

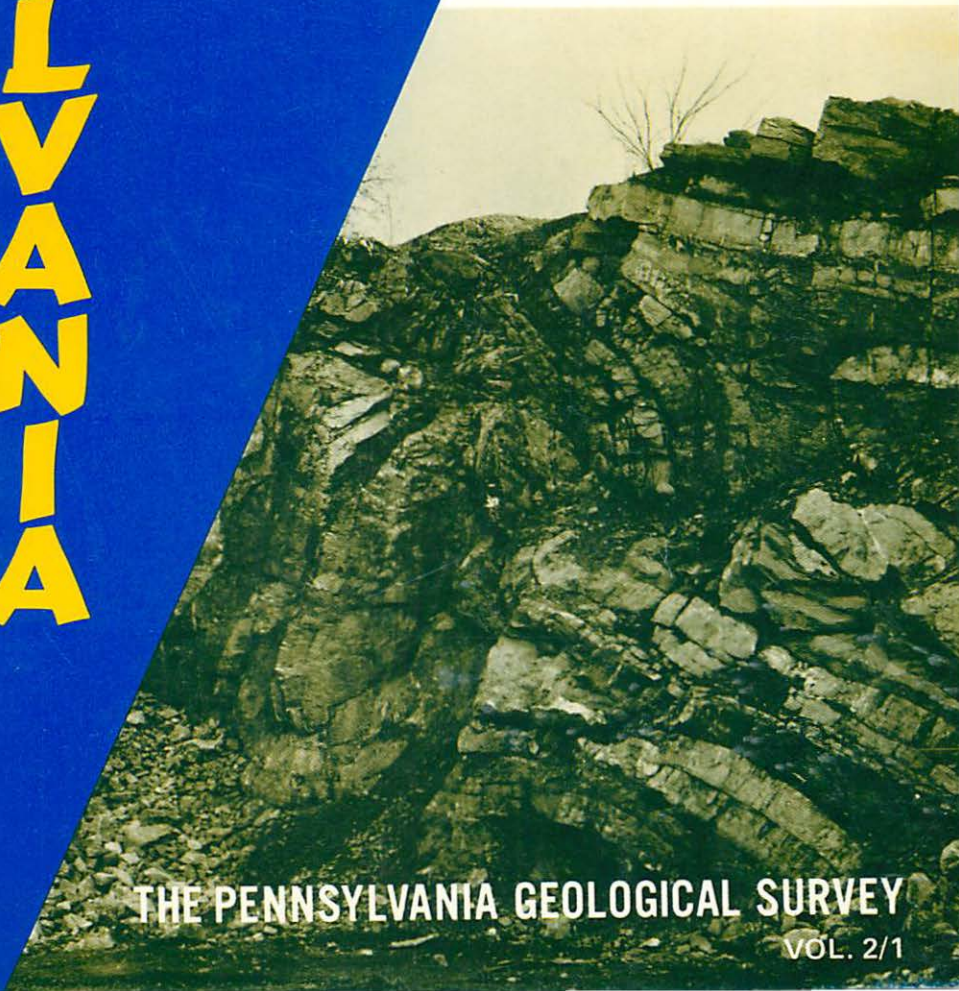
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THE PENNSYLVANIA GEOLOGICAL SURVEY

VOL. 2/1



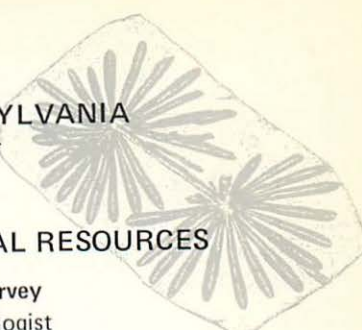


COMMONWEALTH OF PENNSYLVANIA

Milton J. Shapp, Governor

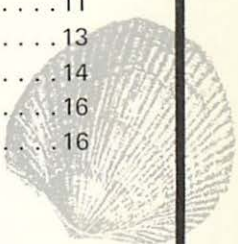
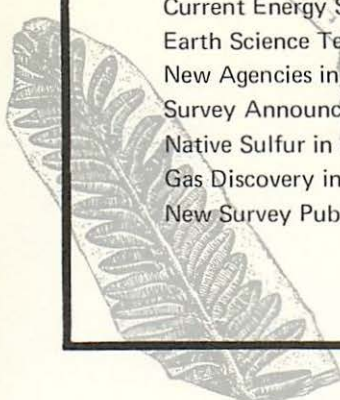
DEPARTMENT OF ENVIRONMENTAL RESOURCES

Topographic and Geologic Survey
Arthur A. Socolow, State Geologist



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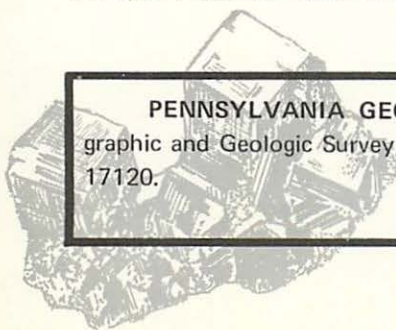
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ON THE COVER — Intricate folding and faulting of limestones and dolomites of the Epler Formation near Annville, Lebanon County, Pennsylvania.

PENNSYLVANIA GEOLOGY is published bimonthly by the Topographic and Geologic Survey, Main Capitol Annex, Harrisburg, Pennsylvania, 17120.

FEBRUARY 1971



**FROM THE DESK
OF THE
STATE GEOLOGIST . . .**



THE PENNSYLVANIA SURVEY JOINS NEW DEPARTMENT

January 19, 1971, was a momentous day in the 135-year history of the Pennsylvania Geological Survey. On that day the Bureau of Topographic and Geologic Survey, by an Act of the Legislature, was transferred to the newly created Department of Environmental Resources. This is the fourth department to which the Survey has been attached in the past 50 years, the previous ones being Forests and Waters, Internal Affairs, and State Planning Board. Each of the past agencies offered most pleasant working relationships for the Survey. Over the years with those agencies the Survey has been able to accept the broadened scope of geologic and environmental responsibilities and services with which it has been called upon to cope.

The Survey's association with the State Planning Board during the past two years has been particularly mutually beneficial. The Survey has come to recognize in great detail the urgent need for input of geologic expertise and data into the planning process. The Planning Board, in turn, has recognized more fully the ability of geology to aid in making critical evaluations for planning and land use studies. The Survey is most appreciative of its pleasant relationship with the State Planning Board.

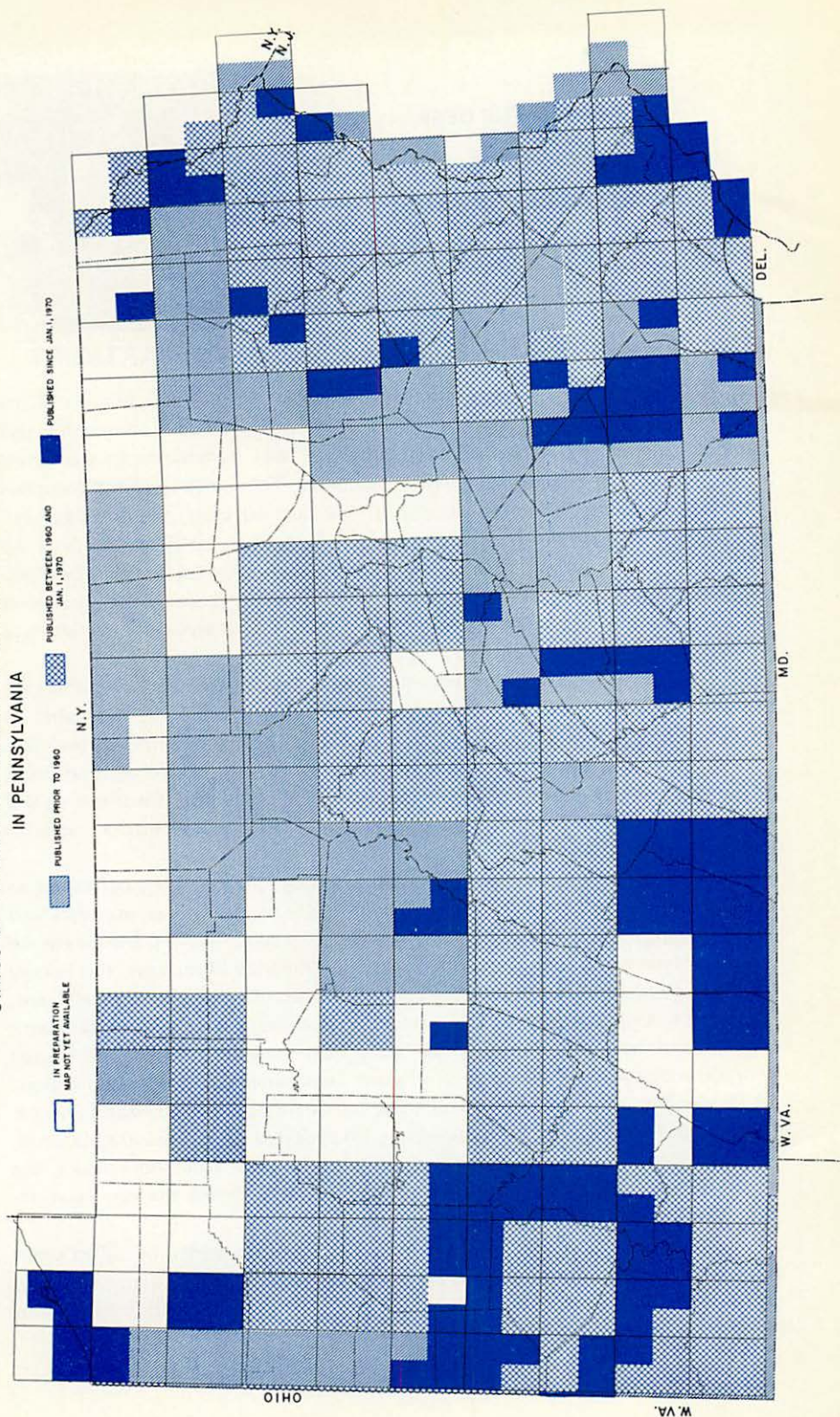
As has been noted in this column in past issues, geology is by definition an environmental science, and geologists continually work with phenomena and problems of the environment. Thus, it was not surprising that as plans developed for the creation of a new Department of Environmental Resources, the Survey was early considered to be a necessary, integral part of such a new department.

In the Department of Environmental Resources, we shall be joining with agencies and friends with whom we have long worked together and shared common interests. These include the former Department of Forests and Waters, the former Department of Mines and Mineral Industries, from the Health Department the Bureaus of Sanitary Engineering, Housing and Environmental Control, Air Pollution Control, and Radiological Protection, and from Agriculture, the State Soil and Water Conservation Commission. We welcome the new relationship with these important and distinguished agencies.

The Topographic and Geologic Survey will undoubtedly be called upon more than ever to furnish data, services, and expertise in a coordinated effort to maintain the quality of Pennsylvania's natural environment. We look forward to this exciting challenge.

Arthur G. Socolow

STATUS OF 7½ MINUTE (1"=2000') TOPOGRAPHIC MAPPING IN PENNSYLVANIA



TOPOGRAPHIC MAPPING IN PENNA.

The topographic mapping program in Pennsylvania is being conducted cooperately by the Pennsylvania Geological Survey and the United States Geological Survey.

The adjoining map shows the progress to date in preparation of up-to-date 7.5 minute quadrangle (1 inch = 2,000 feet) topographic maps for Pennsylvania.

A detailed index to these maps is available **free** from:

Pennsylvania Geological Survey
Main Capitol Annex
Harrisburg, Pa. 17120

Washington Distribution Section
U. S. Geological Survey
1200 South Eads Street
Arlington, Va. 22202

Topographic maps may be purchased for \$0.50 each from the Washington Distribution Section as listed above. On such orders, customers should state the name of the map as well as the type of map desired and are urged to use order blanks supplied with the Index to Topographic Mapping in Pennsylvania mentioned above. Orders must be accompanied by cash, check, or money order in the exact amount. Stamps will not be accepted as payment.

At slightly higher costs, maps may be purchased across the counter at the agents in Pennsylvania listed below:

ALLENTOWN

Nestor Sporting Goods, Inc.

BETHLEHEM

H. M. Paul & Son

BRADFORD

Francis J. Talerico

BROOKVILLE

DeMans

CROSS FORK

Anderson's Esso Service

DOYLESTOWN

Alfred B. Patton, Inc.

ERIE

Commercial Blue Print & Supply Co.

HANOVER

J. W. Fisher & Son

HAWLEY

J. Vance Hunt & Son

HAZLETON

Deemer & Co.

INDIANA

Henry Hall, Inc.

JACOBUS

Straley's

JOHNSTOWN

Turner's Key Shop

Warren Phenicie

LANCASTER

L. B. Herr & Son

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LEMOYNE

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LEWISTOWN

Aurand's

MEADVILLE

Hunters News

MILFORD

Sportsmen's Rendezvous

MILLHEIM

John W. Cooner

MORRIS

Miller's Store

(continued on page 4)

PAOLI

Bookmark

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J. L. Smith Co.

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J. R. Weldin Company

READING

Moyer's Stationery, Inc.

SAINT MARYS

Smith's Sport Store

SCRANTON

Deemer & Co.

STROUDSBURG

Monroe Engineering, Inc.

WATERVILLE

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WELLSBORO

Linck Sporting Goods

WILKES-BARRE

Deemer & Co.

WILLIAMSPORT

Plankenhorn Stationery Co.

Yoas Plate Service

NEW ATTENTION TO ROCK STABILITY

Construction stability in the Pittsburgh region has been a subject of increasing environmental concern, particularly evident in post-mortem attention to failures. Recently this concern has become more appropriately focused on pre-construction feasibility and planning as witnessed by the widespread newspaper, radio, and television publicity given to the proposed East Street Valley expressway north out of the city. The result of this attention has been, and will be, beneficial to all. Greater consideration is being given to the significant geological factors that play such a large role in the serious landslide and rockfalls of the region. Progress in the Pennsylvania Geological Survey compilation of geological data relevant to these hazards (reported in Volume 1/7), and the impending major U.S.G.S. — Pennsylvania Geological Survey environmental study of the Pittsburgh region will afford and make readily available to all concerned the required geological data necessary in the knowledgeable forewarning and prevention of these types of construction failures in the area. The continuing policy of Pennsylvania Geological Survey cooperation with all interested groups has effected greatly improved knowledge as to the nature of these hazards and the necessity for incorporation of geological data.

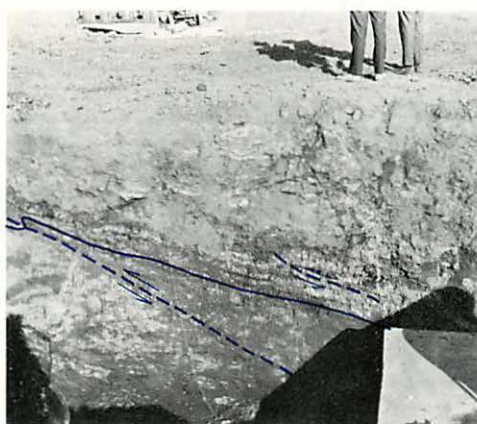
Dana R. Kelley

GEM AND EARTH SCIENCE SHOW

The Mineralogical Society of Pennsylvania will present its 10th Biennial EARTH SCIENCE AND GEM SHOW on April 17-18, 1971, at Thomas Hall, Valley Forge Military Academy, Wayne, Pennsylvania. More specific information may be had by writing Mr. Lawrence Heinrich, 1057 Eagle Road, Wayne, Pa. 19087.

230 MILLION YEARS OF ROCK MISSING

The line drawn on the adjacent photograph represents a 230 million year gap between the rocks below and those above. The shales and limestones below are at least 430 million years old, and the Triassic rocks above are about 200 million



LEGEND

— Contact between Triassic and Paleozoic rocks

- - - Faults (arrows show sense of displacement)

years old. A gap in the geological record such as this is not common and good exposures are even rarer.

This exposure was uncovered during the construction of an overpass on new U.S. 230 near the Highspire entrance to the Pennsylvania Turnpike, east of Harrisburg. Before the rocks were covered up again, geologists from the Pennsylvania Geological Survey examined the area, took photographs, and collected samples for laboratory study. This contact between younger Triassic rocks and older Paleozoic rocks has been a subject of controversy among geologists for more than 100 years because it is seldom seen even though it extends from west of Gettysburg to the Delaware River and on into New Jersey.

Several explanations have been offered to explain the nature of this contact and the absence of 230 million years of rock. One of these is that the contact is a steep fault that moved rocks downward on the south (right) side during Triassic time. According to this theory, rocks 430 million years old, and perhaps younger, lie buried beneath the Triassic rocks. Another possibility is that the younger rocks moved upward (to the left) along a gently dipping thrust fault at this contact and were eroded before Triassic time. A third possibility is that this line represents an old erosion surface on which Triassic sediments were subsequently deposited. Such a surface, would then have the characteristics of a soil and rock-rubble horizon.

Examination of the Highspire exposures has added valuable new data. At this locality, the contact dips irregularly and gently south, with no evidence of a steep border fault present. Mineralogical studies of the rocks at and below the contact indicate clay minerals that are typical of deep weathering such as would be present in an old soil horizon. However, there also is clear evidence of low angle faulting in rocks both above and below the contact. It appears that, here at Highspire, Triassic rocks were deposited on a gently south dipping erosion surface, and both the Triassic and Paleozoic rocks were subsequently faulted. Yet the controversy cannot be settled by one exposure and thus more work is needed to define the nature of this contact more clearly.

D. M. Lapham
R. Fail

SURVEY REPORTS ANSWER MANY QUESTIONS

**ARE URBAN GROWTH AND MINERAL EXTRACTION
COMPATIBLE?**

**CAN MULTIPLE LAND USE SOLVE
THIS DILEMMA?**

**FAST GROWING COMMUNITIES
NEED CONSTRUCTION MATERIALS**



SAND & GRAVEL

STONE

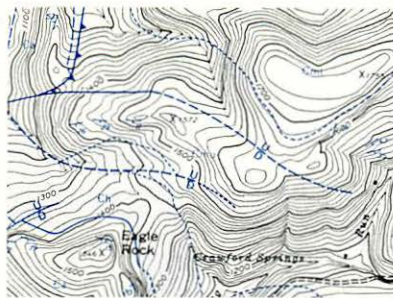


SHALE



**TO KEEP COSTS DOWN
THESE MINERAL RESOURCES
MUST BE CLOSE TO USE**

GEOLOGIC MAPS AND REPORTS TELL
WHAT IT IS.
WHERE IT IS.



URBAN GROWTH AND MINERAL
EXTRACTION ARE COMPATIBLE!



MULTIPLE LAND USE MAY
SOLVE THE DILEMMA

WISE COMMUNITY
PLANNING PERMITS:

MINERAL EXTRACTION



FOLLOWED BY:

INDUSTRIAL SITE

GREENBELT AREA

RESIDENTIAL USE

SANITARY LANDFILL SITE

William G. McGlade
Alan R. Geyer

Map 25	Carnegie, Pittsburgh, Amity, Brownsville
Map 26	Stoneboro, Franklin, Mercer, Hilliards

Paper prints of the bases with field limits can be obtained by writing to the Pennsylvania Division of Documents, 10th and Market Streets, Harrisburg, Pennsylvania 17125. Cost of each map is \$0.50, plus 6 percent state sales tax. A check for the appropriate total amount made out to the Commonwealth of Pennsylvania must accompany the order. When ordering please specify the map number.

An index showing the location of the completed bases may be obtained upon request from the Pittsburgh Branch of the Pennsylvania Geological Survey, 401 Pittsburgh State Office Bldg., 300 Liberty Ave., Pittsburgh, Pa. 15222.

CURRENT ENERGY SHORTAGE

A hundred years ago seventy-three percent of the total energy used by the United States came from burning endless cords of wood. Today seventy-five percent of the energy is supplied by petroleum (oil and gas). At the turn of the century coal became our prime fuel while at mid-century coal was overtaken by crude oil. A few years later natural gas demoted coal to a third rank energy fuel. Some time in the 1980's coal may again be outranked, this time by nuclear energy. At present the United States energy consumption percentage by energy source is 43.7 oil, 31.1 gas, 21.4 coal, 3.7 hydropower, and 0.1 nuclear.

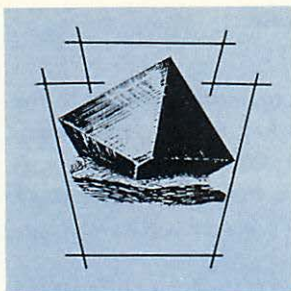
The current shortage of fuel to supply our energy, which is reflected in a short supply of residual fuel oil, a fuel which is in high demand by industry to overcome the shortage, was caused by the following factors:

1. The loss of 1,000,000 barrels a day of oil west of Suez and close to world markets through failure and disrepair of the Trans Arabian Pipeline and a cutback of Libya's oil production.
2. A shortage of natural gas.
3. Failure of completion of nuclear power plants within the time frame originally planned.
4. Failure of coal producers to meet the increased demands for coal.
5. The relatively recent regulatory developments relating to the composition of fuels or the emissions from their burning, imposed as environmental conservation measures.

Therefore, a shortage during the winter months of 1970-1971 of up to 250,000 barrels per day of residual fuel oil is a contingency which must be recognized. To overcome this shortage Texas and Louisiana have increased their output of crude oil. In addition to accommodating all the normal year-to-year growth in crude oil demand, both foreign and domestic, adjustments are now being made in normal refining patterns to make an additional 200,000 barrels a day, or more, of residual fuel oil available to the East Coast area where the shortage occurs.

If the 1970-1971 heating season should be very cold, supplies of residual fuel oil would be tight and in some areas critical even with the above adjustments in refining patterns.

William S. Lytle



EARTH SCIENCE TEACHERS' CORNER

EARTH SCIENCE TEACHERS' PACKET

The United States Geological Survey has prepared a packet of free materials to be sent to earth science teachers. This packet contains many general brochures and booklets on your local area.

Requests for the packet should be addressed to:

Geologic Inquiries Group
U. S. Geological Survey
Washington, D.C. 20242

Requests **must** be written on letterhead stationary showing the school or district where you teach.

OUTSTANDING EARTH SCIENCE TEACHER AWARD

This year the National Association of Geology Teachers has initiated a new program - Awards for the Outstanding Earth Science Teachers in the United States. This first year the awards will be available only to NAGT members but starting the 1971-72 school year, these will be available to any earth science teacher, whether he be a member or not.

Any secondary school teacher who is an active member of NAGT and who is presently engaged in teaching earth science to secondary school students in the U. S. is eligible. He may be teaching in a public or private school, be teaching earth science, geology, environmental science, or general science with major emphasis on the earth sciences. No restrictions will be placed on any person by virtue of race, color, creed or place of natural origin.

Nominations for this award may be made by anyone who knows the nominee and feels he is qualified. Within the Eastern Section there will be a Section winner as well as individual state winners. The deadline for nominations is March 1st, 1971. All nominations should be sent to Alan R. Geyer, Chairman, Education Committee, Eastern Section NAGT, c/o Pennsylvania Geological Survey, Harrisburg, Pa. 17120.

Awards of scientific equipment and of certificates to the state winners and Section winner will be made at the Eastern Sections' annual spring meeting at Millersville State College.

NATIONAL ASSOCIATION OF GEOLOGY TEACHERS (NAGT) SPRING MEETING

The annual spring meeting of the Eastern Section of NAGT will be held this year on April 16th and 17th at Millersville State College. The theme of the sessions will be the "Appalachian Geosyncline in Pennsylvania — Old and New Interpretations." A field trip is planned. For further information contact Dr. William Jordon, Chairman, Department of Earth Science, Millersville State College, Millersville, Pa. 17551.

NEW AGENCIES IN WASHINGTON

Geologists and others interested in environmental matters will be interested in the regrouping of a number of former federal agencies to form two major new organizations during the past few months.

The **Environmental Protection Agency** (E.P.A.) has been created by shifting the Federal Water Quality Administration (from the Department of the Interior), the Air Pollution Control Administration and the Bureau of Solid Waste Management (from the Department of HEW), ecological research (from the Council on Environmental Quality), and radiation standards (from the Atomic Energy Commission). The principal roles and functions of this new agency include the establishment and enforcement of environmental protection standards, conducting research on adverse effects of pollution and methods and equipment for controlling it, assisting others in combating pollution through grants and technical assistance, and working closely with the Council on Environmental Quality in formulating new policies for environmental protection.

The **National Oceanic and Atmospheric Administration** (NOAA) has been created in the United States Department of Commerce by bringing together the Environmental Science Services Administration (ESSA) (which includes the Weather Bureau - now to be called the National Weather Service, and the former Coast and Geodetic Survey), most of the Bureau of Commercial Fisheries (formerly in Interior), the Marine Game Fish Research Program of the Bureau of Sports Fisheries and Wildlife (formerly in Interior), the Office of Sea Grant Programs (formerly in National Science Foundation), the U.S. Lake Survey (from the Dept. of the Army), and the National Oceanographic Data Center (formerly in the Dept. of the Navy). The mission of NOAA is to organize a unified approach to the problems of the ocean and the atmosphere.

That is really quite a reshuffle. As fellow environmentalists, we wish them every success.

INDIANA COUNTY GAS WELLS

Good gas production is indicated for the developing Grip fractured Chert-Oriskany pool in eastern Indiana County. The 8,000 foot deep pool was discovered in December of 1969 by the Felmont Oil Corporation, #1 Hanwell Jr., wildcat, some five miles northeast and on structural trend with the old Chert-Oriskany Nolo field. The discovery was completed on a faulted anticline for 6.2 MMCFGPD. Two offset wells have been reported by Felmont completed to date, one for 10 MMCFGPD, the other for nearly 4 MMCFGPD.

NEW WELLS IN OLD FIELDS

The historic oil and gas fields of Pennsylvania continue to result in good completions. At least seven new development wells in the turn of the century old shallow Venango Sandstone fields of Forest and Venango Counties have reported in excess of 50 barrels of oil per day on initial production tests. Some eight new development wells drilled within the eastern edge of the deeper Upper Devonian gas sand belt of Clearfield, Indiana and Jefferson Counties have been completed for excess of 2 MMCFGPD.



RECORD WELL

A new world's depth record was established when Placid Oil Co. No. 1 Louisiana State Lease No. 5407 was abandoned at 25,600 feet. The St. Bernard Parish test was drilled 260 feet deeper than the old record well, the Phillips No. 1 EEE University in Pecos County, Texas.

SURVEY ANNOUNCEMENTS

NEW PUBLICATION HIGHLIGHTS OIL & GAS POTENTIAL

The Pennsylvania Geological Survey is pleased to announce the release of Bulletin M65, *The Petroleum Industry and the Future Petroleum Province in Pennsylvania*, 1970, by D. R. Kelley, W. S. Lytle, W. R. Wagner, and L. Heyman.

With the demand for energy growing at an ever-increasing rate, and at a time when the Nation is faced with immediate and long-range shortages of energy resources, the Pennsylvania Geological Survey believes it is particularly appropriate to present this analytical enumeration of oil and gas potential in the Commonwealth.

Pennsylvania has long been an important oil and gas producing state. In 1970 there were nearly 60,000 operating oil and gas wells in the Commonwealth. Yet now, 111 years after oil in North America was first brought into production at the Drake Well in Titusville, Pennsylvania, it seems incredible that some 83% of the volume of Pennsylvania's petroleum province remains untested. Beneath the heavily drilled Devonian oil and gas belts of the Plateaus Province lies from 5,000 to more than 20,000 feet of Cambrian, Ordovician, and Silurian strata which contain less than two wells per 25 square miles. These strata, hardly touched by the drill in Pennsylvania, are productive in surrounding states. The present and future need for hydrocarbons combined with proximity to expanding industrial areas should provide the incentive for rebirth of the industry in Pennsylvania.

We sincerely hope that this publication will stimulate exploration in Pennsylvania's large and widely untested oil and gas province. We believe that such exploration will result in important new discoveries of oil and gas which will materially contribute to improvement of the energy resources picture of the future.

Bulletin M65 is available from the Bureau of Publications, Department of Property & Supplies, P.O. Box 1365, Harrisburg, Pa. 17125, for \$.60, plus State Sales Tax.

NATIVE SULFUR IN PENNA.

As a chemical element, sulfur (also spelled sulphur) is a common constituent of the Earth's crust. It averages about 520 grams per ton, or about 1-1/4 pounds per ton, for all rock types. In fact, rather surprisingly it is more abundant than calcium, the major element in limestone. Sulfur is most abundant in sedimentary rocks, particularly in shales and organic sediments such as coal. However, most of this sulfur is not present as the element, called native sulfur, but is present as a sulfate (sulfur-oxygen compounds) or as a sulfide (metallic elements compounded with sulfur).

Native sulfur is rather rare so that two occurrences recently found in Pennsylvania are of unusual interest. Most native sulfur in the United States occurs along the Gulf Coast where it is associated with salt domes and is extensively mined. In Pennsylvania, native sulfur has been reported previously at six localities, although others surely exist. Samuel Gordon in his "Mineralogy of Pennsylvania" (1922) lists an occurrence of sulfur crystals at the old Wheatley lead and zinc mines in Chester County, at the Burning Mine (anthracite) in Carbon County, and in Montgomery County at Barren Hill and King of Prussia. Most of these localities are now either inaccessible or the native sulfur cannot be found. Lapham and Geyer in "Mineral Collecting In Pennsylvania" (Pennsylvania Geological Survey Bulletin G-33, 1969) list two more occurrences in limestone: at Salona in Clinton County and in the Nippenose Valley, Lycoming County. In addition, some native sulfur probably occurs in Pennsylvania coal beds, but it cannot be seen with the naked eye. Most of this organic-associated sulfur is present as a sulfate or a sulfide.

One of the two new localities for native sulfur in Pennsylvania is at Chestnut Hill near Columbia, Lancaster County. This is a locality where there are abundant, large, and well-formed pyrite crystals that have altered to limonite cubes called pseudomorphs (see "Mineral Collecting In Pennsylvania", p. 90-92). The native sulfur occurs sparingly inside these altered cubes as pale yellowish green masses. To date, none of these masses has shown any crystal form. However, an x-ray pattern identified by John Barnes of the Pennsylvania Geological Survey, shows that the sulfur is crystalline and belongs to the orthorhombic crystal system. The native sulfur formed by the alteration of pyrite (iron sulfide) to limonite during weathering.

The other new occurrence of native sulfur is not, strictly speaking, a "natural" occurrence. At the Kehley's Run Mine near Shenandoah Heights, Schuylkill County, there is an abandoned anthracite strip mine. At this locality there is an underground coal bed that is burning. The ground is fractured and hot gases are escaping from the burning coal below. These hot fumes are depositing sulfur crystals at the surface. The crystals are pale yellow to pale greenish yellow, very small and in groups of needle-like aggregates, but they make excellent micromount specimens (see photograph). Samples collected by



Wayne Downey of Harrisburg were donated to the Survey and currently are under study.

These occurrences of native sulfur in Pennsylvania illustrate three of the four major ways in which sulfur is formed. The Kehley's Run Mine occurrence is similar to sulfur that is deposited by volcanic activity, especially fumaroles such as those in The Valley of Ten-Thousand Smokes in Alaska. The limonite pseudomorph occurrence results from the alteration of a sulfide (pyrite) by oxidation. The sulfur in coal beds, and perhaps that in limestone, is biogenic sulfur that results from the action of sulfur-reducing bacteria present during the formation of these sedimentary rocks. Only the native sulfur associated with salt domes is missing in Pennsylvania. Thus, even though it is scarce, the major different kinds of occurrences of native sulfur are well represented here.

Sulfur is one of the few chemical elements that occurs in the native state. These occurrences described here represent a rare opportunity to see and collect a native chemical element and the opportunity should not be missed by anyone interested in the Earth Sciences.

D. M. Lapham

YORK ROCK-O-RAMA

The York Rock and Mineral Club will hold its second annual Rock-O-Rama on March 27 and 28, 1971 at the Alert Fire Co. #1 Manchester Twp. Emigsville, York County, Pa.

GAS DISCOVERY IN ARMSTRONG COUNTY

The Peoples Natural Gas, et.al. #1 Nelliè C. Martin well, near the community of Muff, Wayne Township, Armstrong County, about 50 miles northeast of Pittsburgh, has been completed as a wildcat gas discovery from the Lower Devonian Oriskany Sandstone. Originally drilled to a total depth of 15,574 feet, bottoming in the Upper Cambrian Gatesburg Formation, the well tested the deep Cambro-Ordovician rocks which produce gas in Columbiana County, Ohio about 80 miles to the west. The well apparently found shows of gas in zones besides the Oriskany, but none were commercial.

The well was plugged back to 6,850 feet and completed in the Onondaga and Oriskany zones for a potential of 1.1 million cubic feet of gas per day. This discovery is important because it is less than 2,000 feet southeast of a dry hole which had found no Oriskany Sandstone at the expected horizon. This had discouraged local exploration for gas from the Oriskany Sandstone, a major reservoir elsewhere in the state. Due to the additional data obtained from the Martin well, a large area is no longer condemned for exploration. The pace of wildcatting for other Oriskany gas accumulations in this area is expected to pick up as data accumulated from field wells which will be drilled to define and develop the Martin discovery.

Louis Heyman

NEW SURVEY PUBLICATIONS

Due to an error on our part, Bulletin IC-68, "Chemical Analyses of Three Triassic (?) Diabase Dikes in Pennsylvania" by D. M. Lapham and T. E. Saylor was listed as free in the December 1970 (Vol. 1/9) issue of *Pennsylvania Geology*. The cost of the publication is \$0.30. Bulletin A-157d, *Geology, Mineral Resources and Environmental Geology of the Palmyra Quadrangle, Lebanon and Dauphin counties* was listed as \$2.50. The cost of A-157d is \$2.85. Both publications should be obtained from: Bureau of Publications, P. O. Box 1365, Harrisburg, Pennsylvania, 17125. Checks should be made payable to the Commonwealth of Pennsylvania. For Pennsylvania addresses, please add 6% State Sales Tax.

We apologize for our error.

NEW RELEASES

<i>Publication</i>		<i>Price</i>
A84cd	Geology and Mineral Resources of The Southern Half of The Clearfield 15-minute Quadrangle , by Albert D. Glover, (139 p., 29 figs., 15 pls.)	\$7.40
M65	The Petroleum Industry and The Future Petroleum Province in Pennsylvania, 1970 , by Dana R. Kelley and others. (39 p., 13 figs.)	\$0.60



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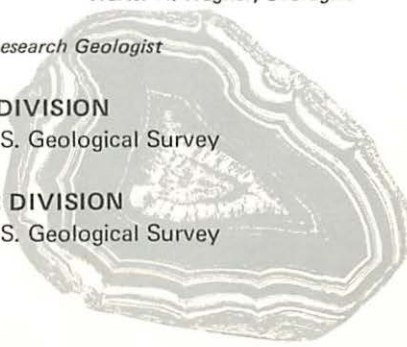
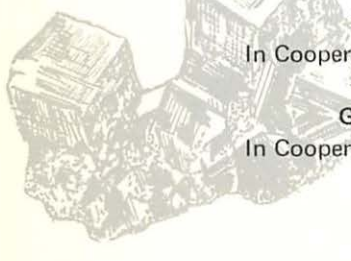
William S. Lytle, *Senior Research Geologist*

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