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An entrenched meander of the Allegheny River, located in Clarion County, Pa. The photograph was taken in February 2014 from an overlook situated in Brady Township on Pa. Route 68, about 520 feet above the river. This site (see TG 16–035.0) is one of many featured in the new *Trail of Geology* publication series. See the related article on page 15.

—*Photograph by Stuart O. Reese*

EDITORIAL

Things Change (Whether We Like It or Not)

Gale C. Blackmer, State Geologist
Pennsylvania Geological Survey

Let's just admit it: change makes us uncomfortable. That isn't necessarily a bad thing. In fact, it probably saves us from some unnecessary upheaval. But reluctance to embrace change can also hold us back.

As geologists, we have an innate sense of constant change in the world. We are schooled in the millennial-scale processes of plate motions, of oceans opening and closing, of mountain ranges rising up only to be eroded to expose their roots. When we pull a fossil sea creature out of an outcrop, the implication that this ridge top or farm field was once the bottom of an ocean barely gives us pause. We blithely identify the geologic horizons where thick accumulations of similar tiny dead things have been transformed into hydrocarbons or aggregate for road building. We think nothing of pointing out the features of the landscape of beautifully temperate Pennsylvania that were left behind by the advance and retreat of continental glaciers 10,000 years ago. We even accept that classic outcrops that were pristine when they were first photographed a hundred years ago, or when we first visited them on a college field trip, will be weathered and overgrown when we visit them now. It's only natural.

Yet we are still confounded by change at the human scale. The loss of a colleague, mentor, and friend leaves a hole in our community. People move around in our organizations and we must adjust to changing management styles and expectations. Colleagues who have been there for our entire careers retire and we wonder how to fill their shoes. (John Barnes attempted to slip quietly out the door after 46 years of service to the bureau and the citizens of Pennsylvania. Of course, we do not let him go quietly. We thank him for his dedication, wish him well, and expect to see him regularly as a volunteer.) If you work for the state, the uncertainties of budgets and hiring have you on pins and needles. It's enough to make even geologists want to dig in their heels, hold the sand in place, and keep that landscape from changing.



But that will never work. As the Greek philosopher Heraclitus recognized, the only constant in life is change. Change is necessary for growth. It helps us remain relevant as technology and societal imperatives change around us. Change is coming, every day, whether we're comfortable with it or not. Better to greet change like a geologist—acknowledge it, explore it, and rise to meet it.

Gale C. Blackmer

North America's First Pennsylvanian Marine Invertebrate Fossil Locality

John A. Harper
 Pennsylvania Geological Survey (retired)
 and
 Carnegie Museum of Natural History

Introduction

In a previous article, I wrote about the Pennsylvanian gastropod *Worthenia tabulata*, one of the first Pennsylvanian invertebrate marine fossils described from North America (Harper, 2014). At that time, I alluded to the fact that the collecting locality for *Worthenia* had historical significance and would be discussed further at a later date. The time has now come for this discussion.

The first Pennsylvanian invertebrate marine fossils described from North America came from a locality about 15 miles east-northeast of Johnstown, Cambria County. Edward Miller, Principal Assistant Engineer of the Allegheny Portage Railroad, collected these fossils along the railroad right-of-way and sent them to the Geological Society of Pennsylvania for study. Timothy Conrad described them in 1835 in the first and only volume of the society's transactions. Later, Conrad described additional fossils from the locality, and later still Joseph Leidy described a very characteristic fish tooth, again from the same locality. Then in the early 1900s, Percy Raymond revisited the locality and reported on a variety of now well-known species.

Edward Miller's Conquest of Allegheny Mountain

Edward Miller (1811–72) (Figure 1), a Philadelphia native, was only seventeen when he graduated from the University of Pennsylvania with Mathematical Honors in 1828 and went to work with the Engineers Corps on the Lehigh Canal in eastern Pennsylvania (Harper, 2015). A year later, he entered into service with the state-owned and state-operated Pennsylvania Mainline Canal.

When completed, the canal system linked Philadelphia and eastern parts of Pennsylvania with the Ohio River at Pittsburgh via a complex series of conventional canals and newfangled railroads (Figure 2). Canal boats built in sections were transported by railroad from Philadelphia to the Susquehanna River canal, then towed north past Harrisburg to the Juniata River canal and westward as far as Hollidaysburg in Blair County. There, the canal boats once again were placed onto railroad cars and hauled over Allegheny Mountain on the Allegheny Portage Railroad to Johnstown, where they were unloaded and towed along the Conemaugh, Kiskiminetas, and Allegheny River

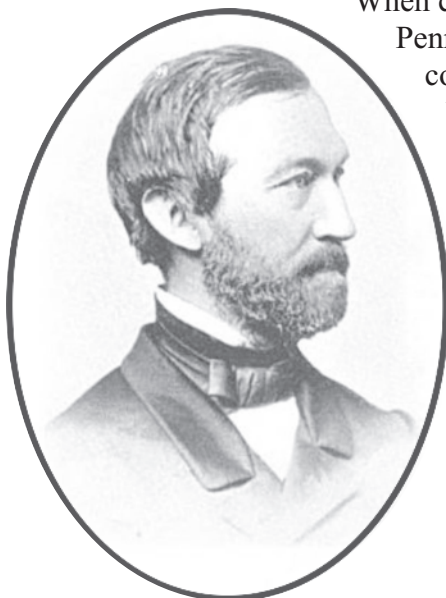


Figure 1. Portrait of Edward Miller (modified from Wilson, 1902).

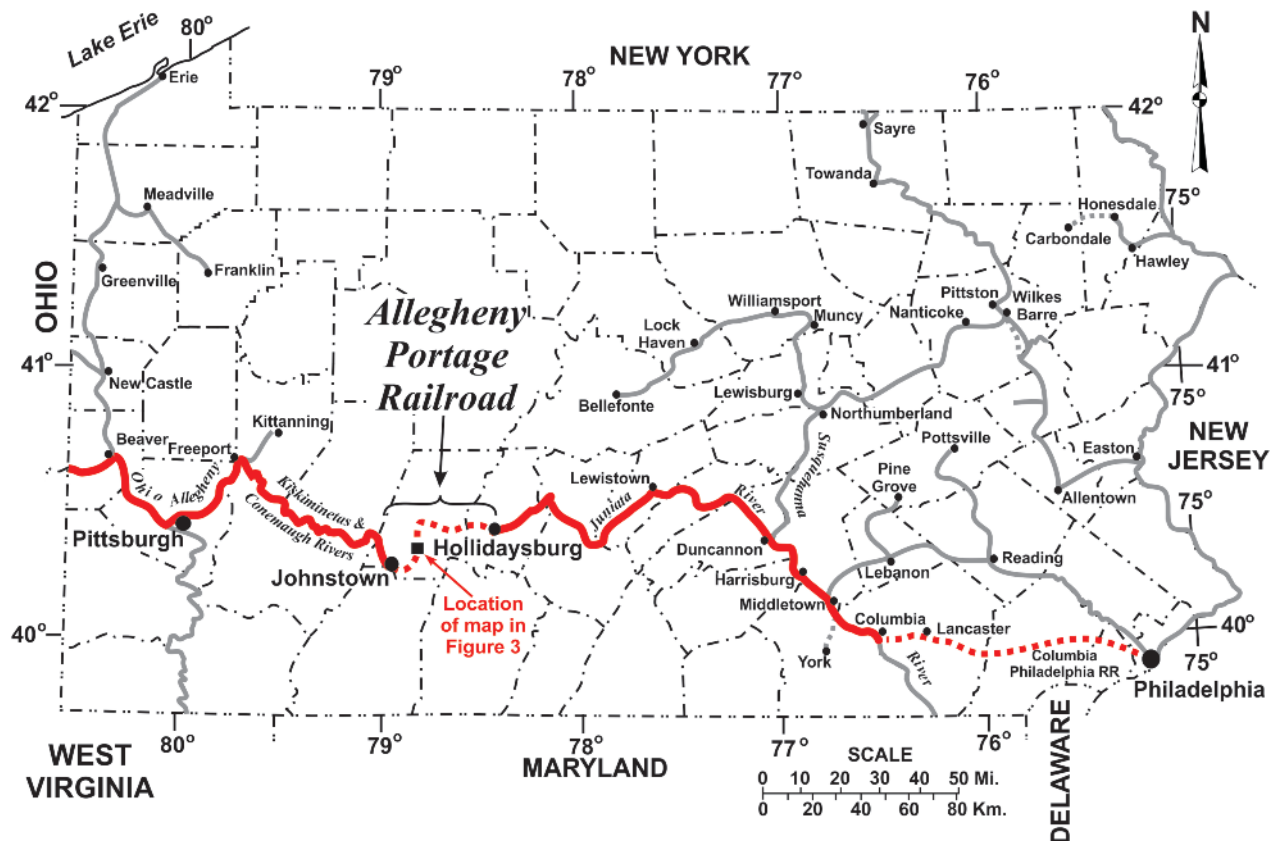


Figure 2. Map of the complex canal system of Pennsylvania (gray lines) in the early to mid-1800s, including the Mainline Canal (red lines) and its associated railroads (dotted lines) (modified from Shank, 2001).

canals to Pittsburgh, the Ohio River, and the great western frontier. The Pennsylvania Mainline Canal played a major role in opening the interior of the United States by allowing settlers ease of travel from the east coast population centers to the center of the North American continent without major interruption.

In 1830, Miller went to work on the Allegheny Portage Railroad, the first railroad to conquer the formidable barrier of the Allegheny topographic front along the eastern edge of the Appalachian Plateau that had presented so many hardships to earlier travelers. Although canal construction was considered a standard engineering achievement in the early 1800s, railroads were considered to be innovative. Constructing a railroad over Allegheny Mountain was especially groundbreaking because it required 10 inclined planes, including all the necessary mechanical equipment to raise and lower loaded rail cars safely over thousands of feet of elevation. Miller spent most of 1831 in Great Britain studying existing railroads. When he returned to Pennsylvania, he was promoted to Principal Assistant Engineer of the railroad and appointed Superintendent in charge of designing and overseeing the construction of the inclined-plane machinery, all before he turned 21 years old (Harper, 2015). The inclined-plane system included pulleys and cables connected to steam engines at the tops of the inclined planes that raised and lowered the rail cars from one level to the next; horses or standard railroad engines hauled the cars on the level tracks between the inclined planes. Miller's designs were "novel and ingenious, and the rapid manner in which the planes on the mountain were worked, as compared with those elsewhere, showed their great superiority" (Roberts, 1872, p. 582).

When it was completed in 1834, the Allegheny Portage Railroad helped passengers and freight on the Pennsylvania Mainline Canal make the journey from Philadelphia to Pittsburgh, a distance of about 400 miles, in less than a week; the trip previously required months of hard travel. During the railroad's relatively short life span, thousands of people made the trek over Allegheny Mountain, including the eminent English writer Charles Dickens (1812–70), whose amusing description of his journey in 1842 from Harrisburg to Pittsburgh is well worth reading (Dickens, 1842).

Upon completion of the Allegheny Portage Railroad, Miller left the service of the Pennsylvania Mainline Canal to become the chief engineer and/or president of no less than eleven canal and railroad systems during his lifetime, including service as Chief Engineer of the Pennsylvania Railroad (PRR) in 1852. At about the same time, it was realized that the Pennsylvania Mainline Canal was not worth the money it took to keep it in operation. When the canal system was sold to the PRR in 1857, the PRR dismantled the entire system. By 1858, the canals had been filled in for use as roadbeds, and the Allegheny Portage Railroad was just a memory.

Miller's "Leisure" Time

Although quite busy with his duties in the Portage Railroad's main office, in his leisure time Miller examined rock outcrops, gathered specimens, took instrument readings, and speculated on what he found. He made the first geological report of the area of Blair and Cambria counties at the 1835 meeting of the Geological Society of Pennsylvania in Philadelphia (Miller, 1835) and provided the following: (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 (1 inch = 1 mile); (2) a cross section along the railroad from the west side of Hollidaysburg to the area just west of Inclined Plane No. 3 (i.e., a cross section of Allegheny Mountain); and (3) geological specimens presented to the society that were studied and reported on by three prominent natural historians of the day. Thomas Green Clemson, who later founded Clemson University, presented a paper on the chemistry of some rock and mineral specimens. Richard Harlan, a well-known Philadelphia physician and natural historian, presented a paper on some plant fossils, and Timothy A. Conrad, a naturalist with the Academy of Natural Sciences of Philadelphia, described and discussed some marine invertebrate fossils.

Fossil Collecting at Inclined Plane No. 3

Miller collected marine invertebrate fossils along the Allegheny Portage Railroad in a deep cut, "the excavation for the buildings to accommodate the stationary engine," according to Leidy (1856, p. 162), at the head of Inclined Plane No. 3 near the present-day villages of Cassandra, Bens Creek, and Jamestown in Cambria County (Figure 3). Miller stated that:

"A stratum of good coal 2 feet thick is found at this place, having a roof of black shale 4 feet thick, upon which is an unstratified bed of argillaceous rock, containing a great variety of shells and other marine remains, with sulphuret of iron and balls of iron stone. The upper part of the stratified shale also contains marine impressions, and some of the more delicate remains have been replaced by sulphuret of iron. In breaking these rocks to pieces to facilitate their removal, great numbers of shells were loosened and fell out" (Miller, 1835, p. 254–255).

The strata at this locality are now recognized as the Brush Creek marine interval of the Glenshaw Formation, part of the Pennsylvanian Conemaugh Group (Figure 4). The coal is the Gallitzin coal, which, although now considered to be noneconomical, had been worked near Cassandra in the past (Butts, 1905). The shale above the coal is the lower marine shale of the Brush Creek, and the "unstratified bed of argillaceous rock" is the Brush Creek limestone. I have been to this locality many

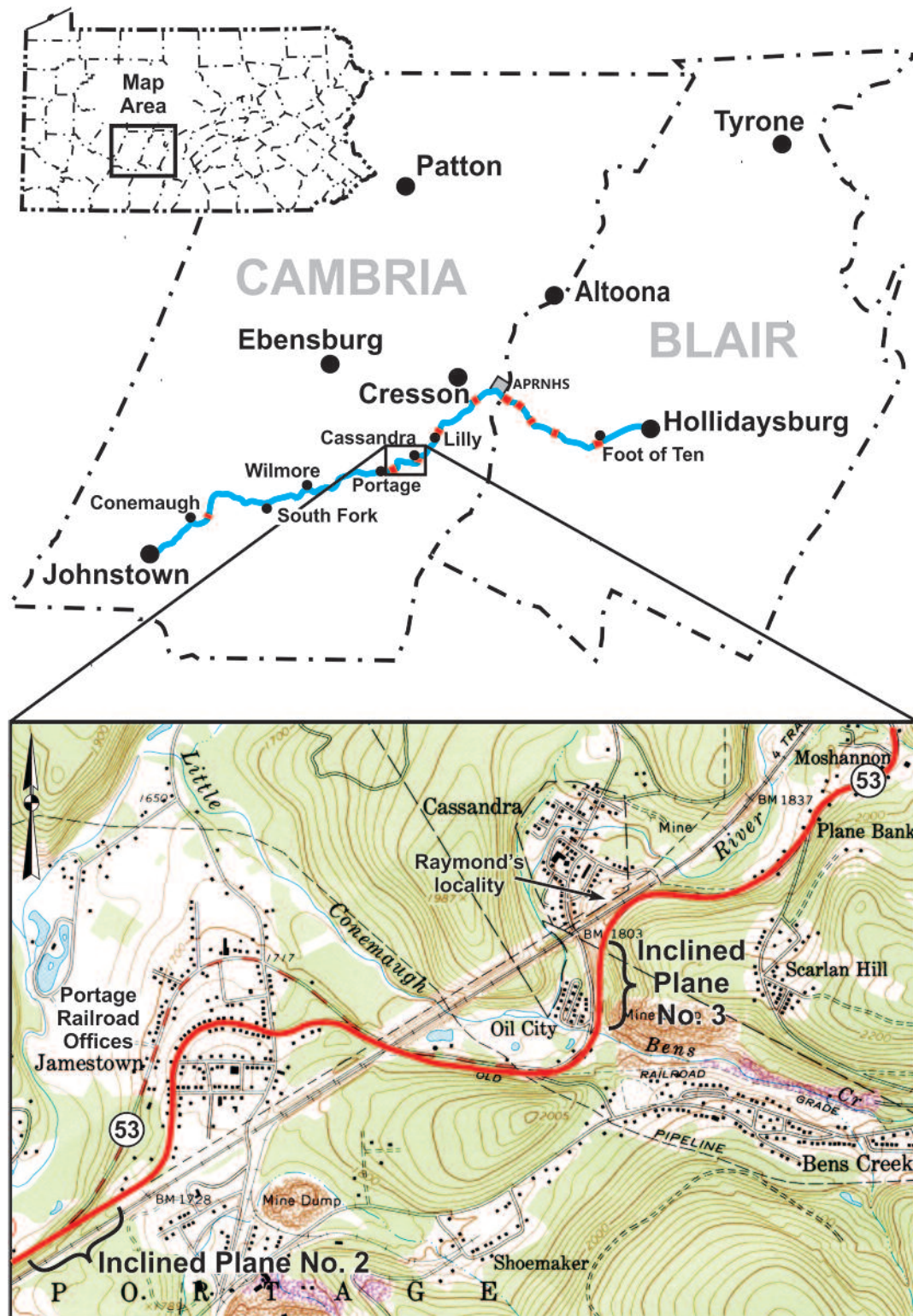


Figure 3. Top, map of Blair and Cambria counties showing the path of the Allegheny Portage Railroad (blue line) and its ten inclined planes (red) (APRNHS, Allegheny Portage Railroad National Historic Site). Bottom, a portion of the Ebensburg 7.5-minute topographic quadrangle showing the locations of Inclined Plane No. 2, Inclined Plane No. 3, Pa. Route 53, and localities discussed in the text. The path of Allegheny Portage Railroad is shown as a red line. The current village of Jamestown on the left side of the map was the railroad's base of operations where Edward Miller worked.

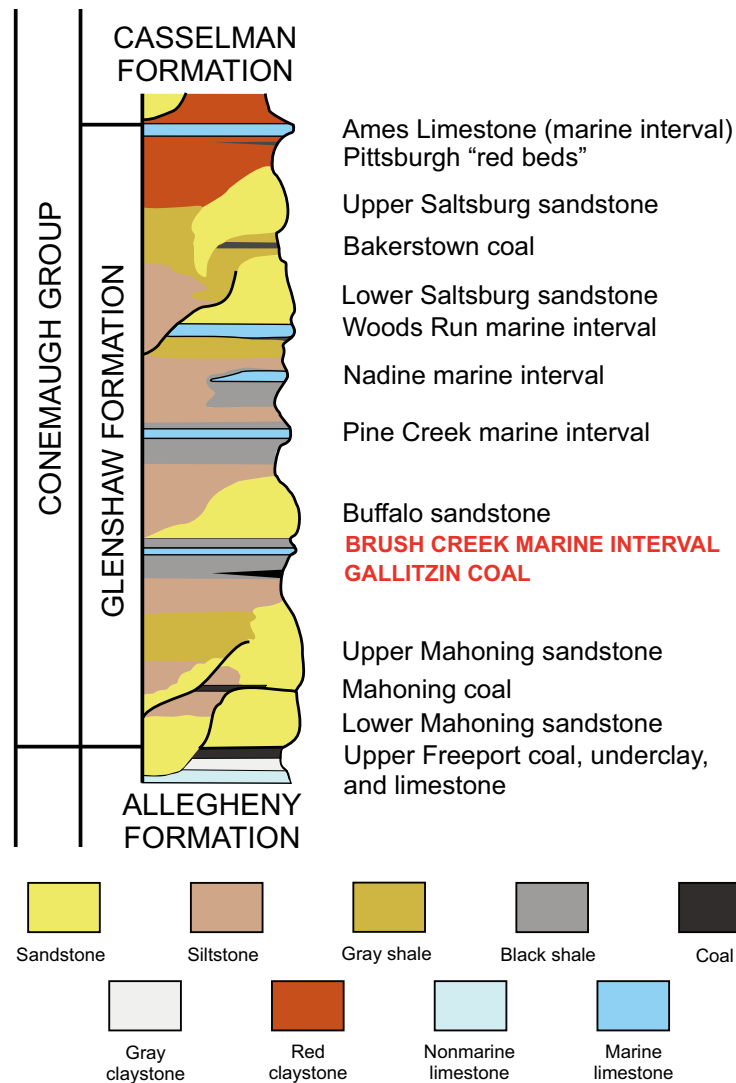


Figure 4. Generalized stratigraphic section of the Glenshaw Formation in western Pennsylvania. The marine intervals are important marker horizons throughout the formation. The Brush Creek marine interval and Gallitzin coal are shown in red upper-case text.

times, but I have not been able to find the Brush Creek limestone in place along Pa. Route 53 at the top of the inclined plane (Figure 3). According to Raymond (1910), this layer is no longer exposed because it is covered by colluvium. Like most of the locations of the engine houses on the inclined planes, the excavation where the machinery sat was backfilled. Not even digging in the colluvium has turned up the Brush Creek in place. All I have been able to find are isolated slabs of argillaceous limestone float on the southeast side of the road (Figure 5). I also examined the railroad cut west of Cassandra and found nothing even remotely fossiliferous above the Gallitzin coal, so it is possible that the marine zone is found only as remnant pods that serendipitously occurred right where the construction workers were excavating for the inclined-plane machinery.

Conrad's Fossil Descriptions

Timothy Abbott Conrad (1803–77) (Figure 6) was a well-known Philadelphia naturalist affiliated with the Academy of Natural Sciences of Philadelphia. As a child, he was so interested in nature and science that he often went on nature hikes instead of attending church on Sunday, which didn't sit well



Figure 5. Photograph of a small float block of Miller's (1835) "unstratified bed of argillaceous rock" (=Brush Creek argillaceous limestone) from the roadcut along Pa. Route 53 near the head of Inclined Plane No. 3. The arrow points to the base of a gastropod fossil, most likely Phymatopleura brazoensis (Shumard), which was not documented previously from this locality. U.S. dime for scale.

with his family or religious community. He taught himself Latin, Greek, and French, and learned the art of lithography in his father's printing shop. With these skills at his disposal, he was in good shape to become a world-class paleontologist, despite never having attended college. Today, Conrad is recognized as one of the pioneers of paleontology (Wheeler, 1935). For example, he was one of the first naturalists to describe the Cenozoic mollusk shells of the southeastern United States (Conrad, 1832), and he helped pioneer the subject of biostratigraphy by using the occurrence of mollusk fossils to recognize the relationships of Cretaceous outcrops from New Jersey to Alabama (Ford, 1873). He later served as a geologist with the New York Geological Survey and in 1838 was appointed paleontologist for the Survey, serving in that capacity until 1841, when the great James Hall received the official title of New York's first State Paleontologist.

In his paper in the Transactions of the Geological Society of Pennsylvania, Conrad (1835) described and illustrated the fossils provided by Miller from Inclined Plane No. 3. Conrad's was only the fourth published paper containing descriptions of Carboniferous invertebrate fossils from North America (the first three were of Lower Carboniferous, or Mississippian, fossils) (Weller, 1898). Raymond (1910) erroneously

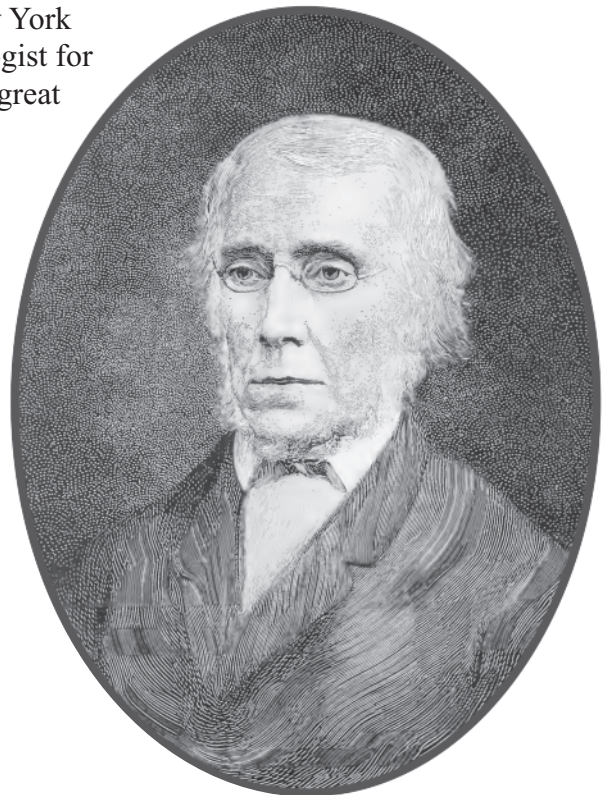


Figure 6. Portrait of Timothy Abbot Conrad (modified from Abbott, 1895).

claimed that Conrad's was the first published report describing fossils from the Coal Measures (Pennsylvanian); in fact, many plant fossils had already been described by 1835. However, Conrad's paper is the first published report on invertebrate marine fossils from the Upper Carboniferous, or Pennsylvanian, of North America. As a result, Miller's locality has much historical significance.

Conrad (1835) described three new species of gastropods, one new bivalve, and one new brachiopod. The type specimens (the specimens on which the species were based), unfortunately, have been lost. Most of them are very recognizable from his illustrations, however, even though his written descriptions are woefully inadequate by today's standards. Still, only two of his species currently are regarded as valid (the names are correct according to established rules). In Figure 7A to 7E, Conrad's lithographs are shown on the left and a recent photograph is shown on the right for comparison.

Stylifer primogenia (Figure 7A) is now known as *Strobeus primogenius*, a very common Pennsylvanian marine gastropod known from all over the United States. *Turbo tabulatus* (Figure 7B) is the very recognizable *Worthenia tabulata* (see Harper, 2014). *Turbo insectus* (Figure 7C) has not been described, illustrated, or documented since Conrad's original report. Given that Conrad's lithographs are probably fairly accurate, it is possible that it was based on a distorted specimen of *Shansiella carbonaria* (Norwood and Pratten) (shown on the right in Figure 7C for comparison). *Shansiella*, like *Worthenia*, is one of the more recognizable fossils found in Pennsylvanian marine faunas throughout North America. I know of no other Pennsylvanian gastropod from North America that comes even close to Conrad's illustration of *Turbo insectus*. *Pecten armigerus* (Figure 7D) probably is *Acanthopecten carboniferus* (Stevens). The only specimen Conrad had to work with was "the interior of the left valve" (Conrad, 1835, p. 268). *Productus confragosus* (Figure 7E) strongly resembles *Juresania nebrascensis* (Owen), arguably the most common productid brachiopod found in western Pennsylvania. Miller had provided Conrad with numerous specimens, but Conrad seems to have been interested more in the preservation of spines than in how the species differed from known European forms.

Conrad (1835) also listed nine other fossils from Miller's locality, but failed to describe or illustrate them. Being familiar with the scientific literature of Europe, Conrad considered most of them to be at least similar, if not conspecific, with well-known European forms. Most of them can be identified at least to genus (by modern standards) with a certain amount of confidence because the fauna of the Brush Creek has been well studied over the years (Table 1).

In a later paper on mostly Silurian and Devonian fossils, Conrad (1842) described and illustrated several other fossils from Miller's locality. All are very well known to this day and have been documented from Pennsylvanian marine rocks across North America, although their generic names have changed several times over the past 170+ years. They include *Bellerophon percarinatus* (= *Pharkidonotus percarinatus*) (Figure 7F), *Inachus catilloides* (= *Amphiscapha catilloides*) (Figure 7G), *Pleurotomaria sphaerulata* (= *Trepostira (Trepostira) sphaerulata*) (Figure 7H), and *Nuculites concentrica* (= *Astartella concentrica*) (Figure 7I).

Miller's locality is also the type locality of a North American Pennsylvanian shark tooth, *Petalodus allegheniensis* (Leidy, 1856) (Figure 7J). Leidy's species actually is a synonym for *Petalodus ohioensis* Safford, 1853. Details and additional information on this fossil will be forthcoming in a future article.

Percy Raymond at Bens Creek

Percy Edward Raymond (1879–1952) (Figure 8), a Connecticut native, attended Cornell University in 1897 to study engineering but became enamored of geology and paleontology instead (Stetson, 1953). After graduating in 1902, he moved on to Yale University and published an extensive review of the

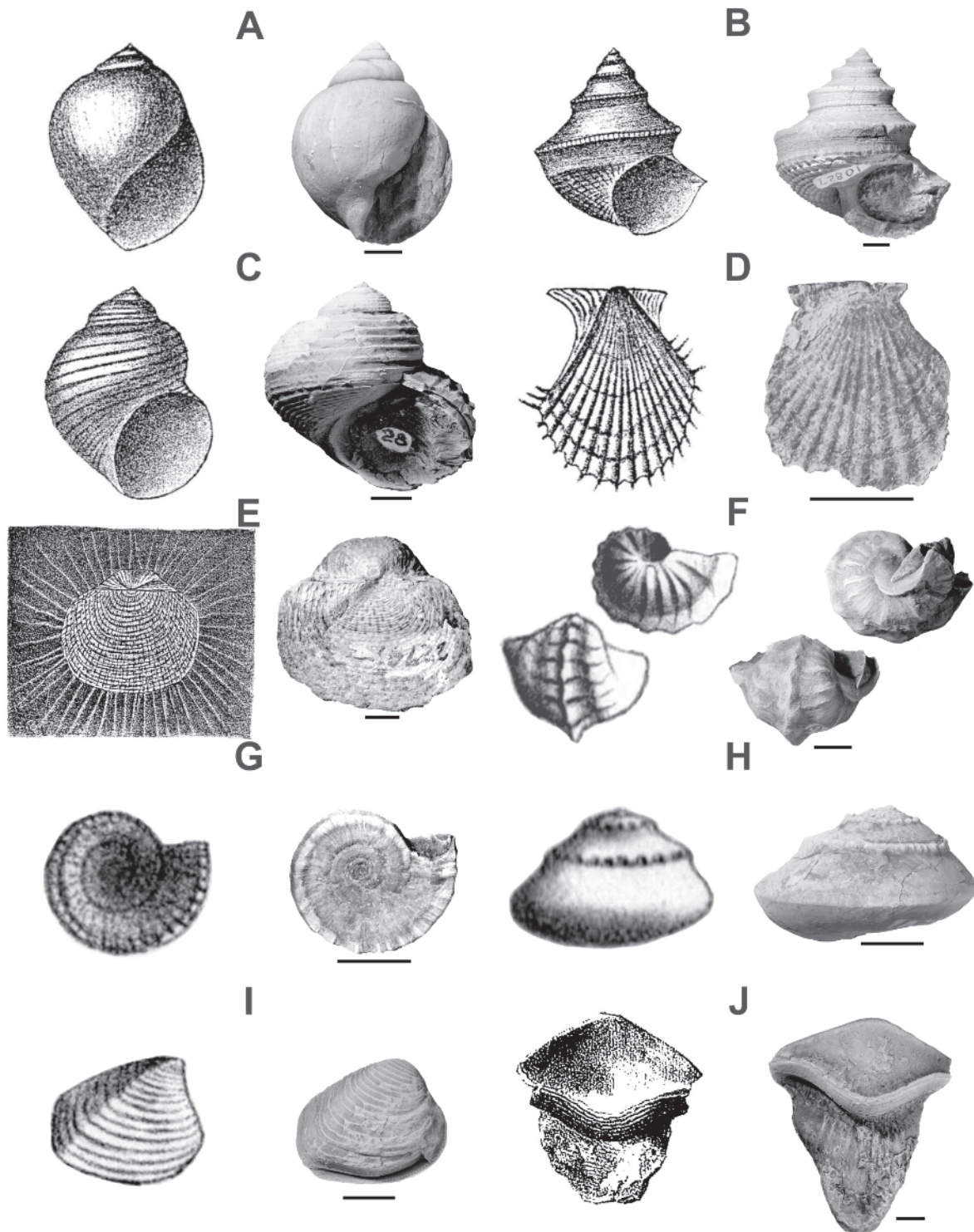


Figure 7. Illustrations of fossils described by Conrad in 1835 (A to E) and 1842 (F to I) and by Leidy in 1856 (J) from Inclined Plane No. 3. The original illustrations are on the left and recent photographs of Carnegie Museum specimens are on the right. Scale bars beneath the photos are 5 mm. See the text for the original nomenclature. A, *Strobeus primogenius*; B, *Worthenia tabulata*; C, “*Turbo insectus*” (with *Shansiella carbonaria* for comparison); D, *Acanthopecten carboniferus*?; E, *Juresania nebrascensis*?; F, *Pharkidonotus percarinatus*; G, *Amphiscapha catilloides*; H, *Trepostira* (*Trepostira*) *sphaerulata*; I, *Astartella concentrica*; J, *Petalodus ohioensis*.

Table 1. List of valid fossils (with taxonomy updated and questioned where uncertain) documented by Conrad (1835, 1842), Raymond (1910, 1911), and Leidy (1856) from the Brush Creek marine zone at or near Edward Miller's locality at the top of Inclined Plane No. 3 on the Allegheny Portage Railroad (see Figure 3)

Fossil group	Updated taxonomic name	Conrad	Raymond	Leidy
Corals	<i>Stereostylus</i> spp.	X		
Brachiopods	<i>Chonetinella plebeia</i> (Dunbar and Condra)		X	
	<i>Derbyia crassa</i> (Meek and Hayden)		X	
	<i>Juresania nebrascensis</i> (Owens)	?	X	
	<i>Linoproductus prattenianus</i> (Norwood and Pratten)	X		
	<i>Antiquatonia portlockiana</i> (Norwood and Pratten)	X		
	<i>Neospirifer cameratus</i> (Morton)	X		
Bivalves	<i>Nuculopsis girtyi</i> Schenck		X	
	<i>Palaeoneilo oweni</i> (McChesney)	X	X	
	<i>Astartella concentrica</i> (Conrad)	X	X	
	<i>Acanthopecten carboniferous</i> (Stevens)	?		
Gastropods	<i>Pharkidonotus percarinatus</i> (Conrad)	X	X	
	<i>Knightites (Cymatospira) montfortianus</i> (Norwood and Pratten)		X	
	<i>Amphiscapha catilloides</i> (Conrad)	X		
	<i>Trepostira (Trepostira) sphaerulata</i> (Conrad)	X		
	<i>Glabrocingulum (Glabrocingulum) grayvillense</i> (Norwood and Pratten)		X	
	<i>Worthenia tabulata</i> (Conrad)	X	X	
	<i>Soleniscus typicus</i> (Meek and Worthen)		X	
	<i>Strobeus primogenius</i> (Conrad)	X	X	
	<i>Shansiella carbonaria</i> (Norwood and Pratten)	?		
Cephalopods	<i>Pennoceras seamani</i> Miller and Unklesbay		X	
	<i>Pseudorthoceras knoxense</i> (McChesney)	X		
	? <i>Metacoceras</i> sp.	X		
Crinoids	? <i>Plummericrinus</i>	X		
Fish	<i>Petalodus ohioensis</i> Safford			X

stratigraphy and paleontology of Trenton Falls, N.Y. (Brett and Caudill, 2004). In 1904, before he could complete his Ph.D., he was appointed the first curator of invertebrate fossils at the Carnegie Museum of Natural History in Pittsburgh, Pa. He served in that position until 1910, with a brief hiatus in 1905 to complete his Ph.D. under the eminent Charles Schuchert at Yale (Stetson, 1953), when he left to join the Geological Survey of Canada as chief paleontologist. Two years later he joined the faculty of Harvard University as an assistant professor and curator of invertebrate fossils at the Museum of Comparative Anatomy. There, he established himself as one of the most well-known and well-respected paleontologists of the early twentieth century. Although he worked on many different phyla of many different ages, his greatest love was for trilobites. He is, perhaps, best known for his work on the classification and morphology of these fascinating creatures (e.g., Raymond, 1920).



Figure 8. Portrait of Percy E. Raymond (courtesy of the Carnegie Museum of Natural History, Section of Invertebrate Fossils).

While at the Carnegie Museum, Raymond ranged far and wide throughout western Pennsylvania looking to add to the relatively sparse assortment of invertebrate fossils then in the museum collections. One of his trips took him to Bens Creek in search of Miller's collecting locality. In a report published in the Carnegie Museum Annals (Raymond, 1910; revised in 1911) he identified the fossiliferous rock at Inclined Plane No. 3 as the Brush Creek limestone and shale. His reports list numerous fossils collected from the first railroad cut east of Bens Creek Station at Cassandra on the Pennsylvania Railroad¹, about 300 feet north of the head of Inclined Plane No. 3 (Figure 3). These fossils are listed in Table 1, using updated nomenclature. Although most of the fossils Raymond collected at Bens Creek seem to be missing from the Carnegie Museum's collection, other Brush Creek fossils from localities in nearby Westmoreland County include some of the best-preserved examples I've seen anywhere from that unit. Many are shown as photographs in Figure 7.

Protection of Important Geological Resources

There are several organizations in the United States that are attempting to protect and preserve localities of geological importance. For example, the United States government protects areas under the jurisdiction of the U.S. Forest Service, the Bureau of Land Management, the Bureau of Reclamation, the National Park Service, and the U.S. Fish and Wildlife Service from destruction or collection of geological and paleontological resources. Some entities definitely need to be preserved for all generations—think of the Grand Canyon, Dinosaur National Monument, and many dinosaur and fossil mammal localities. Similarly, the Pennsylvania Geological Survey has devoted resources to address the need for preserving sites of geological importance within the state. Mineral resource development, as well as residential, commercial, industrial, and infrastructure development, endanger many sites of historical, geological, and/or scenic importance. As Shaulis and Dodge (2004) pointed out, the bureau has limited control in being able to preserve geologically significant sites. One of the things it can do, however, is to develop and maintain close working relationships with other agencies and organizations to promote awareness and understanding of the importance to preserve such sites. For example, the

¹ Raymond's 1911 report, although very similar to the 1910 paper, appears to be contradictory in that he states, "The fossils were obtained in the first cut west of the station," whereas in the next sentence he states, "This locality . . . is only a hundred yards east of the station at Bens Creek." The first reference, to the cut west of the station, apparently was a misprint.

bureau has been attempting to promote the awareness of various outstanding geologic features in Pennsylvania by documenting their presence and recommending them for protection under the Pennsylvania Natural Heritage Program (PNHP) (see www.dcnr.state.pa.us/topogeo/field/pnhp/index.htm and various links therein). Any geologic feature or location designated as a PNHP site is provided the same level of importance as an endangered plant, animal, or ecosystem during the environmental review process that occurs prior to land development in the state. As of this writing, 101 sites have been included as PNHP sites, but there are many others of geological importance that could be designated for preservation. Perhaps North America's first Pennsylvanian marine invertebrate fossil locality will someday be included as well.

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BUREAU NOTES

Staff Update

Stuart O. Reese was recently promoted to manager of the Geologic Mapping Division of the bureau. Stuart began his career at the bureau in March 2002. Prior to that and after receiving his M.S. degree in geology in 1986, he spent several years working as a hydrogeologist, first at Wright-Patterson Air Force



Base in Dayton, Ohio, and then at a Camp Hill, Pa., consulting firm. He went on to serve 10 years with the Pennsylvania Department of Environmental Protection (DEP) in their groundwater protection program. While at DEP, Stuart acquired a strong interest in a newly emerging tool—geographic information systems (GIS). When a position opened at the Survey, he applied and was hired to work in the GIS Services area. Six years after his GIS stint, Stuart was promoted to supervisor of the Groundwater and Environmental Geology Section, where he supervised a staff of four geologists. His latest promotion means that he will be responsible for guiding the work of nine geologists in two sections of the bureau.

NEW PUBLICATION SERIES

Trail of Geology Leads to Places of Geologic Interest in Pennsylvania

Caron O'Neil
Pennsylvania Geological Survey



The Pennsylvania Geological Survey recently introduced *Trail of Geology*, a series of illustrated publications that highlight places of geologic interest within the state. The series includes the Survey's former park guides, a few previously published and new trail guides, and single-page summaries for a large number of outstanding geologic features, which at the time of this writing equals a total of 118 publications!

You can download trail of geology publications from our website (www.dcnr.state.pa.us/topogeo/publications/pgspub/trailgeology/index.htm), and in the near future, you will be able to perform geographical searches for the reports on our web-mapping application, PaGEODE (www.gis.dcnr.state.pa.us/geology/index.html). Plan your next trip with geology in mind. Whether you are driving, biking, hiking, canoeing, or kayaking, there's a trail of geology guide for you. See below (and page 1) for a few examples from around the state; photographs and slightly modified captions are from the guides.

NORTHEAST: TG 16–114.0

Rocks and Ruins of the "Upper Grand"—An Illustrated Trail Guide to the Geology and Historical Archeology of Lehigh Gorge State Park, Northeastern Pennsylvania



Hop on a bike and take a tour with author and now-retired bureau geologist Jon Inners as he leads you down a 26-mile trail along the west bank of the Lehigh River. The report includes 47 illustrations and a trail log with 29 stops. Learn aspects of the geology and geography of the Lehigh Gorge that relate to its industrial and transportation history between White Haven and Jim Thorpe.

The Falls of the Lehigh River at Stoddartsville where the river plunges about 25 feet over well-jointed ledges of Devonian-age Duncannon sandstone.

SOUTHEAST: TG 16-096.0

Outstanding Geologic Feature of Pennsylvania—Ringing Rocks, Montgomery County

In just one page, staff geologist Stuart Reese shows you where to find this ringing boulder field, describes the diabase rock that constitutes the boulders, explains how the field formed, and even gives a tip on which rocks will ring when struck!



Ringin' Rocks boulder field of Montgomery County. Photograph by Kevin Tarbert, Pennsylvania Geological Survey intern.

CENTRAL: TG 16-117.0

A Float Through the Devonian— A River Guide to the Geology of Bald Eagle Creek From Milesburg to Dowdy's Hole

Do you like to kayak? Travel with bureau geologist Rose-Anna Behr as she paddles down a 4.9-mile stretch of Bald Eagle Creek in Centre County. Learn about five Devonian rock formations found in the area: their physical characteristics, depositional environments, and fossils. See evidence of man's impact on the area—both from an historical iron industry and from more current transportation needs.



A resistant ledge of Mahantango siltstone deflects the water.

SOUTHWEST: TG 16–080.0

Outstanding Geologic Feature of Pennsylvania—Mt. Davis, Somerset County



At 3,213 feet, Mt. Davis is the highest point in Pennsylvania. It is underlain by Pennsylvanian-age Pottsville sandstone and occurs along the upfolded Negro Mountain anticline. Stuart Reese describes the physiographic and geologic setting of this prominent peak.

Shown below is the panoramic view to the west and southwest from the observation tower at the summit of Mt. Davis. A raised-relief map at the tower depicts local geographic features and explains how an optical illusion creates the impression that distant summits are higher. Photographs used to create this image by Kevin Tarbert and Peter Reynier, Pennsylvania Geological Survey interns.



NORTHWEST: TG 16–021.0

Presque Isle State Park, Erie County—A Dynamic Interface of Water and Land

Staff geologist Helen Delano wrote the Presque Isle park guide that is now part of the **Trail of Geology** series. Presque Isle is a recurved spit on Lake Erie that had a glacial origin. The guide includes photographs and line drawings that illustrate the role waves, currents, and wind play in the ever-changing shape of the spit and its surficial deposits.



An eroding beach deposit shows layers of sand built up over a long period of time by wave-deposited sand and migrating sandbars. A change in lake level or wave conditions triggered erosion. Repeated cycles of beach building and erosion are normal and are an essential feature of a moving-sand system.

IN MEMORIAM

Richard E. Wright 1936–2016

It is with sadness that we note the passing of Richard “Dick” Wright. A graduate of Franklin and Marshall College and Brigham Young University, Mr. Wright was a distinguished member of the geologic community in Pennsylvania for many years, being the founder and owner of the consulting firm R. E. Wright Associates, Inc., Earth Resources Consultants. He was also the founding president and a lifetime board member of the Pennsylvania Council of Professional Geologists and a principal advocate for the licensure of professional geologists by the commonwealth. Appropriately, he held Professional Geologist License number 1.



Mr. Wright’s connection to the Pennsylvania Geological Survey was multifaceted. Besides being a frequent user of our services who could often be found doing research in our library, until recently he also happened to be the owner of the building where the bureau has been located for the past 15 years.

RECENT PUBLICATIONS

Open-File Geologic Atlas (**December 2016**)

- [Geology of part of the Chester Valley area, Chester, Delaware, Montgomery, and Philadelphia Counties, Pennsylvania](#)

New series, *Trail of Geology* (**December 2016**)

Trail of Geology (**December 2016**)

- [A float through the Devonian—A river guide to the geology of Bald Eagle Creek from Milesburg to Dowdy’s Hole](#)

Open-File Miscellaneous Investigations (**December 2016**)

- [Water depth of Lake Nockamixon—Nockamixon State Park, Bucks County, Pennsylvania](#)
- [Water depth of Promised Land Lake and Lower Lake—Promised Land State Park, Pike County, Pennsylvania](#)

Calling All Authors

Articles pertaining to the geology of Pennsylvania are enthusiastically invited. The following information concerning the content and submission of articles has been abstracted from “Guidelines for Authors,” which can be seen in full on our website at www.dcnr.state.pa.us/topogeo/publications/pageonline/pageoolguide/index.htm.

Pennsylvania Geology is a journal intended for a wide audience, primarily within Pennsylvania, but including many out-of-state readers interested in Pennsylvania’s geology, topography, and associated earth science topics. Authors should keep this type of audience in mind when preparing articles.

Feature Articles: All feature articles should be timely, lively, interesting, and well illustrated. The length of a feature article is ideally 5 to 7 pages, including illustrations. Line drawings should be submitted as CorelDraw (v. 9 or above) or Adobe Illustrator (v. 8 or above) files.

Earth Science Teachers’ Corner: Articles pertaining to available educational materials, classroom exercises, book reviews, and other geologic topics of interest to earth science educators should be 1 to 2 pages in length and should include illustrations where possible.

Announcements: Announcements of major meetings and conferences pertaining to the geology of Pennsylvania, significant awards received by Pennsylvania geologists, and other pertinent news items may be published in each issue. These announcements should be as brief as possible.

Photographs: Photographs should be submitted as separate files and not embedded in the text of the article.

Submittal: Authors may send their article and illustrations as email attachments to RA-pageology@state.pa.us if the file sizes are less than 6 MB. For larger sizes, please submit the files on CD-ROM to the address given below. All submittals should include the author’s name, mailing address, telephone number, email address, and the date of submittal.

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Contributed articles are welcome.

Guidelines for manuscript preparation may be obtained at
www.dcnr.state.pa.us/topogeo/publications/pageonline/pageoolguide/index.htm.

To subscribe, send an email to RA-pageology@state.pa.us.



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