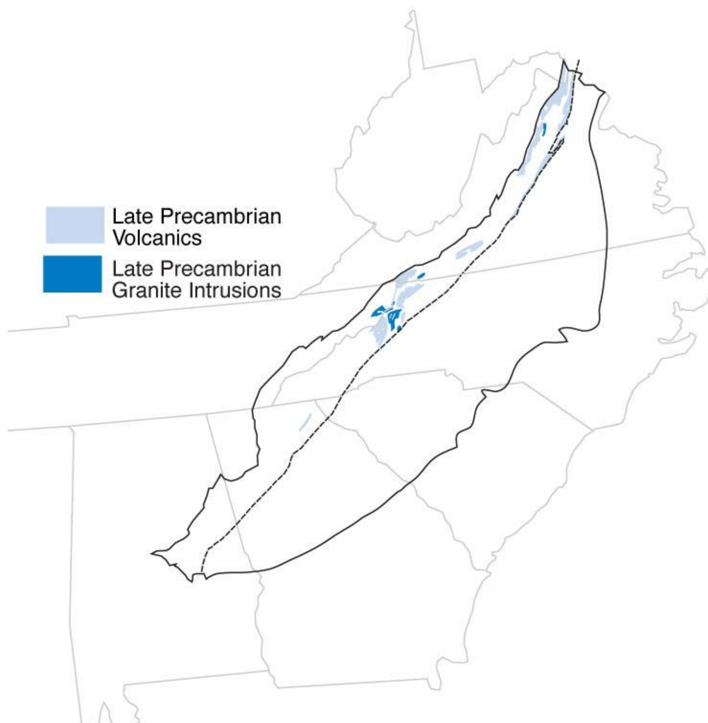


Figure 2.12: Late Precambrian and early Cambrian (Chilhowee Group) rocks of the Blue Ridge and Piedmont Region.

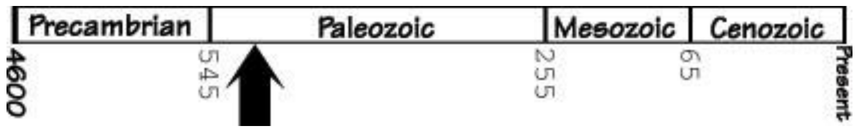
Volcanic activity was common along the margin of North America during the late Precambrian and early Cambrian as a result of rifting of the supercontinent and widening of the Iapetus Ocean. The rifts and fractures in the crust made pathways for emerging lava to pour out across the surface. Lava cooled to form volcanic rocks such as basalt (Figure 2.13). The Catoctin Basalt underlies the Maryland Catoctin Mountains and caps many of the peaks in easternmost West Virginia and the Virginia Shenandoah Mountains. The basalt was also highly metamorphosed during later mountain building events, becoming a very resistant greenstone or amphibolite. At Mount Rogers in southwestern Virginia, there is evidence in the rocks of an explosive Precambrian volcano that formed where the continents were breaking apart. The lava from the volcano eventually cooled to form very thick rhyolite sections (as much as 10,000 feet) in the Mt. Rogers region. The Mount Rogers volcano is extinct and all that is left behind of its active days are cooled lava (now rhyolite), cooled magma that never reached the surface (granite), and ash deposits. The volcanic activity from the shifting crust also caused great blobs of magma to rise up through the crust but not break the surface. The intrusive magma commonly cooled slowly, far beneath the surface, to form granite. The Southeast Grenville granites are exposed today because of erosion and uplift of the area (Figure 2.13).

Figure 2.13: Late Precambrian volcanic rocks and granite intrusions.



The Precambrian rocks (including the Grenville basement discussed above) and earliest Cambrian rocks were repeatedly subjected to enormous pressures and high temperatures from the colliding continents, recrystallizing to become metamorphic rocks such as gneiss, quartzite, greenstone, schist and amphibolite. Indeed, the erosion-resistant Precambrian rocks have become the "backbone" of the Appalachian range, preventing the mountains from being worn completely flat. The Blue Ridge rocks have been compressed by the collisions of the continents into a giant upward fold. The softer sedimentary rocks deposited on top of the crystalline core were eroded away at the peak of the fold, exposing the resistant Precambrian rocks at the center.

Cambrian - Ordovician Rocks



The late Cambrian and early Ordovician sedimentary rocks record the ancient North American shelf and slope sediment of the Iapetus Ocean. These sedimentary rocks were part of a wide bank of carbonate rocks that formed along the margin of the continent while the eroding sediment supply dwindled from the nearly worn-down Grenville Mountains. Because the sediment supply eroding from the mountains had decreased, carbonate-forming environments were widespread. Worldwide sea level was high during the late Cambrian and the Southeast (and most of North America) was entirely underwater. Sandstone and shale were the dominant rocks formed from the eroding sediments of the continental highlands, and limestone was formed from the carbonate sediments and shelled organisms in the inland ocean.

During the late Ordovician, the Inner Piedmont Iapetus Rocks collided with and were attached to the margin of North America. As the Taconic volcanic islands approached North America, the compression caused the original limestone, sandstone and shale to be metamorphosed in many areas, forming marble, quartzite, slate, phyllite, and schist (Figure 2.15). The Murphy Marble, stretching across northern Georgia into North Carolina, dates from the Taconic mountain building period and was originally formed from the build up of calcium carbonate at the bottom of the Iapetus Ocean.

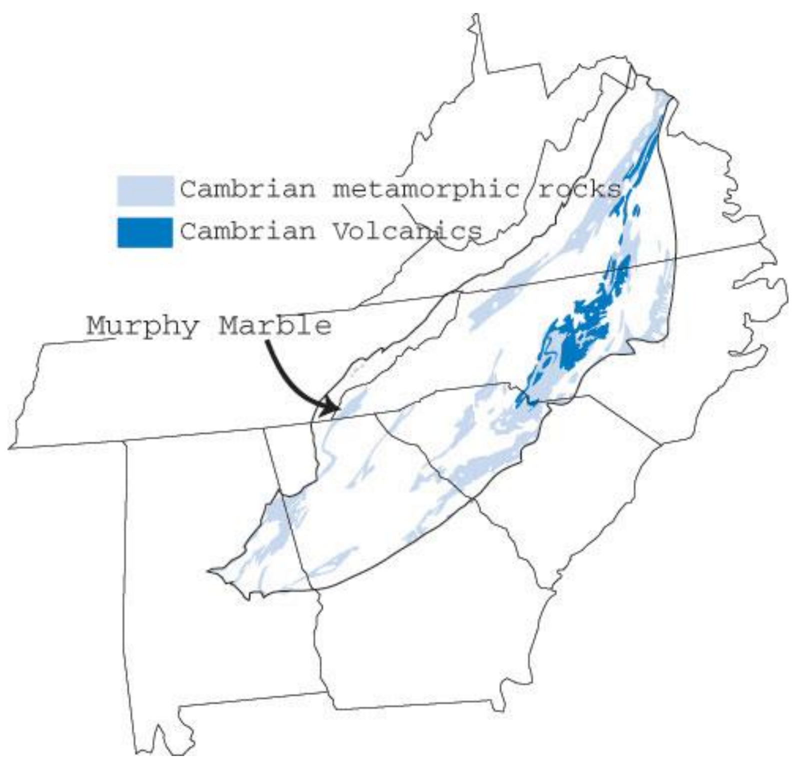


Figure 2.15: Cambrian metamorphic and volcanic rocks.

Evidence of the collision as well as the sediment associated with volcanic activity of the Taconic Mountain building period is found in the rock record of the Southeast. Ordovician-age metamorphosed sedimentary rock that originated from the Taconic volcanic islands is interlayered with metamorphosed volcanic rocks such as slate (originally ash) and greenstone (originally basalt). Ordovician-age igneous intrusions (most commonly granite, but also gabbro and diabase) resulting from the collision are located along the suture area where the Iapetus Rocks were attached to ancient North America (Figures 2.16).

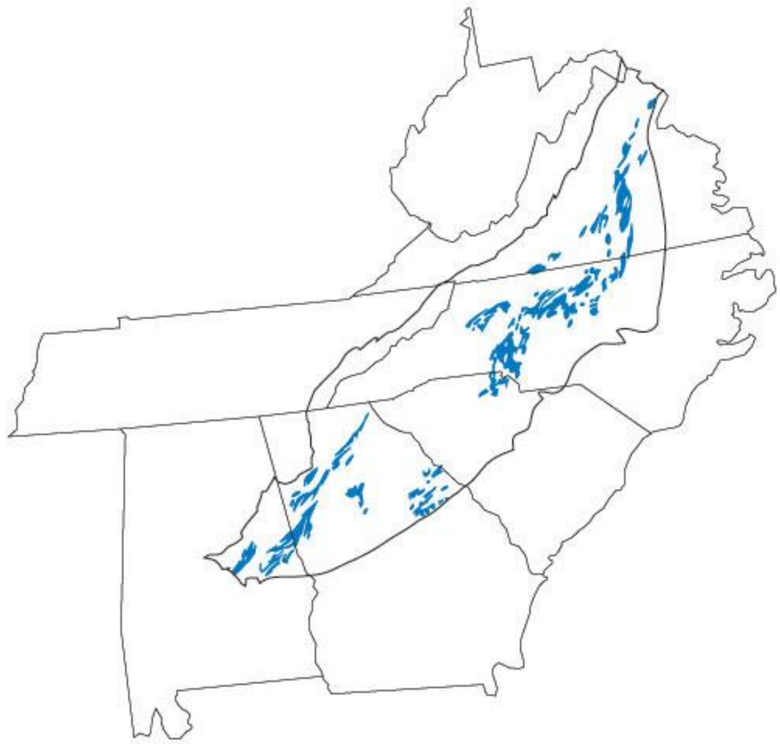


Figure 2.16: Granite intrusions related to the Ordovician Taconic mountain-building event. And Paleozoic mafic intrusions, including gabbro and diabase.

Picconi, J. E. 2003. The Teacher-Friendly Guide to the Geology of the Southeastern U.S. Paleontological Research Institution, Ithaca, NY.

Source: http://geology.teacherfriendlyguide.org/index.php/how-to-use-the-guide-se