Conquering Allegheny Mountain:

The History and Geology of the Allegheny Portage Railroad

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Canals and Railroads

By 1800, traveling from Europe to the US was relatively easy, but traveling westward from the US east coast presented many difficulties. Allegheny Mountain, the imposing front of the Appalachian Plateau, was a formidable barrier between "civilization" and the western frontier, where vast stretches of fertile farmland, great rivers, abundant forests and game, and troves of mineral resources were reported to exist. Wagon tracks, such as the Huntingdon, Cambria, and Indiana Turnpike (now old US 22), crossed the wilderness, but at best they typically provided arduous passage. Canals offered a better, faster, and safer means of transportation, so Pennsylvania began to build a canal system in the 1820s. The original concept of this system included a continuous waterway from Philadelphia to Pittsburgh, which meant digging a canal tunnel through Allegheny Mountain that would have been 4.5 miles long and cost over $11 million (in 2012 dollars). The canal engineers saw value in the "new-fangled" railroad that was so popular in Europe and decided that a railroad over the mountain could carry the canal boats from the Juniata River at Hollidaysburg to the Conemaugh River at Johnstown. Thus was born the Allegheny Portage Railroad (APR).

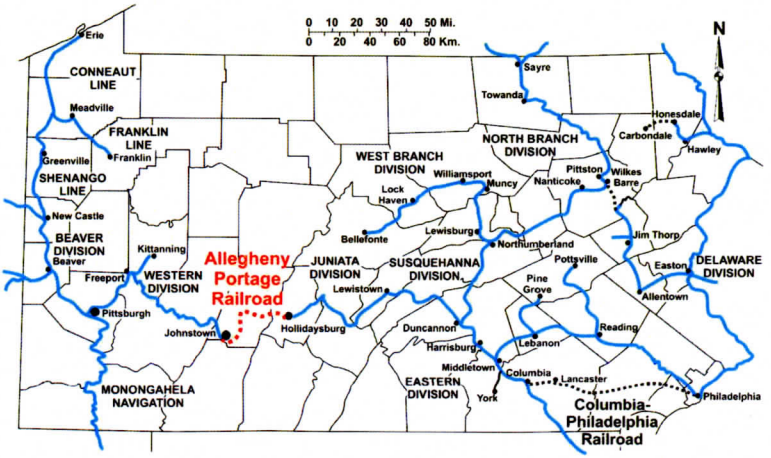

Figure 1. Map of Pennsylvania's canal system (blue) and associated railroads (dotted) in the mid-1800s. The Allegheny Portage Railroad is shown in red. The Juniata Canal, the last remaining part of the Pennsylvania Mainline Canal, remained in operation from 1832 until 1888. Remnants of some of the old canals and their locks remain.

Construction of the Pennsylvania canal system began in 1826 and continued until about 1840 without interruption. The system was a hybrid of public and private canals and railroads (Figure 1), with travel between Philadelphia and Pittsburgh made entirely in canal boats. The boats were loaded onto railroad cars in Philadelphia, transferred to the Susquehanna River canal, then towed to the Juniata River north of Harrisburg. The canal boats traveled westward along the Juniata River canal to Hollidaysburg where they were loaded in sections onto rail cars. The APR took them over the Allegheny Mountains and deposited them

into the Conemaugh River canal at Johnstown. The Conemaugh, in turn, linked Johnstown with the Allegheny River, Pittsburgh, the Ohio River, and the great western frontier. The Pennsylvania Main Line Canal, as the entire system was called, opened in 1834 and operated for 20 years.

The APR was a system of 10 inclined planes with standard railroad lines between them. The inclines used stationary steam engines to lift and lower the rail cars using, at first, hemp rope. Later, it pioneered the use of wire rope, invented by John Roebling, builder of the Brooklyn Bridge. Horses pulled rail cars along the flatter sections at first, but were soon replaced by mobile railroad engines. The first track was completed and opened for traffic early in 1834, and a second track was finished one year later. The APR was 36.5 miles long, and had a total rise and fall of 2,570 feet between Hollidaysburg and Johnstown. The inclination of the planes varied from about 0.07 percent to a little over 10 percent. A viaduct over the Little Conemaugh River eight miles east of Johnstown comprised a single semi-circular, 80-foot arch 28 feet wide and standing 70 feet above the surface of the water. A tunnel at Staple Bend on the Little Conemaugh, four miles east of Johnstown, was the first tunnel built in America. It was 901 feet long, 20 feet wide, and 19 feet high at the top of the arched ceiling. The APR was completed in less than four years, and for the next 20 years it served well those willing to travel west to make their fortunes. The whole journey from Philadelphia to Pittsburgh, a distance of about 400 miles that used to require months of hardship, could be covered in relative comfort in less than a week.

The Pennsylvania and "New" Allegheny Portage Railroads

Construction began on the competing Pennsylvania Railroad (PR) in 1847, leading the legislature to realize that the APR, as it currently existed, had outlived its usefulness. From the beginning, the inclines were regarded as nuisances, and the tracks were always in repair. A better method of crossing Allegheny Mountain was considered that included constructing a tunnel at the summit of the mountain at Sugar Run gap north of the old line. From Hollidaysburg to the Sugar Run summit was only four miles longer than the existing line to Blair Gap summit, and it would avoid Inclined Planes 6 through 10 while keeping the grade to less than 45 feet per mile.

Construction began in June 1851. The new road bypassed the inclined planes, paralleling the PR line much of the way from Johnstown to the mountain summit. It went through the summit at Gallitzin via an 1,800-feet long tunnel and ran down the southern face of Sugar Run Gap. It curved around the eastern slope of Allegheny Mountain to Blair Run Gap where it crossed the old APR at the foot of Inclined Plane 8 on the Muleshoe Curve viaduct. From there it paralleled, and occasionally crossed, the old APR line to the top of Inclined Plane 10, then down a gentle slope to Duncansville where it picked up the old APR railroad line.

By February 1854 the PR had its own road over the mountain, including a separate summit tunnel at Gallitzin, that was faster and more profitable than the APR. As a result, the new APR had just gone into

operation when the legislature decided to sell it and the entire canal system to the PR. The cost of the state canal system from Philadelphia to Pittsburgh had been more than $16 million, but when the PR bought the whole system they paid less than half of that amount. On August 1, 1857 the PR took possession of the Pennsylvania Mainline Canal system, including the APR, and began dismantling it. By 1858 the APR was gone, and by 1866 the PR had sold or abandoned the entire canal system.

The APR was considered a technological wonder in its day, playing a critical role in opening the interior of the United States to further settlement and additional trade. It allowed people to travel to the center of the North American continent without major interruption. During its lifetime, thousands of people made the journey on the APR, including Charles Dickens, who traveled to America in 1841-1842 and chronicled his trip in his *American Notes for General Circulation*.

Edward Miller, Engineer and Naturalist

The numerous surveys made for the canal system prior to 1831 were more concerned with topography than with geology. Edward Miller, the APR's Principal Assistant Engineer and, later, an Associate Engineer of the Pennsylvania Railroad under J. Edgar Thompson, made the first geological report of the APR area in 1835. Although busy with his engineering duties, he found that, in his "leisure" time, the excavations made for the APR, along with many of the ravines and gorges in the mountains, gave him the opportunity to examine rock outcrops, gather specimens, and take instrument readings. Miller's contributions included: 1) an outline map of about 200 square miles of what are now Cambria, Blair, Bedford, and Huntingdon counties at a scale of 1:63,360, showing the crest line of Allegheny Mountain, the courses of all the streams, the APR right-of-way, and the dip and strike of the strata; 2) a cross section along the railroad route from Hollidaysburg to Inclined Plane No. 3 at Cassandra (Figure 2); and 3) specimens of rocks, minerals,

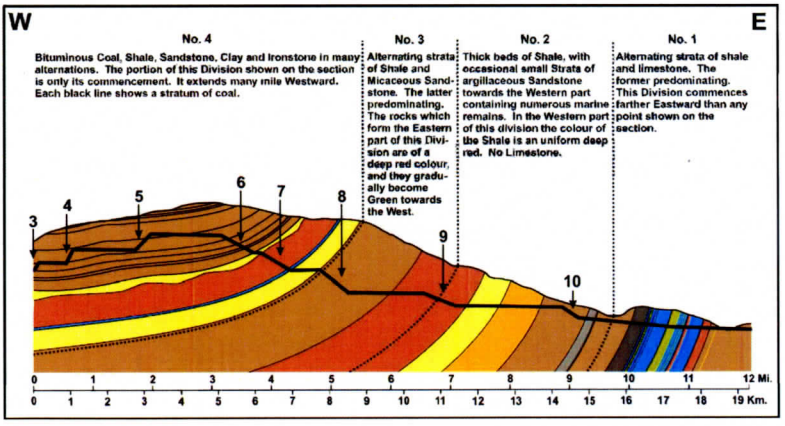

Figure 2. Geologic cross section of Allegheny Mountain from Cassandra in the west to Hollidaysburg in the east. Location of the Allegheny Portage Railroad with its Inclined Planes (No. 3 to No. 10) is shown as the dark line. Edward Miller's numbered sections and descriptions from his original report.

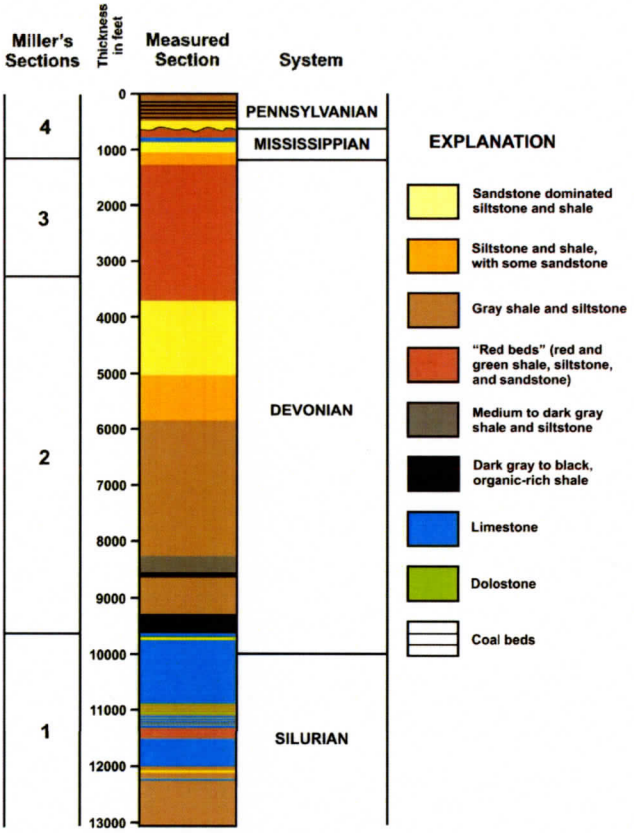

Figure 3. Stratigraphic section from Cassandra to Hollidaysburg along the Allegheny Portage Railroad, with Edward Miller's sections for comparison. (see Figure 2)

and fossils that were studied and reported on by some of the most prominent geologists and paleontologists of the day.

Miller divided the route over the mountain into areas numbered 1 to 4 and included detailed information on the types of strata, dip of beds, bed thicknesses, and total thicknesses of each. Section 1 included rocks we now map as Rose Hill (Lower Silurian) to Onondaga (Middle Devonian). Section 2 included the Marcellus Formation (Middle Devonian) through the lower part of the Catskill Formation (Upper Devonian). Section 3 included the upper Catskill through at least a part of the Rockwell Formation (Upper Devonian and Lower Mississippian), with sandstone that could be quarried easily in thin slabs of large size. Section 4 included Mississippian and Pennsylvanian strata, which he called "the coal measures" because he found sandstone containing "vegetable remains" that he believed were indicative of coal-bearing strata. The first true coal, probably a Pottsville coal, actually appears at the top of Inclined Plane No. 7. See Figure 3 for a modern day geologic column of rocks found along the APR route.

First Described Pennsylvanian Marine Fossils

At the top of Inclined Plane No. 3, near the present-day village of Cassandra, Miller discovered a sequence of black shale and argillaceous limestone containing numerous marine fossils, some of which had been replaced by pyrite. This was the first record of the Brush Creek marine zone. This spot is of historic importance in geology because it is the location from which the first marine invertebrate fossils described from the Pennsylvanian of North America were obtained.

Timothy Abbott Conrad, one of America's pre-eminent naturalists affiliated with the Academy of Natural Sciences of Philadelphia, is now recognized as one of the pioneers of paleontology. His expertise on Eocene fossil sea shells from Alabama made him the most suitable person to work with Miller's new material. He described and illustrated the fossils in the Transactions of the Geological Society of Pennsylvania in 1835, which was only the fourth published paper describing Carboniferous invertebrate fossils from North America. The other three concerned Mississippian faunas. Conrad's descriptions included three new species of snails, a brachiopod, and a bivalve (Figure 4). Unfortunately, Conrad's type specimens have been lost, but many of them are so recognizable from the illustrations that there is no question of their identification. They include the first documented specimens of what we now call *Strobeus primogenius* and *Worthenia tabulata*, two well-known North American Pennsylvanian gastropods. The names of the other fossils described by Conrad are not recognized as valid today, but most of the illustrations will seem familiar to the avid western Pennsylvania fossil collector. Miller's locality is also the type locality of the common Pennsylvanian shark tooth *Petalodus allegheniensis* Leidy (1856).

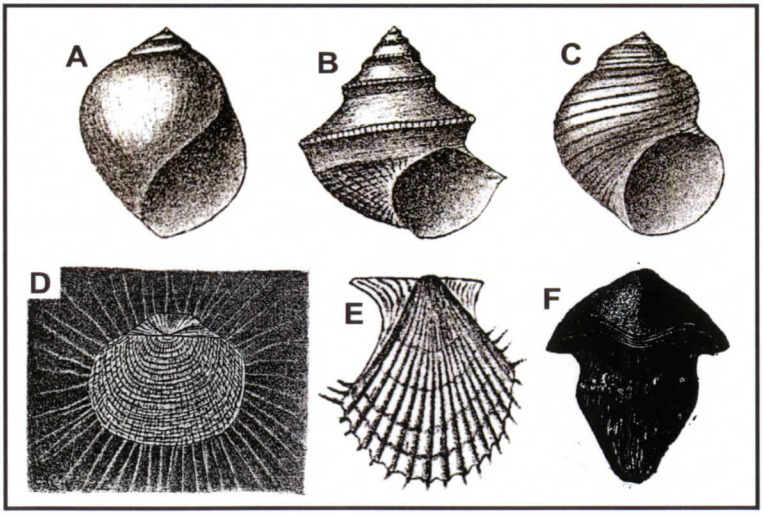

Figure 4. Illustrations of fossils from Inclined Plane No. 3. A to E were collected by Edward Miller and described by Timothy Abbott Conrad. A—*Stylifer primogenia*; B—*Turbo tabulata*; C—*Turbo insecta*; D—*Productus confragosus*; E—*Pecten armingerus;* F—*Petalodus allegheniensis.*