

GEOL 1101 Introductory Geology
Summer I 2005
Field Trip 2

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The New Jersey Highlands

The New Jersey Highlands contain some of the most scenic areas in the state, with many lakes, parks, and hiking trails. It is also made up of the oldest rocks in the state. These rocks were exploited for their mineral deposits for hundreds of years, with major iron, zinc and uranium mines located in the region. Most (if not all) of the mines are now closed down, having been worked out or abandoned for richer ores in the Great Lakes region, the western U.S., and elsewhere.

Stop 1: Picnic area, Route 23, Newfoundland, NJ

Stop 1a: Green Pond conglomerate

This very distinctive rock formation at the picnic area is of Silurian age (about 420 million years old). At the time it was formed, North America looked very different than it does today. The Taconic mountains, formed about 30 million years earlier when what is now New England collided with the rest of North America, may have risen as high as 20,000 feet of elevation. To the west, in what is now the center of the continent, was a shallow sea. Large, energetic rivers were helping to erode the mountains and carry the sediment to the sea. This conglomerate was formed near the mouth of one of those rivers. The coarse gravel embedded in it shows that it was deposited in an energetic environment. Its purple-red color comes from iron (mostly in the form of the mineral hematite) that helps to cement the grains and cobbles of quartzite together.

The Green Pond conglomerate (and a similar, slightly younger unit called the Skunnemunk conglomerate, which outcrops further north at Bearfort Mountain and into New York State) is very recognizable, and can be found as glacial erratics in Manhattan as well as other places, which helps determine how the glaciers moved. It is also a durable building stone, and can be seen in fences and houses around northern New Jersey.

Stop 1b: Route 23 road cut

Use extreme caution crossing the busy highway! Cross in small groups rather than all at once, and feel free to stay at the picnic area if you are uncomfortable crossing the highway.

From the north end of the picnic area, carefully walk along the (narrow) shoulder of the highway until the road behind you is *completely* clear (traffic on Route 23 is moving fast!) and you can cross over to the median. Once

on the median, stay well clear of the highway at all times. Walk up to the outcrop at the north end of the grassy area in the median, and look at the road cut to your right, across the northbound lanes you just crossed. This fold is a textbook quality example of deformation (in fact, it is in your textbook as Figure 9-5a).

How did this fold form? Look at the continuation of the fold in the outcrop in the median, and on the other side of the southbound lanes. Can you see that the fold is part of a three-dimensional structure that we can only see a 2-D slice from because of the road cuts here? Road cuts are often the best available places to see sections of rock outcrop, especially in areas where vegetation cover is thick, as in most of the eastern U.S.

Stop 2: McAfee, NJ

Stop 2a: Ski shop parking lot

Look at the rock outcrop on the east side of the parking lot (to the right looking from the road). The outcrop is of Franklin Marble (see Stop 2b below). Look for the mafic intrusion into the marble. How did it form? What kind of intrusion is it?

Stop 2b: Gravel quarry across Route 94/Sussex County 517

Carefully cross the road to the large outcrop of white rock at the quarry site. This rock is part of the Franklin Marble, a 1.1 billion year old metamorphic rock that is the host to the once-valuable zinc mines and the remarkable minerals of Franklin and Ogdensburg, a few miles to the southwest. The ore deposits were remarkably concentrated, and the rocks at this outcrop, though not perfectly pure marble, have no sign of the rich metals and fluorescent minerals found in Franklin.

If we have time here, we'll walk around to the top of this outcrop to look for glacial striations, scratch marks left by the last ice age, more than 10,000 years ago.

Stop 3: Road cuts along Route 15, south

If time allows, we will stop at one or two road cuts along Route 15 south to see examples of more typical rocks of the New Jersey highlands, granite and granitic gneiss. The distinction between a gneiss and a granite here is often one that only a geologist (and a pedantic one) might care about, since the granites often have a foliated (“gneissic”) texture and the gneisses have

a composition similar to granite. In fact, there is some debate about how different in origin the rocks are, but we can agree that they are some of the oldest rocks in New Jersey, forming bedrock here that is well over a billion years old (*Puffer*, 1980).

Driving directions

Stop 1: Picnic area, Route 23, Newfoundland, NJ

Go north on I-287 about 15 miles to exit 52B, Route 23 North (Butler). Take Route 23 North for 7.0 miles from the exit. Turn into the picnic area immediately after the stoplight at Echo Lake Road. Park towards the middle or far end of the picnic area if possible.

Stop 2: McAfee Ski & Snowboard, 105 State Rte. 94, Vernon, NJ

From the picnic area, continue north on Route 23 through Franklin. In Hamburg, turn right on Route 94, following signs for Vernon. The next major junction is the small town of McAfee. Turn right, following signs for route 94 north, County Road 517 South, and Vernon. Very shortly on the left there will be a ski shop with a large parking lot and patio furniture out front. Park here.

Stop 3: Route 15 south of Sparta, NJ

Return along Sussex County 517 south, through Ogdensburg, home of the Sterling Hill Mine, to Route 15 south near Sparta. On Route 15, if time allows, we will stop along a convenient road cut or two. Watch the van carefully for stops on the shoulder.

Take Route 15 south to I-80 east, to I-287 south and back to the FDU campus.

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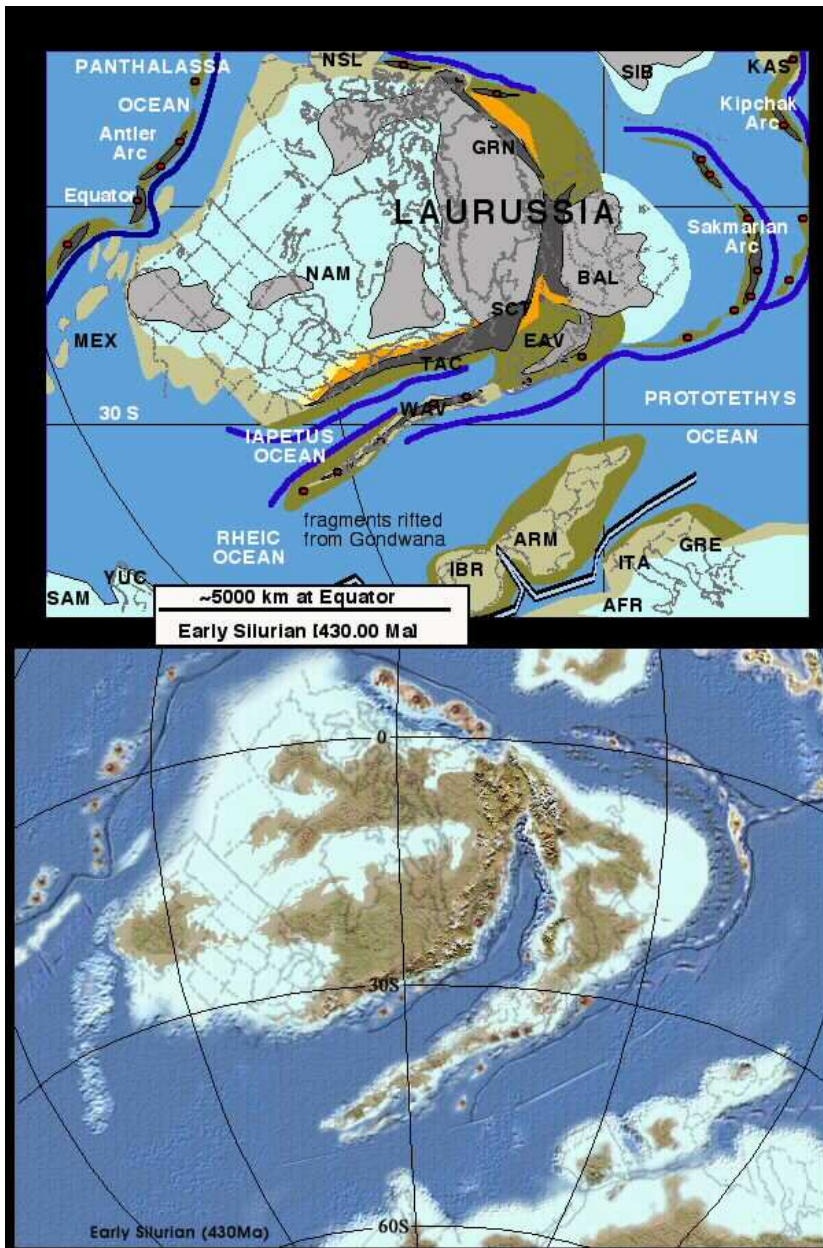


Figure 1: A recent reconstruction of North America during Silurian time shows that the geography is not very recognizable from our perspective. The bottom figure shows topography and sea level as it may have appeared 430 million years ago. (Blakey, 2004).