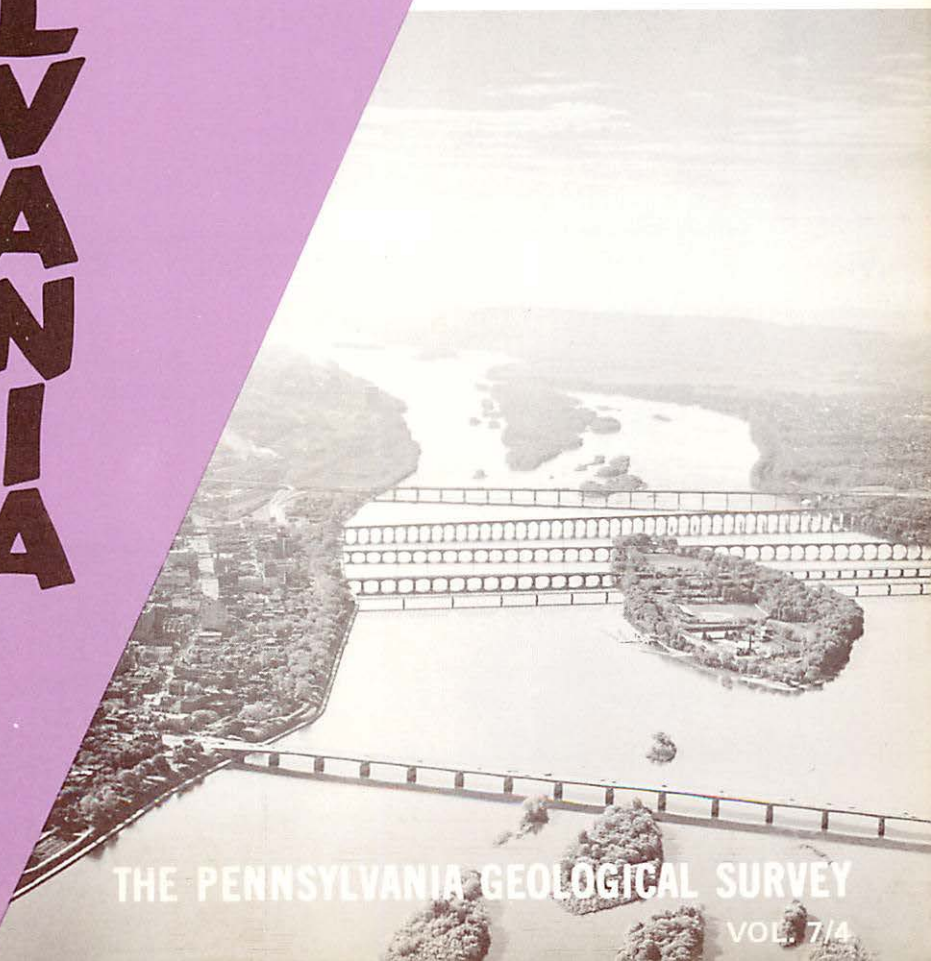


P GEOLOGY

N N S Y L V A N I A



THE PENNSYLVANIA GEOLOGICAL SURVEY

VOL. 7/4

COMMONWEALTH OF PENNSYLVANIA

Milton J. Shapp, Governor

DEPARTMENT OF ENVIRONMENTAL RESOURCES

Maurice K. Goddard, Secretary

TOPOGRAPHIC AND GEOLOGICAL SURVEY

Arthur A. Socolow, State Geologist

CONTENTS

The State Geologist Reports	1
Geological Research in Pennsylvania	2
Research in Progress	2
Reports Published	23
Publications in Press	30
Announcements	32

ON THE COVER: View at Harrisburg looking south along the Susquehanna River during one of its more peaceful moments. Photo courtesy of Grant Heilman, Lititz, Pa.

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

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

AUGUST 1976

FROM THE DESK
OF THE
STATE GEOLOGIST...



LEAD AND ZINC, MUCH IN THE PAST, MORE IN THE FUTURE

Today Pennsylvania has no lead mining and only one operating zinc mine, located in Lehigh County, at Friedensville, just south of Bethlehem. But it was not always so. More than 40 mines have produced lead and zinc in Pennsylvania during the past 200 years and there were times when more than a score of zinc-lead mines were operating concurrently and the Commonwealth was recognized as one of the nation's leading zinc-producing states.

It all began in 1778 with some shallow zinc-lead mines in the Sinking Valley of Blair County. The ores were actually used to support the Revolutionary War operations with the lead content sought for bullet making. Several mines in that first area operated on and off until about 1900, with attention in later years focused more on the zinc content rather than the lead. The history of Sinking Valley zinc-lead production includes such mine names as Albright, Keystone, Fleck, Bridenburgh, and Isett.

In Bucks County the history of the New Galena mine is reputed to go back to the days of George Washington's Valley Forge encampment, with the major production in the 1860's.

The Chester and Montgomery County area, centered on the town of Phoenixville, has a rich and extensive history of zinc prospecting and production, with a long list of well known mines, including the Wheatley, Phoenix, Pennypacker, Perkiomen, Buckwalter, Ecton, Napoleon, Charlestown, and Brookdale Mines. Mining was well underway by 1809 and continued until nearly 1870; in 1917 the mines were reopened and some high grade ore was produced.

Columbia County made its contribution to our mining record with a report of lead mining in 1816 at Webb's mine, some 24 miles from Northumberland.

Lead and zinc mining in Lancaster County goes back well over a 100 years with the famous Pequea Mine (north of Marticville) and Bamford Mine providing a record of extensive production of zinc, a small amount of lead, and even by-product silver. Bamford production supported a large furnace and chemical operation at the site.

In terms of size of mines, volume, and value of production, the zinc mines of Lehigh County rank foremost. Located in Saucon Valley, just south of Bethlehem, the list of mines includes such names as Ueberroth, Old Hartman, New Hartman, Correll, and Triangle. Starting with open-surface mining in the early 1800's and then by deep-shaft mining, the ores were processed through large mills and furnaces. Since the mid-1950's the sole operator there has been the New Jersey Zinc Company which has developed a modern, integrated mining and milling operation. That one mine places Pennsylvania in the ranks of the country's major zinc producers.

(Continued on page 32)

GEOLOGICAL RESEARCH IN PENNSYLVANIA 1976

INTRODUCTION

This publication is the nineteenth annual report on Geological Research and Publications in Pennsylvania. This is an attempt to list all current geologic research in Pennsylvania and includes persons and projects other than those of the Pennsylvania Geological Survey. Because of the extensive response and large number of projects reported to us, we have had to exercise editorial license to reduce the description of the research projects to fit our available space. We have also attempted to determine an anticipated completion date (ACD) for each project. The anticipated completion date is the estimate of the date when the author will complete his report; additional time for publication should be projected.

The listings are grouped into major categories of research to facilitate your search for information on a particular subject. Publications in press are listed by author.

As with all compilations, there may be omissions; this is unintentional. Additional copies of this report may be obtained by writing to the Bureau of Topographic and Geologic Survey, Department of Environmental Resources, Harrisburg, Pennsylvania 17120.

RESEARCH IN PROGRESS

AREAL

GEOLOGY

T. M. BERG, A. A. SOCOLLOW, D. M. HOSKINS, A. R. GEYER, S. I. ROOT, A. D. GLOVER, W. E. EDMUNDS, and W. D. SEVON, Pa. Geol. Survey. Revision

of Pennsylvania State Geologic Map. Approximately one-third of



the commonwealth has been compiled. Includes new and revised detailed geologic mapping accomplished since 1960. Remaining areas of the state are being revised by extrapolation and reconnaissance. It is expected that the 1:125,000 working revision will be completed by Fall 1976; final publication will be at the customary 1:250,000 scale. ACD: Mid-1977.

M. J. BERGIN, U. S. Geol. Survey. Geology of the Northern Anthracite Field, Pa.

M. R. CANICH, The Pa. State Univ. Structural Analysis of the Tyrone-Mt. Union Lineament. The study of the general nature of the transgressive morphological differences between Tyrone and Petersburg by combining field observations with data from Landsat images and U-2 and low altitude photographs. ACD: Sept. 1976.

WILLIAM CROWLEY, Md. Geol. Survey. The Geology of Carroll Co., Md. On the basis of both stratigraphic and structural evidence I have traced George Fisher's Wakefield Valley syncline northeastward to the Mason-Dixon Line. Examination of available high altitude imagery suggests that the syncline can be further traced at least to the Susquehanna River. I think this structure may turn out to be a major element in the crustal architecture of the Piedmont.

WILLIAM CROWLEY, Md. Geol. Survey. The Geology of the Eastern Maryland Piedmont. On the basis of mapping in Md.'s eastern Piedmont I think there is substantial evidence that the Baltimore Mafic Complex (Baltimore Gabbro) is allochthonous.

A. A. DRAKE, JR., U. S. Geol. Survey. Allentown Quadrangle and Vicinity. Project temporarily recessed.

J. B. EPSTEIN, U. S. Geol. Survey. Wind Gap and Adjacent Quads. Continue map and report preparation and field work in the Saylorsburg quadrangle. ACD: 1977.

J. L. FAUTH,, SUNY at Cortland. Geology of the Iron Springs Quad. Area, South Mountain, Pa. ACD: Sept. 1976.

G. W. FISHER, Johns Hopkins Univ., and M. W. HIGGINS and I. ZIETZ, U. S. Geol. Survey. Aeromagnetic Interpretation of Northern Piedmont [Piedmont and Blue Ridge of Pa., Md., and Va.]. Regional interpretation of Piedmont structure and stratigraphy, based on reconnaissance mapping, aeromagnetic maps, and detailed mapping of selected areas. ACD: 1976.

A. D. GLOVER, J. H. WAY, JR., and R. T. FAILL, Pa. Geol. Survey. Geology and Mineral Resources of the Altoona 15' Quad., Blair and Cambria Cos., Pa. ACD: 1977.

J. D. INNERS, Pa. Geol. Survey. Geology and Mineral Resources of the Berwick Quad., Columbia Co., Pa. ACD: 1977.

S. I. ROOT, Pa. Geol. Survey, and A. E. BECHER and W. WETER-HILL, U. S. Geol. Survey. Hydrogeology of Cambro-Ordovician of the Great Valley, Cumberland Co. Bedrock mapping of Cambro-Ordovician sedimentary rocks in Cumberland Co. ACD: 1976.

H. W. SCHASSE, Dunn Geoscience Corp., and A. W. ROSE, The Pa. State Univ. Geology of Jacks Mountain within Butler Knob and Mt. Union, Pa. 7½' Quads. Geologic map and cross sections of the crestal portions of Jacks Mountain (southern extension of Kishacoquillas anticlinorium) within Huntingdon and Mifflin Cos., Pa. Includes a structural study of the anticline and a study of base-metal sulfide vein orientations and their possible relationship to local structures. ACD: July 1976.

W. D. SEVON, Pa. Geol. Survey. Surficial Geologic Map of Pennsylvania at 1:1,000,000 Scale. ACD: Sept. 1976.

W. D. SEVON and T. M. BERG, Pa. Geol. Survey, and L. D. SCHULTZ, Gilbert Assoc. Geology and Mineral Resources of Pike Co., Pa. ACD: 1977.

R. B. WELLS, Pa. Geol. Survey. Geology and Mineral Resources of Montoursville North and Huntersville Quads., Lycoming Co., Pa. Geologic mapping of Devonian through Mississippian sedimentary rocks, with a description of the structure, stratigraphy, economic geology, geomorphology, and engineering characteristics of each formation. ACD: Dec. 1976.

G. H. WOOD, JR., U. S. Geol. Survey. Geology and Coal Resources of the Southern Anthracite Field [1500+ sq. mi.]. Project objective is to map the complete geology of the Southern Anthracite field.

ECONOMIC

GEOLOGY

J. M. DENNISON, Univ. of N. C. Uranium Favorability of Nonmarine and Marginal Marine Strata of Late Precambrian and Paleozoic Age in Ohio, Pa., N. J., and N.Y. ACD: Late 1976.

WALLACE DE WITT, JR., U. S. Geol. Survey. Appalachian Basin Oil and Gas Resources. Although the basic synthesis of oil and gas data for Paleozoic rocks and a deep-well map showing location of recent tests for oil and gas in the Appalachian Basin have been compiled and published, work will continue in collection of data on geometry, structure, and gas potential of Devonian black shales in the Appalachian Basin until project is terminated in June. ACD: June 1976.

A. F. JACOB, U. S. Geol. Survey. Basin Analysis of Uranium-Bearing Paleozoic Rocks of Eastern U. S. Reconnaissance of Paleozoic delta systems in central and southern Appalachian Basin and compilation of a map of uranium occurrences in Paleozoic sedimentary rocks of the Appalachian Basin. Work will then begin on the depositional systems, stratigraphy, and petrology of a selected Paleozoic delta system. ACD: 1980.

W. S. LYTLE and LAJOS BALOGH, Pa. Geol. Survey. Oil and Gas Field Map of Pa. The 1963 map showing the locations of the oil and gas pools and fields will be brought up to date as of June 1, 1976. ACD: 1976.

W. S. LYTLE, Pa. Geol. Survey, and petroleum engineers with the major oil operators in Pa. Description of the Oil Fields in Pa. and Their Reserves. Recomputing the crude oil reserves on the basis of additional data and better understanding of the reservoirs. ACD: 1976.

B. J. O'NEILL, JR., and J. H. BARNES, Pa. Geol. Survey, and K. J. LILES, U. S. Bur. Mines. Properties and Uses of Pa. Shales and Clays, Southwestern Pa. Continuation of the series of programmed studies to evaluate the economic potential of clay-shale raw materials for ceramic and non-ceramic uses. ACD: Jan. 1977.

B. J. O'NEILL, JR., and Geologic Mapping Division, Pa. Geol. Survey, and U. S. Bur. Mines. Investigations for High-Calcium Limestones in Pa. Objectives are: (1) to sample and analyze limestone units where information is lacking, incomplete, or widely scattered; (2) to map any newly discovered high-calcium limestone unit that has a potential for commercial extraction; and (3) to synthesize the data into publications which will be useful guides to exploration targets.

QUAKER STATE OIL REFINING CORP. Secondary Oil Recovery, Bradford Second Sandstone [McKean County].

A. W. ROSE, R. L. SCHMIERMUND, and DENNIS MAHAR, The Pa. State Univ. Geology and Geochemistry of Uranium Occurrences near Penn Haven Junction, Carbon Co., and Beaver Lake, Lycoming and Sullivan Cos., Pa. The geology of the deposits and their surroundings has been mapped and the geological and geochemical controls for mineralization are being studied. In addition, the geochemical behavior of uranium and its mode of occurrence are being investigated. ACD: Sept. 1976.

A. W. ROSE and SCOTT TREGASKIS, The Pa. State Univ. Geology and Mineral Occurrences of the Morrison Cove Area, Bedford Co., Pa. ACD: June 1977.

R. C. SMITH, II, Pa. Geol. Survey. Zinc-Lead Occurrences in Pa. The report covering the location and geology of all known zinc and/or lead occurrences in Pa. is in preparation. Following publication, pure mineral separates will be analyzed for selected elements. These data will be interpreted for economic by-product, pathfinder, genetic, and environmental implications.

C. E. TURNER, U. S. Geol. Survey. Basin Analysis as Related to Uranium Potential in Triassic Sedimentary Rocks, Eastern U. S. Preparation of location map for uranium occurrences in Triassic rocks, and field work in Newark-Gettysburg Basin. Environmental interpretations of Stockton, Lockatong, and Brunswick Formations, and study to determine mineralogy of uranium sandstones and shales from Newark-Gettysburg Basin will then begin. ACD: 1977.

ENGINEERING

GEOLOGY

J. A. CICIARELLI, The Pa. State Univ. Surface Reduction Rates of Carbonate Dimension Stone in Urban-Industrial Atmospheres of Southwestern Pa. 500

marble headstones in 50 cemeteries in Allegheny Co. have been ex-



amed. Solutioned (lowered) carbonate surfaces were measured with respect to insoluble mineral grains which stand out in relief. On clear white marble the average reduction rate is 3.28 mm/100 yrs. with variations occurring with direction of exposure and height above ground surface.

W. E. DAVIES, R. L. HACKMAN, A. B. OLSON, and G. C. OHL-MACHER, U. S. Geol. Survey. Safe Coal Refuse Disposal [Appalachian Plateau, Pa. to Ala.]. Project is the production of maps classifying slope stability along with an inventory of landslides. Compilation of data from aerial photographs and field investigations is on standard 7½' quads. made available through open file. Final product will be published at 1:250,000. Present effort in Pa. covers the area south of 40° and west of 78°30'. Open file maps should be available in late 1976. Slope stability studies in the rest of western Pa. are planned to be done in 1977. ACD: 1978 for western Pa.

O. C. FARQUHAR, Univ. of Mass., and UNITED TECHNOLOGIES RESEARCH CENTER. Preliminary Evaluation of Bedrock Formations for Deep Storage of Compressed Air [SE Pa.]. ACD: 1976.

N. K. FLINT, Univ. of Pittsburgh, and W. R. ADAMS, JR., Allegheny Co. Planning and Development Dept. Causes of Landsliding in Allegheny Co.

S. R. JONES, Pa. Dept. Trans. The Yellow Breeches Thrust Near Chambers Hill, Harrisburg, Pa. Refraction seismic and electrical resistivity were used to locate the Yellow Breeches Thrust in the subject area. Information will be used in a highway design project. St. Paul Group limestone was located 70 to 100 feet below the elevations anticipated from published geological reports available for this area. Based on the Barnes Layer Resistivity values the thrust appears to be entirely within the Martinsburg shale rather than between the shale and the underlying St. Paul Group limestone. ACD: July 1976.

S. R. JONES, Pa. Dept. Trans., and R. C. OBERMAN, Pa. Dept. Environ. Resources. A Subsurface Investigation of Three Diabase Intrusives Near Bunker Hills, Lebanon Co. Proposed highway excavations will cross diabase intrusives mapped at several locations in the Bunker Hills area. Of three sites investigated, only one intrusive was confirmed in the area in which it was mapped. Refraction seismic and core borings were used in the investigation. Petrographic analyses of core boring samples were completed. ACD: Mid-1977.

ENVIRONMENTAL GEOLOGY

W. H. BOLLES, Pa. Dept. Educ., and A. R. GEYER, Pa. Geol. Survey. Catalog of Pa.'s Geologically Outstanding Areas. Geologically outstanding areas cataloged are



those with values of such distinctive quality as to be of county, state or national significance and worthy of designation as a U. S. Registered Natural Landmark. ACD: Dec. 1976.

R. P. BRIGGS, U. S. Geol. Survey. Greater Pittsburgh Regional Studies. Final technical report summary and a catalog of products produced by the project. ACD: 1976.

KENT BUSHNELL, U. S. Geol. Survey/Slippery Rock State Coll. Map Showing Likelihood of Surface Subsidence Due to Underground Mining in Armstrong, Beaver, and Butler Cos. ACD: Spring 1976.

A. R. GEYER, Pa. Geol. Survey. Building Stones of Pa.'s Capitol. Booklet will describe the source, type, and appearance of stones used in numerous Capitol buildings, monuments, and other historical structures of the Harrisburg area. ACD: June 1976.

W. R. GOUGH, Moody & Assoc./The Pa. State Univ., and R. R. PARIZEK, The Pa. State Univ. The Geology and Water Resources of the Milesburg-Sayers Dam Area, Centre Co., Pa. ACD: 1976.

P. M. HUNTER and R. R. PARIZEK, The Pa. State Univ. The Environmental Geology and Hydrogeology of Portions of the Pine Grove Mills, Julian, Port Matilda, and Franklinville Quads., Pa. Project involves both basic geologic mapping and the compilation of a series of land use-related derivative maps. ACD: July 1976.

J. O. OSGOOD, Pa. Dept. Environ. Resources. Comprehensive Water Quality Management Planning Program (COWAMP). Project examines surface and subsurface waters of Pa. Includes a compilation of all existing water quality data and identifies point and non-point sources of pollution, critical recharge areas, soil renovation capabilities, existing and future waste disposal requirements. Also examines the physical relationships of water quality to geology,

soils, mining practices, land development, competitive pressures for conflicting land uses, ability of water resources to satisfy future demands, as well as many other major factors which directly or indirectly influence water quality. Heavy emphasis is placed on public participation at all levels. Final goal is to define a general plan which integrates the type of environmental future desired by the public with the type of future that will best protect the water resources of Pennsylvania. ACD: 1978.

J. O. OSGOOD and J. A. MOSER, Pa. Dept. Environ. Resources. Hydrogeologic Element of the Comprehensive Water Quality Management Planning Program of the Pa. Area of the Erie Basin and the Erie Standard Metropolitan Statistical Area. Special emphasis is placed on the geology, structure, soils, ground-water quality and quantity, existing waste disposal practice and future requirements, polluted areas and future resource management policies of the area. ACD: July 1976.

R. R. PARIZEK, E. G. WILLIAMS, and R. J. HORNBERGER, The Pa. State Univ. Delineation of Acid Mine Drainage Potential of Coal-Bearing Strata of the Pottsville and Allegheny Groups in Western Pa. ACD: Dec. 1977.

PITTSBURGH GEOL. SOC. Home Owners Guide to Geologic Hazards — Southwestern Pa. A series of articles concerning foundation problems, floods, landslides, water supplies, septic and sewer systems and mine subsidence. ACD: 1976.

J. S. POMEROY, U. S. Geol. Survey. Southwestern Pa. Slope Stability Studies — Energy Lands [Butler, Beaver, Washington Cos.]. Intensive examination of 1975 1:24,000 photography with subsequent field checking enables investigation to formulate criteria for determining slope stability from aerial photographs and integrate it into field studies of geomorphology, geologic structures, rock lithology, soils, and slope steepness. Investigation of current coal mining activity and its relation to slope stability. ACD: 1977.

F. W. WILLIAMS and T. O. WRIGHT, Allegheny Coll. Determination of Heavy Metal Concentrations in Roadside Soils [NW Pa., along Interstate 90 in the Albion and East Springfield 7½' quads.]. This project is to determine if and to what extent automobiles produce greater than normal heavy metal concentrations in roadside soils. The soil samples will be analyzed for acid leachable cadmium, lead, nickel, and zinc. ACD: June 1976.

J. P. WILSHUSEN, Pa. Geol. Survey, and M. E. HORNE, Consultant. Greater York Area Environmental Geology. A compilation of geologic information pertinent to the development and environmental protection of the greater York area, composed predominantly of maps with interpretive legends discussing geology, water resources, mineral resources and engineering characteristics of bedrock and soils. ACD: Sept. 1976.

GEOCHEMISTRY

C. W. POTH, U. S. Geol. Survey. Ground-Water Quality in Pa. Between 4,000 and 5,000 U. S. Geol. Survey chemical analyses of water from about 2,600 wells and springs have been computerized and will be used to give a statewide picture of ground-water chemical quality. ACD: 1976.

A. W. ROSE, M. L. KEITH, N. H. SUHR, and others, The Pa. State Univ. Geochemical Techniques for Discovery of Uranium Deposits in Northeastern Pa. Orientation studies using stream sediment, stream water and radon in water are being carried out near known occurrences near Jim Thorpe and Hughesville, Pa. Deposits are detectable using partial extractions of uranium from stream sediments. Waters show very large temporal changes. ACD: Apr. 1976.

H. A. TOURTELOT, U. S. Geol. Survey. Urban Geochemistry. To determine the effects of urbanization and industrialization on the chemical composition of soils and plants within major centers of population, and to identify urban geochemical processes and their consequences, investigations are underway involving distribution of elements around a point source, a power plant, around a diffuse source, the city of Washington, and within the heavily industrialized Allegheny and Youghiogheny River sectors of metropolitan Pittsburgh. ACD: 1978.

R. W. White, U. S. Geol. Survey. Dispersion of Elements in the Zone of Weathering. Study of the geochemistry and mineralogy of weathered profiles on 24 basaltic and 18 granitic rocks in 11 states, including a locality on diabase at the quarry 2.5 miles west of Birdsboro, Berks Co. ACD: Dec. 1976.

GEOMORPHOLOGY

R. G. CRAIG, The Pa. State Univ. Simulation of Stream Basin Organization and Development [central

Pa.]. A recursive model of the interrelationships of pertinent variables in the development of a stream basin has been derived. Approximately 8,000 measurements of lithology, elevation and slope have been obtained; further empirical data required to calibrate and test the model remain to be obtained. Interdependencies in these data are being studied by methods of Time Series Analysis and two-dimensional spatial autocorrelation functions. ACD: Sept. 1978.

W. B. WHITE, The Pa. State Univ. Caves of Pa. Work progresses to describe caves in the Valley and Ridge province of central and eastern Pa. The object is to locate, describe, and to some extent interpret every known cave in the state. ACD: Summer 1976.

W. B. WHITE and E. L. WHITE, The Pa. State Univ. Geomorphology of the Appalachian Karst [Pa. to Ala.]. To describe and interpret surface and underground landforms in selected areas of the Appalachian Highlands. An area now underway is the carbonate valleys of the folded Appalachians in Pa. New quantitative measures of karst development have been devised and are being measured from topographic maps and aerial photographs. ACD: 1984.

GEOPHYSICS

D. L. CAMPBELL, U. S. Geol. Survey. Geophysical Studies Relating to Uranium Deposits in Crystalline Terranes. Analysis and report writing from electrical resistivity data in the Gettysburg Triassic Basin will be completed. ACD: 1979.

B. F. HOWELL, JR., The Pa. State Univ. Relative Seismic Hazard in the U. S.

P. M. LAVIN and JOHN KUSIAK, The Pa. State Univ. Gravity and Magnetic Studies in Pa. Current efforts include detailed studies in the area of the Jacksonwald syncline and South Mountain anticlinorium and the correlation of lineaments with gravity and magnetic features.

K. W. VOLK, P. M. LAVIN, and A. W. ROSE, The Pa. State Univ. Rock Magnetism and Paleomagnetism of Mesozoic Intrusives in Southeastern Pa. The late-stage tectonic history of the Triassic Basin in Pa. is being studied. Secular variations have been estimated to be less than 10° . Mineralogical and petrological distinctions between types are reflected by differences in their magnetic domain structures. ACD: 1977.

R. VAN DER VOO, R. B. FRENCH, and D. WATTS, Univ. of Mich. Paleomagnetism of Paleozoic Rocks [central Appalachians]. Several formations have been sampled for paleomagnetic studies. These formations include the Rome formation, the Rose Hill formation, the Juniata sandstone, the Catskill redbeds. Completion of several paleomagnetic studies is anticipated for summer 1976. ACD: 1978.

ISIDORE ZIETZ, U. S. Geol. Survey. Regional Aeromagnetic Studies of the U. S. Hope to prepare the Pennsylvania aeromagnetic map in color this year.

GLACIAL GEOLOGY

M. F. BUCEK, H. R. B. Singer Inc., and R. B. WELLS, Pa. Geol. Survey. Surficial Deposits of Montoursville North and Huntersville Quads. [Lycoming Co.]. Mapping of the distribution of three distinct glacial till deposits, glaciofluvial sand and gravel, glaciolacustrine silt and clay, Recent alluvium and colluvium, and areas underlain by bedrock without significant unconsolidated materials. ACD: Dec. 1976.



G. H. CROWL, Ohio Wesleyan Univ., and W. D. SEVON, Pa. Geol. Survey. The Late Wisconsinan Border in Northeast Pa. Mapping of the Late Wisconsinan-Woodfordian border deposits from the Delaware River to Trout Run north of Williamsport. ACD: Aug. 1976.

G. M. FLEEGER, Bucknell Univ. Glacial and Periglacial Features in Northwestern Butler Co., Pa. Investigating possibility of extension of presently recognized glacial boundary. ACD: Jan. 1977.

F. R. NEHER and E. B. EVENSON, Lehigh Univ., and W. D. SEVON, Pa. Geol. Survey. A Quantitative Differentiation of the Glacial Drift of Northeastern Pa. Investigation of the three distinct drift sheets identified in northeastern Pa. (Illinoian, Altonian, Woodfordian). The current differentiation procedure involves the investigation of

each of the three drift sheets to determine the degree of weathering as an indicator of its relative age. Parameters to be measured include: 1) depth and character of soil profile development; 2) weathering and alteration of the heavy mineral suite; 3) degree of clast weathering as measured by rind thickness; 4) depth of carbonate leaching; and 5) the clay mineral alteration sequence of each unit. ACD: Sept. 1976.



HYDROLOGY

E. S. BAIR and R. R. PARIZEK, The Pa. State Univ. Permeability Distribution in Surficial Glacial Outwash Material as Revealed by Shallow Subsurface Temp-

eratures. During a seven month sampling period surface-water, ground-water, and soil temperatures were measured at the Edgely Well Field 12 miles north of Phila. along the floodplain of the Delaware River. Flow net analysis, water-quality data, and temperature data showed that recharge was not a result of induced infiltration from the Delaware River, two aquiferous zones are present, and a zone of increased permeability extends northwestward across the well field. ACD: Feb. 1976.

A. E. BECHER, U. S. Geol. Survey. Hydrogeology of the Great Valley in Franklin Co., Pa. Project is beginning. ACD: Jan. 1980.

A. E. BECHER, U. S. Geol. Survey. Urban and Rural Ground-Water Hydrology in the Northern Part of the Cumberland Valley. Data collection and geological mapping are complete and report is in preparation. Excellent potential exists for development of large supplies, especially from the Tomstown and Rockdale Run Formations. Water quality is good and pollution is of local origin in both rural and urban environs. ACD: June 1976.

C. E. BROWN and R. R. PARIZEK, The Pa. State Univ. Multivariate-Statistical Analysis of Chemical and Petrographic Properties Influencing Porosity and Permeability of Several Carbonate Aquifers in Central Pa. [Centre Co.]. Properties of the carbonate rocks which are most important will be used to establish a model for predicting

values of porosity and permeability using a minimum amount of research on rock samples. Properties will be related to water-yielding characteristics of the various hydroformations. ACD: Nov. 1976.

L. D. CARSWELL, U. S. Geol. Survey, and T. M. BERG and W. D. SEVON, Pa. Geol. Survey. Geology and Ground-Water Resources of Pike County. Occurrence, availability, movement, and chemical quality of ground water in the unconsolidated Pleistocene deposits and in the bedrock will be investigated throughout the county. Of particular interest are the Pleistocene deposits in the valley of the Delaware River, which form a reservoir of ground water up to several hundred feet thick. ACD: July 1979.

R. M. FOOSE, Amherst Coll. Ground Water Storage and Movement in the Carbonate Rocks of the Hershey Valley. Research continues by extensive monitoring of the total behavior of ground water in the carbonate rocks of the Hershey Valley. This involves the collection of data dealing with precipitation, influent seepage, ground water levels, porosity and permeability with respect to structural controls and depth, rates of movement, and discharge as springs and base flow in the Hershey Valley. ACD: 1980.

W. R. FRANTZ, Bloomsburg State Coll. Selected Hydrologic Characteristics of Green Creek, Columbia Co., Pa. Project includes such hydrological parameters of Green Creek and its tributaries as stream hydrograph, sediment load, chemical analysis, plus measurable changes in channel configuration. ACD: Jan. 1977.

J. T. GALLAHER, HARRY KOESTER, and T. F. BUCKWALTER, U. S. Geol. Survey. Hydrology and Geology of Erie County, Pa. ACD: Dec. 1978.

J. M. GERHART and R. R. PARIZEK, The Pa. State Univ. A study of the quantity and quality of the ground water in the Pocono sandstone of Clearfield Co. using digital modelling techniques. ACD: Summer 1976.

D. J. GROWITZ and M. M. BEARD, U. S. Geol. Survey. Coal-Mine Discharges in the Anthracite Fields of Pa. An overview of the hydrology of the anthracite region. Compilation of data from a recent mass-sampling program in the four anthracite fields indicates the average daily flow of mine drainage amounts to about 900 cubic feet per second, the average acid load (to pH 7 as H_2SO_4) is approximately 300 tons per day, and the average total dissolved iron

load is about 75 tons per day. In excess of 80% of the total mine drainage and acid load is discharged to the Susquehanna River basin; the remaining flow enters the Delaware River basin. ACD: July 1976.

E. D. HESS, Pa. Geol. Survey. Pa. Water Well Inventory. Identification of lithologic units, positioning of wells by coordinates, and analysis of rock units as potential aquifers.

W. A. HOBBA, JR., and J. C. CHEMERYS, U. S. Geol. Survey. Reconnaissance Appraisal of the Thermal Springs of the Appalachian Mountains [Ga. to N.Y.]. The principal objective is to describe the physical and chemical character of the thermal springs based on modern investigative techniques. Emphasis is being placed on the collection of hydro-geochemical data from which residence times and maximum temperatures at depth can be inferred. Data have been collected on numerous wells, cold springs and warm springs. Samples have been collected from 36 selected wells and springs and are being analyzed for gases, trace metals, several isotopes, and other common dissolved constituents. ACD: Sept. 1976.

L. J. MCGREEVY and R. A. SLOTO, U. S. Geol. Survey. Ground-Water Resources of Chester Co., Pa. ACD: July 1976.

H. W. RAUCH and M. P. LaRICCIA, W. Va. Univ. A Study of Structural Geologic Variables Related to Water Well Productivity in Pa. [Lebanon Valley, Lancaster Co., and central Chester Co.]. We are investigating the effects of mapped photo-lineaments (from both large- and small-scale photography), structural fold axes, and faults on water well productivity. ACD: Aug. 1976.

G. R. SCHINER, HARRY KOESTER, T. F. BUCKWALTER, and CLIFFORD DODGE, U. S. Geol. Survey. Water Resources of the Clarion River and Redbank Creek Basins in Western Pa. ACD: Oct. 1978.

E. T. SHUSTER, Pa. Geol. Survey. Hydrogeology of the DuBois Area, Jefferson and Clearfield Cos. ACD: 1976.

E. L. WHITE, The Pa. State Univ. Role of Carbonate Rocks in Modifying Extreme Flow Behavior [Appalachian Highlands]. Flood and sustained flow measures for 62 carbonate basins located in the Appalachian Highlands were analyzed with respect to their basin and karst measures. ACD: Completed.

W. B. WHITE and E. L. WHITE, The Pa. State Univ. Characterization of Carbonate Aquifers by Spring Discharge Hydrographs [eastern U. S.]. Specific storm event hydrographs are compiled for gaged limestone springs and values for response time, storage coefficient, and peak/base flow discharge calculated. These are then correlated over period of record and over storms of differing intensity. ACD: 1976.

C. R. WOOD, U. S. Geol. Survey. Ground-Water Resources of the Gettysburg Formation. ACD: June 1979.

IGNEOUS AND METAMORPHIC PETROLOGY

M. L. CRAWFORD, Bryn Mawr Coll. Study of Mineral Compositions in the Wissahickon Schist. Composition and zoning pattern in garnet, plagioclase and epidote from selected samples of schist are being determined to identify the reactions between calcium-bearing minerals in pelitic schists. ACD: 1977.

A. A. DRAKE, JR., and R. I. TILLING, U. S. Geol. Survey. Petrochemistry of the Precambrian Rocks of the Reading Prong [eastern Pa., northern N. J., SE N. Y.]. Project temporarily recessed.

W. F. THOMANN and W. A. CRAWFORD, Bryn Mawr Coll. Igneous and Metamorphic Petrology of the Honey Brook Uplands [Honey Brook, Wagontown 7½' quads. and major portions of the Elverson and Pottstown 7½' quads.]. Crystalline rocks west, north and northeast of the Honey Brook anorthosite will be remapped within the Honey Brook uplands. Data collected will be used to apply appropriate modern terminology to the rock units, to determine the pre-metamorphic origin of the rocks, and to ascertain the grade and number of metamorphic events. ACD: Apr. 1977.

CYNTHIA WOOD and M. L. CRAWFORD, Bryn Mawr Coll. Fluid Inclusion Studies of Quartz Vein Assemblages in the Octorara Phyllite [Coatesville 15' quad.]. ACD: 1976.

MINERALOGY

J. H. BARNES, Pa. Geol. Survey, and W. F. DOWNEY, JR., Juniata Coll. Mineralogy Associated with

Burning Anthracite Deposits [Luzerne, Schuylkill, N. Dauphin Cos.]. Study of minerals forming from sublimation of gases produced by subsurface fires in anthracite mines and culm banks. ACD: 1976.

G. W. BRINDLEY and D. L. BISH, The Pa. State Univ. Currently studying the hydrous nickel-containing layer silicates (garnierites), and related minerals, including kerolite, deweylite, pimelite, etc. Our objective is a study of the crystal chemistry of these minerals and a clarification of the nomenclature.

D. K. SMITH and ADEL DABBOUS, The Pa. State Univ. Characterization of Uranium Minerals from the Williams Quarry. Three secondary uranium minerals from the C. K. Williams Quarry, Easton, Pa., are being characterized by microprobe and scanning microscopic studies. The species may be new minerals, or at least new to Pa. ACD: Fall 1976.

R. C. SMITH, II, Pa. Geol. Survey, M. L. ANNE and others, and Friends of Mineralogy, Pa. Mineralogy of Pennsylvania, 1965-1975. Sixty species new to the state are described in detail with physical properties, chemistry, and precise location supplemented by crystal drawings, reproductions of old mine maps, geologic cross sections, and photographs. ACD: Dec. 1976.

PALEONTOLOGY

BRUCE CORNET and ALFRED TRAVERSE, The Pa. State Univ. Palynology, Chronology, and Paleoecology of the Newark Group Basins in the Eastern U. S.

A palynoflorule from the lowest New Oxford Formation of the Gettysburg Basin, Pa., indicates a middle Carnian age, while a palynoflorule from the Heidlersburg Member of the Gettysburg Shale indicates a Norian age. A palynofloral succession just below the Jacksonwald basalt of the Newark Basin in Pa. has restricted the Triassic/Jurassic boundary to 60 stratigraphic feet of outcrop. A major floral change occurs at the boundary, accompanied by a change from shale to mudstone. ACD: Aug. 1976.



JACK DONAHUE, H. B. ROLLINS, PETER DICKSON, STEVE DODIN, JOHN HARPER, MARSHALL CAROTHER, and JOHN FIERSTEIN, Univ. of Pitt. Paleocology of Conemaugh Marine Events [SW Pa.]. Reconstruction of Conemaugh marine benthic communities.

A. G. EPSTEIN, U. S. Geol. Survey. Paleozoic Stratigraphy, Appalachian Region—Appalachian Basin Conodont Studies. Analyses of conodont faunas in Ordovician through Pennsylvanian age rocks to determine distribution in time and space, and conodont-color alteration to produce detailed maps of areas for oil and gas potential in the Appalachian Basin.

E. B. GIFFIN, William Penn Mem. Mus. Thelodont Denticles from the Bloomsburg Formation of Central Pa. ACD: 1976.

P. W. GOODWIN, E. J. ANDERSON, and JOHN WAGNER, Temple Univ. Trace Fossils in Paleozoic Tidal Quartzites [SE and central Pa.]. ACD: Spring 1977.

W. F. KLOSE II, Paleontological Research Inst. Cones and Metaspores of *Lepidocarpon* from Pennsylvania [NE Pa.]. Materials for the study collected and curated. Review of specimens (types) at the USNM completed. ACD: 1977.

W. F. KLOSE II and DONALD BADMAN, Paleontological Research Inst.

1. Additions to the Coal Fauna (Allegheny) of Pennsylvania [NE Pa.]. Specimens of crustaceans, insects and medusa found in the past few years will be treated. ACD: 1978.

2. The Flora of the Baltimore Coal (Allegheny) [Wilkes-Barre]. ACD: 1979.

3. The Flora of the Clark Coal, Carbondale, Pa. ACD: 1977.

4. The Flora of the Sugarnotch 2 Vein. ACD: 1978.

5. The Flora and Fauna of the Buck Mountain 5 Coal [Southern Anthracite Basin]. A study of fossil plants, insects and crustacea from the Buck Mt. 5 coal (Basal Allegheny Series) in the Southern Anthracite Basin in the Klose, Badman, William Penn Memorial Museum, USNM, and Reading Public Museum (Unger Collection) collections. ACD: 1980.

W. F. KLOSE II and CHARLES KLINE, Mineralogical Society of NE Pa. Curation of The Edward S. Jones Collection [Lackawanna Historical Society]. Curation and cataloging of 140 exceptional

fossil plants. Complete. Curation of the mineralogical collections 50% complete. ACD: 1977.

A. J. MICKLAUSEN, Shippensburg State Coll. Contributions to the Fossil Flora of the Mississippian. ACD: Dec. 1977.

W. A. OLIVER, JR., U. S. Geol. Survey. Biostratigraphy and Systematic Paleontology of Rugose Corals in the Keyser Limestone. ACD: 1978.

BARRY PERLMUTTER, Jersey City State Coll. Conodonts from the Keyser Limestone (Silurian-Devonian) and the Helderberg Group (Devonian) in Pa. and W. Va. The conodonts will be described and illustrated. The individual conodont elements will be grouped to form the whole organism empirically based on models previously developed. An attempt will be made to relate these conodont apparatuses to the environments represented. ACD: Feb. 1977.

JEROME RACKOFF, Bucknell Univ. On the Origin of the Tetrapod Limb. *Stenropterygion* (U. Dev., Lycoming Co.) is more tetrapod-like than any other known rhipidistian fish in the morphology of the paired fin skeletons, the pattern of mobility of the fin joints, and the presence of the first pre-tetrapod ankle joint. New information on fin orientation suggests the manner in which the difference between the fore and hind limbs of tetrapods arose. ACD: 1976.

JOHN STOLAR and ALFRED TRAVERSE, The Pa. State Univ. Megaspores from Some Upper Devonian and Lower Mississippian Deltaic Sediments of Central Pa. The uppermost Chemung, the Catskill, and the lowermost Pocono Formations have been extensively sampled for megaspores. The object of the study is to locate the local Devonian-Mississippian stratigraphic boundary based on the megaspore genera that are present. Preliminary findings show that megaspores are abundant in the siltstones and coaly shales of the Chemung and Pocono Formations. ACD: Aug. 1976.

R. E. THOMS, Portland State Univ., and T. M. BERG, Pa. Geol. Survey. Studies on Vectorial Analysis of *Pelecypodichnus*. Studies on the form and function of the Recent freshwater mussel, *Margaritifera margaritifera* are being made in order to establish a valid means of interpreting *Pelecypodichnus* structures in the basal Catskill. If validly interpreted, these primary biogenic structures will aid in reconstruction of the ancient sedimentary environment.

SEDIMENTOLOGY

J. R. BEERBOWER, KATHY GERETY and MIKE KROLL, SUNY at Binghamton. Biogenic and Pedogenic Features in Catskill Formation (Devonian). ACD: June 1977.



J. R. BEERBOWER and STEVEN STANCEL, SUNY at Binghamton. Stratigraphy and Sedimentology of Mauch Chunk Formation (Mississippian). ACD: June 1977.

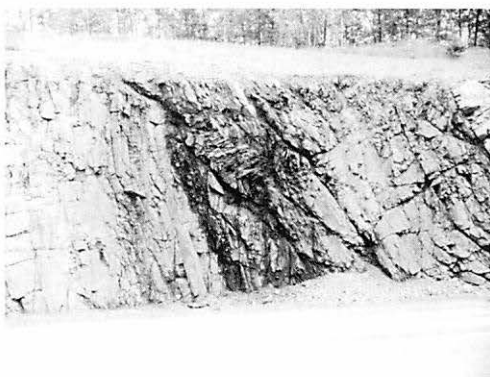
JACK DONAHUE, JAMES ADORASIO and JOEL GUNN, Univ. of Pitt., and ROBERT STUCKENRATH, Smithsonian Institution. Meadowcroft Rock Shelter [Avella, Washington Co.]. Sedimentology of the Meadowcroft paleo-Indian rock shelter. The site is a colluvial fill of sediments located on the north side of Cross Creek. Sedimentation has occurred during at least the past 16,000 years. Precise rates for colluvial sedimentation and rock face migration are being established. ACD: 1978.

ALAN DONALDSON, W. Va. Univ. Petrology of Lower Kittanning Coal.

M. E. KAUFFMAN, Franklin and Marshall Coll. Barrier Islands, a New Interpretation of Antietam Formation. The outcrop pattern of the Antietam Formation can best be interpreted as a series of barrier islands in front of the linear clastic shoreline of Early Cambrian seas. The long discontinuous Antietam ridges have heretofore been variously interpreted as fault-bounded blocks or slices associated with imagined thrust and/or normal faults. Mapping over a period of years in the Lancaster-Morgantown area has suggested a sedimentary explanation for these Antietam sandstone bodies. ACD: Fall 1977.

M. E. KAUFFMAN and R. D. K. THOMAS, Franklin and Marshall Coll. Paleoenvironmental Significance of Cambrian Carbonates near Morgantown, Pa.

STRATIGRAPHY



PING-FAN CHEN, W. Va. Geol. Survey. Stratigraphy and Tectonics of Lower Paleozoic Rocks in Central Appalachians. Detailed discussion for each formation on name, distribution, description, thickness, lithofacies, stratigraphic relationships, environments, and sources with measured sections appended. Detailed discussion on the tectonics from the Blue Ridge to the Appalachian Plateau provinces in central Appalachians. ACD: Spring 1976.

J. M. DENNISON, Univ. of N. C. Hamilton Group Stratigraphy of Devonian Fulton Lobe [Va., W. Va., Md., and Pa.]. ACD: 1979.

J. M. DENNISON, Univ. of N. C. Paleozoic Eustatic Sea-Level Changes in Appalachian Basin. ACD: 1977.

J. M. DENNISON and D. A. TEXTORIS, Univ. of N. C. Stratigraphy and Petrology of Tioga Bentonite (Devonian) [Appalachian Basin]. ACD: 1977.

W. E. EDMUNDS, A. D. GLOVER, M. A. SHOLES, and V. W. SKEMA, Pa. Geol. Survey. TASIC (Temporarily Available Stratigraphic Information Collection). This project is a continuing program involved with the recovery of stratigraphic data from active coal and clay strip mines and construction sites while exposures are available. The long-term project is designed to provide data for future mapping and regional mineral resource evaluation.

P. W. GOODWIN, PETER FRISCHMANN and WILLIAM WADE, Temple Univ. Middle Ordovician Carbonate Paleoenvironments and Stratigraphy [central Pa.]. ACD: Spring 1977.

LOUIS HEYMAN, Pa. Geol. Survey. Oriskany (Lower Devonian) and Related Sandstones in the Subsurface of Western Pa. Rocks previously mapped as "Oriskany" in the subsurface of Pa. comprise all of the following: a sandy carbonate to sandstone zone in the upper Helderberg Group, the Ridgeley Sandstone (Oriskany Sandstone proper), and sandstone lenses in the basal portion of the Bois Blanc

(Lower Devonian) Formation and locally perhaps in the basal portion of the Onondaga Group. Data are at present being compiled for map(s) at 1:250,000 which will show the distribution of these units and their thickness. ACD: 1977.

LOUIS HEYMAN, Pa. Geol. Survey. Subcrop Map of the Rocks Beneath Onesquethaw Stage Rocks in the Subsurface of Western Pa. In a large area of western Pa., the Onondaga Group, Huntersville Chert, Needmore Shale and Bois Blanc Formation overlie rocks ranging from the Ridgeley (Lower Devonian) Sandstone to Bertie-Bass Islands (Upper Silurian). Map will be at scale 1:250,000.

R. G. PIOTROWSKI, Pa. Geol. Survey. Upper Devonian Subsurface Framework Stratigraphy of Western Pa. This framework will consist of a series of gamma ray logs showing regional correlations, hydrocarbon-bearing zones, and facies relations for the Upper Devonian in western Pa. ACD: 1976.

B. F. ROWELL and field geology class students, Kutztown State Coll. Stratigraphy of the Kutztown Quad. ACD: May 1976.

T. O. WRIGHT, Allegheny Coll., and G. C. STEPHENS, Bryn Mawr Coll. Martinsburg of Eastern Pa. Investigation of the stratigraphic relationships between the various Middle and Upper Ordovician clastic rocks of eastern Pa. ACD: 1977.

STRUCTURAL GEOLOGY

R. T. FAILL, Pa. Geol. Survey. Fossil Deformation in the Valley and Ridge Province, Central Pa. Fossils throughout the province exhibit angular and shape distortions caused by a penetrative deformation. Crinoid columns have been collected and are being measured to evaluate the magnitude, orientation, and dynamics of the deformation. ACD: 1977.



PETER GEISER, Univ. of Conn. An Investigation of Regional Pre-folding Cleavage in the Valley and Ridge Province of the Central Appalachians. ACD: 1979.

LOUIS HEYMAN, Pa. Geol. Survey. Map of Subsurface Structure of Western Pa. In many areas, the Ridgeley (Oriskany) Sandstone is unconformable on subjacent rocks or is absent, so that at least two pre-Oriskany horizons will be used in different areas as structural datum planes. Where the Ridgeley is conformable, the top of the Ridgeley will be used as a structural datum. Map will be at scale 1:250,000. ACD: 1977.

W. S. KOWALIK, U. S. Geol. Survey. Lake Wallenpaupack Circular Feature. A well-expressed circular drainage pattern of unknown origin was detected on Landsat imagery of the Pocono Plateau east of Scranton. Field reconnaissance of the feature indicated no obvious consistent structure throughout the 25-km-diameter feature. An aeromagnetic anomaly is present over the feature. Structural mapping and a gravity survey in the area are planned. ACD: Fall 1976.

W. S. KOWALIK, D. P. GOLD, S. S. ALEXANDER, U. S. Geol. Survey, and various graduate students. Everett Lineament [between Everett and Breezewood]. Geologic mapping is being conducted in conjunction with geophysical work to accurately determine the nature and location of a major cross strike discontinuity which appears to extend from South Mountain to the Allegheny Front. The lineament/discontinuity is expressed by enechelon faulting just west of Everett and is characterized generally as a zone along which many major folds plunge. ACD: Summer 1976.

S. I. ROOT and D. B. MacLACHLAN, Pa. Geol. Survey. Southern Limit of Taconic Allochthons in Pa.

S. I. ROOT and D. B. MacLACHLAN, Pa. Geol. Survey. Structural Geology of the Gettysburg Basin.

REPORTS PUBLISHED

ADAMS, J. K., and GOODWIN, P. W., 1975, The Chickies Quartzite and some tectonic implications. *Proc. Pa. Acad. Sci.*, v. 49, p. 165-167.

ALEXANDER, S. S., GOLD, D. P., PARIZEK, R. R., KOWALIK, W. S., WEINMAN, B. L., and BAUMGARDT, D. R., 1975, Application of Skylab data to selected geologic and natural resource problems in Pennsylvania [abs.]. *Eos*, v. 56, no. 6, p. 348.

BAILEY, J. F., PATTERSON, J. L., and PAULHUS, J. L. H., 1975, Hurricane Agnes rainfall and floods, June-July 1972. *U. S. Geol. Survey Bull.* 924.

BARKER, J. L., 1976, Effects of air injection at Prompton Lake, Wayne County, Pennsylvania. *Jour. Research U. S. Geol. Survey*, v. 4, no. 1, p. 19-25.

- BATES, R. L., 1975, Sub-Trenton structure of Ohio, with views on isopach maps and stratigraphic sections as basis for structural myths in Ohio, Illinois, New York, Pennsylvania, West Virginia, and Michigan: Discussion. *Am. Assoc. Petroleum Geologists Bull.*, v. 59, no. 5, p. 878-879.
- BERTI, A. A., 1975, Pollen and seed analysis of the Titusville section (mid-Wisconsinan), Titusville, Pennsylvania. *Can. Jour. Earth Sci.*, v. 12, no. 9, p. 1675-1684.
- BLACKBEER, L. E., FELDMAN, H. R., and KENNESH, M. J., 1975, Modification of trace fossil systematics of western Pennsylvania [abs.]. *Geol. Soc. America Abs. with Programs*, v. 7, no. 1, p. 27-28.
- BOLLES, W. H., 1975, Scranton's mineral heritage preserved. *Pa. Geology*, v. 6, no. 6, p. 2-5.
- BRIGGS, R. P., 1975, Distribution of geologists in Pennsylvania. *Pa. Geology*, v. 6, no. 3, p. 14-15.
- BRIGGS, R. P., and KOHL, W. R., 1975, Map of zones where land use can be affected by landsliding, flooding, and undermining, Allegheny County, Pennsylvania. *U. S. Geol. Survey Misc. Field Studies Map MF-685-D*.
- BRIGGS, R. P., POMEROY, J. S., and DAVIES, W. E., 1975, Landsliding in Allegheny County, Pennsylvania. *U. S. Geol. Survey Circ.* 728.
- BUCEK, M. F., 1975, Pleistocene geology and history of the West Branch of the Susquehanna River valley near Williamsport, Pennsylvania. The Pa. State Univ., Dept. of Geosciences, unpub. Ph.D. dissertation.
- BUSANUS, J. W., 1976, Faunal distribution within the Greenbrier-Mauch Chunk transition (Chesterian, Elviran) along the Chestnut Ridge anticline [abs.]. *Geol. Soc. America Abs. with Programs*, v. 8, no. 2, p. 143.
- BUSHNELL, KENT, 1975, Map showing depths to the Pittsburgh coal bed, mining activity, and related surface subsidence, Allegheny, Washington, and Westmoreland Counties, Pennsylvania. *U. S. Geol. Survey Misc. Field Studies Map MF-693-A*.
- _____, 1975, Map showing areas that correlate with subsidence events due to underground mining of the Pittsburgh and Upper Freeport coal beds, Allegheny, Washington, and Westmoreland Counties, Pennsylvania. *U. S. Geol. Survey Misc. Field Studies Map MF-693-C*.
- _____, 1975, McConnells Mill State Park. *Pa. Geol. Survey, 4th ser., Park Guide* 9.
- BUSHNELL, KENT, and PEAK, J. R., 1975, Map showing depths to the Upper Freeport coal bed, mining activity, and related surface subsidence, and the Redstone coal bed mines, Allegheny, Washington, and Westmoreland Counties, Pennsylvania. *U. S. Geol. Survey Misc. Field Studies Map MF-693-B*.
- CALVERT, W. L., 1975, Sub-Trenton structure of Ohio, with views on isopach maps and stratigraphic sections as basis for structural myths in Ohio, Illinois, New York, Pennsylvania, West Virginia, and Michigan: Reply. *Am. Assoc. Petroleum Geologists Bull.*, v. 59, no. 5, p. 879-880.
- _____, 1975, Sub-Trenton structure of Ohio, with views on isopach maps and stratigraphic sections as basis for structural myths in Ohio, Illinois, New York, Pennsylvania, West Virginia, and Michigan: Discussion. *Am. Assoc. Petroleum Geologists Bull.*, v. 59, no. 6, p. 1023.
- CHURCHILL, N. J., 1975, Soil survey of Venango County, Pennsylvania. *U. S. Dept. Agric., Soil Conservation Serv., Washington, D.C.*
- COLEMAN, S. L., MEDLIN, J. H., MEISSNER, C. R., TRENT, V. A., WINDOLPH, J. F., and ENGLUND, K. J., 1975, Environmental consideration of the distribution of trace elements in selected low-sulfur bituminous coal and anthracite beds of the Appalachian Basin [abs.]. *Geol. Soc. America Abs. with Programs*, v. 7, no. 7, p. 1032-1033.
- COPELAND, M. J., 1976, Late Silurian and Early Devonian ostracode provinces in eastern North America [abs.]. *Geol. Soc. America Abs. with Programs*, v. 8, no. 2, p. 154.
- CORNET, BRUCE, and TRAVERSE, ALFRED, 1975, Palynological contributions to the chronology and stratigraphy of the Hartford Basin in Connecticut and Massachusetts. *Geoscience and Man*, v. 11, p. 1-33.
- CORTIS, S. E., ALEXANDER, T. B., EDMUNDS, W. E., and CRAFT, J. L., 1975, Greater Pittsburgh Region maps of mined out areas and thickness of rock over the Pittsburgh coal. *Pa. Geol. Survey, 4th ser., Map* 45.

- CRAFT, J. L., 1975, The role of geological reviews in the A-95 processes [abs.]. Geol. Soc. America Abs. with Programs, v. 7, no. 1, p. 42.
- CRAFT, J. L., CHAPMAN, W. F., LUKERT, M. T., and WARD, A. N., JR., 1976, Environmental geology applied to rural-urban needs [abs.]. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 155-156.
- CRAWFORD, W. A., and HUNTSMAN, J. R., 1976, Metamorphic rock types, Wagontown 7½' quadrangle, Chester County, Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 156.
- DAVIES, W. E., POMEROY, J. S., and KOHL, W. R., 1976, Map of coal-mining features, Allegheny County, Pennsylvania. U. S. Geol. Survey Misc. Field Studies Map MF-685-C.
- DENNISON, J. M., and HASSON, K. O., 1976, Stratigraphic cross section of Hamilton Group (Devonian) and adjacent strata along south border of Pennsylvania. Am. Assoc. Petroleum Geologists Bull., v. 60, no. 2, p. 278-287.
- DENNISON, J. M., and HEAD, J. W., 1975, Sealevel variations interpreted from the Appalachian Basin Silurian and Devonian. Am. Jour. Sci., v. 275, no. 10, p. 1089-1120.
- DERSTLER, K. L., 1975, Carpodid echinoderms from Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 7, no. 1, p. 48.
- DE WITT, WALLACE, JR., 1975, Geologic map of the Beans Cove and Hyndman quadrangles and part of the Fairhope quadrangle, Bedford County, Pennsylvania. U. S. Geol. Survey Misc. Geol. Inv. Map I-801.
- DONAHUE, JACK, ADOVASIO, J. M., GUNN, J. D., and STUCKENRATH, R., 1976, Meadowcroft Rockshelter: Evidence for human occupation back to 16,000 B.P. [abs.]. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 163.
- FISHER, G. W., 1976, The geologic evolution of the northeastern Piedmont of the Appalachians [abs.]. Geol. Soc. of America Abs. with Programs, v. 8, no. 2, p. 172-173.
- GARLOCK, T. L., and ISAACSON, P. E., 1976, An occurrence of a *Cruziana* community in the Moyer Ridge Member of the Bloomsburg Formation (Late Silurian)—Snyder County, Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 178-179.
- GEYER, A. R., 1976, The history and mystery of the Pequea silver mines. Pa. Geology, v. 7, no. 2, p. 2-5.
- GIFFIN, E. B., 1975, Second Geological Survey fossil collection curated. Pa. Geology, v. 6, no. 3, p. 10.
- GLASER, E. R., and SUFFET, I. H., 1975, Sampling design, collection and analyses of watershed soil samples for water resources management, in Krizek, Raymond, and others, eds., Measuring and sensing methods. Ann Arbor, Ann Arbor Publ., Inc., v. 1, p. 379-399.
- GOHN, G. S., 1976, Platform and basin lithofacies in Lower Cambrian carbonate rocks—Tomstown and Vintage Dolomites, central Appalachians [abs.]. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 182.
- GRAUERT, B., and WAGNER, M. E., 1975, Age of the granulite-facies metamorphism of the Wilmington complex, Delaware-Pennsylvania Piedmont. Am. Jour. Sci., v. 275, no. 6, p. 683-691.
- GROSHONG, R. H., JR., 1975, Strain, fractures and pressure solution in natural single-layer folds. Geol. Soc. America Bull., v. 86, no. 10, p. 1363-1376.
- HAJI-VASSILIOW, ANDREAS, and PUFFER, J. H., 1975, A macrocrystalline attapulgite-palygorski occurrence in calcite veins. Am. Mineralogist, v. 60, no. 3-4, p. 328-330.
- HARRISON, S. S., 1975, Turbidite origin of glaciolacustrine sediments, Woodcock Lake, Pennsylvania. Jour. Sed. Petrology, v. 45, no. 3, p. 738-744.
- HARRISON, S. S., and TOPP, L. M., 1975, False "bedrock" in glacial drift. Bull. Assoc. Eng. Geologists, v. 12, no. 4, p. 323-325.
- HASSON, K. O., and DENNISON, J. M., 1974, The Pokejoy Member, a new subdivision of the Mahantango Formation (Middle Devonian) in West Virginia, Maryland, and Pennsylvania. Proc. W. Va. Acad. Sci., v. 46, p. 78-86.
- HOLEYWELL, R. C., and TULLIS, T. E., 1975, Mineral reorientation and slaty cleavage in the Martinsburg Formation, Lehigh Gap, Pennsylvania. Geol. Soc. America Bull., v. 86, no. 9, p. 1296-1304.
- HOLLOWELL, J. R., and KOESTER, H. E., 1975, Ground-water resources of Lackawanna County, Pennsylvania. Pa. Geol. Survey, 4th ser., Water Resource Rept. 41.
- HOQUE, MOMINUL, 1975, Paleocurrent and paleoslope, a case study [Paleocurrent pattern of Loyahanna-Trough Creek Limestone (Mississippian) area]. Palaeogeography, Palaeoclimatology, Palaeoecology, v. 17, no. 1, p. 77-85.

- HOSKINS, D. M., and SEVON, W. D., 1976, New Illinoian till (?) locality and river terraces in the Millersburg area, Susquehanna River valley, Pennsylvania [abs.]. *Geol. Soc. America Abs. with Programs*, v. 8, no. 2, p. 200.
- HUMPHREYS, MATTHEW, and FRIEDMAN, G. M., 1975, Late Devonian Catskill deltaic complex in north-central Pennsylvania, *in* Broussard, M. L., ed., *Deltas, models for exploration*. Houston, Houston Geol. Soc., p. 369-379.
- INNERS, J. D., and HESS, E. D., 1975, Invertebrate fossils in the upper Mahantango Formation, Suedberg, Schuylkill County, Pennsylvania. *Pa. Geology*, v. 6, no. 5, p. 8-10.
- JACOBEE, FRANK, JR., and KANES, W. H., 1975, Structure of Broadtop synclinorium, Wills Mountain anticlinorium, and Allegheny frontal zone. *Am. Assoc. Petroleum Geologists Bull.*, v. 59, no. 7, p. 1136-1150.
- JOHNSON, R. C., and MYER, G. H., 1975, Sillimanite nodules in the Wissahickon Schist, Philadelphia. *Proc. Pa. Acad. Sci.*, v. 49, p. 34-36.
- KARCZ, IAAKOV, MORREALE, JoANNE, and POREBSKI, FRANCIS, 1975, Vertical crust movements in New York and Pennsylvania— Neotectonics or benchmark-instability [abs.]. *Geol. Soc. America Abs. with Programs*, v. 7, no. 7, p. 1138-1139.
- KHOURY, S. G., TILLMAN, J. E., and WALLACH, J., 1976, Expression of lithologies and structures on aeromagnetic and gravity map of the Piedmont in the central Appalachians [abs.]. *Geol. Soc. America Abs. with Programs*, v. 8, no. 2, p. 209-210.
- KOHL, W. R., and BRIGGS, R. P., 1975, Map of rock types in bedrock of Allegheny County, Pennsylvania. U. S. Geol. Survey Misc. Field Studies Map MF-685-A.
- KOWALIK, W. S., 1975, Comparison of Skylab and Landsat lineaments with joint orientations in north central Pennsylvania. The Pa. State Univ. ORSER Tech. Rept. 12-75.
- KOWALIK, W. S., and GOLD, D. P., 1975, Lineaments and mineral occurrences in Pennsylvania. The Pa. State Univ. ORSER Tech. Rept. 14-75.
- KOWALL, S. J., 1975, Relationship of the hypsometric integral to low streamflow duration for some Pennsylvania watersheds [abs.]. *Geol. Soc. America Abs. with Programs*, v. 7, no. 1, p. 85.
- KRAJEWSKI, S. A., and CUFFY, R. J., 1976, The Ashcraft-quarry limestone mound, an Upper Devonian shell-bank in northeastern Pennsylvania [abs.]. *Geol. Soc. America Abs. with Programs*, v. 8, no. 2, p. 212.
- KUHLMAN, ROBERT, 1976, Stratigraphy and metamorphism of the Wissahickon Formation in southeastern Chester County, Pennsylvania [abs.]. *Geol. Soc. America Abs. with Programs*, v. 8, no. 2, p. 213.
- LAMBORN, RICHARD, and GUTSCHICK, RAYMOND, 1975, *Bifungites*, trace fossils from Devonian-Mississippian rocks of Pennsylvania and Montana, U.S.A. *Palaeogeography, Palaeoclimatology, Palaeoecology*, v. 18, p. 193-212.
- LANGMUIR, DONALD, 1975, The geochemistry of Cu, Zn, Fe, and Mn in soil moisture in a Pennsylvania soil [abs.]. *Geol. Soc. America Abs. with Programs*, v. 7, no. 7, p. 1160-1161.
- LAPHAM, D. M., 1975, Interpretation of K-Ar and Rb-Sr isotopic dates from a Precambrian basement core, Erie County, Pennsylvania. *Pa. Geol. Survey, 4th ser., Inf. Circ.* 79.
- _____, 1975, The State Line District's many rock types. *Pa. Geology*, v. 6, no. 5, p. 2-7.
- LEWIS, D. M., 1975, The use of lead-210 as a heavy metal tracer in the Susquehanna River system [abs.]. *Geol. Soc. America Abs. with Programs*, v. 7, no. 7, p. 1168.
- LOWRIGHT, R. H., 1975, Climatic cause of variation in hydraulic equivalence [abs.]. *Geol. Soc. America Abs. with Programs*, v. 7, no. 1, p. 90-91.
- LUTZ-GARIHAN, A. B., 1976, The influence of geologic and geomorphic parameters on the flood response of small drainage basins in Pennsylvania [abs.]. *Geol. Soc. America Abs. with Programs*, v. 8, no. 2, p. 223.
- LYTLE, W. S., 1975, Oil and gas, Pennsylvania 1975. *Pa. Geology*, v. 6, no. 6, p. 9-10.
- _____, 1975, Oil and gas developments in Pennsylvania in 1974. *Pa. Geol. Survey, 4th ser., Prog. Rept.* 188.
- _____, 1975, Pennsylvania oil and gas developments in 1974. *Am. Assoc. Petroleum Geologists Bull.*, v. 59, no. 8, p. 1438-1441.
- _____, 1976, Oil fields of the Greater Pittsburgh Region. *Pa. Geol. Survey, 4th ser., Min. Resource Rept.* 70.

- LYTLE, W. S., and BALOGH, LAJOS, 1975, Greater Pittsburgh Region oil and gas fields map. Pa. Geol. Survey, 4th ser., Map 44.
- LYTLE, W. S., EDWARDS, JONATHAN, JR., DeBROSSE, T. A., ROANE, K. J., BENDER, E. P., BUSCHMAN, W. J., KELLEY, W. A., JR., and PATCHEN, D. G., 1975, Oil and gas developments in Maryland, Ohio, Pennsylvania, Virginia and West Virginia. Am. Assoc. Petroleum Geologists Bull., v. 59, no. 8, p. 1438-1470.
- MacLACHLAN, D. B., BUCKWALTER, T. V., and McLAUGHLIN, D. B., 1975, Geology and mineral resources of the Sinking Spring quadrangle, Berks and Lancaster Counties, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 177d.
- MAYNARD, B. R., and HUMBERTON, P. G., 1975, Some jointing and stream pattern relationships in southwestern Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 7, no. 1, p. 93-94.
- McCABE, W. M., and KAERNER, R. M., 1975, High pressure shear strength investigation of an anisotropic mica schist rock. Internat. Jour. Rock Mech. Min. Sci., v. 12, no. 8, p. 219-228.
- McCULLOCH, C. M., 1975, Selected geologic factors affecting mining of the Pittsburgh coalbed. U. S. Bur. Mines Rept. Inv. 8093.
- McCULLOCH, C. M., JERAN, P. W., and SULLIVAN, C. D., 1975, Geologic investigations of underground coal mining problems. U. S. Bur. Mines Rept. Inv. 8022.
- McGREEVY, L. J., and SLOTO, R. A., 1976, Selected hydrologic data, Chester County, Pennsylvania. U. S. Geol. Survey open-file rept.
- McINTOSH, W. C., and HARGRAVES, R. B., 1976, Magnetic reversals in the Brunswick Formation of the Newark Group in New Jersey and eastern Penna. [abs.]. Eos, v. 57, no. 4, p. 238.
- MEDLIN, J. H., COLEMAN, S. L., WOOD, G. H., JR., and RAIT, N., 1975, Differences in minor and trace element geochemistry of anthracite in the Appalachian Basin [abs.]. Geol. Soc. America Abs. with Programs, v. 7, no. 7, p. 1198.
- MESSINGER, D. J., WALTON, J. C., FAHNESTOCK, R. K., and NUMMEDAL, DAG, 1975, Modern evolution of Gull Point [abs.]. Geol. Soc. America Abs. with Programs, v. 7, no. 1, p. 95.
- MILAZZO, V. A., 1975, Land use and land cover, 1972, Lycoming County, Pennsylvania. U. S. Geol. Survey Misc. Field Studies Map MF-684.
- MILICI, R. C., and HARRIS, L. D., 1976, Structural subdivision of the Valley and Ridge and Appalachian Plateaus physiographic provinces [abs.]. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 229-230.
- MILLER, B. M., 1975, A summary of oil and gas production and reserve histories of the Appalachian Basin, 1859-1972. U. S. Geol. Survey Bull. 1409.
- MINERALOGICAL SOCIETY OF PENNSYLVANIA, 1976, Annotated bibliography of minerals new to the Pennsylvania list, 1965-1974.
- NICKELSEN, R. P., 1976, Sequence of structural phases, Allegheny orogeny, Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 235.
- OLIVER, W. A., JR., 1975, Endemism and evolution of Late Silurian to Middle Devonian rugose corals in eastern North America, in Sokolov, B. S., ed., Drevnie Cnidaria [Ancient Cnidaria], Novosibirsk, Nauka Publ. House, v. 2, p. 148-160.
- OSGOOD, J. O., 1975, Ground-water's role in water quality management. Jour. Hydraulics Div., ASCE, v. 101, no. HY3, Proc. paper 11159, p. 517-521.
- OWENS, J. P., and MINARD, J. P., 1975, Geologic map of the surficial deposits in the Trenton area, New Jersey and Pennsylvania. U. S. Geol. Survey Misc. Geol. Inv. Map I-884.
- PEDLOW, G. W. III, 1976, Palinspastic base map: Central and southern Appalachians. Geol. Soc. America Bull., v. 87, p. 133-136.
- PENNSYLVANIA GEOLOGICAL SURVEY, 1975, Base map of Pennsylvania, 2nd ed., scale 1:250,000. Pa. Geol. Survey, 4th ser., Map 41.
- PETRUS, C. A., 1975, Investigation of exit areas of ground water related to anthracite deep mines [abs.]. Geol. Soc. America Abs. with Programs, v. 7, no. 1, p. 105.
- PIMENTEL, NELLY, BIKERMAN, MICHAEL, and FLINT, N. K., 1975, A new K-Ar date on the Masontown dike, southwestern Pa. Pa. Geology, v. 6, no. 3, p. 5-7.

- PIOTROWSKI, R. G., 1976, Reef hunting in McKean County continues. Pa. Geology, v. 7, no. 1, p. 2-3.
- POMEROY, J. S., and DAVIES, W. E., 1975, Landsliding in the Pittsburgh area, Allegheny County, Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 7, no. 1, p. 107.
- _____, 1975, Map of susceptibility to landsliding, Allegheny County, Pennsylvania. U. S. Geol. Survey Misc. Field Studies Map MF-685-B.
- POPP, J. T., and McCULLOCH, C. M., 1976, The methane content of the Beckley coalbed and its relationship to geology [abs.]. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 248-249.
- QUEHL, A. R., JR., 1975, *Delocrinus* speciation during the late Pennsylvanian in western Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 7, no. 1, p. 109.
- RANKIN, D. W., 1975, Opening of the Iapetus Ocean: Appalachian salients and recesses as Precambrian triple junctions [abs.]. Geol. Soc. America Abs. with Programs, v. 7, no. 7, p. 1238.
- RANNEY, R. W., CIOLKOSZ, E. J., CUNNINGHAM, R. L., PETERSEN, G. W., and MATELSKI, R. P., 1975, Fragipans in Pennsylvania soils: Properties of bleached prism face materials. Soil Sci. Soc. America Proc., v. 39, p. 695-698.
- REED, L. A., 1976, Sediment characteristics of five streams near Harrisburg, Pennsylvania, before highway construction. U. S. Geol. Survey Water-Supply Paper 1798-M.
- REICH, J. R., JR., compiler, 1975, Caves of southeastern Pennsylvania. Pa. Geol. Survey, 4th ser., Gen. Geology Rept. 65.
- ROOT, S. I., 1976, Engineering problems in areas of limestone springs. Pa. Geology, v. 7, no. 2, p. 6-9.
- ROSE, A. W., 1975, The mode of occurrence of trace elements in soils and stream sediments applied to geochemical exploration, in Elliott, I. L., and Fletcher, W. K., eds., Geochemical exploration 1974. Amsterdam, Elsevier, p. 691-705.
- SANFORD, J. T., 1975, Sub-Trenton structure of Ohio, with views on isopach maps and stratigraphic sections as basis for structural myths in Ohio, Illinois, New York, Pennsylvania, West Virginia, and Michigan: Discussion. Am. Assoc. Petroleum Geologists Bull., v. 59, no. 9, p. 1689.
- SCHWEINFURTH, S. P., 1975, Geologic map of the West Middletown quadrangle and part of the Bethany quadrangle, Washington County, Pennsylvania. U. S. Geol. Survey Misc. Geol. Inv. Map I-871.
- _____, 1976, Geology of the Avella quadrangle and part of the Steubenville East quadrangle, Washington County, Pennsylvania. U. S. Geol. Survey Misc. Geol. Inv. Map I-908.
- SEARS, S. O., DEINES, P., and LANGMUIR, D., 1975, Geochemistry of recharge water in the unsaturated zone of a carbonate terrane [abs.]. Eos, v. 56, no. 6, p. 359.
- SEVON, J. J., 1976, Flooding and flood protection at Harrisburg. Pa. Geology, v. 7, no. 1, p. 4-9.
- SEVON, W. D., 1975, Geology and mineral resources of the Christmans and Pohopoco Mountain quadrangles, Carbon and Monroe Counties, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 195ab.
- _____, 1975, Geology and mineral resources of the Hickory Run and Blakeslee quadrangles, Carbon and Monroe Counties, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 194cd.
- _____, 1975, Geology and mineral resources of the Tobyhanna and Buck Hill Falls quadrangles, Monroe County, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 204ab.
- _____, 1975, Sandstone, roundstone diamicton and the Harrisburg peneplain in eastern Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 7, no. 1, p. 118.
- SEVON, W. D., CROWL, G. H., and BERG, T. M., 1975, The Late Wisconsin drift border in northeastern Pennsylvania. Guidebook, 40th Ann. Field Conf. Pa. Geologists, Pa. Geol. Survey.
- SHEARROW, G. G., 1975, Sub-Trenton structure of Ohio, with views on isopach maps and stratigraphic sections as basis for structural myths in Ohio, Illinois, New York, Pennsylvania, West Virginia, and Michigan: Discussion. Am. Assoc. Petroleum Geologists Bull., v. 59, no. 6, p. 1022-1023.
- SHUSTER, E. T., 1975, Current status of Bureau's water well inventory. Pa. Geology, v. 6, no. 5, p. 11-13.

- SKEMA, V. W., BERG, T. M., BRAGONIER, W. A., EDMUNDS, W. E., GLASS, G. B., GLOVER, A. D., INNERS, J. D., and SHOLES, M. A., 1975, Analyses and measured sections of Pennsylvania bituminous coals, Part II. Pa. Geol. Survey, 4th ser., Min. Resource Rept. 69.
- SMITH, R. C., II, 1975, New molybdenite occurrence in Berks County. Pa. Geology, v. 6, no. 6, p. 16.
- _____, 1975, New uranium-thorium occurrence in Northampton County. Pa. Geology, v. 6, no. 6, p. 11.
- SMITH, R. C., II, ROSE, A. W., and LANNING, R. M., 1975, Geology and geochemistry of Triassic diabase in Pennsylvania. Geol. Soc. America Bull., v. 86, no. 7, p. 943-955.
- SNELSON, SIGMUND, 1976, Seismic data bearing on the tectonic style of the Valley and Ridge province [abs.]. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 272.
- SOCOLOW, A. A., 1975, And then came Eloise. Pa. Geology, v. 6, no. 6, p. 6-9.
- STEPHENS, G. C., and WRIGHT, T. A., 1976, Spitzenberg Hill, Berks County, Pa.: Triassic or Ordovician [abs.]. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 276-277.
- STEVENSON, D. L., 1975, Sub-Trenton structure of Ohio, with views on isopach maps and stratigraphic sections as basis for structural myths in Ohio, Illinois, New York, Pennsylvania, West Virginia, and Michigan: Discussion. Am. Assoc. Petroleum Geologists Bull., v. 59, no. 8, p. 1503-1506.
- SUMNER, J. R., 1976, Residual gravity anomaly map of the Newark-Gettysburg Triassic Basin [abs.]. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 280.
- TESMER, I. H., 1975, Geology of Cattaraugus County, New York. Buffalo Soc. of Nat. Sci. Bull., v. 27.
- TING, F. T. C., and SPACKMAN, W., 1975, The coal lithotype concept and seam profile. Septième Congrès International de Stratigraphie et de Géologie du Carbonifère, Krefeld, 23-28 August 1971, Compte Rendu, Band IV, p. 307-311.
- U. S. GEOLOGICAL SURVEY and PENNSYLVANIA GEOLOGICAL SURVEY, 1975, The ground-water program for Pennsylvania, 2nd ed. Pa. Geol. Survey, 4th ser., Inf. Circ. 7.
- WAGNER, M. E., and CRAWFORD, M. L., 1975, Polymetamorphism of the Precambrian Baltimore gneiss in southeastern Pennsylvania. Am. Jour. Sci., v. 275, no. 6, p. 653-682.
- WAGNER, W. R., 1976, Growth faults in Cambrian and Lower Ordovician rocks of western Pennsylvania. Am. Assoc. Petroleum Geologists Bull., v. 60, no. 3, p. 414-427.
- WAGNER, W. R., CRAFT, J. L., HEYMAN, LOUIS, and HARPER, J. A., compilers, 1975, Greater Pittsburgh Region geologic map and cross sections. Pa. Geol. Survey, 4th ser., Map 42.
- WAGNER, W. R., HEYMAN, LOUIS, CRAFT, J. L., EDMUNDS, W. E., and HARPER, J. A., 1975, Greater Pittsburgh Region structure contour map. Pa. Geol. Survey, 4th ser., Map 43.
- WAGNER, W. R., and LYTLE, W. S., 1976, Greater Pittsburgh Region revised surface structure and its relation to oil and gas fields. Pa. Geol. Survey, 4th ser., Inf. Circ. 80.
- WALLACE, R. J., and CHAMBERLAIN, J. A., JR., 1975, Paleogeology and community succession of a Devonian patch reef [abs.]. Geol. Soc. America Abs. with Programs, v. 7, no. 1, p. 129-130.
- WALLACH, J., KHOURY, S. G., and TILLMAN, J. E., 1976, Relative importance of the Drumore fold and Peach Bottom fold in the Piedmont of southeastern Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 294.
- WALTON, J. C., MESSINGER, D. J., FAHNESTOCK, R. K., and NUMMEDAL, DAG, 1975, Environments of erosion and deposition on a recurved sandspit, Presque Isle, Erie, Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 7, no. 1, p. 130-131.
- WELLS, R. B., 1976, Quiggleville gas prospect—Lycoming County. Pa. Geology, v. 7, no. 2, p. 10-13.
- WILLIAMS, E. G., HOLBROOK, P. R., LITHGOW, E. W., and WILSON, B. R., 1975, Properties and occurrence of bloating shales and clays in the Pennsylvanian of western Pennsylvania. AIME Trans., v. 256, p. 237-240.
- WILSON, B. R., and TRAVERSE, ALFRED, 1975, Further information on the palynological stratigraphy of Devonian-Carboniferous rocks of central Pennsylvania [abs.]. Geoscience and Man, v. 11, p. 60.
- _____, 1975, Geology of anthracite in the Tamaqua quadrangle, Carbon and Schuylkill Counties, Pennsylvania. U. S. Geol. Survey Misc. Geol. Inv. Map I-809.

- WOOD, G. H., JR., 1973, Geologic map of the Delano quadrangle, Schuylkill County, Pennsylvania. U. S. Geol. Survey Geol. Quad Map GQ-1067.
- WRIGHT, T. O., and STEPHENS, G. C., 1976, Structure, age and depositional environment of Shochary Ridge, Martinsburg Formation, Berks and Lehigh Counties, Pennsylvania [abs.]. J. Geol. Soc. America Abs. with Programs, v. 8, no. 2, p. 305.

PUBLICATIONS IN PRESS

- ADAMS, J. K., and GOODWIN, P. W., The Chickies quartzite and some tectonic implications. Proc. Pa. Acad. of Sci.
- BERG, T. M., 1975, Geology and mineral resources of the Brodheadsville quadrangle, Monroe and Carbon Counties, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 205a.
- BERG, T. M., and GLOVER, A. D., 1976, Geology and mineral resources of the Sabula and Penfield quadrangles, Clearfield, Elk, and Jefferson Counties, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 74ab.
- BERG, T. M., SEVON, W. D., and BUCEK, M. F., 1977, Geology and mineral resources of the Pocono Pines-Mt. Pocono quadrangles, Monroe County, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 204cd.
- BERGIN, M. J., Bedrock geologic map of the anthracite-bearing rocks in the Wilkes-Barre West quadrangle, Luzerne County, Pennsylvania. U. S. Geol. Survey Misc. Geol. Inv. Map.
- BOLLES, W. H., and GEYER, A. R., 1976, Pennsylvania Interstate 81—Geologic guide, Pa. Dept. Educ.
- CLENDENING, J. A., 1976, Palynological evidence for a Pennsylvanian age assignment of the Dunkard Group in the Appalachian Basin: Part 1. W. Va. Geol. Survey, I. C. White Memorial Symposium Volume.
- CRAFT, J. L., HEYMAN, L., and PIOTROWSKI, R. G., 1976, Greater Pittsburgh Region thickness of rocks over the Upper Freeport coal. Pa. Geol. Survey, 4th ser., Map 49.
- CROWL, G. H., 1976, The geologic setting of the Shawnee-Minisink archeological site. N. Y. Acad. Sci. Annals.
- DENNISON, J. M., Appalachian Queenston delta related to eustatic sea level drop accompanying Late Ordovician glaciation in Africa. Proc. vol. for Ordovician System Symposium held by the Palaeontological Assoc. in Birmingham, England, Sept., 1974, Univ. of Wales Press.
- _____, Gravity tectonic removal of cover of Blue Ridge anticlinorium to form Valley and Ridge province. Geol. Soc. America Bull.
- _____, Possibilities for magmatic heat in the Appalachian Basin. Proc. of workshop on geothermal energy in eastern U. S., Energy Research and Development Admin., Washington, D. C., Mar. 10-11, 1975.
- DRAKE, A. A., JR., The Lyon Station-Paulins Kill nappe—the frontal structure of the Musconetcong nappe system in eastern Pennsylvania and New Jersey. U. S. Geol. Survey Prof. Paper.
- FAILL, R. T., 1977, Geology and mineral resources of the Montoursville South, Muncy, and Hughesville quadrangles, Lycoming, Northumberland, and Montour Counties, Pennsylvania. Pa. Geol. Survey, Atlas 144ab.
- _____, 1977, Structural analysis of the Valley and Ridge province in Pennsylvania. Pa. Geol. Survey, 4th ser., Gen. Geology Rept.
- FAILL, R. T., HOSKINS, D. M., and WELLS, R. B., 1976, Middle Devonian stratigraphy in central Pennsylvania. Pa. Geol. Survey, 4th ser., Prog. Rept.
- FAILL, R. T., WELLS, R. B., and SEVON, W. D., 1976, Geology and mineral resources of the Linden and Williamsport quadrangles, Lycoming County, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 134ab.
- _____, 1976, Geology and mineral resources of the Salladasburg and Cogan Station quadrangles, Lycoming County, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 133cd.
- FINKELMAN, R. B., and KLEMIC, HARRY, Brannerite from the Penn Haven Junction uranium occurrence, Carbon County, Pennsylvania. U. S. Geol. Survey Jour. Research, v. 4.

- GEYER, A. R., SMITH, R. C., II, and BARNES, J. H., 1976, Mineral collecting in Pennsylvania, 4th ed. Pa. Geol. Survey, 4th ser., Gen. Geology Rept. 33.
- GLASS, G. B., EDMUNDS, W. E., SHEPPS, V. C., INNERS, J. D., and SHOLES, M. A., 1977, Geology and mineral resources of the Ramey and Houtzdale quadrangles, Clearfield and Centre Counties, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 85cd.
- GLOVER, A. D., and BRAGONIER, W. A., Geology and mineral resources of the DuBois 15-minute quadrangle, Blair and Cambria Counties, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 64.
- HEYMAN, LOUIS, 1977, Tully to Queenston correlations in the subsurface of Pennsylvania. Pa. Geol. Survey, 4th ser., Min. Resource Rept. 74.
- HOSKINS, D. M., 1976, Geology and mineral resources of the Millersburg 15-minute quadrangle, Dauphin, Juniata, Northumberland, Perry, and Snyder Counties, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 146.
- KOWALIK, W. S., and GOLD, D. P., The use of Landsat-1 imagery in mapping lineaments in Pennsylvania. First Internat. Conf. on New Basement Tectonics, Symposium volume, Salt Lake City, Utah, June 1974.
- LLOYD, O. B., JR., and GROWITZ, D. J., Ground-water resources of central and southern York County, Pennsylvania. Pa. Geol. Survey, 4th ser., Water Resource Rept. 42.
- LYTLE, W. S., HEYMAN, LOUIS, and PIOTROWSKI, R. G., 1976, Oil and gas developments in Pennsylvania in 1975. Pa. Geol. Survey, 4th ser., Prog. Rept. 189.
- McGLADE, W. G., and GEYER, A. R., 1976, Environmental geology of the greater Harrisburg Metropolitan area. Pa. Geol. Survey, 4th ser., Environ. Geology Rept. 4.
- NEWPORT, T. G., 1977, Summary ground-water resources of Luzerne County, Pennsylvania. Pa. Geol. Survey, 4th ser., Water Resource Rept. 40.
- O'NEILL, B. J., JR., 1976, The distribution of limestones containing at least 90 percent CaCO_3 in Pennsylvania. Pa. Geol. Survey, 4th ser., Min. Resource Rept. 50, part 4.
- _____, 1976, Greater Pittsburgh Region properties and uses of clays and shales. Pa. Geol. Survey, 4th ser., Min. Resource Rept. 71.
- PERISSORATIS, CONSTANTINE, BROCK, P. W. G., BRUECKNER, H. K., DRAKE, A. A., JR., and BERRY, W. B. N., The Jutland Klippe in western New Jersey—new evidence. Geol. Soc. America Bull.
- PHILBRICK, S. S., Kinzua Dam and the glacial foreland, in Coates, D. R., ed., Geomorphology and engineering. 7th Ann. Geomorphology Symposium, Dowden, Hutchinson, and Ross, Inc.
- POTH, C. W., Summary ground-water resources of Lancaster County, Pennsylvania. Pa. Geol. Survey, 4th ser., Water Resource Rept. 43.
- ROOT, S. I., 1977, Geology and mineral resources of the greater Harrisburg West area. Pa. Geol. Survey, 4th ser., Atlas 148ab.
- ROSE, A. W., The effect of cuprous chloride complexing in the origin of red-bed copper and related deposits. Econ. Geology.
- SCHINER, G. R., and KIMMEL, G. E., 1976, Geology and ground-water resources of northern Mercer County, Pennsylvania. Pa. Geol. Survey, 4th ser., Water Resource Rept. 33.
- SEVON, W. D., and BERG, T. M., Geology and mineral resources of the Skytop quadrangle, Monroe and Pike Counties, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 214a.
- SHOLES, M. A., EDMUNDS, W. E., and SKEMA, V. W., Stratigraphy, sedimentology, and economic geology of the Upper Freeport coal, Hunker area, western Pennsylvania. Pa. Geol. Survey, 4th ser., Min. Resource Rept. 73.
- TAYLOR, A. F., Geology of the Lock Haven quadrangle, Clinton and Lycoming Counties, Pennsylvania. Pa. Geol. Survey, 4th ser., Atlas 124a.
- WHITE, E. L., 1976, Role of carbonate rocks in modifying flood flow behavior. Water Res. Bull., v. 12, no. 2.
- _____, Surface water hydrology in carbonate basins within the Appalachians. Memoirs of Internat. Assoc. Hydrogeologists.
- _____, Sustained flow in small Appalachian watersheds underlain by carbonate rocks. Jour. Hydrology.
- WHITE, W. B., Base level control of underground drainage in the Potomac River basin. Proc. of 4th Conf. on Karst Geology and Hydrology, W. Va. Geol. Survey.
- _____, ed., 1976, Caves of western Pennsylvania. Pa. Geol. Survey, 4th ser., Gen. Geology Rept. 66.
- _____, ed., 1976, Geology and biology of Pennsylvania caves. Pa. Geol. Survey, 4th ser., Gen. Geology Rept. 67.
- WILSHUSEN, J. P., Geologic hazards in Pennsylvania. Pa. Geol. Survey, 4th ser., Educ. Series 9.

ANNOUNCEMENTS

GEM & MINERAL SHOW

The East Hempfield Lions Club is sponsoring its Second Annual Gem & Mineral Show on October 16 and 17 at the Lancaster County Farm and Home Center, 1383 Arcadia Road (off Pa. Rt. 72 at U.S. 30). Hours are 10 a.m.-9 p.m. on the 16th; 10 a.m.-6 p.m. on the 17th.

GEM AND MINERAL SHOW AT HERSHEY

The Central Pennsylvania Rock and Mineral Club will hold its 11th Annual Gem and Mineral Show in the Blue Room of the Hershey Community Building. October 9th from 10 a.m. to 9 p.m. and October 10th from 10 a.m. to 6 p.m. There will be demonstrations in stone cutting and polishing and silversmithing. Admission will be charged. Adults \$1.00 Students \$.50.

GEMERAMA

The Tuscarora Lapidary Society, "Gemerama '76" will be held on September 11 and 12, 1976, at the Holiday Inn in Lima, Del. Co., Penna., Rt. U.S. #1, opposite Granite Run Mall. Hours will be from 10:00 a.m. to 10:00 p.m. on Saturday and 10:00 a.m. to 6:00 p.m. on Sunday.

"LITHIUM—NATURE'S LIGHTEST METAL", 15 pages

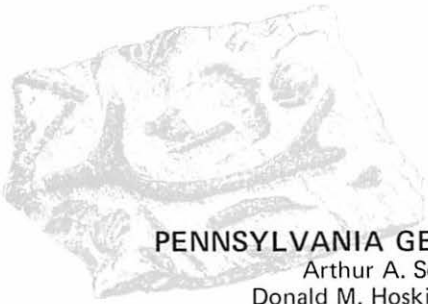
Lithium is the lightest of all metals, and has the highest electrical potential when used in batteries. Furthermore, it can be split to form tritium, an essential fuel element in the generation of power by fusion reaction. Because these new uses may play a major role in solving our energy problems, the U.S. Geological Survey has begun to search for sources of lithium.

This pamphlet is available free of charge from the U.S. Geological Survey, Distribution Section, 1200 South Eads Street, Arlington, Virginia 22202.

FROM THE DESK OF THE STATE GEOLOGIST (Continued from page 1)

The historical progression down to one remaining zinc mine does not necessarily point to early extinction of Pennsylvania's zinc-lead mining. New and sophisticated exploration techniques, improved and efficient milling methods, and increased demand and prices for lead and zinc all point to the need for reexamining and re-assessing Pennsylvania's widespread occurrences. Just such a project is being completed by Dr. Robert Smith of the Pennsylvania Geological Survey. As soon as completed the results will be made available to all. We feel very confident that the information will enable Pennsylvania to witness the development of new production of lead and zinc, so vital to the nation's economy and security.

Arthur G. Gordon



PENNSYLVANIA GEOLOGICAL SURVEY STAFF

Arthur A. Socolow, *State Geologist*
Donald M. Hoskins, *Assistant State Geologist*

TECHNICAL SERVICES

Shirley J. Barner, *Stenographer*
Sandra Blust, *Librarian*
Joanne Bowman, *Typist*
John G. Kuchinski, *Draftsman*
Christine Miles, *Geological Editor*

Virginia Milewski, *Draftsman*
Mary A. Miller, *Stenographer*
Marjorie Steel, *Stenographer*
Albert Van Olden, *Draftsman*
John H. Way, Jr., *Geological Editor*

ENVIRONMENTAL GEOLOGY DIVISION

Alan R. Geyer, *Division Chief*
Jesse Craft, *Geologist* (Pittsburgh Office)
Eugene H. Hess, *Geologist*
Donna M. Snyder, *Stenographer*

Grace Tyson, *Clerk*
John P. Wilshusen, *Geologist*

GEOLOGIC MAPPING DIVISION

Samuel I. Root, *Division Chief*
Thomas M. Berg, *Geologist*
William E. Edmunds, *Geologist*
Rodger T. Faill, *Geologist*
Albert D. Glover, *Geologist*
Jon D. Inners, *Geologist*
David B. MacLachlan, *Geologist*

Phyllis Ritter, *Typist*
William D. Sevon, *Geologist*
Mark A. Sholes, *Geologist*
Viktoras W. Skema, *Geologist*
Richard B. Wells, *Geologist*

MINERAL RESOURCES DIVISION

Bernard J. O'Neill, *Division Chief*
John H. Barnes, *Geologist*
John C. Benson, *Typist*

Leslie T. Chubb, *Laboratory Technician*
Robert C. Smith, *Geologist*

OIL AND GAS DIVISION

1201 Kossman Bldg.
100 Forbes Ave., Pittsburgh, Pa. 15222
William S. Lytle, *Division Chief*
Lajos Balogh, *Draftsman*
Cheryl Cozart, *Stenographer*
Elizabeth A. Eberst, *Typist*

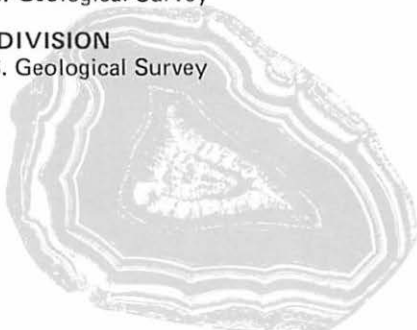
Robert Fenton, *Laboratory Technician*
Louis Heyman, *Geologist*
Robert G. Piotrowski, *Geologist*

TOPOGRAPHIC DIVISION

In Cooperation with The U.S. Geological Survey

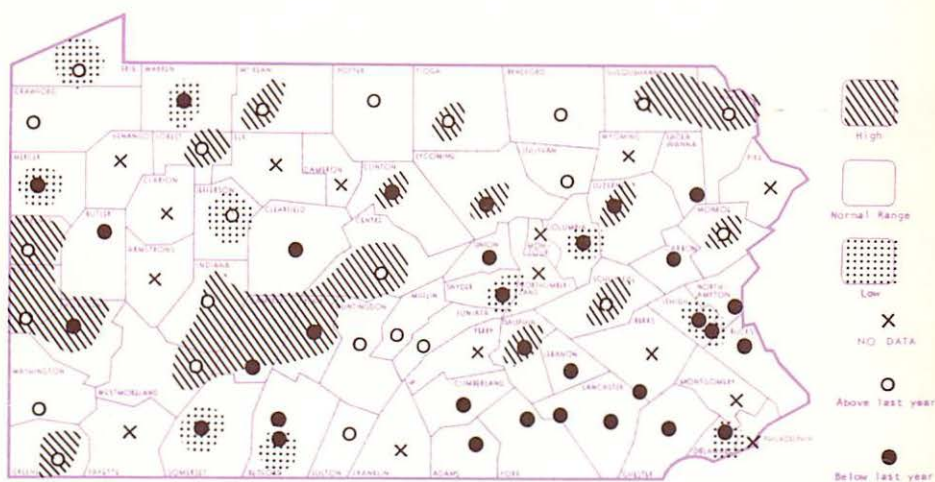
GROUND WATER DIVISION

In Cooperation with The U.S. Geological Survey



JULY 1976

GROUND-WATER LEVELS



BUREAU OF TOPOGRAPHIC AND GEOLOGIC SURVEY
DEPT. OF ENVIRONMENTAL RESOURCES
HARRISBURG, PA. 17120

BULK RATE
U. S. Postage
PAID
Harrisburg, Pa.
Permit No. 1

CORRECT ADDRESS REQUESTED