We regret to announce that the new quarters of the Pennsylvania Geological Survey were totally destroyed by the Harrisburg flood on June 23. Our proud library of 40,000 volumes, our collections, and our laboratories are gone. Our collection of over 200,000 topographic and geologic maps is gone, and our voluminous photo files were all totally destroyed. Obviously, this is a major disaster to us and to all whom we serve.

Continued on Page 1
CONTENTS

Pennsylvania's Booming Oil and Gas Search .................................... 2
Altoona Area Geologic Study Initiated ........................................ 3
Simplified Method for Calculation of Mineral Reserves or "The Pennsylvania Planimeter Eliminator" ........................................ 4
World's Deepest Well .................................................................. 5
Index to Current Mapping Projects ............................................ 6
New Directory of Geology Publications ....................................... 7
Faulting Revealed in the Northern Penfield Area, Clearfield County ... 8
New and Updated Oil and Gas Base Maps .................................... 10
Surface to Middle Devonian Stratigraphy of Pennsylvania on Open File 11
Gas Reserves Down .................................................................. 12
Survey Announcements ............................................................... 13
Earth Science Teachers' Corner .................................................. 14
New Susquehanna Book ............................................................... 15
Meet the Staff .......................................................................... 16

PENNSYLVANIA GEOLOGY is published bimonthly by the Topographic and Geologic Survey, Dept. of Environmental Resources, Harrisburg, Pennsylvania, 17120.

JUNE 1972
FROM THE DESK OF THE STATE GEOLOGIST . . .

At present we are in temporary quarters trying to salvage some few oil soaked, water-logged manuscripts and office records. Our mail address remains the same, as does our phone number.

We shall rise again from the ruins. Undoubtedly we shall have to call upon many of our friends for assistance to replace portions of our library which are out of print. Most of all we beg your patience until we can again be in a position to render the many services we have offered in the past.

Arthur G. Jocohow

Flood destruction of The Geological Survey Offices
PENNSYLVANIA'S 
BOOMING OIL AND GAS SEARCH

The scarcity of fuels, particularly oil and gas, to meet our energy requirements, the discovery of gas in the Onondaga reef just north of the Pennsylvania - New York line, and a new awareness of the tremendous thickness of the unexplored sedimentary column (30,000 feet) has caused more leasing and drilling activity than has been seen in Pennsylvania since the discovery of the Leidy Field in Clinton County.

Millions of acres have been leased in recent months throughout the oil and gas belt in an area from Greene to Bedford Counties on the south, then north to a line connecting Erie and Tioga Counties and then east to Wayne and Pike counties. The acreage acquired, in many instances, must first be evaluated before drilling can be started.

Nevertheless, several companies have scheduled deep tests to be started during the current year. Columbia Gas Transmission is drilling a well in Wayne County to the Queenston of Upper Ordovician age to a total depth of 13,000 feet. This well is presently drilling at a depth of over 10,000 feet. Troy Enterprises has scheduled a 11,000 foot basement test in northwestern Pennsylvania to be started before the years end. Pennzoil and AMOCO are together on a basement test which is located along the New York - Pennsylvania line, possibly on the New York side. AMOCO hopes to get a couple more deep tests started this year. United Natural Gas Company wants to drill two Silurian tests. Trend Exploration has made a location for an Oriskany test in Cameron County. This is the first of six wells they hope to drill this year to test for gas in Onondaga reefs or the Oriskany sandstone. AMOCO, Gulf and Humble are interested in northeastern Pennsylvania as well as in other areas in the Commonwealth. Shallow drilling commitments in leasing agreements made by some companies have been farmed out to other companies who will complete the wells in 1972.

And so it goes, but it is not all for gas. The refiners all need oil to keep their refineries going. Quaker State's new Congo refinery needs 10,000 barrels per day of crude oil to run at capacity. This refinery just went on stream in May, 1972. So things are wide open, and whether crude oil or natural gas is found, it can all be used. Primary production yields only 25 percent of the oil in the reservoir. Therefore, man continually tries to recover at least some of the remaining oil. That is why you hear such words as "Maraflood"—(A method developed by Marathon Oil Company to produce a lot of the oil left in the ground); three Maraflood projects are currently in operation in the Commonwealth; "Nergas"—(a repressuring process using exhaust gas from a diesel engine as a driving medium), six projects now in operation in Pennsylvania; and "Waterflooding"—(water used under pressure to drive the crude oil to the producing well bore) systematic intensive "floods" started in Pennsylvania in 1928 and are still continuing.
One refiner has started an incentive program to encourage the oil operator to drill for oil. Quaker State Oil Refining Company has offered operators in southwestern Pennsylvania 50 cents more a barrel for all new crude oil produced during the first 12 months of production with the crude being available to the refinery for at least the first three years. The wells must be drilled between April 1, 1972 and March 31, 1973.

Although 1971 was a big year for leasing and seismic activity in Pennsylvania (crew weeks totaled 147 in 30 counties) it has continued at the same rate during the first five months of 1972. Out of all this activity, there will be some discoveries made. If a discovery is a major one, then Pennsylvania will see activity that it hasn’t seen for some time.

William S. Lytle

**ALTOONA AREA GEOLOGIC STUDY INITIATED**

The Pennsylvania Topographic and Geologic Survey is initiating a comprehensive geologic investigation of the Altoona area starting in June, 1972. This project will include the compilation of detailed geologic, mineral resource and environmental factor maps which should help to stimulate future development projects beneficial to the area.

Altoona and surrounding communities comprise a growing metropolitan area and information resulting from the new geological study will be of particular interest to the urban and rural planners, construction engineers, mineral industries, professional geologists, and conservationists. Special attention will be focused throughout the investigation on those aspects of the geology that control and affect the environment, thus assisting sound, orderly planning and development.

Pennsylvania Survey geologists Albert D. Glover and John H. Way, Jr., the principal investigators, will be working in the Altoona area for the next several summers. The Altoona geological project is scheduled to continue into 1975. This project is just one of the many urban area geologic studies being carried out by the Pennsylvania Geologic Survey. By providing accurate maps and detailed reports of its geological investigations, basic technical data is made available in a format understandable to all who require geologically oriented information.
SIMPLIFIED METHOD FOR CALCULATION OF MINERAL RESERVES OR "THE PENNSYLVANIA PLANIMETER ELIMINATOR"

A new way of computing tonnages of coal reserves from geologic maps has been developed by geologists in the Field Geology Division. The estimation of coal reserves has always been considered a necessary—although time consuming—part of compiling geologic reports in the Allegheny plateau. In recent years, the principal means used by the Pennsylvania Geological Survey for determining areas underlain by coal beds on geologic maps has been the rolling planimeter. The new technique makes use of a point-counting method similar to that used in petrographic modal analysis of rock thin-sections.

The proportion of a surface, such as a geologic map or a rock slab, underlain by any given constituent, such as a coal bed or mineral type, can be determined by overlaying an array of equally-spaced points on the surface, counting the number of these points which are located in the area of interest, and then dividing this number by the total number of points used. Theoretically, this method will be 100 percent accurate when an infinite number of points are used. In practice, it is found that a reasonably accurate estimate can be made using 1600 points.

Once the proportion of the map underlain by the coal bed, excluding mined-out areas, is known, the tonnage of coal is calculated by multiplying this figure by the total number of acres in the map area, and then multiplying by the average thickness of the coal bed. This gives the total number of acre-feet of coal present, which when multiplied by 1800, (the average number of tons of bituminous coal per acre foot), gives the total tonnage in that particular bed in the map area. For anthracite coal, a figure of 2,200 tons per acre foot is used.

The total number of acres in a map area can be found by using the equation

$$A = \frac{L \times W \times S^2}{(144)(43,560)}$$

where \(A\) is the total map area, in acres, \(L\) and \(W\) are the length and width of the map, in inches, and \(S\) is the map scale. This equation can be simplified by the substitution of constants which depend on the scale of the map. A few examples for the determination of map areas, in acres, for some commonly used map scales are given in Table 1.

<table>
<thead>
<tr>
<th>Scale</th>
<th>Equation</th>
</tr>
</thead>
<tbody>
<tr>
<td>1:24,000</td>
<td>(A = L \times W) (91.83)</td>
</tr>
<tr>
<td>1:48,000</td>
<td>(A = L \times W) (367.3)</td>
</tr>
<tr>
<td>1:62,500</td>
<td>(A = L \times W) (622.7)</td>
</tr>
<tr>
<td>100 feet/inch</td>
<td>(A = L \times W/4.356)</td>
</tr>
<tr>
<td>400 feet/inch</td>
<td>(A = L \times w) (3.673)</td>
</tr>
<tr>
<td>1,000/inch</td>
<td>(A = L \times W) (22.96)</td>
</tr>
</tbody>
</table>
To test the accuracy of this method, it was used to calculate the tonnage of coal reserves in the Lower Kittanning coal bed in the northern half of Penfield 15-minute Quadrangle, which has been mapped by Thomas M. Berg and Albert D. Glover, to be published as Geologic Atlas Report A-74 ab. To obtain the proportion of the map underlain by this coal bed, each edge of the map was first marked off in 40 equally-spaced divisions. Lines drawn across the map connecting these points would produce a grid of 1600 equally-spaced points. However, the drawing of lines on the map can be avoided by the use of a straight-line template. A straight-edge was laid along the left edge of the map, and the division marks were transferred to it. The next step is to move this straight-edge across the map, one division at a time, and record the number of points falling on the map pattern of the area underlain by the coal, for each traverse. These are then totalled up and divided by 1600 to get the percentage of the map area underlain by the coal bed.

Using this method, a figure of 56.4 percent or 40.291 acres was obtained in 90 minutes of point-counting. The area of this coal bed had previously been determined by the use of a rolling planimeter to be 39,776 acres, or 55.6 percent of the map area. However, the area calculation by planimeter involved over 50 man-hours of work. Total tonnage of Lower Kittanning coal still in the ground in the northern half of Penfield Quadrangle is 178,992,000 tons (using the planimeter method) or 181,472,000 tons (using the point-counting method). The difference in the resulting estimate is approximately one percent, and the speed of the point-counting method represents a saving in calculation time of more than 95 percent.

The point-counting method for determining areas can also be applied to the evaluation of other mineral deposits such as limestone or clay, and can be used to find the volume of fluid reservoirs in porous rock formations.

Richard B. Wells
Field Geology Division

WORLD'S DEEPEST WELL

The world's deepest well, the No. 1 E A Baden Unit, bottomed out at 30,050 ft. in Viola limestone last month. Lone Star Producing Co. decided against continuing to its objective, a test of Arbuckle dolomite; the estimate for total cost of the well is $6 million. The record may not stand long — Western States Producing Co. is drilling to 31,000 ft. near Pampa, Texas.
INDEX TO CURRENT GEOLOGIC MAPPING PROJECTS

The Pennsylvania Geological Survey and the U.S. Geological Survey are currently engaged in many geologic mapping projects in Pennsylvania. The index map below shows areas where our field parties are working. In addition, five reports not included in the index maps in volume 3/2, pages 6-7, of "Pennsylvania Geology" are shown by heavy lines. Information on the areas being mapped may be obtained by contacting the Survey's offices.

The combination of the index map presented here and the index maps of published reports in volume 3/2 of "Pennsylvania Geology" give a reasonably complete picture of the publicly available detailed geologic mapping in Pennsylvania.
NEW DIRECTORY OF GEOLOGY PUBLICATIONS

A comprehensive, new directory entitled, "Pennsylvania Geological Publications" has just been released by the Topographic and Geologic Survey of the Pennsylvania Department of Environmental Resources. This publication is a complete listing of all reports ever published on Pennsylvania geology by the Pennsylvania Geological Survey as well as the U. S. Geological Survey and the U. S. Bureau of Mines.

The new, comprehensive directory will be helpful to a wide range of people, whether they seek information on the general geology of Pennsylvania, or more detailed and technical knowledge of the geology of specific areas or specific topics. Water resource reports, mineral resource reports, maps, information circulars, environmental geology reports, geologic quadrangle reports, and the popular Educational Series and Park Guides are among the major categories of publications listed.

An annotated index map as well as county and commodity cross-references are included in the new publication so that any reader interested in a particular area of the state or a particular subject may rapidly discover the geological reports that are available. Instructions are given telling how and where to write to obtain copies of all reports in print. A page is also devoted to instructions for ordering topographic maps of Pennsylvania.

To obtain a free copy of "Pennsylvania Geological Publications" write to the Bureau of Topographic and Geologic Survey, Department of Environmental Resources, Harrisburg, Pennsylvania 17120.

THINGS IS THINGS

From Little Rock came the following morsel addressed to the State Geologist:

Dear Pen-Pal,

I am studying your state. Would you please send a little box of things from your state? I will send you a box of things from Arkansas. I go to Wilson School. What school do you go to?

Your Pen-Pal,
R. W.
FAULTING REVEALED
IN THE NORTHERN PENFIELD AREA, CLEARFIELD COUNTY

As the national demand for energy resources continues to rise, particularly in regard to oil and gas, we are witnessing a continuing demand for accurate structural geologic maps in Pennsylvania. Oil and gas are frequently found in traps formed by structural deformation, particularly folding and faulting, of oil- or gas-bearing strata.

Recently completed geologic mapping by Pennsylvania Survey Geologists T. M. Berg and A. D. Glover in the northern half of the Penfield 15-minute Quadrangle in Clearfield and Elk Counties has confirmed the existence of a high-angle reverse fault at the surface called the Mountain Run Fault that has up to 400 feet of displacement and can be traced for at least seven miles. This kind of fault, rarely seen at the surface in western Pennsylvania, is located on the southeastern flank of Boone Mountain (Sabinsville) Anticline. The fault trace is roughly parallel to the axial trace of folds in this region. Evidence for this fault is not obvious at the surface, and there is no outcrop of the fault plane, but there appears to be some topographic expression of a fault zone. Undisputed evidence for faulting comes from numerous shallow and deep gas wells. By plotting the subsurface occurrence of the top of the Catskill red beds ("red rock" of driller's terminology), it is evident that there is an offset of this stratigraphic horizon that is too abrupt to be explained by folding or sedimentological variations.

Deep gas wells on the flanks of Punxsutawney-Caledonia Syncline in this area and in the southern half of the Penfield 15-minute Quadrangle, show that the Oriskany Sandstone which is the principal producing horizon, is repeatedly offset, indicating extensive faulting. Faults at the Oriskany level, much deeper in the subsurface than the Catskill red beds, are thought to be related to movements along deep décollement or detachment slip surfaces as splays that rise up through the strata, becoming high-angle reverse faults dipping toward syncline hinges. None of these reverse faults have been mapped at the surface and we have assumed that displacement was dissipated in the thick marine Devonian beds.

Although the Mountain Run Fault probably originated in the same manner, it is unusual not only in that it occurs at the surface, but also in that it is apparently non-planar and dips toward the anticlinal hinge. If it were planar, the fault trace as it has been mapped, would indicate a very low-angle (8°±) fault. Non-repetition of stratigraphic units in the subsurface records negates low-angle thrusting. Although the relative movement of blocks on either side of the fault plane is known, the dip of the plane is not certain, making the fault difficult to classify. The upthrown block lies on the northwestern side of the fault with a maximum displacement estimated at about 400 feet near the northern edge of its presently mapped extent. If the fault surface dips towards the Punxsutawney-Caledonia Syncline to the southeast, the fault must be a normal fault. Normal
faulting occurs when the overlying block moves down the inclined fault plane relative to the underlying block. If the fault surface dips toward Boone Mountain Anticline to the northwest, the fault must be a reverse fault. Reverse faulting occurs when the overlying block moves up the inclined fault plane relative to the underlying block. To our knowledge, normal faulting does not fit any of the known or theoretical structural patterns in this part of the Allegheny Plateau. We prefer to classify the Mountain Run Fault as a steeply dipping, almost vertical, reverse fault at the surface, with the irregular fault plane gradually curving down through the subsurface, intersecting the axial plane of Boone Mountain Anticline, and ultimately merging with the décollement slip surface at great depth.

One other fault like the Mountain Run Fault has been mapped by M. N. Shaffner (Pa. Geol. Survey, Atlas 57) in the New Florence 15-minute Quadrangle, Westmoreland County, Pennsylvania. It is important that this type of structure be documented now, especially since similar, but unmapped faulting of this nature may affect the occurrence of our energy resources.

Thomas M. Berg
NEW AND UPDATED
OIL AND GAS BASE MAPS

The above index map shows the oil and gas base maps that are now available. Numbers 34, and 35 are new as of June 1, 1972. Numbers 16, 17, 18, 19, 21, 22, 23, 24, 25, 26, 28, 30, 31, 32, 33 have been updated (posted date June 1, 1972). Paper prints of these maps, which show the locations of all the wells drilled for oil and gas since 1956 with gross field limits, can be obtained by writing to Pennsylvania Bureau of Publications, P. O. Box 1365, 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.

WE GIVE TILL IT HURTS

A Philadelphia friend sent this one:

Dear Sir Mr. Arthur Socolow,

Will you please send me some molecules and a microscope.

Thank you,

M. C.

Since we had more molecules than microscopes on hand, we sent some of the former.
SURFACE TO MIDDLE DEVONIAN STRATIGRAPHY OF PENNSYLVANIA ON OPEN FILE

The Pennsylvania Geological Survey has placed on open file a new report on Surface to Middle Devonian Stratigraphy. The new report consists of a short text and eight gamma-ray log cross sections whose locations are shown in the above figure. The cross section interval is from the surface to the base of the Upper Devonian shallow oil and gas sands.

The purpose of these cross sections is multifold:

1. To establish regionally consistent correlations and to delineate prominent reservoir zones and marked changes in thickness and facies.
2. To indicate occurrence of fresh and salt water where reported in the vicinity of control wells and to mark the position of prominent coals, limestones, clays, and other resources.
3. To reproduce gamma-ray logs at the same vertical scale (1 inch to 100 feet) as commercially available geophysical and sample logs, thus enabling direct correlation of our regional cross sections with currently available commercial data.

The cross sections form a basic reference network of geophysical logs for subsurface investigations. These investigations may be directed toward oil and gas reservoir distribution, subsurface disposal of effluent wastes, sources of brine or fresh water, potential migration of pollutants, or the distribution in the near subsurface of exploitable resources such as coal, clay, limestone, dolomite, aggregate, and other construction material.

The selection of specific gamma-ray logs used in these sections was difficult. Some short logs of very shallow wells best exhibit the near surface stratigraphy whereas good illustrative deep well logs commonly lack significant detail in the near surface rocks. Date of logging, areas of recent or past subsurface inactivity, and geographic and stratigraphic location are other factors that prohibited the optimum selection of all logs. Hopefully these cross sections will stimulate adequate logging of holes in areas where data are scarce, and will encourage the release of existing logs and other information in these areas.

The cross sections are divided into major "Zones" and subordinate "Units" which can be correlated throughout western Pennsylvania. Near surface Zones—Dunkard, Monongahela, Conemaugh, and Allegheny—are equivalents of surface groups of the same name. Stratigraphically below these groups the terminology and boundaries of some units are less well-established and locally controversial. Consequently, we have established the following informal Zones for reference: Pottsville-Burgoon, Middle and Lower Pocono of Carboniferous age, and Zones D, C, B, and A of Late Devonian age. Zones D and B contain beds of sandstone and are productive of oil or gas whereas beds of sandstone are scarce or absent in Zones C and A. These are the same Zones used in PR 178 "Representative Gamma-Ray Logs from Shallow and Deep Wells", where the Zones are shown in detail.
Zones are further subdivided into Units. The thick Pottsville-Burgoon Zone of southern Pennsylvania contains three Units: Pottsville Group, Mauch Chunk Formation, and Big Injun Unit. Zone D has Units D3, D2, D2b, D2a, and D1. Zone B is subdivided into Units B4, B3, B2, and B1. The Units are the productive oil and gas sands in the Zones.

The top of the Warren First Sand or its lateral equivalent was selected as the principal datum because it is a widespread marker in the northern two-thirds of the area studied, and is present throughout the western Pennsylvania Plateau. The datum marks one of the major changes in the stratigraphic column in the northern cross sections.

Although the gross stratigraphic pattern of Zones and Units is one of relative uniformity or gradual change, the cross sections clearly illustrate the rapidity of local variations in thickness and facies within Units. These changes make correlation difficult and are a major cause of miscorrelation of reservoir beds and the resulting confusion of terminology of oil and gas sands. Within units, the variations in lithology and bed thickness are most important in defining and delineating near surface fresh water reservoirs, coals, clays, and limestones or deeper subsurface oil, gas, and disposal reservoir. The consistent thickness of the larger lithic groups offer a framework for unravelling the details of the individual stratum of economic importance.

The report is on open file at the Pennsylvania Geological Survey, 401 Pittsburgh State Office Building, 300 Liberty Avenue, Pittsburgh, Pennsylvania 15222. It is available for examination at the above office and copies of the report will be made available at the expense of the individual.

GAS RESERVES DOWN

The American Gas Assn. reports that U. S. proven reserves of natural gas were reduced to 278.8 trillion cu. ft. at the end of 1971 — down from 290.7 trillion cu. ft. in 1970. The AGA, an industry organization whose figures are used by the Federal Power Commission, said that reserves in the lower 48 states fell to 247.4 trillion cu. ft., the lowest since 1957. AGA president F. Donald Hart announced that total reserves, including Alaskan estimates, are lower than in 1964, while demand has increased nearly 45%.
The Pennsylvania Geological Survey is pleased to welcome three new geologists to our staff.

Bernard J. O'Neill has returned to the Survey after spending several years with Foote Mineral Co., Inc. as an exploration and economic geologist. "Buck" O'Neill's wide-ranging background in mineral resources, his familiarity with Pennsylvania geology and its industry, and his previous experience at the Survey will be invaluable to us. His current research is primarily concerned with the utilization of shales and clays from southwestern Pennsylvania.

Robert C. Smith II comes to the Survey via Lafayette College and Pennsylvania State University where he has recently completed a Ph.D. thesis on the geochemistry of diabase in Pennsylvania. Bob also has completed research on lead-zinc occurrences and rare-earth pegmatites, all in Pennsylvania, and is a specialist in the field of analytical techniques. His modern research abilities and experience in Pennsylvania geology will, in his future research, add much to our knowledge in the fields of geochemistry and metallic mineralization.

Jesse L. Craft, Jr. has joined the staff of the Pennsylvania Geological Survey at the Survey's Pittsburgh branch office. Jesse, assigned to the Environmental Geology Division, will be responsible for carrying out the Division's goals and objectives throughout western Pennsylvania. In addition, he will work closely with the Survey's growing commitment to the "Greater Pittsburgh Regional Studies Program" which aims to enumerate the environmental geology factors of the six-county area around Pittsburgh. Jesse received his B.Sc. degree from Sul Ross State College (Texas) and his M.Sc. degree from Syracuse University. He is currently a Ph.D. candidate at the University of Western Ontario (Canada). Jesse's professional experience includes several years with the U.S. Army Urban Intelligence Research Team, geology instructor at Brock University, and geology laboratory supervisor at Carleton University. His Ph.D. dissertation research experience has been in stratigraphy and geomorphology of the High Peaks Region in the Adirondack Mountains of New York. Jesse has written 13 published papers and abstracts and is a member of several national, professional societies. Jesse and his wife will reside in the Pittsburgh area.

**MARBLE**

Marble was first quarried in Italy in 283 B.C. Roman emperors developed a passion for marble, and Augustus boasted, "I found Rome of unbaked brick and left it of marble".
The Pennsylvania Earth Science Teachers Society has unusual call letters but they like it that way. They hope to be friendly pests in the promotion of earth science education in Pennsylvania. That is their purpose and they plan to work to that end.

Several earlier meetings by a group of Pennsylvania earth science educators were followed by the constitutional meeting on May 6, 1972 at West Chester State College. At that meeting the general policies of PESTS were agreed upon and the new officers began immediately to set up programs to initiate these policies.

Pennsylvania is in the Eastern Section of the National Association of Geology Teachers. It was felt that this local section and the national association were too general to specifically aid Pennsylvania earth science education at local institutions. However, PESTS will work with the Eastern Section by sponsoring sectional field trips or programs in the fall of each year. These will be designed to familiarize earth science teachers with their local areas and opportunities. A general meeting will be held each spring to conduct business and present material pertinent to earth science education. One of the first projects now underway is an inventory of school districts in the state and the identification of those teachers involved in earth science teaching. The scope of earth science education in the state will be documented.

The constitution of the society has incorporated into it that of ten members on the board of directors, at least four will be school teachers and at least four shall be from higher education. This stipulation is included to prevent domination of the organization by any one group of educators and guarantees that each segment of the educational community will be heard. The executive committee which will lead the organization consists of the ten members of the board of directors and five officers.

PESTS expects to aid earth science educators in the following ways:

1. sponsor local programs and field trips each fall
2. sponsor a program and general meeting each spring
3. sponsor a state fossil, rock, and mineral exchange
4. create standards for state earth science teacher certification
5. catalog legislation concerning earth science in the state, and perhaps influence it
6. select the teacher of the year from Pennsylvania for the Eastern Section of NAGT
7. set up guidelines for an earth science curriculum
8. act as a clearing house for vacancies within the state
9. encourage institutions of higher education to establish programs for training earth science teachers
10. encourage all school districts within the state to include earth science education in their programs
11. coordinate earth science clubs around the state

In conclusion the Pennsylvania Earth Science Teachers Society is an organization designed to forward the course of earth science education within the state. We welcome members from all walks of life as well as educators from all levels of the academic community. Interested persons should contact Dr. S. Greenburg, Earth Science Department, West Chester State College, West Chester, Pa.

John Tomikel
California State College of Pennsylvania

new leaflets from the U.S.G.S.

Two new U.S. Geological Survey leaflets have been introduced to their popular geology series, and you might say the emphasis this time is on the “environment”.


These pamphlets are available free of charge from the U.S. Geological Survey, Distribution Section, 1200 South Eads Street, Arlington, Virginia, 22202.

NEW SUSQUEHANNA BOOK

A new book has just been issued which will be of interest to many Pennsylvanians and friends of the Susquehanna River. The Susquehanna Compact: Guardian of the River's Future is by William Voigt, Jr. who was Executive Director of the Interstate Advisory Committee on the Susquehanna River Basin from 1963 to 1968 during which time the Compact was drafted and passed by the three-state legislatures.

Written in a folksy, easily-read style, the book is loaded with important information and background “color” on the needs, trials and tribulations, and results of the Compact development.

The Susquehanna Compact: Guardian of the River's Future was published by Rutgers University Press and is priced at $15; it is sold through retail bookstores.
Davis M. Lapham joined the Survey staff as mineralogist in 1957. At that time, the Survey began an expansion of its staff and facilities, one aspect of which involved the setting up of modern laboratory facilities. Since then, Dr. Lapham, as Chief of the Mineral Resources Division, has supervised the Survey's laboratories and the geological research concerned with them.

Besides planning and guiding the research in his Division, Dave has been involved in numerous investigations of his own ranging from descriptive mineralogy for collectors, published as the Survey's popular "Mineral Collecting in Pennsylvania", to such topics as the occurrence and structure of rare minerals and the origin of diabase and associated magnetite ore. Pioneer work in the techniques of quantitative X-ray mineralogy has been applied to the utilization of clays and shales in Pennsylvania and Dave is continuing this study with other staff geologists. In addition, current work includes the application of radiometric dating to Pennsylvania geology and studies in the serpentinite area of Lancaster and Chester counties.

Dave was born in Glens Falls, New York, obtained his A.B. degree from Middlebury College in Vermont, and his M.A. in 1955 and Ph.D. in 1957 from Columbia University. In addition to his early hobby of mineral collecting throughout New York and New England, Dave worked for the New York State Geological Survey performing glacial geologic mapping, for the U.S. Atomic Energy Commission on Colorado uranium ores, and studied alteration effects in Canadian gold deposits. He is a member or fellow of numerous professional societies, recently was elected to the executive board of the Friends of Mineralogy, is in charge of regional abstracting for the International Mineralogical Association, and acts as a critical referee for several international publications. In addition, he has authored or co-authored nearly 50 articles and publications.

Dave lives outside New Cumberland with his wife, Nancy, and daughter, Heather. As he says, "It's a great place to live: right on top of the diabase contact where clusters or garnet crystals occur practically on my doorstep." Geologists never do seem to escape the clutches of their fascinating science, and Dave is no exception.
PENNSYLVANIA GEOLOGICAL SURVEY STAFF
Arthur A. Socolow, State Geologist
Donald M. Hoskins, Assistant State Geologist

ADMINISTRATIVE DIVISION
Mary Jane Adams, Typist
Shirley J. Barner, Stenographer
Sandra Blust, Librarian
Joanne Bowman, Typist
John G. Kuchinski, Draftsman
Christine Miles, Asst. Editor

ENVIRONMENTAL GEOLOGY DIVISION
Barbara Conrad, Clerk
Jesse Craft, Geologist (Pittsburgh Office)
Mary E. Horne, Geologist
William G. McGlade, Geologist

FIELD GEOLOGY DIVISION
Thomas M. Berg, Geologist
William A. Bragonier, Geologist
William E. Edmunds, Geologist
Rodger T. FailI, Geologist
J. Douglas Glaeser, Geologist

MINERAL RESOURCES DIVISION
John H. Barnes, Geologist
John C. Benson, Typist
Leslie T. Chubb, Laboratory Technician

OIL AND GAS DIVISION
(Pittsburgh State Office Bldg.)
William S. Lytle, Division Chief

TOPOGRAPHIC DIVISION
In Cooperation with The U.S. Geological Survey

GROUND WATER DIVISION
In Cooperation with The U.S. Geological Survey
CORRECT ADDRESS REQUESTED

JUNE 1972
GROUND-WATER LEVELS