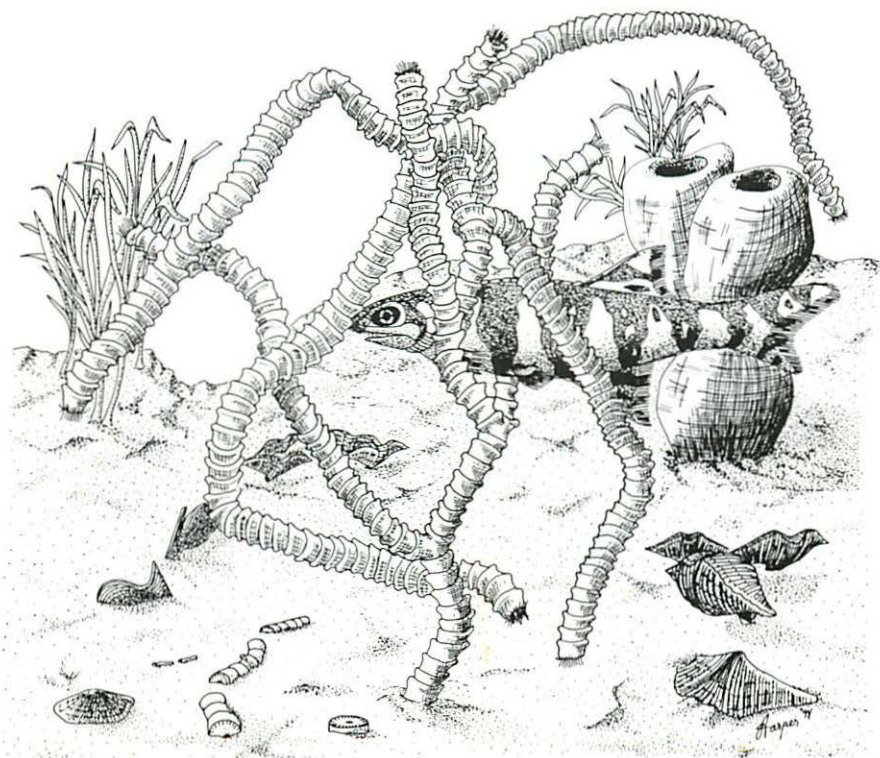


VOL. 25, NO. 3

Pennsylvania **GEOLOGY**



COMMONWEALTH OF PENNSYLVANIA
DEPARTMENT OF ENVIRONMENTAL RESOURCES
OFFICE OF PARKS AND FORESTRY
BUREAU OF
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ON THE COVER

Interpreted reconstruction of a portion of the Late Devonian Corry seafloor in the vicinity of what is now Titusville, Pa. (see article on page 2). A fine specimen of *Titusvillia drakei* Caster grows in the foreground, offering insubstantial shelter to a small paleoniscoid fish. To the right is a small group of *Cyrtospirifer* brachiopods, and some sponges and seaweed are present behind them. The brachiopod *Syringothyris*, the clam *Leiopteria*, and some seaweed grow in the left background. In the foreground is some scattered crinoid and brachiopod debris. Drawing by John A. Harper; *Titusvillia* based on Caster (1939, description and Figures 3 and 8).

PENNSYLVANIA GEOLOGY

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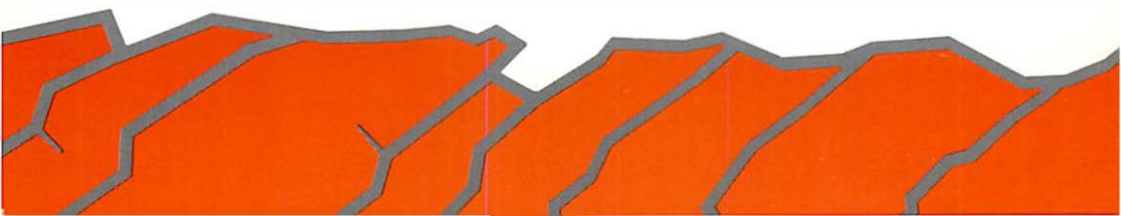
Editors: Christine M. Dodge, Anne B. Lutz, and Donald M. Hoskins.

Contributed articles are welcome; for further information and guidelines for manuscript preparation, contact D. M. Hoskins at the address listed above.

Articles may be reprinted from this magazine if credit is given to the Bureau of Topographic and Geologic Survey.

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FALL 1994



STATE GEOLOGIST'S EDITORIAL

Research in Geoscience

A recent newsletter (*American Paleontologist*) stated that geoscientists (specifically the newsletter readers, who are principally paleontologists) now need to focus their research proposals on "strategic" issues in order to receive funding support. "Strategic" research, a current defining buzzword, is explained as research that "advances the national social or economic well-being." Labeling research as "strategic" seems to impart some higher level of value than calling the research "basic," "core," "framework," or any of the many other labels that might be used to categorize a research proposal.

To be concerned about labeling research as strategic is, I believe, to participate in a subterfuge which avoids defining the values of research. All research that serves to better explain our world to us and allows us to become concordant with our world is supportable. The present-day trend of directing research to strategic issues, I believe, results from a long-standing and continuing reluctance of geologists and other scientists to acknowledge the need to adequately explain to their audiences, and to the larger public, the value and need for the research. Some scientists fear that they cannot be understood because of the inherent complexities of the science. However, science can be clearly explained to nonscientists, as many well-known scientists have proven. Some scientists disdain clear-language justifications as "popularizing" science. If it is beneath the dignity of a scientist to adequately explain the value of research in clear language, the research probably should not be supported.

From the notice included on page 12 of this issue of *Pennsylvania Geology*, you will learn about a report that includes extended descriptions of each of the investigations now being conducted by Pennsylvania Geological Survey staff. These projects are designed to explain Pennsylvania's geology and resources. Each was selected for investigation to provide a public service. I urge that you obtain this report, read about these investigations, and evaluate whether we have described each in a manner such that you can decide whether it has value and deserves your support. If you are not satisfied with the value of our research to yourself or to our Commonwealth through the provided descriptions, at your request we will respond to your concerns and provide further explanation.



Donald M. Hoskins
State Geologist

Historical Marker Commemorates a Sponge, a Scientist, and the Oil Industry

by John A. Harper and Kathy J. Flaherty
Pennsylvania Geological Survey

How often have you seen or heard of a sponge being honored by a city, officials from local, state, and federal governments, the petroleum industry, a scientific research facility, and history buffs, all at the same time? In all likelihood, such an event had never occurred prior to August 27, 1993, when a new historical marker was unveiled on Union Street in Titusville, Pa. The plaque (Figure 1) commemorates the discovery and naming of an ancient fossil sponge found in the bed of Church Run in Titusville over 60 years ago.

Yes, a sponge! One of those lowly, primitive life-forms that consists of a semigelatinous blob held together by either a network of collagen fibers or a fairly rigid skeleton of siliceous or calcareous elements called spicules. A member of the phylum that you might have bought at the hardware store recently to wash your car or your bathroom walls.

Yet, as ridiculous as it might sound at first, the Devonian sponge *Titusvillia drakei* (Figure 2 and cover illustration) is unique and important enough to have been honored at the ceremony by the Titusville High School Marching Band, the pastor of St. Walburga Church, a member of the Titusville City Council, Titusville's "Man of the Year," representatives of the Pennsylvania and West Virginia Geological Surveys and the Bureau of Oil and Gas Management of the Pennsylvania Department of Environmental Resources, the Chief of the Paleontology and Stratigraphy Branch of the U.S. Geological Survey, the President of the Penn Grade Crude Oil Association, the Director of the Paleontological Research Institution in Ithaca, N.Y., the President of the Board of The Colonel, Inc., and a diverse audience of Crawford County and Venango County citizens. The attendance by so many people confirms the significance of the fossil. However, the marker and the event honored not just a sponge; included in the compliment were the scientist who found and identified it, the city of Titusville, the accomplishments of Colonel Edwin L. Drake, founder of the modern petroleum industry, and the petroleum industry itself.

THE MARKER. The hoopla surrounding the dedication of the historical marker took place at an annual event called Drake Day, in



Figure 1. Some of the people present at the unveiling of the *Titusvillia* historical marker included, from left to right, Kathy J. Flaherty, Pennsylvania Geological Survey; Warren Allmon, Director of the Paleontological Research Institution in Ithaca, N. Y.; John Pojeta, Chief of the Paleontology and Stratigraphy Branch of the U.S. Geological Survey; Samuel T. Pees, President of the Board of The Colonel, Inc.; John H. Bryner, President of the Penn Grade Crude Association; Pat Johns, West Virginia Geological Survey; and Larry D. Woodfork, State Geologist of West Virginia. Photograph courtesy of Jim Farling, Quaker State Corporation.

honor of the day in 1859 when Colonel Edwin L. Drake's oil well finally "came in." The day typically consists of a variety of festivities, including live entertainment, a banquet, and a keynote address. The historical marker is the brainchild of Samuel T. Pees, a well-known consulting geologist and oil-field historian from Meadville, Crawford County. The placement and unveiling of the plaque were sponsored by The Colonel, Inc., a dynamic organization whose members help support exhibits, education, and preservation of oil-field history.

The dedication on the historical marker (Figure 1) reads, "In ancient sea bottom rocks exposed in this stream, the holotype specimen of a rare fossil sponge was found by paleontologist Kenneth E. Caster. In 1939 in recognition of the support which brought the sciences of geology and paleontology to such eminence he named this new species in honor of the oil industry's birthplace and its founder."

(A holotype is a specimen considered by the describer to be typical of the species, and to which all other specimens are to be compared.) In the paper in which he described the fossil, Caster (1939, p. 9) wrote, "The name *Titusvillia drakei* is given in recognition of the place of discovery of the holotype specimen and for the founder of the oil industry in Pennsylvania, without the ramifications of whose enterprise geology and paleontology could not have reached the station of eminence they hold today." Caster had created the name to honor the very dynamic interactions of the paleontological/geological community and the petroleum industry that has employed so many of its members over the past century. Many of the concepts that have shaped the science of geology as we know it today originated with oil-field geologists, paleontologists, geochemists, and geophysicists.

THE SPONGE. *Titusvillia drakei* is a member of the Hexactinellida, a class of sponges of highly variable shape that originated about 500 million years ago. These wholly marine animals are characterized by skeletons of six-pronged siliceous spicules. The glass sponge called "Venus's flower basket" is a good modern example of this class.

Unlike other hexactinellids, *Titusvillia* consisted of a branching supercolony of individual cuplike animals (cover illustration). Colonies (branches) diverged from a central axial colony at regular intervals in a spiral pattern. One especially interesting facet of this sponge was the tendency for some colonies to reverse the orientation of the cups—some are oriented outward from the axis, whereas others are oriented inward. Caster (1939, p. 8) speculated that this phenome-



Figure 2. Three slabs of rock containing specimens of *Titusvillia drakei* Caster collected by Samuel T. Pees from an outcrop of Corry Sandstone at the Drake Well Museum. The pen at the bottom indicates the scale. Photograph courtesy of Samuel T. Pees.

non occurred when the supercolony became too massive for the skeleton to support all of the branches in a normal upright fashion. Then the branches drooped and the cups grew upward, that is, toward the axis, or horizontally along the seafloor. Collectors should be aware that a close look at a specimen with a hand lens or microscope may be required to see the network of spicules on the surface of the fossil.

Caster collected the type specimens of *Titusvillia drakei* in 1931, in the bed of Church Run about 50 yards north of the Union Street bridge over the creek. He included in his collections specimens from the areas around Johnsonburg in Elk County, Kushequa in McKean County, Pleasantville in Venango County, and Tidioute and Warren in Warren County. Another well-known locality is the outcrop of Corry Sandstone across the tracks from the railroad station at the Drake Well Museum (Hoskins and others, 1983). Caster thought that his specimens represented a strange form of fossil worm trail having unique nodes on it when he first found them. It was only when he began preparing a paper on Late Devonian trace fossils seven years later that he realized what he had discovered (Caster, 1939, p. 7).

THE SCIENTIST. Kenneth E. Caster (Figure 3) was a native Pennsylvanian, born in New Albany, Bradford County, in 1908. He spent a considerable part of his formative years in Ithaca, N.Y., where he developed an early interest in natural history. While studying for a bachelor's degree in zoology at Cornell University, which he received in 1929, he came under the influence of the eminent paleontologist Gilbert D. Harris (Holland, 1989). Among Harris' numerous contributions to the science of paleontology were the founding of the Paleontological Research Institution at Ithaca and its major publication series, the *Bulletins of American Paleontology*, considered one of the premier paleontological monograph series in the world. Caster helped Harris with the Institution collections, as well as with typesetting, preparing plates, and printing the Bulletins. This practical experience proved to be useful when he published his senior thesis on Late Devonian fossils from Pennsylvania and New York (Caster, 1930) as one of the Bulletins.

Caster's doctoral dissertation on the stratigraphy and paleontology of the Upper Devonian and Lower Mississippian of the New York-Pennsylvania border area also was published as one of the *Bulletins of American Paleontology* (Caster, 1934). It remains to this day one of the seminal publications dealing with Appalachian stratigraphy, particularly the facies concept.

Caster's descriptions and discussions of *Titusvillia* and other Devonian sponges are considered groundbreaking because the paper



Figure 3. Eminent paleontologist and stratigrapher Kenneth E. Caster, 1908–1992, with his wife and coresearcher, Anneliese (Annie). Photograph courtesy of David L. Meyer, University of Cincinnati.

was one of the earlier works that dealt with the biology and ecology of the organisms as well as their taxonomy and biostratigraphy. He is also credited with being one of the pioneers in the study of fossil animal tracks and trails (Holland and Pojeta, 1994).

Caster was interested in people as well as fossils. Considering the importance of science education, his influence on numerous amateur geologists and paleontologists in the Cincinnati area may have been his greatest contribution to society and the sciences. He was a helpful teacher and doting mentor to

his many students. During his Drake Day keynote address, Dr. John Pojeta, Chief of the Paleontology and Stratigraphy Branch of the U.S. Geological Survey (Figure 1, third from left) and one of Caster's former students, spoke of Caster's keen sense of humor and his delight in his students' practical jokes. Pojeta cited as an example a birthday card full of confetti that fell onto Caster's lap, desk, and chair.

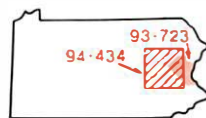
"Ken would have been delighted to know about today's *Titusvillia drakei* marker presentation," said Pojeta. "So, Ken, wherever you are, this marker's for you!"

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NEW PUBLICATIONS

New U.S. Geological Survey Open-File Reports



The U.S. Geological Survey (USGS) has issued two new open-file reports, both of which contain preliminary results of cooperative USGS-Pennsylvania Geological Survey geologic-mapping projects currently being funded under the National Geologic Mapping Act.

Open-File Report 93-723, **Surficial Geologic Map of Part of the Allentown 30' x 60' Quadrangle, Berks, Bucks, Carbon, Lehigh, Luzerne, Monroe, Northampton, and Schuylkill Counties, Pennsylvania**, by Duane D. Braun and Jack B. Epstein, consists of a 14-page text and an uncolored 1:100,000-scale regional surficial geologic map derived mainly from published 1:24,000-scale geologic maps. The text contains a map showing glacial borders as mapped by all previous workers and an explanation of the 22 surficial map units.

Open-File Report 94-434, **Late Wisconsinan to Pre-Illinoian (G?) Glacial Events in Eastern Pennsylvania**, by Duane D. Braun, Edward J. Ciolkosz, Jon D. Inners, and Jack B. Epstein, is the guide-

book for the 57th Field Conference of the Northeastern Friends of the Pleistocene, held at Hazleton, Pa., on May 20-22, 1994. This 117-page report contains a detailed road log, descriptions of 15 localities illustrating glacial and periglacial processes in the North Branch Susquehanna Valley, Anthracite region, and Great Valley, and nine short articles on such subjects as bedrock geology, soil development, tors, and paleomagnetism.

Copies of these reports are available for inspection or loan from the library of the Pennsylvania Geological Survey, Evangelical Press Building, 1500 North Third Street, Harrisburg, or for purchase (Open-File Report 93-723 at \$5.75 plus \$0.35 state sales tax for Pennsylvania residents and Open-File Report 94-434 at \$5.00 plus \$0.30 state sales tax for Pennsylvania residents) from Jon D. Inners, Pennsylvania Geological Survey, P. O. Box 8453, Harrisburg, PA 17105-8453. Checks should be made payable to *Commonwealth of Pennsylvania*.

Stratigraphic Framework of Cambrian and Ordovician Rocks, Part 2



The U.S. Geological Survey (USGS) has published its fourth report in a series of restored stratigraphic cross sections showing the Cambrian and Ordovician rocks in the central Appalachian basin. The series includes two cross sections across Ohio and West Virginia and one across northeastern Ohio and northwestern Pennsylvania (Miscellaneous Investigations Series Map I-2200). The most recent report, Bulletin 1839-K, includes text and a cross section that extends from north-central Ohio across southwestern and south-central Pennsylvania into northeastern West Virginia. The cross section consists of the stratigraphic interval between the Lower Silurian and the Precambrian, and was compiled from geophysical and drill-hole data. The text contains a discussion of basement structures, the overlying stratigraphic intervals, and their interrelationships.

Appalachian basement structure beneath the Appalachian Plateaus province is only now being studied in any detail. At present, only a few wells have penetrated the sedimentary cover. Thus, we must rely on interpretation of mostly proprietary geophysical data such as seismic-reflection, aero-

magnetic, and gravity surveys. The USGS authors use a combination of (a) the stratigraphic and structural variations in the Paleozoic sedimentary rock cover and (b) published seismic survey and gravity data to infer the basement structure along the lengths of the cross sections. The interpretations provided in these reports are provocative and should help stimulate some debate.

Bulletin 1839-K provides descriptions of the stratigraphic units from the basal Cambrian to the Lower Silurian Tuscarora Sandstone and its equivalents. The descriptions include thicknesses and basic compositions, lateral equivalents, synonyms, and discussions of pertinent previous and new research. For example, the reader will learn that the Beekmantown Group in Somerset County, Pa., is a 3,800-foot-thick dolomite interval traditionally considered to be of Early and Middle Ordovician age. However, conodont fossils recovered from drill cuttings indicate, questionably, that most of this sequence, the upper 3,000 feet, is of Middle Ordovician age. The authors believe that this age assignment for much of this sequence is incorrect, based on the supposition that fossils from higher in

the bore hole might have contaminated the drill cuttings.

Bulletin 1839-K, **Stratigraphic Framework of Cambrian and Ordovician Rocks in the Central Appalachian Basin from Medina County, Ohio, through Southwestern and South-Central Pennsylvania to Hampshire County, West Virginia**, by R. T.

Ryder, A. G. Harris, and J. E. Repetski, is available from the U.S. Geological Survey, Map Distribution, Federal Center, P. O. Box 25286, Denver, CO 80225, for \$5.00 plus \$1.00 for handling. Payment must accompany the order. Please make checks payable to *Department of the Interior—USGS.*

Sinkholes and Karst-Related Features of Chester, Montgomery, and Bucks Counties

Three new open-file reports have recently been released by the Pennsylvania Geological Survey. **Sinkholes and Karst-Related Features of Chester County, Pennsylvania** (Open-File Report 93-01), **Sinkholes and Karst-Related Features of Montgomery County, Pennsylvania** (Open-File Report 93-02), and **Sinkholes and Karst-Related Features of Bucks County, Pennsylvania** (Open-File Report 93-03) are part of a series of county-based reports that relate to sinkhole occurrences in Pennsylvania (see back cover). Compiled by staff geologist William E. Kochanov, each report includes a brief explanatory text and copies of 7.5-minute-quadrangle maps (1:24,000 scale). The methods used in compiling the report are described in the text, which also includes references and a glossary. The maps show the locations of karst surface depres-

sions, sinkholes, surface mines, cave entrances, and carbonate bedrock geology.

The three reports may be examined at the Pennsylvania Geological Survey, Evangelical Press Building, 1500 North Third Street, Harrisburg. Copies of the reports may be purchased by mail from the Pennsylvania Geological Survey, P. O. Box 8453, Harrisburg, PA 17105-8453. The prepaid copying and shipping costs are as follows: Chester County report, \$25.00 plus \$1.50 state sales tax for Pennsylvania residents; Montgomery County report, \$15.00 plus \$0.90 state sales tax for Pennsylvania residents; and Bucks County report, \$12.50 plus \$0.75 state sales tax for Pennsylvania residents. Please make checks payable to *Commonwealth of Pennsylvania.*

Plain English Booklet Explains Aggregate Business

Aggregate is one of the most commonly used mineral commodities in the United States, yet it is also one of the least understood and most taken for granted. "Aggregate" is the name applied to all the sand, gravel, crushed stone, and similar materials that are used for the construction of highways, bridges, dams, tunnels, and most other major and minor structures. Between 1970 and 1990, an average of 1.84 billion tons of aggregate was used in the United States every year. Even the construction of a typical six-room house requires 90 tons of aggregate.

In order to increase public awareness and understanding of the aggregate industry, the U.S. Geological Survey has issued a colorful publication, written in plain English for the nongeologist, entitled **Natural Aggregate—Building America's Future**. The authors, William H. Langer and V. M. Glanzman, describe all aspects of this major mineral commodity, the production of which yielded a gross value of about \$9.1 billion in the United States in 1990. A portion of the booklet is devoted to a discussion of the uses of aggregate and the types of materials that are used for aggregate in

various parts of the United States. Most of the remainder is devoted to a discussion of the many factors that determine where and how aggregate is mined. Among these are the demand for aggregate for a particular purpose in a given area versus the availability of aggregate having appropriate properties for that use in that area, the cost of transportation from a distant site versus the cost of land acquisition and development at a site closer to the place where the aggregate is needed, and the reconciliation of conflicts between the producers of aggregate and the people who must coexist with an aggregate-extraction facility nearby.

Natural Aggregate—Building America's Future should be a useful source of background information for local officials who must make informed decisions regarding the enactment of regulations controlling zoning, land use, traffic, and noise that affect the aggregate industry. Property owners who are affected by such decisions might also find this booklet a useful source of information in understanding this important industry. This full-color 39-page booklet, U.S. Geological Survey

Circular 1110, is available free on request from the U.S. Geological Survey, Map Distribution, Box

25286, Building 810, Denver Federal Center, Denver, CO 80225.

Report Issued on Potential New Natural Gas Reservoir

Pennsylvania Geological Survey geologists participated with geologists of the Ohio Geological Survey in producing timely geological information on an active hydrocarbon target in western Pennsylvania and eastern Ohio. John A. Harper, Chief of the Sub-surface Geology Section, and Christopher D. Laughrey, Geologist in the Section, were part of a five-member interstate team who, within a two-year period, studied the hydrocarbon potential of the Cambrian-age Rose Run Sandstone of western Pennsylvania and eastern Ohio, and compiled and published a geologic report. This formation is currently the most active exploration target in the Appalachian basin. The team described and interpreted the numerous geological factors affecting the variability of the Rose Run Sandstone (Upper Sandy Member of the Gatesburg Formation). In Pennsylvania, this potential hydrocarbon reservoir is encountered at a minimum of approxi-

mately 1 mile below the surface in Erie County and at a maximum of more than 3 miles below the surface in Somerset County. Four distinct types of hydrocarbon trapping mechanisms were identified for this single reservoir.

Measuring and Predicting Reservoir Heterogeneity in Complex Deposystems: the Late Cambrian Rose Run Sandstone of Eastern Ohio and Western Pennsylvania is a 257-page report that was prepared for the U.S. Department of Energy by the Appalachian Oil and Natural Gas Research Consortium of which the Pennsylvania Geological Survey is a member. The book is available for \$10.00 plus \$2.00 for postage and handling from the Pittsburgh Geological Society, P. O. Box 3432, Pittsburgh, PA 15230. It is also available from the Ohio Department of Natural Resources, Division of Geologic Survey, 4383 Fountain Square, Columbus, OH 43224-1362, telephone 614-447-1918.

Geological Research in Pennsylvania, 1993-94

The Pennsylvania Geological Survey recently released **Geological Research in Pennsylvania, 1993-94**, a 53-page compilation of geological research in Pennsylvania reported for the period 1993 through the first half of 1994. A listing of geological re-

ports published during the same time period is also included. For a free copy of the report, contact the Pennsylvania Geological Survey, P. O. Box 8453, Harrisburg, PA 17105-8453, telephone 717-787-2169.

ANNOUNCEMENTS

Mineral Collecting in Pennsylvania (G 33) Now Out of Print

The fourth edition of *Mineral Collecting in Pennsylvania* (General Geology Report 33), which consisted primarily of brief descriptions of some prominent mineral-collecting localities in the state, is now out of print and will not be reprinted in its present format. This is partly because at least one third of the sites are no longer open for collecting. Also, it is no longer easy to obtain permission from property owners to include their properties in such a list.

Collectors looking for interesting localities may wish to contact local mineral clubs, which could

provide information. A list of mineral clubs in Pennsylvania is available from Richard Keen, Librarian, Pennsylvania Geological Survey, P. O. Box 8453, Harrisburg, PA 17105-8453.

If a new format that reflects the realities of mineral collecting in the 1990's can be designed, a new edition of this handbook may be printed. Your suggestions regarding the content or style of a new edition are welcome and requested, and may be sent to the Director of the Pennsylvania Geological Survey at the address listed in the preceding paragraph.

Other Survey publications that may be of interest to some mineral collectors include the following: ES 1, *Rocks and Minerals of Pennsylvania* (free); IC 54, *Directory of the Nonfuel-Mineral Producers in Pennsylvania* (\$6.00); M 27, *Manganese Minerals of Pennsylvania* (\$3.40); M 43, *Uranium in Pennsylvania* (\$2.50); M 50, *Atlas of Pennsylvania's Mineral Resources—Part 3, Metal Mines and Occurrences in Pennsylvania* (\$3.50); M 72, *Zinc and Lead Occurrences in Pennsylvania* (\$14.55); M 78, *Mineralogy Associated With Burning Anthracite Deposits of Eastern Pennsylvania* (\$3.65); and M 80, *Geology and Mineralogy of Copper-Uranium Oc-*

currences in the Picture Rocks and Sonestown Quadrangles, Lycoming and Sullivan Counties, Pennsylvania (\$19.00). Some of these reports include specific localities where minerals may be found. ES 1 can be obtained by contacting the Pennsylvania Geological Survey, P. O. Box 8453, Harrisburg, PA 17105-8453; telephone 717-787-2169. The other publications are available at the cost indicated, plus 6 percent state sales tax if mailed to a Pennsylvania address, from Department of General Services, State Book Store, 1825 Stanley Drive, Harrisburg, PA 17103-1257. Checks should be made payable to *Commonwealth of Pennsylvania*.

Mineral Producer Directory to be Updated

by John H. Barnes
Pennsylvania Geological Survey

The fourth edition of the Pennsylvania Geological Survey's Information Circular 54, **Directory of Nonfuel-Mineral Producers in Pennsylvania**, was published in 1985 and is among the Survey's better selling publications. The purpose of this directory is to assist the large nonfuel-mineral industry in Pennsylvania by help-

ing producers and consumers of mineral commodities locate each other. In late 1994, we began what we anticipate will be a two-year effort to compile data for a new edition that will reflect changes in the industry over the past 10 years.

Production statistics prove the importance of the nonfuel-

mineral industry to Pennsylvania. In the late 1980's, production reached a peak of over \$1 billion. In 1992, the most recent year for which statistics from the U.S. Bureau of Mines are available, the value of production in Pennsylvania was approximately \$863 million. Pennsylvania ranked first in the nation in stone production in 1992, fourth in the production of cement, third in the production of lime, eleventh in the production of clay, thirteenth in the production of sand and gravel, and thirteenth in the total value of all nonfuel-mineral production. This level of production is equivalent to 540 pounds of minerals every week for each of the state's 11.9 million citizens.

The content of the fifth edition of the directory will be similar to that of the fourth. The name, address, location, telephone number, and type of each operation will be listed, as will the geologic

resource being mined or quarried, the normal uses of the mined material, and other information that pertains to the operation. As before, the location of each operation will be plotted on a 1:500,000-scale folded map.

Preparing a directory such as this is a cooperative effort between the Survey and the state's mineral industry. In the near future we will send questionnaires to the mineral producers who are listed in the fourth edition. Additional questionnaires will be sent to those not previously listed whom we are able to identify from industry and trade association records and from permit files. We hope that those who receive them will provide the cooperation that we have enjoyed in the past so that the listings in the new directory will be as complete and accurate as possible.

EARTH SCIENCE TEACHERS' CORNER

Video Brings Mining into the Classroom and Stimulates Discussion

by John H. Barnes

Pennsylvania Geological Survey

Few of us take the time to notice where the things that we encounter every day really come from, but if we did we would find that nearly everything we see,

hear, and touch came from mining. This is one of the points raised by an interesting, well-paced 10-minute video produced by the American Mining Congress enti-

itled Mining: Discoveries for Progress. Among the interesting facts presented are the following:

- In the United States, 40,000 pounds of minerals are used per person per year.
- Nearly 300,000 people are employed by the mining industry.
- Mining is responsible for the indirect employment of more than 3 million people.
- Mining accounts for exports of as much as \$6 billion per year.
- Laws now protect air, water, vegetation, and historic sites from mining activities.
- Modern reclamation techniques can restore mined land to other uses.
- Minerals are where you find them. We do not have the luxury of finding minerals where we would like them to be.

Mining is portrayed in this video as a modern high-tech industry that provides safe, high-paying jobs for men and women across the country in many professions, among them environmental science, engineering, manufacturing, accounting, biology, and geology. Although this portrayal is,

to some degree, true, it must be kept in mind that the video was produced by an organization that is an advocate of mining interests. The bias of this organization becomes most apparent near the end of the video, when a case is made that more Federal lands should be opened to mining development. This bias could, however, serve as a catalyst for interesting classroom discussion after the video has been viewed.

Mining: Discoveries for Progress is being distributed by the American Mining Congress to schools, civic groups, and mining associations, as well as television stations. Copies are also for sale at \$10 each, \$7.50 each for 50 to 99 copies, and \$6.00 each for 100 copies or more. For more information, write to the American Mining Congress, 1920 N Street NW, Suite 300, Washington, DC 20036-1662, telephone 202-861-2800.

IN MEMORIAM

Louis Heyman

1923-1994

1966-1979 Pennsylvania Geological Survey

Louis Heyman, a geologist who worked in the Survey's Pittsburgh office for 13 years, died in Amarillo, Tex., on February 10, 1994, just 15 days before his 71st birthday.

Lou was born and reared in the Bronx, N. Y., the younger of two children. He began college in 1941, but his formal education was interrupted by World War II.

After serving in the South Pacific, Lou returned to school and received a B.S. degree in geology from Brooklyn College in 1947 and an M.S. degree in geology from the University of Michigan in 1949.

Lou worked as a geologist for Kerr-McGee Oil Industries and Continental Oil Company in Amarillo and Oklahoma City until 1963, when he began working on a Ph.D. degree at Virginia Polytechnic Institute in Blacksburg, Va. He joined the Pennsylvania Geological Survey in 1966 and in 1970 received his degree upon completion of his dissertation on *Petrology of the Basal Middle Ordovician Blackford Formation of the Type Belt, Russell County, Virginia*.

While he was with the Survey, Lou worked on a variety of projects ranging from resource evaluation to environmental geology, most of which resulted in published reports. Perhaps his best known contributions are Mineral Resource Report 59, *Geology of the Elk Run Gas Pool, Jefferson County, Pennsylvania*, and Mineral Resource Report 73, *Tully (Middle Devonian) to Queenston (Upper Ordovician) Correlations in the Subsurface of Western Pennsylvania*. Lou also contributed to General Geology Report 59, *Geology of the Pittsburgh Area*, and coauthored a variety of maps for the Pittsburgh Regional Environmental Geologic Study (PREGS). He was working on his magnum opus, a regional study of the Low-



Photograph from AAPG Bulletin, v. 78, no. 7, p. 1098. Reprinted by permission.

er Devonian Oriskany Sandstone, when he left in 1979 to return to the oil industry. Lou worked for Coastal Corporation as an exploration geologist in its Amarillo office until 1984, and spent the remainder of his life as a consultant specializing in the geology of the Texas panhandle.

Louis Heyman truly was a unique individual, and his years with the Survey were memorable in many respects. He was brilliant, extremely well read, and had a highly retentive memory that allowed him to carry on an intelligent conversation on almost any subject. He often would go out of his way to help a visitor or a fellow Survey staff member solve a geologic problem.

Lou is survived by a brother, a daughter, two sons, and a grandson. His wife, Sarah McConnell Heyman, died several years ago.

—John A. Harper

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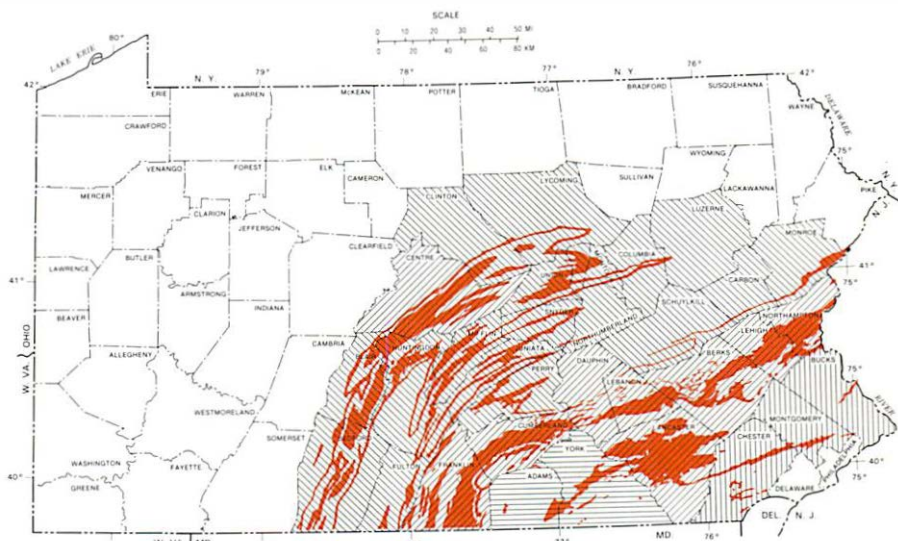
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STATUS OF SINKHOLE-INVENTORY COUNTY REPORTS

(see article on page 9)



EXPLANATION



Newly completed reports
(see page 9)



Counties where work is in
progress



Previously completed reports



Counties remaining to be studied



Area where limestone or dolomite
is at the surface

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