Vol. 44, No. 2

Pennsylvania Geology

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Thrombolites (moundlike nonlaminated masses formed by microbial activity) in the Mifflintown Formation along Penns Creek in the Middleburg, Pa., quadrangle (see article on page 14).

—Photograph by Rose-Anna Behr

EDITORIAL

Share Your Knowledge

George E. W. Love, State Geologist
Pennsylvania Geological Survey

Pennsylvania—what a place to live! We have a wonderful assortment of interesting natural features to see, enjoy, and ponder. Stuart Reese's article guides us toward an appreciation of what we have. I wish that more people appreciated the beauty of this state; unfortunately, in this article, Stuart also points out some of the darker aspects of our times—the lack of respect for the beauty of our state.

"So what do we do about this," you ask. Be proactive! As geologists and earth science enthusiasts, we have the opportunity to share with people our love of the science, our appreciation of nature, and our concern for tomorrow. One long-term solution is to instill the love of our state in our youth. Benjamin Franklin of hundred-dollar-bill fame summed it up nicely, "An investment in knowledge pays the best interest."

And to follow that statement, I call your attention to Laura Guertin's article regarding PAESTA, a professional organization for Pennsylvania's K–12 earth science teachers and *supporters of K–12 earth science education,* asking ***us*** (you and me) to volunteer, to help, to share. Her article mentions the expected national dearth of some 135,000 geoscientists by the end of the decade. A similar report in October 2013 stated that about 25 percent of recent geoscience graduates made their decision to enroll in the field before entering college. That means that somewhere during those "formative years" they had an exposure to the out-of-doors, the rocks in their neighborhood, or a teacher or speaker who excited that spark. You could be the one! Volunteer at a school. Help a teacher to develop a curriculum that will inspire children. Not only will you help develop an appreciation of the natural beauty around us that might eliminate one can of spray paint applied to our rocks, but you will most likely enjoy the experience!

Here are two examples of outreach:

In the "Bureau News" section of this issue, staff geologist Victoria Neboga reports on her experience speaking to children from kindergarten through 5th grade about Pennsylvania's rocks and minerals and her everyday duties at work.

And in October, staff geologist Aaron Bierly ". . . will be doing some fun outreach at the Reeds Gap State Park's Kids Festival. I will be doing a 'Painting with Pennsylvania Clay,' which essentially is getting kids to play with pretty-colored dirt as they block out [ignore] my lecture on the formation, uses, and importance of clays in Pennsylvania."

Based upon American Geosciences Institute data published in October 2008, the ". . . majority of geoscientists in the workforce are within 15 years of retirement age." Wow! Since this is 2014, some 6 years later, I am guessing that some of those folks have already left our ranks. By my reckoning, that means we remaining "old geologists" need to share our enthusiasm for the science in the formative years of our children, our friends' children, and our elementary/middle school/high school classes. We need to replace ourselves with the geologists of tomorrow. We need to ensure that the institutional knowledge that we have accumulated is not lost. (Note that I am quoting myself from my editorial in the Winter 2013 issue of *Pennsylvania Geology* [v. 43, no. 4].) In the event that you are a little unsure of my point—SHARE YOUR KNOWLEDGE! Geology is a lifelong love affair from which you never recover. Oh, and there are other interesting articles in this number. Read on!

More Than a Data Layer—Outstanding Geologic Features of Pennsylvania

Stuart O. Reese
Pennsylvania Geological Survey

A fascinating geologic story lies behind Pennsylvania's scenery, yet you do not need to be a geologist to appreciate and enjoy the scenic features . . . [however,] an acquaintance with certain geologic principles can enhance your appreciation of the site.—Arthur A. Socolow, 1987, Preface, *Outstanding Scenic Geological Features of Pennsylvania—Part 2.*

What geologist has not marveled at the beauty of the natural world and contemplated the geological processes involved in its creation? Whereas anyone can enjoy a grand vista, a cluster of glistening stalactites, a tree-mantled chasm, or a pounding waterfall, many geologists achieve a greater exhilaration and appreciation because they sense the geology behind the beauty.—Charles H. Schultz, 1999, *The Geology of Pennsylvania.*

Introduction

The notion of data sometimes brings to mind dry, repetitious numbers and mind-numbing descriptions. Two years ago, Michael Moore, one of the Pennsylvania Geological Survey's managers, asked me if I would be willing to take on the compilation of a data layer for the new online geologic mapping tool under development. This data layer was for summaries of Pennsylvania's OGFs (outstanding geologic features). "Well, you won't have to twist my arm for this assignment," I thought. Since then, we have developed 76 one-page summaries that are included in a data layer on the bureau's web-mapping application, PaGEODE (Pennsylvania GEOlogic Data Exploration) (Figure 1). Another 10 site summaries are in development. Each geologic feature is described in a PDF (portable document format) that includes a location, photographs, and a brief geologic explanation of what makes the site special.

Grand Vistas

Spectacular and interesting geologic features, like good books, do not typically generate feelings of indifference (Figure 2). Geologists, especially, feel the tug of these sites, and numerous "bucket lists" of extraordinary locales or geologic processes have been compiled.

Last summer, I had the good fortune to do something that is on many bucket lists: hike the Grand Canyon in Arizona. With a 6:00 a.m. start, my family and I descended the South Kaibab Trail, spent a day at Bright Angel campground and two nights sleeping under the stars and a waxing gibbous moon, and then ascended 4,380 feet up the Bright Angel Trail. Sweeping panoramic views, rugged landscapes, cool green canyon islands in the heat of summer, and rocks, lots of colorful rocks, are firm in my memory. On the return hike to the rim, I couldn't help but turn around and stare at perhaps the most picturesque vista in the entire country (Figure 3).

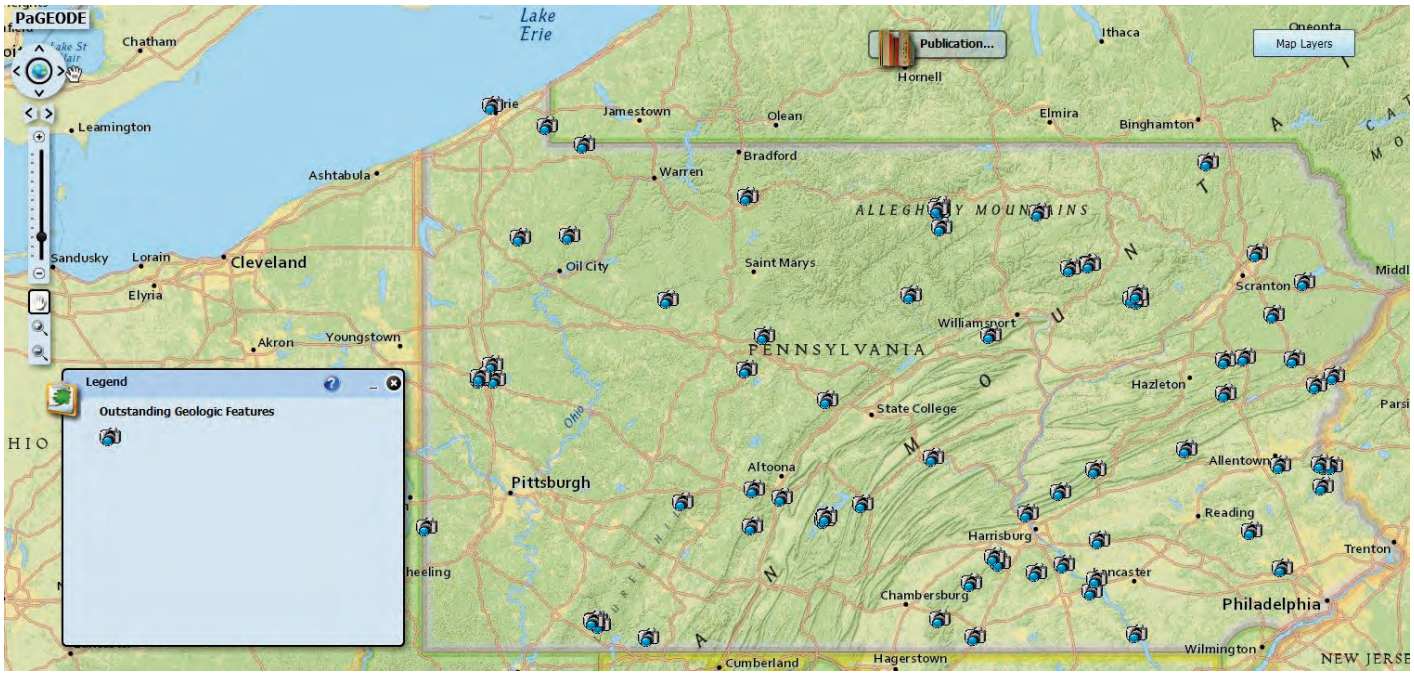


Figure 1. Screen shot of PaGEODE (Pennsylvania GEOlogic Data Exploration) showing the locations of outstanding geologic features (www.gis.dcnr.state.pa.us/geology/index.html).

Figure 2. View to the northeast of the Ridge and Valley physiographic province from Tuscarora Mountain, Franklin County, Pa.

Figure 3. View of the Grand Canyon from the Bright Angel Trail.

Yet, Pennsylvania does not take a back seat for outstanding vistas and geologic features. Though not on the same scale, the Pennsylvania Grand Canyon is majestic in its own lush setting, and numerous other exceptional places inspire a contemplative response from its visitors. As in our opening quotes, those with a background in geology or even those merely appreciative of geologic foundations (including, we assume, readers of this publication) may have an extra benefit because of their interest in geology.

Clues

Outstanding geologic sites have long been a source of inspiration for faith, geologic curiosity, and wonder. George Ashley, the first Director of the Fourth Geologic Survey of Pennsylvania, compared the study of landscape features to "unraveling the plot of a detective story" (Ashley, 1933, p. 1).

Sir Walter Scott slipped into his 1820s novel, *St. Ronan's Well,* the delightful description of geologists that some "rin up hill and down dale, knapping the chucky stanes to pieces wi' hammers, like sae many road makers run daft. They say it is to see how the warld was made" (now online, see Scott, 2007).

Geyer and Bolles compiled two of the most popular publications ever produced by the bureau. Released in two parts, *Outstanding Scenic Geological Features of Pennsylvania* listed more than 500 sites for their geologic value (Geyer and Bolles, 1979, 1987). The two volumes include descriptions of Pennsylvania vistas, outcrops, waterfalls, springs, rock cities, boulder fields, cliffs, gorges, islands, landforms, folds, faults, fossil localities, glacial features, and so on. These books publicized the best of scenic geologic features in Pennsylvania.

Bad Publicity?

Unfortunately, the publicity of certain special sites is not always beneficial. For example, the listing of one site in the publication *Fossil Collecting in Pennsylvania* (Hoskins, Inners, and Harper, 1983) resulted in the posting of "No Trespassing" signs. Eager collectors created a hazard that undermined an interstate highway. The listing of any site on private property can attract unwanted visitors, despite warnings. This very conundrum was described 25 years ago in an editorial in *Pennsylvania Geology* (Hoskins, 1989).

Famous sites such as the highest point in Pennsylvania, Mt. Davis (Parrish, 2009), and boulders at Hickory Run Boulder Field (Gray, 2005) have been objects of graffiti and vandalism. The Tuscarora sandstone shown in Figure 2 is found in a remote location but still needed to be over-painted to cover up graffiti. The bureau's efforts to safeguard such sites from illegal activities have centered on the establishment of geoheritage sites through the Pennsylvania Natural Heritage Program (Pennsylvania Geological Survey, 2014). Department-wide discussions continue to occur regarding the best methods of protecting outcrops at state parks and forests from indiscriminate vandalism (Figure 4).

Most of the sites included to date in the OGF list are publicly accessible or viewable from a distance. To not publicize such outstanding sites robs those who have not seen such treasures and prevents those of future generations from having a chance of appreciation. The risk is worth the reward, but it is an understandable response by some to want to hide or not openly share sites with others. My recent investigation of a beautiful spring on state land was accompanied by an appeal from local voices not to publicize "their" spring for fear of it being damaged. Who can blame them? Some sites are so delicately balanced or fragile that a thoughtless, simple act can destroy them or render them defaced for years to come. Claiming ownership is a healthy response and one possible option for protecting our outstanding natural features.

Otherwise, would someday visitors to OGFs on state lands be warned that "you are under video surveillance," or would drones provide an attentive eye when spray painting or vandalism is occurring? We hope that OGF sites can be publicly listed and at the same time protected from those who might come for other than thoughtful observation of such outstanding geologic features.

Awesome

Pennsylvania's natural areas are awe-inspiring, and the geologic stories about them have been pieced together through the detective work of many scientists. Thirty of the OGF sites are included in the Department of Conservation and Natural Resource's Story Maps website (Pennsylvania Department of Conservation and Natural Resources, 2014), which provides a shorter list of "must-see" sites. The geologic summaries serve to give a glimpse of a remarkable, ancient past that brought us to the present. It's no wonder that most Pennsylvanians have pride in the beauty of the state; geologists like to think they contribute to the wonder of it all by describing it so that others can understand what they see.

—Try and leave this world a little better than you found it—Robert Baden-Powell (http://scout.org/bp)

Figure 4. Graffiti at Bauer Rock, Lehigh County, in October 2012.

Acknowledgments

Numerous staff members of the bureau have had a hand in reviewing, editing, and posting of the OGF summaries, including Gary Fleeger, Helen Delano, John Harper (retired), Kristen Hand, Carrie Tropasso (Bureau of Information Technology Services), Caron O'Neil, Michael Moore, Gale Blackmer, and Bill Kochanov. In fact, the summaries could not have been done without their expertise; however, mistakes that remain are those of the compiler. Corrections and comments, and suggestions for additional OGFs, are most welcome.

References

Ashley, G. L., 1933, The scenery of Pennsylvania—Its origin and development based on recent studies of physiographic and glacial history: Pennsylvania Geological Survey, 4th ser., General Geology Report 6, 91 p., also online at www.dcnr.state.pa.us/topogeo/publications/pgspub/general/index.htm (accessed August 5, 2014).

Geyer, A. R., and Bolles, W. H., 1979, Outstanding scenic geological features of Pennsylvania: Pennsylvania Geological Survey, 4th ser., Environmental Geology Report 7, pt. 1, 508 p., also online at www.dcnr.state.pa.us/topogeo/publications/pgspub/enviromental/index.htm (accessed August 5, 2014).

_____, 1987, Outstanding scenic geological features of Pennsylvania, Part 2: Pennsylvania Geological Survey, 4th ser., Environmental Geology Report 7, pt. 2, 270 p., also online at www.dcnr.state.pa.us/topogeo/publications/pgspub/enviromental/index.htm (accessed August 5, 2014).

Gray, Murray, 2005, Geodiversity and geoconservation—What, why, and how?, *in* Santucci, V. L., guest ed., Geodiversity and geoconservation: v. 22, no. 3, p. 4–12, www.georgewright.org/node/97 (accessed August 5, 2014).

Hoskins, D. M., 1989, Geology, art, and vandalism: Pennsylvania Geology, v. 20, no. 4, p. 1, also online at www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_20027656.pdf (accessed August 5, 2014).

Hoskins, D. M., Inners, J. D., and Harper, J. A., 1983, Fossil collecting in Pennsylvania (3rd ed.): Pennsylvania Geological Survey, 4th ser., General Geology Report 40, 215 p.

Parrish, J. B., 2009, More or less: Pennsylvania Geology, v. 39, no. 2, p. 1–2, also online at www.dcnr.state.pa.us/cs/groups/public/documents/document/dcnr_006814.pdf (accessed August 5, 2014).

Pennsylvania Department of Conservation and Natural Resources, 2014, A gallery of DCNR Story Maps—30 outstanding geologic features in Pennsylvania: http://maps.dcnr.pa.gov/StoryMaps/ (accessed August 5, 2014).

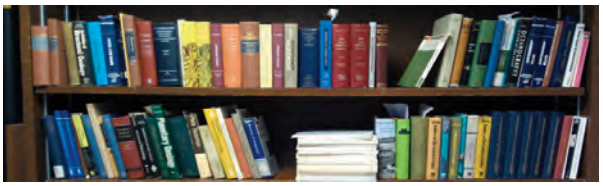
Pennsylvania Geological Survey, 2014, Heritage geology of Pennsylvania: www.dcnr.state.pa.us/topogeo/field/pnhp/index.htm (accessed August 5, 2014).

Scott, Sir Walter, 2007, The Project Gutenberg EBook of *St. Ronan's well,* www.gutenberg.org/files/20749/20749-h/20749-h.htm (accessed August 5, 2014).

Shultz, C. H., 1999, The geologic tourist, Part X *of* Shultz, C. H., ed., The geology of Pennsylvania: Pennsylvania Geological Survey, 4th ser., Special Publication 1, p. 803. [Co-published with Pittsburgh Geological Society.]

ANNOUNCEMENT

Library Catalog Available Online!



The Pennsylvania Geological Survey is pleased to announce that most of our library collection is now available for searching in the State Library of Pennsylvania's online catalog. Over the past year, thousands of records have been added to this database. The catalog makes searching the library's holdings easier than ever. Records continue to be added on a daily basis, so if there is a publication you are looking for that is not in the catalog, please contact the bureau library to determine its availability.

You can search the catalog by title, author, subject, or keyword. The online catalog provides a listing of all the resources available in libraries under the State Library of Pennsylvania. To search only in the Survey library's holdings, you should select "Conservation and Natural Resources Geology" under "Set Single Limit." This will limit your search results to publications found in the Pennsylvania Geological Survey library.

Most books and journals may be checked out of the Survey library for a loan period of 28 days. To borrow materials from the library, you must visit in person and provide identification that also indicates your permanent address (e.g., a driver's license). If you are not able to visit the library in person, you can contact your local library to arrange for an interlibrary loan. Some items are not available to check out; for example, most maps can only be viewed in the library. If you are uncertain as to the check-out status of a publication, please contact our librarian at RA-pagslibrary@pa.gov.

To access the online catalog, and for more information about the Pennsylvania Geological Survey library, please visit our library web page at http://dcnr.state.pa.us/topogeo/library/index.htm.

Cleaning House

John H. Barnes
Pennsylvania Geological Survey

Among the activities that we have been engaging in recently at the bureau is the necessary occasional task of cleaning house. Part of that has included reviewing old correspondence dating back to the 1970s to determine what is worth keeping and what is not. As anyone who has engaged in a similar activity can attest, you never know what you will find.

Among the routine letters telling people that they will not become wealthy by panning for gold in our streams or that the suspected meteorite that they found is actually slag, we found a copy of an interesting letter written by economic geochemist Bob Smith, who retired several years ago but is still working with us as a volunteer. The letter was dated July 17, 1978. Bob had been asked by a member of the public to identify an unusual rock that he had found at Accomac in York County, Pa. The rock may have been the one shown in Figure 1. If it was not that same rock, it was a similar one: a bright green rock having vugs containing a shiny black metallic mineral. Bob identified the black mineral as specular hematite and the green matrix as epidote. The rock is Catoctin Metabasalt, which is peculiar to that region of York County.

What especially caught our eye as we read this letter was the name of the person who sent the rock to us for identification, a young exploration geologist living in Beaver, Pa., named George E. W. Love (Figure 2). George does not remember the circumstances or the letter, but he thinks he was probably

Figure 1. Catoctin Metabasalt from York County, Pa., featuring black specular hematite crystals filling vugs in a matrix of bright green epidote.

visiting relatives in York County when he spotted that rock. (We didn't remember the letter, either.) But maybe there was some subliminal tug from that letter that worked over the years and got George to eventually join our staff nearly 30 years later and become Pennsylvania's State Geologist in 2010.

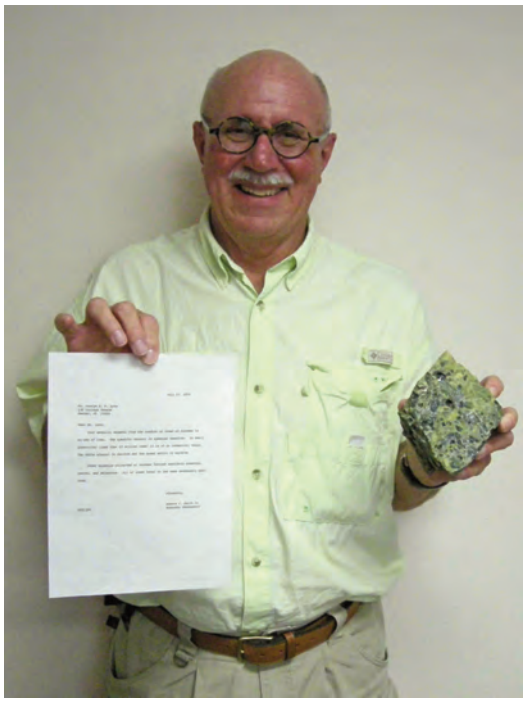


Figure 2. State Geologist George Love, appropriately wearing an epidote-green shirt, holding both the epidote-bearing rock that he may have sent to us for identification in 1978 and a copy of the letter that was sent to him identifying the black mineral in vugs as specular hematite. Photograph by Helen Delano.

ANNOUNCEMENT

Field Conference of Pennsylvania Geologists, 2014

The 79th Annual Field Conference of Pennsylvania Geologists, "Pennsylvania's Great Valley and Adjacent Mountains," will convene in Carlisle, Pa., October 16 through 18, 2014. The hosts for this year's meeting are Dickinson College and the Pennsylvania Geological Survey. The meeting will focus on bedrock, economic, and environmental geology, structures, and geomorphology of South Mountain, the Great Valley, and the bordering area of the Appalachian Mountains that occur principally in Adams, Cumberland, Franklin, and Perry Counties. The use of lidar in mapping and interpreting bedrock and geomorphology will also be considered at the meeting. Three classic sites from the 1991 Field Conference will be revisited, and new interpretations will be presented. We will visit five quarries in sandstone, limestone, shale, and colluvium/alluvium and discuss their geologic and economic importance. The results of dye-tracing that demonstrates long-distance travel of groundwater to large springs in carbonates will be featured. The banquet program will include a discussion of the history of iron mining at one of the 19th century charcoal furnaces in the area. Half-day pre-conference trips include Yellow Breeches geology by kayak, caving in the Great Valley, orienteering at South Mountain, the Marcellus of south-central Pennsylvania, the Battle of South Mountain, fossil collecting, and the story of Boiling Springs. For more information, or to register, visit the Field Conference's website at http://fcopg.org/.

EARTH SCIENCE TEACHERS' CORNER

PAESTA—A Professional Organization for Pennsylvania's K–12 Earth Science Teachers

Laura Guertin
Penn State Brandywine[1]

Earth science instruction has an important role in the K–12 classroom. From natural disasters to natural resources, students need to learn about the interactions among and between Earth's systems, as well as their own role and impact on the planet. Curricular units integrating earth science can increase scientific literacy of students and guide their decisions as future voting citizens. Although most students will not think to pursue a career in the earth sciences, earth science lesson plans can allow teachers to introduce students to the variety of earth science-related careers (such as art and journalism), as well as future employment opportunities based on federal workforce statistics that predict a national shortage of around 135,000 geoscientists by the end of the decade (Wilson, 2014).

The benefits of earth science instruction for students come with challenges for teachers. Some Pennsylvania teachers are the only ones in their schools covering earth science, and are therefore teaching in isolation. Other teachers are teaching earth science in addition to other subjects, requiring them to spread their content knowledge across more than one discipline. Teachers are also disadvantaged by not having the classroom materials or quality lesson plans focused on Pennsylvania geology, a lack of access to professional development in the earth sciences, and for some teachers, an overall lack of respect towards their role and identity as an earth science teacher.

Members of the Penn State ESSP (Earth Space Science Partnership) have moved forward in addressing the challenges and celebrating the successes in Pennsylvania K–12 earth science education. In 2011, with financial support from the National Science Foundation (Award no. DUE–0962792 and Award no. GEO–0631377), ESSP personnel established a Pennsylvania state affiliate of the National Earth Science Teachers Association. PAESTA (the Pennsylvania Earth Science Teachers Association, www.paesta.org) has a mission of facilitating and advancing excellence in earth and space science education across the state of Pennsylvania. The PAESTA strategic plan focuses on establishing and building the PAESTA community, providing curricular resources in earth science teaching and learning, and advocacy for the teaching and learning of earth science.

The PAESTA community allows teachers to become part of a statewide network and to build connections and collaborations with their peers. Conversations pertaining to earth science education are facilitated through monthly eNewsletters, social media, an annual conference, and opportunities for teachers to become organization leaders and serve on committees. We celebrate the accomplishments of teachers through a monthly PAESTAR (Pennsylvania Earth Science Teacher Achievement Recognition) honor and an annual Award for Teaching Excellence. High-quality, freely available curricular resources are available in a searchable database called the PAESTA Classroom. We are also building our collection

[1]Penn State Brandywine, 25 Yearsley Mill Road, Media, PA 19063

of position statements from national organizations that state the importance of earth science education, as well as adding materials to help teachers become advocates of K–12 earth science education in their schools, districts, and at the state level. Teachers can also find career information on the PAESTA website to introduce students to the numerous pathways available.

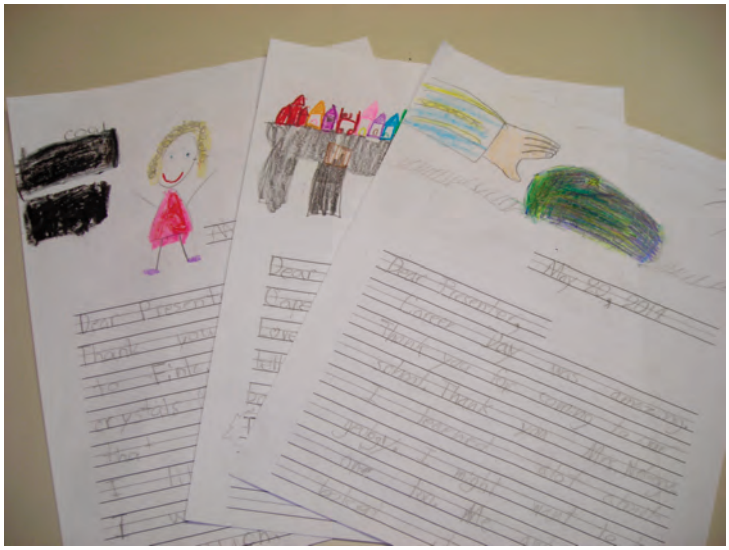
PAESTA membership is free and open to any educator or supporter of K–12 earth science education in Pennsylvania. We welcome announcements about teacher workshops, grant opportunities, classroom contests, and events for students and teachers. We are considering adding field trip opportunities for our members, and we are especially interested in professional geologists, higher education faculty, and museum scientists serving as field trip leaders. We are also looking for members who will contribute to developing and strengthening the organization. Please visit our website and help us promote the mission of PAESTA to benefit our Pennsylvania teachers and students at www.paesta.org/. We can also be reached via email at paesta@psu.edu.

Reference

Wilson, Carolyn, 2014, Status of the Geoscience Workforce—2014: Alexandria, Va., American Geosciences Institute, 134 p.

BUREAU NEWS

On May 15, 2014, Lyall J. Fink Elementary School in Middletown, Pa., held its annual Career Day. Staff geologist **Victoria Neboga** participated as a guest speaker and talked about Pennsylvania's rocks and minerals as well as her everyday duties at work. Children from kindergarten through 5th grade learned about the coal resources of Pennsylvania and enjoyed touching samples of minerals and fossils. Victoria also involved them in hands-on activities using the EnviroScape model, which was recently acquired by our bureau. The Enviroscape watershed/nonpoint source model is an interactive learning tool that helps people to make a visual connection between land use and water quality. This model illustrates residential, recreational, agricultural, industrial and transportation areas and includes a topographic map. The kids also learned how different human activities can introduce contaminants to the nearby parks and streams, and what they can do to prevent these sources of pollution. It was a fun-filled day, full of curious questions and excited faces, which reflected the students' eagerness to learn about geology.



Letters from grateful students.

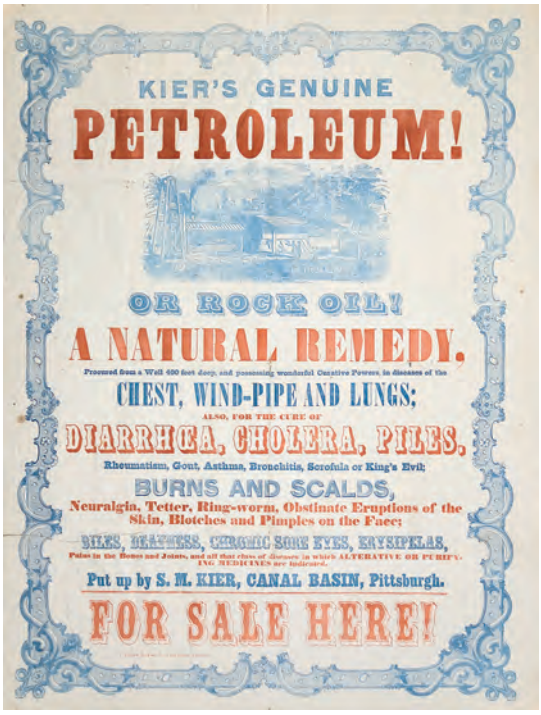
NEW RELEASES

Oil and Gas Booklet Updated

Caron E. O'Neil
Pennsylvania Geological Survey

The Pennsylvania Geological Survey has published a new (third) edition of **Educational Series 8,** *Oil and Gas in Pennsylvania.* The authors, Kathy J. Flaherty and Thomas Flaherty, III, updated the previously out-of-print booklet to include the advancements in drilling techniques being used by industry to target the shale reservoirs in our state. Kathy is a former Pennsylvania Geological Survey geologist who now works for ABARTA Energy, and Tom is a licensed professional geologist with the Pennsylvania Department of Environmental Protection, Office of Oil and Gas Management. Their efforts have produced a well-illustrated, 36-page text for the interested public that covers all aspects of oil and gas (petroleum) and its relationship to Pennsylvania: its uses, how it forms, where it is found, how it is produced, environmental concerns, production statistics, and the history of the industry—ancient and modern.

You can view ES 8 online at the link above, or you can order a free printed copy by email from the Pennsylvania Geological Survey. Orders must include the publication series and number (ES 8), the quantity you desire, the ship-to address, and a telephone number where you can be reached if necessary. If requesting classroom quantities, please provide the school affiliation. If you have any questions concerning the ordering process, you may call the Survey at 717–702–2017.



This image of an old advertising poster was provided by the Pennsylvania Historical and Museum Commission, Drake Well Museum. It appears on page 32 of ES 8. In the 1840s, salt-water well operators along the Allegheny River in northwestern Pennsylvania were having problems with oil contamination in their wells. One of those operators, Samuel M. Kier, decided to sell the greasy crude oil as medicine. Its medicinal powers were awesome, as the poster suggests. Being quite successful, Kier expanded his operations to include refining the oil to kerosene for use in oil-burning lamps. His enterprises caught the attention of East Coast investors and led to the drilling of the first oil well (the famous Drake well) in Titusville, Pa.

Report on Geology and Mineral Resources of the Middleburg Quadrangle, Snyder and Union Counties, Released

Rose-Anna Behr
Pennsylvania Geological Survey

This summer, the Pennsylvania Geological Survey released Atlas 135d, ***Geology and Mineral Resources of the Middleburg Quadrangle, Snyder and Union Counties, Pennsylvania,*** by Rose-Anna Behr. The project was proposed in 2010, guided by the recommendations of the Survey's Geologic Mapping Advisory Committee, which suggested mapping in Union County with a focus on Marcellus Formation outcrops. The Middleburg quadrangle was selected on these criteria. Additionally, for half of the neighboring quadrangles, mapping is complete or in progress.

The topography of the Middleburg quadrangle is typical of the Ridge and Valley physiographic province (Figure 1). Resistant sandstone and orthoquartzite beds create long linear ridges, and less resistant limestone and shale create intervening linear valleys. The stratigraphy ranges from the Silurian Tuscarora Formation to the Devonian Catskill Formation (some units have interesting features; see front cover for an example). These rocks are folded into broad, open first-order folds, which shape the landscape. From north to south, the named folds are Jacks Mountain anticline, Northumberland syncline, and Shade Mountain anticline. Several higher order folds and many small tear faults were also mapped. Glacial, periglacial, and fluvial processes influenced the geomorphology of the quadrangle. Historical economic resources of the quadrangle include clay and iron, and current extraction includes shale and limestone.

The report consists of 21 pages of text; an appendix of bedding and joint measurements; and a map plate showing bedrock geology, a cross section, and lithologic descriptions of the units. GIS datasets and metadata also accompany the report.

The report is now available for free downloading from the bureau's website by going to the following address and scrolling down to report A 135d: www.dcnr.state.pa.us/topogeo/publications/pgspub/atlas/index.htm.

Figure 1. View of Jacks Mountain looking northwest.

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 been seen in full on our website at www.dcnr.state.pa.us/topogeo/publications/pageolonline/pageolguide/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.

George Love, Director
Bureau of Topographic and Geologic Survey
3240 Schoolhouse Road
Middletown, PA 17057
Telephone: 717–702–2017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This old house (now a business) was built with a serpentinite facade (see article on page 14). It is located at the corner of Clay and North Duke streets in Lancaster and was built in 1890.

—Photograph by Stephen Shank

NEW PUBLICATIONS

Educational Series: **(June 2014)**

Oil and gas in Pennsylvania (new edition)

Atlas Report: **(July 2014)**

A 135d—Geology and mineral resources of the Middleburg quadrangle, Snyder and Union Counties, Pennsylvania

Department of Conservation and Natural Resources
Bureau of Topographic and Geologic Survey

Main Headquarters
3240 Schoolhouse Road
Middletown, PA 17057–3534
Phone: 717–702–2017 | Fax: 717–702–2065

Pittsburgh Office
400 Waterfront Drive
Pittsburgh, PA 15222–4745
Phone: 412–442–4235 | Fax: 412–442–4298

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