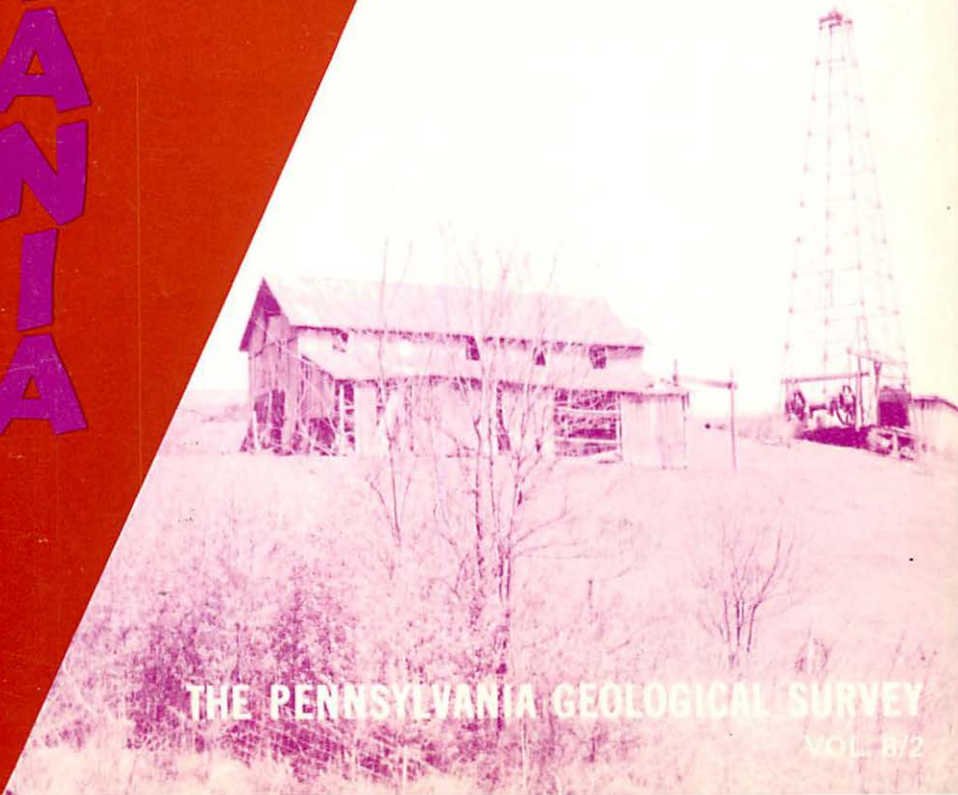
PENNSYLVANIA GEOLOGY



THE PENNSYLVANIA GEOLOGICAL SURVEY
VOL. 8/2

COMMONWEALTH OF PENNSYLVANIA
Milton J. Shapp, Governor

DEPARTMENT OF ENVIRONMENTAL RESOURCES
Maurice K. Goddard, Secretary

TOPOGRAPHIC AND GEOLOGICAL SURVEY
Arthur A. Socolow, State Geologist

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ON THE COVER: One of Venango County's older oil wells, a tribute to Pennsylvania's past and present contribution of energy raw materials.

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

APRIL 1977

FROM THE DESK
OF THE
STATE GEOLOGIST . . .

NOT YET, NOT YET

In the early 1950's, while finishing up my thesis field work near one of my favorite towns, Crested Butte, Colorado, I was struck by the fact that outhouses were the most conspicuous plumbing facility of the town. I approached a veteran citizen of the community and asked why it was that with most of the homes equipped with running water, only two could boast the existence of flush toilets. After a moments careful thought, he replied, "Those things just haven't been perfected yet."

I was reminded of that little episode when I read recently that a judge has declared void the OCS (Outer Continental Shelf) oil and gas development leases on the Atlantic Coast. After at least ten years of studies by government, academic, and consulting researchers on possible physical, biological, economic, and social environmental impacts on both the offshore and the onshore environments that might be affected by OCS drilling, and after scores of environmental reports which total tens of feet of library shelf space, the judge has ruled that environmental impact statements for the OCS program haven't been perfected yet.

True, even today we find that flush toilets haven't been perfected yet, and neither have automobiles or airplanes. So it is probably also correct that the OCS environmental impact statements haven't yet been perfected. But how long can we wait to attain perfection?

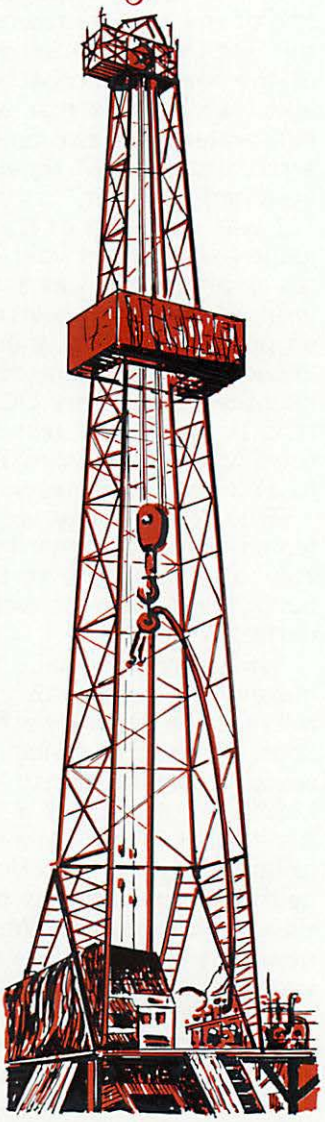
This is not to make light of the importance of comprehensive, meaningful environmental impact evaluations, particularly with reference to activities affecting our life-giving oceans, and our coastlines. Through service as Pennsylvania's representative on the advisory committee to the President's Council of Environmental Quality, I developed a profound respect for the complexity and significance of environmental impacts related to prospective OCS drilling. But my experience also impressed me with the fact that neither a final analysis nor a final course of environmental protection can be achieved. We must do what we can for the environment now, but also recognize that unanticipated developments will occur and we must be prepared to respond to them promptly as they arise.

Speaking of unanticipated developments. I am also reminded of a recent exchange of communications. We announced in an earlier edition of this journal that the Pennsylvania Survey was undertaking a comprehensive geologic mapping project which, barring unforeseen difficulties, would take two years to complete. A serious, well-intentioned reader responded with a letter inquiring "Please list the unforeseen difficulties which might cause a delay in the project." It appears the latest ruling on the OCS is based on similar logic.

Arthur A. Socolow

New Gas Discovery in Lycoming County Sparks A Flurry of Activity

by Richard Wells



Natural gas exploration in north-central Pennsylvania received a shot in the arm when the discovery well in the Salladasburg Field in Mifflin Township was completed last November. Initial production in the John Ware III No. 1 Hess was 1,000 mcf per day from 29 feet of Ridgeley sandstone at a depth of 6,271 feet. The well is located a mile northeast of Salladasburg on Tombs Run anticline, on a prospect described in Pennsylvania Geology last year (Wells, 1976). A confirmation well, the Ware No. 1 Charles Emig, slated to test the Ridgeley sandstone is drilling a half-mile southwest of the discovery.

Geologic mapping on Cogan Station and Salladasburg Quadrangles (Faill and Wells, in press) indicates a closure of at least 500 feet on the surface, with the highest point on the structure lying northeast of the Hess well, towards Quiggleville.

Another Devonian test, the Pennsylvania Energy Resources Number 1 Woodley, is currently drilling in Mill Creek Township northeast of Montoursville. The operators have announced another five well locations in this same area, one of them on the same farm. These are stratigraphic tests in the 2000 - 3600 foot range, being drilled to evaluate the potential of sandstone beds in the Upper Devonian "Chemung" or Lock Haven Formation. Several beds of very-fine to fine-grained, slightly calcareous sandstone were reported in this interval in the Delta Number-1 Ging well in Cascade Township, north of Wallis Run

Bodines Quadrangle (Fettke, 1956). These five new locations are the No. 2 Woodley (Huntersville E), No. 1 Lauchle in Muncy Township (Huntersville H), No. 1 Schaeffer (Huntersville I) and No. 1 McCloskey (Picture Rocks G), both in Wolf Township, and the No. 1 Miller in Upper Fairfield Township (Montoursville North F). The Miller location is on the crest of the untested Warrensville anticline.

Meanwhile, Pennsylvania Energy Resources, a subsidiary of Pennsylvania Gas and Water Co. of Wilkes-Barre, have purchased an abandoned dry hole some two miles east of the Woodley farm, and moved in a rig to clean out the hole, run logs and tests. This well was originally the Storey No. 1 Berkheart, drilled in 1954 to a depth of 6,854 feet and abandoned in the Middle Devonian somewhere above the Onondaga Formation. This well reportedly will be deepened to about 7,000 feet to the Ridgeley sandstone, after gas shows in upper formations are tested.

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Publication on Drilling of World's First Oil Well

The Department of the Interior has published its second Bicentennial historical vignette — Success At Oil Creek — which describes the drama and events that led to the drilling of the world's first oil well in 1859 by Colonel Edwin L. Drake near Titusville, Pennsylvania.

The recognized birth of the petroleum industry in the United States occurred August 27, 1859, along Oil Creek in western Pennsylvania. There, the famed Colonel Drake, a former railroad conductor and jack-of-all-trades, proved that oil could be found in quantity by drilling into the earth.

At 69½ feet, the hole he bored filled with oil to signal monumental changes in the development of the world and the history of man.

The 24-page illustrated Bicentennial Vignette, *Success At Oil Creek,* is for sale for 65 cents by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The stock number is 024-000-00823-1.

The Role of Geology in Coal Mining*

by C. Richard Dunrud
U. S. Geological Survey, Denver, Colorado

Geology plays an important role in both underground and surface coal mining. In underground mining, the lithology, structure, and ground-water conditions of rocks above and below the coal affect the behavior of these rocks in response to mining in three important ways: First, structure and lithology control the rate and direction of erosion, which, in turn, govern the thickness, depth, and configuration of the overburden and consequently control those stress conditions that are related to topography. Faults, joints, and ground water tend to weaken rocks in the overburden and to increase the rate and amount of subsidence above mine workings. Second, any active organic stresses can alter, increase, and otherwise modify the stresses produced by topography. Third, the lithology and the primary and secondary structures in the rocks above and below the coal — such as bedding, cross-bedding, organic structures, channel sandstones, dikes, joints, and faults — tend to influence stability of the mine roof and floor. Knowledge of the ways in which these structures affect the stability of the roof is very important, because statistics show that roof falls are the primary hazard to coal miners.

Short- and long-term stability of highwalls and spoil piles in surface-mining operations also are controlled by the structure and lithology of the bedrock, by local surface-water and ground-water conditions, as well as by climate. The depth limit and benching requirements for stripping overburden, for example, are governed to a large extent by the short-term strength of the bedrock, which is controlled by the structure and lithology and by the distribution of surface and ground water. The final grading specifications for the last cut in a surface mine depend upon the long-term slope stability of the bedrock, which is in turn governed by the strength of weathered rock. Chemical weathering and leaching of spoil piles, as

well as the stability of the slopes and of the settlement characteristics of the regraded materials, also are controlled by the lithology and structure of the initial bedrock or surficial material, as well as by the climatic conditions in the mining area. These factors, therefore, are important to well-planned and efficient surface restoration.

*Abstract of talk given at the U. S. Geological Survey Symposium on Coal Geology and the Future, Reston, Va., September 27, 1976.

mineral production UP

The recently issued U. S. Bureau of Mines summary of the mineral industry of Pennsylvania in 1975 highlights a continued growth in the value of raw mineral resources produced, reaching a figure of just under $3 billion, up 22% over the prior year. Coal again was the largest single commodity in value, accounting for approximately 75% of the total value of minerals produced in the Commonwealth. Following coal, in decreasing order of dollar value, were cement, stone, lime, natural gas, sand and gravel, petroleum, zinc, clays, and peat.

Pennsylvania's stone values led the nation; lime was second in the nation; zinc product value was seventh in the nation. Northampton and Lawrence Counties led in cement production, Montgomery and Bucks Counties headed the stone production, Centre County was the leading county in lime production, and Bucks and Armstrong Counties headed a long list of sand and gravel producers.

At this time of energy concern, it is noteworthy that Pennsylvania's oil production for the year was 3.3 million barrels valued at $39.6 million, and the natural gas production was 84.7 billion cubic feet valued at $57.1 million.

New Guide to Mining and Mineral Operations

For those who have an interest in locating and visiting outstanding past and present mining and mineral operations, the U. S. Bureau of Mines has issued an impressive, beautifully illustrated 72 page booklet entitled, **Mining and Mineral Operations in the New England and Mid-Atlantic States.** This is one of a series of six such reports which collectively cover the entire United States.

The publication on the New England and Mid-Atlantic states locates and described 119 individual localities in the states of Con-

necticut, Maine, Massachusetts, New Hampshire, New Jersey, New York, Pennsylvania, Rhode Island, and Vermont.

Mining and Mineral Operations in the New England and Mid-Atlantic States is sold by the Superintendent of Documents, U. S. Government Printing Office, Washington, D. C. 20402. The price is $2.30 and the stock number is 024-004-01889-5.

geologists present geologic hazards seminar

Dr. Jesse L. Craft, Environmental Geologist, Pennsylvania Geological Survey; Dr. Kent Bushnell, Slippery Rock State College; and Mr. Larry Davis, Washington Jefferson College presented a one and one-half hour seminar on geologic hazards and how they influence community planning at the Annual Meeting of the Pennsylvania Planning Association. The meeting was held in Seven Springs on October 7, 8, 9, 1976, and over 400 individuals involved in community planning attended the conference. Topics covered in the seminar were landslides, deep mine subsidence and tributary stream flooding. Emphasis was given in the seminar on use of existing geologic information for input into the early planning of projects with the community.

new water data system

The Commonwealth of Pennsylvania, Department of Environmental Resources has become a participating member of the National Water Data Exchange (NAWDEX). NAWDEX is comprised of water-oriented organizations working together to provide convenient access to water data. The NAWDEX mission is to identify sources of water data, to index data holdings of water-oriented organizations, and to provide the linkage between those who acquire and those who use water data.

The U. S. Geological Survey (USGS), through its NAWDEX Program Office, will provide the central management of NAWDEX, and will serve as a coordinating facility for all NAWDEX facilities.

VOLUME 7/3 PENNSYLVANIA GEOLOGY NEEDED

Due to an unfortunate circumstance, some libraries did not receive Volume 7/3 of Pennsylvania Geology (June 1976). In order to fill out their sets to provide complete volumes, we are issuing an appeal to anyone who wishes to return their Volume 7/3 issue. These will be distributed to libraries and other public institutions who need them for completing bound volumes. Please return to Pennsylvania Geological Survey, P. O. Box 2357, Harrisburg, PA 17120.

SURVEY ANNOUNCEMENTS

MERCER COUNTY REPORT ISSUED

Geology and Ground Water Resources of Northern Mercer County, Pennsylvania, has been published by the Bureau of Topographic and Geologic Survey as Water Resources Report 33. Authored by George R. Schiner and Grant E. Kimmel of the U. S. Geological Survey, the 136-page text with 8 large, full-colored geologic maps presents a comprehensive description of the geologic conditions and groundwater resources upon which planning, development, and conservation must be based.

The geologic maps and text descriptions of the rock formations and glacial deposits provide the basic data necessary for all forms of land use, including transportation, home construction, industrial development, agriculture, and recreational facilities. The detailed data on available subsurface water quantity and quality, based on studies of some 2,000 wells in the area, is especially important to this northwest Pennsylvania region of growing population and development.

Water Resources Report 33, **Geology of Ground Water Resources of Northern Mercer County** is available for $17.50 (plus 6% tax for Pennsylvania residents) from the Pennsylvania Bureau of Publications, P. O. Box 1365, Harrisburg, PA 17125.

MINERAL CLUBS ANNOUNCE MEETINGS

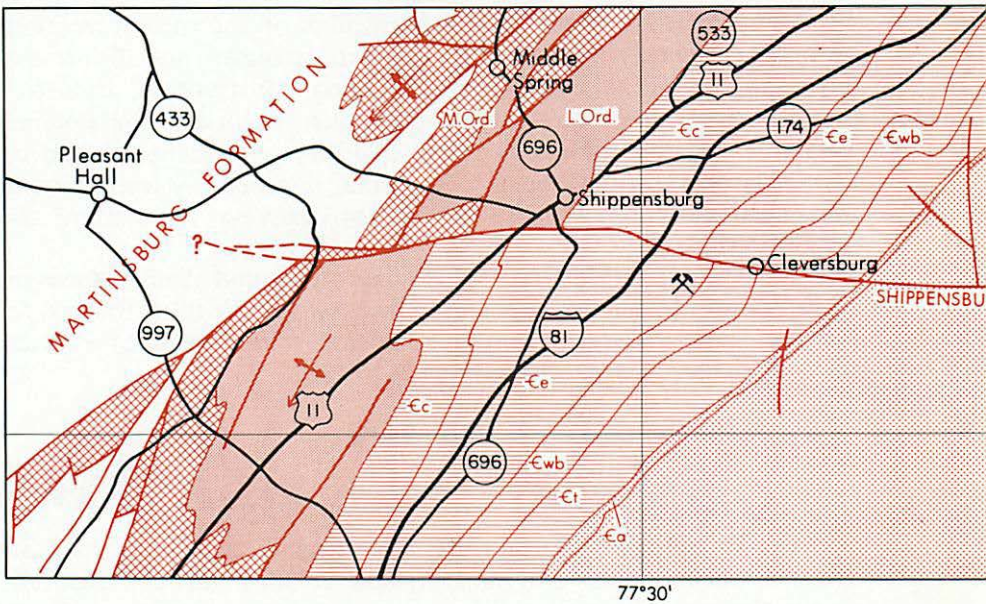
The Mineralogical Society of Pennsylvania will hold its 13th Biennial Earth Science and Mineral Show, entitled "Earth Treasures," at the Guernsey Barn, five (5) miles east of Lancaster, Pa., on Route 30, at the intersection of Route 896, on May 28-29, 1977.

The York Rock & Mineral Club, Inc. will hold its fifth Annual "Rock Swap" on Saturday, June 4th and Sunday, June 5th, 1977 at Rohlers Picnic Grounds on Rohlers Church Road. These picnic grounds are located three (3) miles east of Mt. Royal off Pennsylvania Route 74. Mt. Royal is approximately 2 miles north of Dover, Pennsylvania on Route 74.

MAJOR CROSS STRUCTURES IN PENNSYLVANIA (PART I)

by Samuel Root and Donald Hoskins

Detailed geologic mapping in the Cumberland Valley in conjunction with Survey hydrologic investigations, and reconnaissance mapping in South Mountain, related to compilation of a new State Geologic Map, confirm an unusual fault a few miles north and approximately parallel to N 40° latitude. Similar mapping by D. M. Hoskins in the Valley and Ridge Province to the west confirms two additional new and unusual faults along the same east-west trend.



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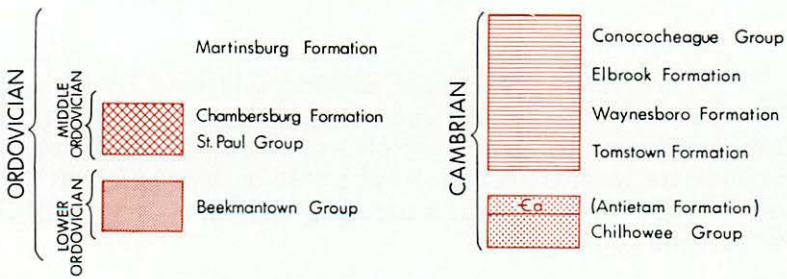
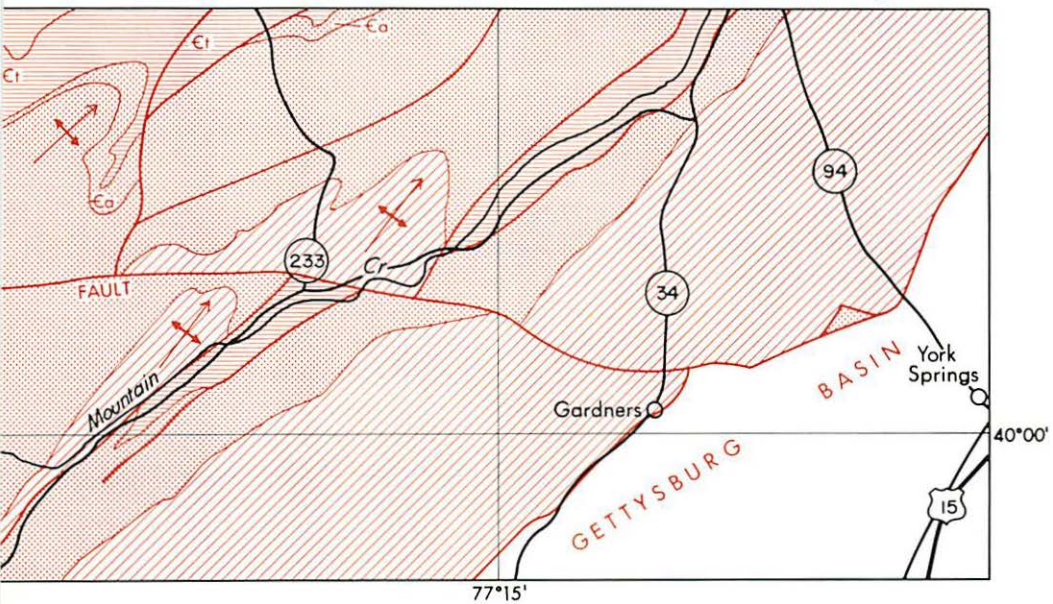


The Valley and Ridge faults will be discussed in Part II of this article.

Most of the previously mapped faults in the complex Cumberland Valley-South Mountain Anticlinorium are steep thrusts, usually moderately dipping to the southeast, and parallel to the northeast-southwest trending structural grain. This newly recognized fault, named the Shippensburg Fault, differs significantly from most of the other faults in the region.

The Shippensburg Fault (Figure 1) trends east-west at a considerable angle to the regional structural grain. It has a relatively straight trace, even in the high-relief terrain of South Mountain, which indicates a subvertical attitude. It has a mapped length of 23 miles (37 km), covered on the east by Triassic rocks of the Gettysburg Basin, and on the west it extends into terrain of the Martinsburg Forma-



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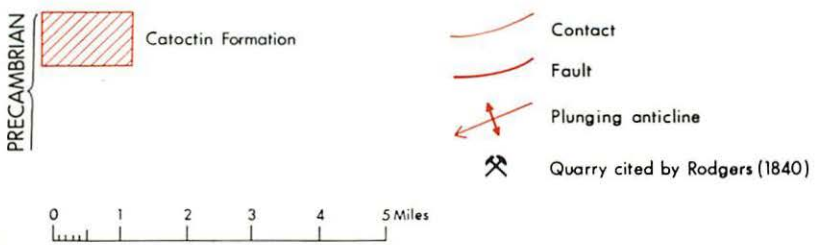

tion where its identity is lost.

In the area shown on the map, structures are not merely offset across the fault as with a simple tear fault. Rather, in the Great Valley carbonate terrain, semi-independent shortening on either side of the fault is inferred because folds and faults cannot be matched across the fault, although structures are related in a general way. However, in South Mountain simple offset occurred as structures in the Cambrian Chilhowee Group quartzites and Precambrian Catoctin metavolcanics can be matched across the fault. From relations in the metavolcanics, the block north of the fault is interpreted to have been uplifted between 2900-4200 feet (880-1280 m). Based on offset of vertical Antietam quartzite ridges, there is also component of left-lateral slip which appears to be less than the amount of vertical displacement.

The Shippensburg Fault is located in a regionally significant structural position. North of the fault structures of the South Mountain Anticlinorium, all plunge northeast; south of the fault all structures plunge southwest. Therefore, the fault is on the structural culmination of the South Mountain Anticlinorium.

Principal deformation of the rocks in the region is considered to be at the end of the Paleozoic (Alleghanian Deformation). Because semi-independent shortening occurs across part of the Shippensburg Fault, it may have been active during the shortening process and may be part of the Alleghanian Deformation. The eastern part of this fault may have been active after the deformation that formed the Gettysburg Basin because the border fault that marks the northwest margin of the basin is offset where it transects the Shippensburg Fault. The Shippensburg Fault may reflect a deep-seated zone of weakness rather than dermal faulting related to shortening above a detachment horizon. Affinities with the similar Carbaugh-Marsh Creek Fault near Chambersburg (Root, 1970 and 1971) are indicated.

Of particular interest is the possibility of mineralization associated with the Shippensburg Fault. Ore from a limonite iron mine close to the fault near Cleversburg, which was operated in the early 1800s, formed abundant, peculiar encrustations in the Mary Ann furnace stack where it was smelted. These crusts analyzed at 92.5% PbO (Rodgers, 1840). Geochemical sampling from the B-soil horizon near this quarry by R. Smith II (in preparation) indicates values of Zn 6 times greater than regional background and Pb 25 times greater than regional background. Chemical analyses of limonite from this area contain .28% Zn and .05% Pb. Both this fault and the Carbaugh-Marsh Creek Faults may be prospective areas for Pb-Zn exploration.

More significant than establishing the presence of this fault in the Cumberland Valley and South Mountain is the recognition by Hoskins of related faults farther west (to be discussed in more detail in Part II of this paper). Along the east-west trend of the Shippensburg Fault through the Fannettsburg, Burnt Cabins, Hustontown, and Breezewood quadrangles, other similar faults crossing the structural grain have been mapped in compilation for the new geologic map of Pennsylvania. Other faults on this east-west trend extend, intermittently, westward to near the Allegheny Front. Across the Front on the Allegheny Plateau an extension of the faults merits consideration based on anomalous patterns on the aeromagnetic map and its interpretation of this region (Popenoe and others, 1964 and Beck and Mattick, 1964). A slightly northwest-trending anomaly passes near Pittsburgh, continuing to Ohio. Also, a zone of subsurface structural discontinuity (Wagner and Lytle, 1976) coincides with the aeromagnetic anomaly.

The authors believe that this zone of faulting represents a major fault, or zone of weakness, in the continental crust along which movement of various types occurred in the Paleozoic and Mesozoic. As this structure transects virtually two-thirds of Pennsylvania, the name Transylvania Fault is proposed for this feature.

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The Geological Society of Pennsylvania 1832-1836

by Anne Millbrooke

Part 2: Promoting a State Survey

(Part 1, Published in Dec. 1976, v. 7/6)

To establish a state geological survey, the Geological Society lobbied for the passage of a state law. Although a bill was considered at each legislative session, the geological survey did not win legislative approval until 1836. In the spring of 1833, however, a committee of the House of Representatives recommended "an appropriation by the Legislature to make a Geological Survey of the State under the direction of the Geological Society of Pennsylvania."[1] Politics and economics, as well as the character of the Geological Society, decided the establishment of the Pennsylvania geological survey.

The committee of the House of Representatives passed favorably in the spring of 1833 on a memorial submitted by Peter A. Browne and modified by the Geological Society. Through a committee consisting of Chief Justice John B. Gibson, Dr. Richard Harlan, and engraver Henry S. Tanner, the Geological Society proposed, with little geologic justification,

> to establish accurately three meridian or transit lines, extending entirely across the state, to be denominated the eastern, the middle, and the western meridians of the state, measured with the utmost care and precision, and permanently marked at intervals of a mile, or oftener, on suitable posts or stones, set for that purpose.
>
> Measurements of the elevation above mean tide carefully marked, and the latitude of each line precisely determined by a series of astronomical observations. Also, another line traversing the state longitudinally, which would intersect nearly every variety of rocks which exists in our state, and afford important connexions with the primitive meridians.[2]

The legislative committee included this proposal in a bill, which, if passed, would have provided not more than $15,000, and not more than $5,000 in any one year, for a geological survey of the state. Although Pennsylvania would not be the first state to sponsor such a survey, the committee argued that the proposed survey would

"unquestionably redound to the credit of the state, and richly repay any expenditure in its attainment."[3]

The political and economic picture confronting the legislature in 1833 strongly influenced the decision not to fund the geological survey, which came with canals and railroads under the general heading of internal improvements. The legislature had passed in 1826 its first internal improvement program; it authorized the construction of canals and the borrowing of funds to pay the expenses. Later the program was expanded to include railroads, principally because Pennsylvania was in competition for trade with New York, Albany, and Baltimore. In order to compete successfully the state needed transportation systems; therefore, canals and railroads were of higher priority than a geological survey. As the internal improvement program grew, so did the state debt. Even before 1833 the legislature became aware of the state's precarious financial situation and began to cut back public works or internal improvements. The state geological survey, thus, was not funded in 1833, despite the favorable committee report, because the legislature was consciously limiting internal improvement expenditures. By 1836 when the geological survey of Pennsylvania was established, the political and economic situation had changed.

After the rejection of a state survey by the 1833 legislature, the Geological Society continued its promotional efforts but changed its tactics. Up till then the Geological Society had been arguing from an economic ideology that said that state agriculture and manufactures, and therefore the whole state, would economically benefit from a survey. The argument was similar to that used in support of canals and railroads. But economic priorities being what they were, the Geological Society turned to an ideology of science that claimed a purity of motives. A new constitution adopted in January of 1834 reflected the change in ideology. It specified seven activities for the promotion and diffusion of geologic knowledge: (1) "the collecting, digesting and publishing . . . [of] new, interesting and useful facts and discoveries in Geology"; (2) "the gradual accumulation of the most approved books, maps, specimens, and all such documents and materials as shall best elucidate the science"; (3) "preparing brief instruction for members of this society, or others, who design to visit distant parts of the state"; (4) "affording pecuniary or other assistance to such travellers or surveyors as may require it"; (5) "corresponding and communicating with similar societies abroad"; (6) "inviting communications, either speculative or practical from members and others"; and (7) "causing the formation of auxillary

societies in the several counties of the state."[4] Advocacy of a state geological survey, which was the dominant theme of the earlier constitution, was implicit, not explicit, in the new constitution.

The appeal of science was also expressed by the publication of the Geological Society's *Transactions.* The volume, which included a memorial in support of state geological survey, was published in two parts, the first in 1834 and the second in 1835. The Geological Society had changed its image. In 1835 it had more than two hundred members. It had moved from the hospitality of the Franklin Institute to its own quarters in the new Exchange Building. Lectures on geology and mineralogy were given weekly, and the cabinet and library had grown. Still the Geological Society was not a scientific society in the professional sense; its membership consisted primarily of amateur scientists. Less than five percent of the membership, for example, contributed to the *Transactions,* and less than two percent (that is, four members) wrote more than half the articles. Moreover, the *Transactions* received a guarded review in the *American Journal of Science*, which trusted that "it is only an earnest of more to come."[5]

The Geological Society of Pennsylvania, a Philadelphia based organization, had three types of membership — honorary, corresponding, and residential. Approximately half of the over two hundred members were residents; honorary members could be counted on one hand. The list of corresponding members contained the names of many notable foreign scientists: Alexandre Brongniart, French geologist and chemist; Adolph Brongniart, French botanist; William Buckland, British geologist; Alexander von Humboldt, German naturalist; R. I. Murchison, British geologist; and Adam Sedgwich, British geologist. The list also included various people scattered throughout the United States, like Edwin James of Albany and Gerard Troost of Nashville. The corresponding members, however, were not active in the Geological Society. Only one, Gerard Troost, published in its *Transactions.* Residential members controlled the Geological Society. Unlike among the corresponding members, practicing scientists were rare among the residential members. They were principally physicians, businessmen, and lawyers. The officers in 1834, as in 1832, reflected the amateur nature of the membership. The only significant change was the substitution of a geologist for a judge in the presidency. Andres del Rio, the new president, was a professor of mineralogy in the School of Mines in Mexico. While temporarily residing in Philadelphia, Del Rio lent his name to the Geological Society, giving the appearance of science.

On the 19th of March 1836 the Pennsylvania legislature passed an act providing for a geological survey of the state. It authorized the governor to appoint a state geologist, who, in turn, would appoint an assistant in mineralogy and an assistant in chemistry. The state geologist and his assistants were to make

> a geological and mineralogical survey of the state, with a view to determine the order, succession, arrangement, relative position, and the dip or inclination and also the comparative magnitude of the several strata or geological formations within the state, and to discover and examine all beds and deposits of ores, coals, clays, marls, and such other mineral substances as may be deemed useful or valuable, together with such other duties as may be necessary to make a full and complete geological and mineralogical survey of the state.[6]

The act provided for an annual appropriation of $6,400; $2,000 was for the state geologist's salary, $1,200 for each assistant, $1,000 for expenses incurred by the chemist, and $1,000 for incidental expenses. The act established the First Geological Survey of Pennsylvania, but it made no mention of the Geological Society of Pennsylvania.

The passage of the act establishing a state geological survey reflected the economic and political situation of Pennsylvania in 1836.[7] The state's early internal improvement program, which began under Governor John Shulze, was financed almost entirely through loans, many from the United States Bank. As the program expanded, the debt grew, and though the program was cut back under Governor George Wolf, the debt remained. President Andrew Jackson, meanwhile, stopped depositing federal funds in the United States Bank. The president of the United States Bank, Nicholas Biddle – an officer of the Geological Society – began to call in loans in case Jackson should decide to withdraw the federal funds already deposited in the United States Bank. The result was that fewer monies were available. By 1835 the monetary situation was unstable. The political situation, to complicate matters, was also unstable. The Democratic Party in Pennsylvania split between Governor Wolf and Henry A. Muhlenberg. As one newspaper described the situation: "The *'wolves'* and *'mules'* of Pennsylvania, as two of the parties to the election of governor are *politely* called, are telling tales of one another that both parties ought to be ashamed of – and will be, 'after the election'."[8] In the 1835 fall election a third party candidate, Joseph Ritner, was elected governor. He was, in addition to being anti-Mason and anti-Van Buren, was pro-Bank and pro-internal

improvement. The United States Bank was then chartered by the state of Pennsylvania, prolonging its life beyond the 1836 federal expiration date. Ritner, with aid of legislators Thaddeus Stevens and Charles B. Trego, guided the act for a state geological survey through the state legislature.

The same arguments that the Geological Society had early advanced in its promotion of a state survey, that is the economic and educational arguments, convinced the state to finance a survey. The 1836 act specified that the state geologist and his assistants were "to discover and examine all beds and deposits . . . and such other mineral substances as may be deemed *useful or valuable*" [emphasis added]. It also provided for state and county cabinets to display the geology of the state. The act did require the geologist and his assistants to be scientific, but they were also to be practical. The state legislature, like the Geological Society, advanced science for economical reasons.

The Geological Society accomplished its purpose. Despite rhetoric, like the reference in the *Transactions* to "the future success and permanency of this institution,"[9] the success of the Geological Society necessitated its expiration. In 1836 the Geological Society was the political pressure (or, if you prefer, civic minded) group that it had been in 1832, but now without a cause it dissolved. Chief Justice Gibson never intended to participate in the survey. He and the majority of the members of the Geological Society were not scientists and would reap the benefits of the state geological survey regardless of who conducted it. Those few members with survey aspirations chose to leave the Geological Society in 1836 rather than work through it. G. W. Featherstonhaugh, for example, became U.S. Geologist, and Peter A. Browne became professor of mineralogy and geology at LaFayette College in Easton, Pennsylvania. Having accomplished its political and sole purpose, the Geological Society of Pennsylvania died a natural death.

NOTES

1 Pennsylvania General Assembly, House of Representatives, "Report of a Committee of the House of Representatives, recommending an appropriation by the legislature to make a geological survey of the state, under the direction of the Geological Society of Pennsylvania. Mr. Say, Chairman – Read March 23d, 1833," *Hazard's Register of Pennsylvania,* 11 (13 April 1833), p. 225.

2 Pennsylvania General Assembly, "Report . . . ," p. 225.

3 Pennsylvania General Assembly, "Report . . . ," p. 226.

4 Geological Society of Pennsylvania, *The Constitution and Bye-Laws, to which is added a list of the officers and members of the society* (Philadelphia, 1834, pp. 8-9.

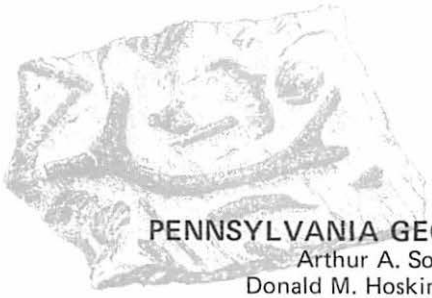
5 "Notice of the Transactions of the Geological Society of Pennsylvania – August, 1834, Part I," *American Journal of Science and Arts,* 27 (1835), p. 347.

6 "Act of 29th March 1836," *Parke & Johnson's Digest,* v. 2 (Philadelphia: James Key, Jun. & Brother, 1837), p. 594.

7 For general discussion of the economic and political situation, see Louis Hartz, *Economic Policy and Democratic Thought: Pennsylvania, 1776–1860* (Cambridge: Harvard University, 1948); and Philip S. Klein and Ari Hoogenboom, *A History of Pennsylvania* (New York: McGraw-Hill Book Company, 1973).

8 *Niles' Weekly Register,* 49 (26 September 1835), p. 50.

9 Geological Society of Pennsylvania, *Transactions,* I (1835), p. 414.



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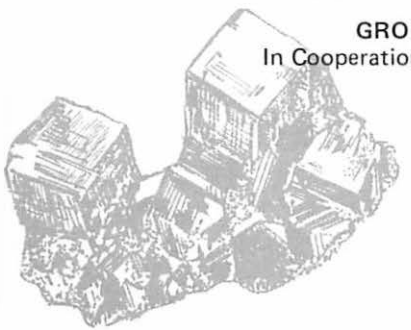

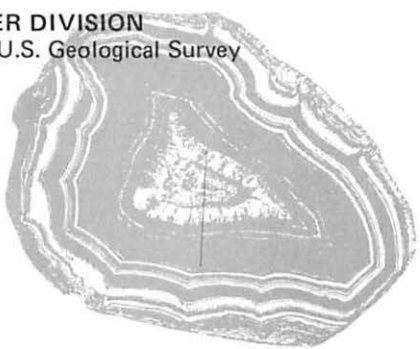

GROUND-WATER LEVELS

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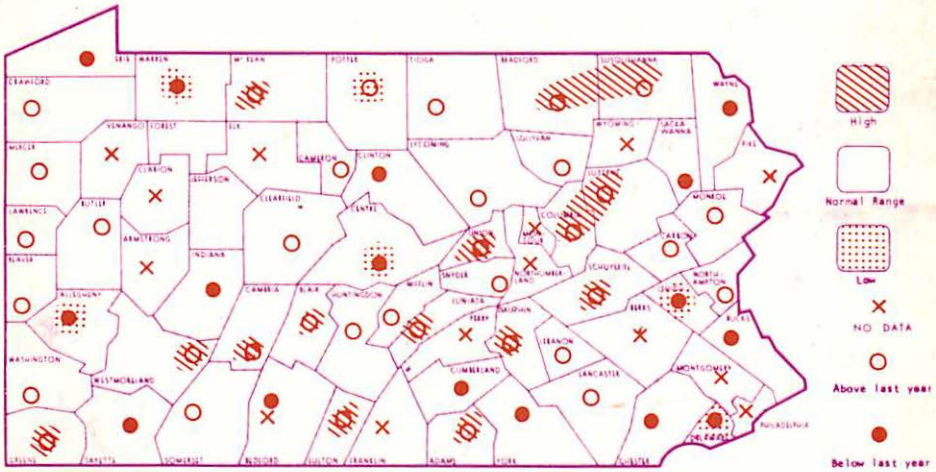

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