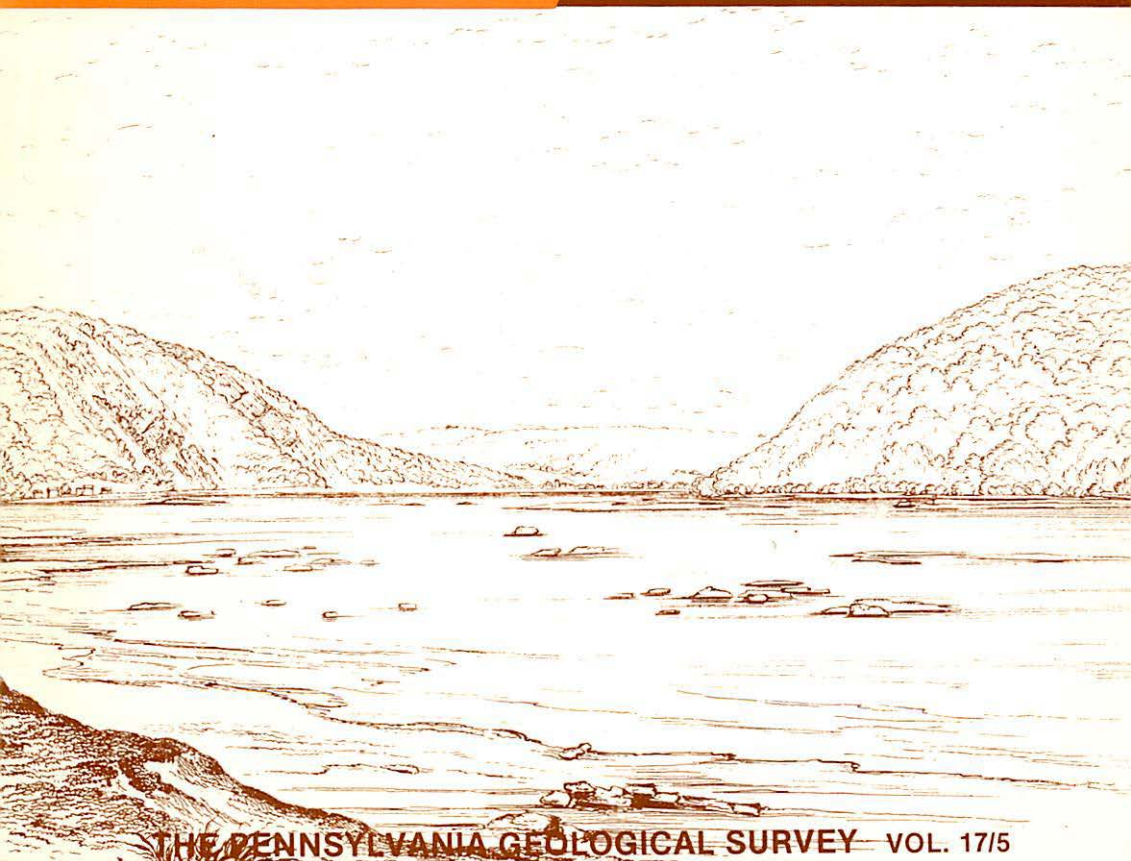
PENNSYLVANIA GEOLOGY

PENNSYLVANIA GEOLOGICAL SURVEY
150TH ANNIVERSARY
1836 - 1986



THE PENNSYLVANIA GEOLOGICAL SURVEY VOL. 17/5

COMMONWEALTH OF PENNSYLVANIA
Dick Thornburgh, Governor

DEPARTMENT OF ENVIRONMENTAL RESOURCES
Nicholas DeBenedictis, Secretary

OFFICE OF RESOURCES MANAGEMENT
Patrick J. Solano, Deputy Secretary

TOPOGRAPHIC AND GEOLOGIC SURVEY

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ON THE COVER: Reproduction of a portion of a copper plate lithograph entitled "Second Mountain Gap, Susquehanna River", sketched by George Lehman, an artist employed by Henry D. Rogers in the 1840's to illustrate *The Geology of Pennsylvania, a Government Survey*, published in Philadelphia, Pa. in 1858.

PENNSYLVANIA GEOLOGY is published bimonthy by the Topographic and Geologic Survey, Pennsylvania Dept. of Environmental Resources, Harrisburg, Pennsylvania 17120.
Editor, Donald M. Hoskins.
Articles may be reprinted from this magazine if credit is given to the Topographic and Geologic Survey.
VOL. 17, No. 5 **OCTOBER 1986**

Harvest of the Season

With Fall comes the celebration of the harvest of our labors and a sharing of our efforts. For our Bureau, Fall is both a beginning and an ending. A beginning of more intensive field work in our ongoing mapping projects as the falling foliage reveals rock outcrops hidden by summer's greenery - and an ending as some of our work becomes available to the public. Thus, in this issue of "Pennsylvania Geology" we announce the publication of the free report on the geology of the Department of Environmental Resources' Kings Gap Educational Center.

And with 1986's Fall, the column you are reading is different from the one to which you are accustomed. The past Director of the Pennsylvania Geological Survey, and former writer of this page, has ended his formal efforts on behalf of the citizens of Pennsylvania. The Geologic Survey of Pennsylvania, however, has had a long and productive history in public service and we shall strive to continue this service and share with you our continuing "harvest" through this column and publication.

As part of our harvest, in this issue we share with you the results of our cooperative association with the U.S. Geological Survey's National Mapping Division in announcing new 1:100,000 topographic maps and a new distribution site for map purchase. We announce for your use aerial photography added to our library's collection. We notify you of the efforts of our Environmental Geology Division, in cooperation with the U.S.G.S.'s Water Resource Division, in improving the methods of maintaining and searching our extensive files of water well data. And we report to you a mineral found only at four sites in the world, one of which is in Pennsylvania. Finally, we share with you the report of one of our friends in the geologic community who writes of new fossils to be found in Lancaster County.

It is our Bureau's pledge to continue to "harvest" the products of our staff, colleagues and friends so we can share them with you during all seasons as we have in the past.

Guide to the Geology of Kings Gap Published

The Bureau of Topographic and Geologic Survey has published a booklet entitled, *Your Guide to the Geology of the Kings Gap Area, Cumberland County, Pennsylvania.* Prepared as a joint project with the Bureau of State Parks this free booklet gives a broad overview of the geology of the South Mountain region, around the Kings Gap Environmental Education and Training Center, which is located approximately 25 miles southwest of Harrisburg, Pennsylvania.

This report is one of the many reports issued by the Department of Environmental Resources as part of its program of Environmental Education, and is aimed at aiding the understanding of visitors to the Education Center into the multifaceted origin of the mountains, and their included rocks and mineral resources. A major portion of the text is devoted to the economic development of the area's natural resources which can be traced back to colonial times. A location map with 20 sites described in the text is included. Highlighted is the view of Pennsylvania's Great Valley and Blue Mountain from the Mansion Terrace atop South Mountain, the 18th Century iron industry and iron mining, and prominent rock outcrops and minerals found locally.

The 31-page booklet is profusely illustrated with drawings and maps. It is written in layman's language and is distributed free to the public.

A copy of *Your Guide to the Geology of the Kings Gap Area, Cumberland County, Pennsylvania*, Environmental Geology Report No. 8, is available from the Kings Gap Environmental Education and Training Center, 500 Kings Gap Rd., Carlisle, Pa. 17013, or from the Pennsylvania Geological Survey, P.O. Box 2357, Harrisburg, Pa. 17120.

WATER WELL INVENTORY -- A STATUS REPORT

Donna M. Snyder
Pennsylvania Geological Survey

In the October 1983 issue of "Pennsylvania Geology," we reported on the history, current status and future projections concerning our Water Well Inventory Program. Since that time, we have instituted a major change in our computer processing. A new data base has been developed to replace our outdated system. The Water Well Computer Data file established in 1969 only allowed for sorting by county and township. The new data base allows for various types of sorting and selecting of records and can produce customized reports according to individual user needs.

In a cooperative effort with the U.S. Geological Survey (USGS), we have developed a new data base for the Pennsylvania Water Well Inventory Program. The new data base uses the USGS Prime Computer in Harrisburg. Computer terminals are now installed in the Pennsylvania Geological Survey's office in Harrisburg from which we directly access the files for data entry and retrieval. We are now in the process of adding data to the file. To date, we have entered approximately 18,000 well records. Table 1 lists those counties which have been completed. The total number of well records for each county represents two types: 1) those wells that have had a map location determined in the office and then coded with information based on the map location and 2) those wells for which no map location could be determined and thus no processing completed other than computer entry of driller provided data.

Each well record in the new data base is assigned an identification number. Reports generated from the new data base will include wells with numbers ending with an 'N' which represents a well for which a map location has been determined. A well number preceded with a 'UL' indicates that that well was not located or processed other than computer entry of the information provided by the driller. The Pennsylvania Water Well Inventory file is classified as *unverified* data in that the well location or other data has not been verified at the well site. (For detailed groundwater studies, which contain field-location and *verified data* on selected water wells,

Table 1. Counties Completed - Computer Entered Into Water Well Inventory Data Base

County	Year of Update	Number Of Well Records Entered
Adams	7-83	997
Allegheny	8-83	192
Armstrong	7-83	262
Bucks	12-84	2853
Cameron	8-86	34
Carbon	7-84	1184
Centre	7-86	258
Clearfield	6-86	226
Clinton	8-86	257
Columbia	6-86	213
Delaware	12-84	349
Elk	10-85	102
Erie	10-85	927
Fayette	8-86	81
Franklin	8-85	1649
Juniata	7-86	155
Lancaster	7-86	4973
Lebanon	7-86	917
Lycoming	8-86	675
Mifflin	8-86	132
Northumberland	7-86	179
Perry	6-84	394
Potter	8-86	291
Snyder	8-86	291
Sullivan	8-86	116

please consult our List of Publications for the appropriate report covering your area of interest.) In cooperation with the USGS, we are also establishing procedures for providing information from the USGS *verified* Ground-Water Site Inventory file (GWSI) to all users of groundwater data. GWSI will be discussed in a future article in 'Pennsylvania Geology'.

We currently have a backlog of 30,000+ well records to enter in the new system and plan to greatly reduce this backlog over the next six or seven months so that information is available for each county.

The original four-part computer printouts (records from 1966-1979) will still be available along with the new printouts (records from 1980-present). In instituting the changes in computer processing, we feel we are able to provide a more efficient data retrieval system.

Table 2. Water Well Inventory Data and Service Fees

PRINTOUTS

Under 10 sheets ..... No charge

10 sheets or more (including first 10 sheets) ..... .02 per sheet

XEROXING OF MAPS AND RECORDS

Under 10 sheets ..... No charge

10 sheets or more (including first 10 sheets) ..... .30 per sheet

STAFF SERVICE CHARGES (Searching files and xeroxing or monitoring the copying of records.)

Support Staff

First ½ hour ..... No charge
Excess ½ hour (including first ½ hour) ..... 10.00 per hour

Technical Staff

First ½ hour ..... No charge
Excess ½ hour (including first ½ hour) ..... 15.00 per hour

These charges were established by the Department of Environmental Resources consistent with Commonwealth policies and are subject to change without notice.

When requesting information for a specific area, it is important to identify the county, township and 7.5-minute quadrangle map name. If you are requesting a search for a particular well record you should also provide the name of the owner at the time the well was drilled, the year it was drilled and the driller's name, if possible.

Table 2 is a listing of the fees charged for the information and services provided by the staff of the Water Well Inventory Program. The Information is available from the WATER WELL INVENTORY PROGRAM, BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY, DEPARTMENT OF ENVIRONMENT RESOURCES, P.O. BOX 2357, HARRISBURG, PA 17120; Telephone 717-787-5828.

NAKAURIITE
A New Blue Mineral From Cedar Hill

by John H. Barnes
PA. Geol. Survey

Ten years ago, Jujin Suzuki, Masahira Ito, and Tsutomu Sugiura published a paper describing their discovery of a copper sulfate-carbonate hydroxide hydrate from Nakauri, Aichi Prefecture, Japan. This was a new mineral that they named nakauriite (Suzuki and others, 1976). This sort of discovery takes place many times each year, and is noted in the major mineralogical journals. Often, mineralogists in the United States may give such a far-off discovery no more than passing notice. But this discovery was to prove to be of considerable significance in Pennsylvania and elsewhere in the United States. Indeed, ten years later, nakauriite is still a subject of controversy and great interest to those who study the mineralogy of Pennsylvania.

The description of nakauriite carried in the "New Mineral Names" section of the *American Mineralogist* (Fleischer, 1977, p. 594) indicated the mineral to be sky blue aggregates of slender to fibrous crystals, occurring in massive and sheared sepentinite. X-ray diffraction and optical properties were also given. This description turned out to fit quite well with the properties of a blue mineral discovered in the Cedar Hill serpentinite quarry in Lancaster County, Pennsylvania. The strange mineral had been spotted at Cedar Hill at least twice before 1976, in 1972 by Richard Haefner, who worked with Deane K. Smith of the Pennsylvania State University in an attempt to identify it, and in 1975 by Robert C. Smith, II, of the Pennsylvania Geological Survey and Robert B. Finkelman, then of the U.S. Geological Survey (Smith, 1978; Foord and others, 1985).

Everyone working with the material collected at Cedar Hill suspected that it was something new, but it proved difficult to work with, being of small quantity and containing antigorite as an impurity. It was not until several years after Suzuki, Ito, and Sugiura published their data that the identification of the mineral at Cedar Hill was confirmed, aided by two developments.

The first of these was the refinement of analytical data on nakauriite, carried out by Peacor and others (1982) as a part of the process of clearing up an unfortunate incident in which nakauriite was allegedly misrepresented by a mineralogist as two "new" minerals, "cuproartinite" and "cuprohydromagnesite." Peacor and

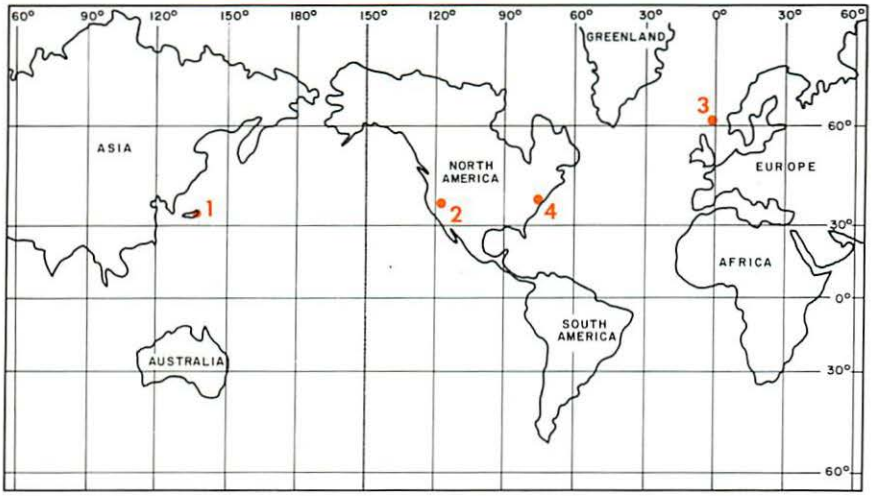

Figure 1. Locations known to contain nakauriite: (1) Nakauri, Japan (Suzuki and others, 1976); (2) Gabbs, Nevada (Peacor and others, 1982); (3) Unst, Shetland Islands (Braithwaite and Pritchard, 1983); and (4) Cedar Hill, Pennsylvania (Foord and others, 1985).

others improved upon the X-ray diffraction data for nakauriite, refined the unit cell parameters, and found evidence that the chemical composition reported by Suzuki and others (1976) was probably in error.

The other development was the collection of better specimens at Cedar Hill by mineral collectors Bryon Brookmyer of Harrisburg and Martin Anne of Wrightsville. Their specimens were larger and free of the antigorite contamination that had plagued earlier studies. They sent samples to Robert Smith, Deane Smith, and Eugene Foord and Allen Heyl of the U.S. Geological Survey in Denver, Colorado. Deane Smith also studied samples donated by another mineral collector, Thomas O'Neil of Montoursville. The identification of this material as nakauriite came from Robert Smith in April 1983 (Foord and others, 1985).

Additional studies were carried out on Pennsylvania material by Arnold H. Fainberg, an infrared spectroscopist with an interest in minerals. He found evidence agreeing with that of Peacor and others (1982) and Braithwaite and Pritchard (1983) that nakauriite contains no sulfate, suggesting that the initial description by Suzuki and others (1976) could, indeed, be in error (Foord and others, 1985).

Foord and others (1985) conclude, based on optical and chemical data, that there could be at least three species, or end members, making up a series of nakauriite-like minerals, one containing copper as a dominant component, one with nickel, and one with magnesium. A fourth species, with manganese as the dominant cation, is also possible. They indicate that, even ten years after its acceptance as a new species, additional work is needed to fully understand this mineral that has been a source of controversy and great interest to the mineralogical community. What is clear is that it is still possible to encounter very rare and attractive minerals that have not been previously known in Pennsylvania, and about which much remains to be learned.

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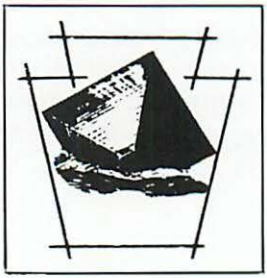

Survey Library Adds NHAP Photography

The recent acquisition of black-and-white NHAP (National High Altitude Program) photography has increased the aerial photography holdings of the Pennsylvania Geological Survey Library. Previously only color infrared images were in the Library collections. NHAP photo coverage for Pennsylvania spans the six year period from 1980 through 1985. The NHAP photography is the most current photography available from the U.S.G.S. Coverage is complete but for two narrow strips, one is to the west of Harrisburg in Franklin County and the second strip is east of Pittsburgh in Westmoreland County.

The photography purchased by the Pennsylvania Geological Survey is in a 9 x 9 inch contact print format and has a scale of 1:80,000 (1 inch = about 1.25 miles). A single photograph covers a ground area of almost 130 square miles.

Black-and-white NHAP photographs are ideally used for map-making, geologic studies, and engineering applications. They provide high-resolution and stereoscopic coverage needed for these types of applications. Each photograph in a flight line overlaps the next by sixty percent. The overlapped area can be viewed in three dimensions with the help of a stereoscope.

For more information or access to photographs, contact the Pennsylvania Geological Survey Library, the National Cartographic Information Center Affiliate for Pennsylvania.

Pa. Geological Survey Library
916 Executive House
P.O. Box 2357
Harrisburg, PA 17120
(717) 783-8077

EROS Data Center
U.S. Geological Survey
User Services Section
Sioux Falls, SD 57198
(605) 594-6151

NHAP VIDEOTAPE AVAILABLE

A VHS videotape of the National High Altitude Photography Program has been released by the EROS Data Center of the U.S.G.S. Featured in the videotape is Viktoras Skema, geologist of the Pennsylvania Geological Survey, who has used NHAP photography in mapping Pennsylvania counties with bituminous coal resources. This videotape is available for use by schools and other groups interested in learning about the latest technology in obtaining and utilizing aerial photography.

NEW CAMBRIAN FOSSIL LOCALITY IN LANCASTER COUNTY

by John E. Ryan
Delaware Valley Paleontological Society

Lower Cambrian fossils may be collected at a small quarry on Harrisburg Pike, about 3 miles northwest of Lancaster, Pennsylvania. The quarry is owned by and located next to Brubaker, Inc. on the south side of Harrisburg Pike (L.R. 36184) about 300 feet west of its intersection with Rohrerstown Road (L.R. 36006) (40°04′12″N/76°21′36″W, Lancaster quadrangle; Figure 1). Fossils are found in loose blocks which compose several dump piles located in the northern portion of the quarry. Certain rock layers in the floor of the quarry near the dump piles are fossiliferous as well.

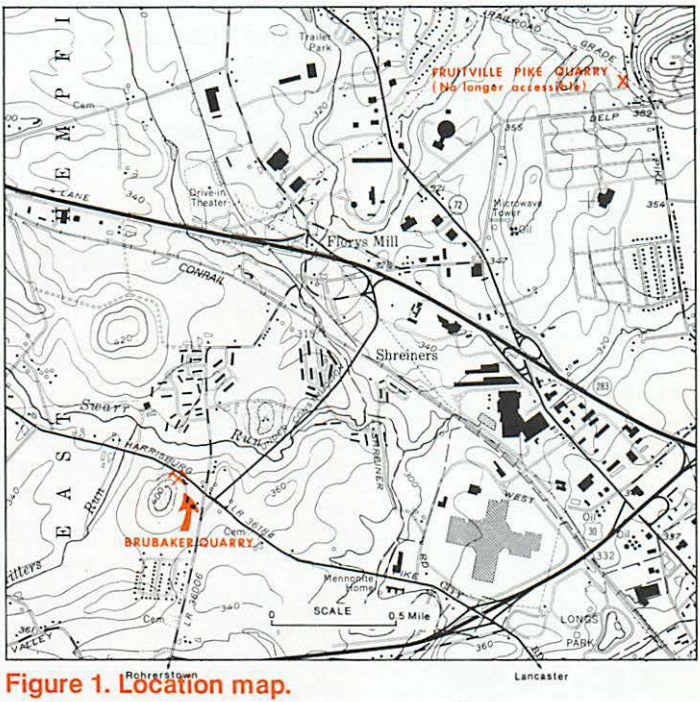

Figure 1. Location map.

The Company requires collectors to secure permission in advance and to sign a release. Persons wishing to visit the quarry

should contact Donald Brubaker, President, Brubaker, Inc., 1284 Rohrerstown Road, Lancaster, PA 17601. IN NO EVENT MAY COLLECTORS VISIT THE QUARRY WITHOUT FIRST OBTAINING PERMISSION AND SIGNING A RELEASE. Collectors must abide by any company rules and must not litter or deface the quarry. It should be noted that the company is removing material from this quarry for construction use, and accordingly the site may disappear within the next few years.

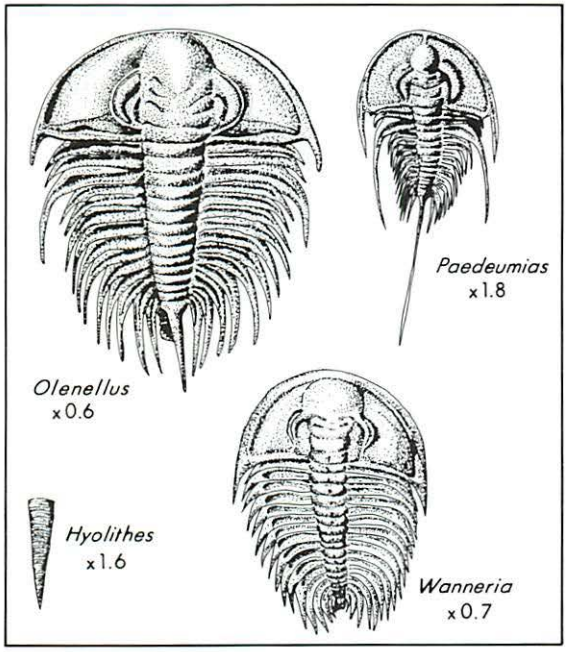

Figure 2. Typical Lower Cambrian fossils present at site. (Illustrations from Harrington and others, 1959, and Hoskins, 1969.)

The fossiliferous rocks exposed in the quarry are shales, siltstones, and sandstones belonging to the Kinzers Formation (Jonas and Stose, 1930; Meisler and Becher, 1971). These rocks show incipient metamorphism and compression, with many of the fossils exhibiting substantial distortion. The following fossils have been identified at this locality (Figure 2):

Trilobites
- *Olenellus*
- *Paedeumias*
- *Wanneria*

Annelid?
- *Hyolithes*

Brachiopods
- Unidentified valves

Figure 3. *Wanneria* specimens collected in Brubaker quarry. (Note quarter for scale.) (Photo by John D. Inners.)

The most interesting fossils found are the olenellid trilobites. While most trilobite finds consist of isolated cephalons or thoracic segments, articulated and partially articulated specimens can be turned up with persistent searching. The remains of the trilobite *Wanneria* often are quite large, with fragments from six-inch or larger individuals being not uncommon (Figure 3). *Hyolithes*, possibly an annelid fossil, is found as 1/8 to 1/2 inch conical molds.

A major problem facing the collector at this locality is the fact that compression of these rocks has resulted in cleavages which run at sharp angles to the original bedding. The rock splits much more readily along these cleavages than along the planes in which the fossils lie, and thus it is difficult to split the rock so as not to injure or destroy the fossils. The best method of collecting is to examine a block to ascertain the direction of the original bedding, and then to split the block along the bedding using a heavy hammer and a wide-bladed chisel. This method works fairly well, although the task of properly splitting these rocks is a challenge to the most experienced collector.

The fossiliferous rocks exposed at this locality were deposited in a shallow sea some 570 million years ago. These rocks contain a fauna similar to the Kinzers fauna found in the famous Fruitville Pike quarry (Hoskins, 1969) which now is owned by Franklin and Marshall College. The fact that articulated trilobite specimens are found regularly in the two quarries indicates that both faunas are life assemblages. The rocks exposed in the Harrisburg Pike quarry, however, are somewhat coarser grained than those in the Fruitville quarry. Perhaps the shoreline was closer to the sea floor on which the Harrisburg Pike quarry organisms lived than was the case for the Fruitville faunal assemblage.

The author wishes to thank Jon D. Inners of the Pennsylvania Geological Survey, Milton and David Funk of Funk Brothers, Inc., and Donald Brubaker of Brubaker, Inc., for their assistance in the preparation of this article. Jeffrey K. Jones, formerly of the Academy of Natural Sciences of Philadelphia, aided in the initial field investigation of the site.

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New U.S. Geological Survey Report on Pennsylvania Surface-Water Resources

Pennsylvania's surface-water resources — 45,000 miles of streams, more than 2,300 reservoirs and 76 natural lakes — have been a major factor in the state's growth, according to the Pennsylvania section of the 1985 National Water Summary by the U.S. Geological Survey, Department of the Interior.

The 1985 National Water Summary is the third in an annual series of comprehensive reports on the status and supply of the nation's vital water resources. It provides an extensive state-by-state look at the country's surface-water resources, which provide about 80 percent of the daily water needs of the United States.

Table 1. Surface-water facts for Pennsylvania

[Data may not add to totals because of independent rounding. Mgal/d = million gallons per day; gal/d = gallons per day; < = less than. Source: Solley, Chase, and Mann, 1983]

POPULATION SERVED BY SURFACE WATER, 1980	
Number (thousands)	6,620
Percentage of total population	56
From public water-supply systems:	
Number (thousands)	6,620
Percentage of total population	56
From rural self-supplied systems:	
Number (thousands)	0
Percentage of total population	0
OFFSTREAM USE, 1980	
Freshwater Withdrawals	
Surface water and ground water, total (Mgal/d)	16,000
Surface water only (Mgal/d)	15,000
Percentage of total	94
Percentage of total excluding withdrawals for thermoelectric power	83
Category of use	
Public-supply withdrawals:	
Surface water (Mgal/d)	1,300
Percentage of total surface water	9
Percentage of total public supply	87
Per capita (gal/d)	196
Rural-supply withdrawals:	
Domestic:	
Surface water (Mgal/d)	0
Percentage of total surface water	0
Percentage of total rural domestic	0
Per capita (gal/d)	0
Livestock:	
Surface water (Mgal/d)	7
Percentage of total surface water	<0.1
Percentage of total livestock	11
Industrial self-supplied withdrawals:	
Surface water (Mgal/d)	13,000
Percentage of total surface water	90
Percentage of total industrial self-supplied:	
Including withdrawals for thermoelectric power	96
Excluding withdrawals for thermoelectric power	86
Irrigation withdrawals:	
Surface water (Mgal/d)	140
Percentage of total surface water	0.9
Percentage of total irrigation	88
INSTREAM USE, 1980	
Hydroelectric power (Mgal/d)	81,000

David E. Click, District Chief of the U.S.G.S. Water Resources Division office in Harrisburg, Pa., estimates that 94 percent of the state's total water use is from surface-water supplies.

"Because of the great dependency on surface water, most critical water issues in Pennsylvania relate to high or low flows, available storage, and/or the quality of the source."

Single copies of the Pennsylvania section of the 1985 National Water Summary are available from the District Chief, U.S. Geological Survey, P.O. Box 1107, 4th Floor, Federal Bldg., 228 Walnut St., Harrisburg, Pa. 17108.

Each state section contains maps and graphs that portray runoff and precipitation; the location of principal rivers, reservoirs and hydropower plants; trends in average streamflow discharge; how surface-water resources are managed and a table on surface-water use.

Copies of the entire 506-page 1985 National Water Supply, including all state sections plus an overview of hydrologic conditions

for the 1985 water year are available for $31 each. Orders must include check or money order payable to Department of the Interior-U.S.G.S. and should be directed to: U. S. Geological Survey, Books and Open-File Reports, Federal Center, Bldg. 41, Box 25425, Denver, Colo. 80225.

U.S. Geological Survey Consolidates Map and Publication Distribution Facilities

The U.S. Geological Survey has begun consolidating its facilities for nationwide distribution of maps, scientific books and reports, and general-interest publications into a single building in suburban Denver.

The consolidation will result in phasing out the USGS Eastern Distribution Branch, which has facilities in Arlington and Alexandria, Virginia and was scheduled to be completed by September 30, 1986.

The Eastern Distribution Branch will merge with the Western Distribution Branch, now in Building 41 at the Denver Federal Center in suburban Lakewood, Colorado, to form the consolidated facility.

After consolidation, map distribution services for all states will be provided by the U.S. Geological Survey, Map Distribution Section, Federal Center, Box 25286, Denver, Colorado 80225.

The consolidation will not affect customer service at the more than 2,800 private map dealers in the nation who sell USGS topographic maps. They will continue to provide this service in their respective state and regional market areas.

The Eastern Distribution Branch facility at 604 South Pickett Street in Alexandria, Virginia, which sold and distributed USGS professional papers, bulletins, circulars, general-interest publications and other book products has terminated all sales.

Distribution from the Alexandria facility is being shifted to the U.S. Geological Survey, Books and Open-File Reports Section, Federal Center, Box 25425, Denver, Colorado 80225.

Although the Eastern Distribution Branch facilities in Alexandria and Arlington are being closed, over-the-counter services for USGS maps and reports will continue at two USGS Public Inquiries Offices in the Washington, D.C. area. The PIO in Room 1028 of the General Services Administration Building, 18th and F Streets, N.W., Washington, D.C., and the PIO in Room 1C402 of the USGS National Center, 12201 Sunrise Valley Drive, Reston, Virginia, will continue selling limited numbers of maps and books. Large orders should be directed to the consolidated facility in Denver.

THE WORLD IN ROCKS
THE LATEST SURVEY SUCCESS STORY

Aaron M. Ford
1657 E. 126th St.
Compton, Cal. 90222
May 5, 1986

Pennsylvania Geological Survey
Harrisburg, PA 17120

Dear Dr. Socolow,

When I wrote to you and requested a rock and/or mineral specimen, for my Science Fair entry, I promised to let you know how I did with my entry. Well, I am very proud to let you know that I took FIRST PLACE in Earth and Science.

I am planning on entering again next year, in the same catagory. I will expand my exhibit by including polished rocks, gems, rocks from other countries, and I want to try and design or invent something made out of rocks. I'm sure I should be able to come up with something between now and next April.

I want to THANK YOU VERY MUCH for your time, effort, and consideration. All of the material and information was truly helpful. If it weren't for you, I couldn't have presented, " THE WORLD IN ROCKS" exhibit.

I am looking forward to doing business with you again next year.

Sincerely,

Aaron M. Ford

Aaron M. Ford

Geochips

Mike Shaffner told this story to Bill Lytle many years ago, and Bill related it to the staff of the Oil and Gas Geology Division in Pittsburgh:

During one summer in the late 1930's or early 1940's the Survey received the services of a young fellow who was apparently a political appointee. He didn't really know anything about geology or he wouldn't have done what he did. George Ashley, who was the State Geologist at that time, gave him the job to go out and make an areal survey of some area around Harrisburg. Although the fellow was expected to report back at periodic intervals, nobody heard from him for some time. After about a month Ashley directed someone to contact the fellow and tell him to come in so his work could be reviewed.

When the fellow finally came in, Ashley asked him how his work was coming along. The fellow replied that he was doing okay and got out his maps. Ashley couldn't see much on the maps, just a few dots or something, so he asked, "What's all this?" The young man replied, "Well, you wanted me to make an aerial survey, so I got a radio and put it in my car and went around to all these different areas to see how the reception was. I've marked on the map where the reception was good and where the reception was bad, and where I couldn't get anything I marked that, too."

Ashley threw up his hands, and I guess that was the end of that!

GEOCHIPS will be presented in the issues of *Pennsylvania Geology* during our Sesquicentennial year. As we celebrate 150 years of pondering the geology of the Commonwealth, *GEOCHIPS* will share some of the human side of our geologists' life at the Pennsylvania Geological Survey.

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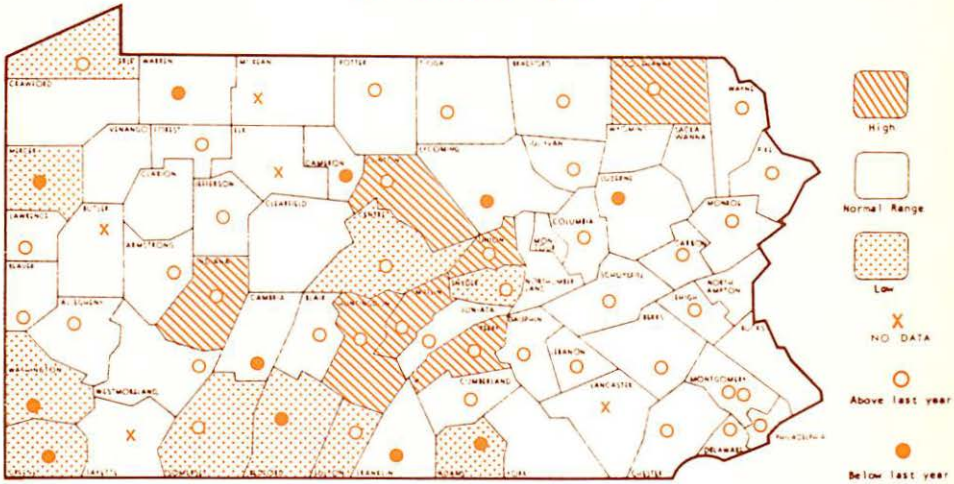

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