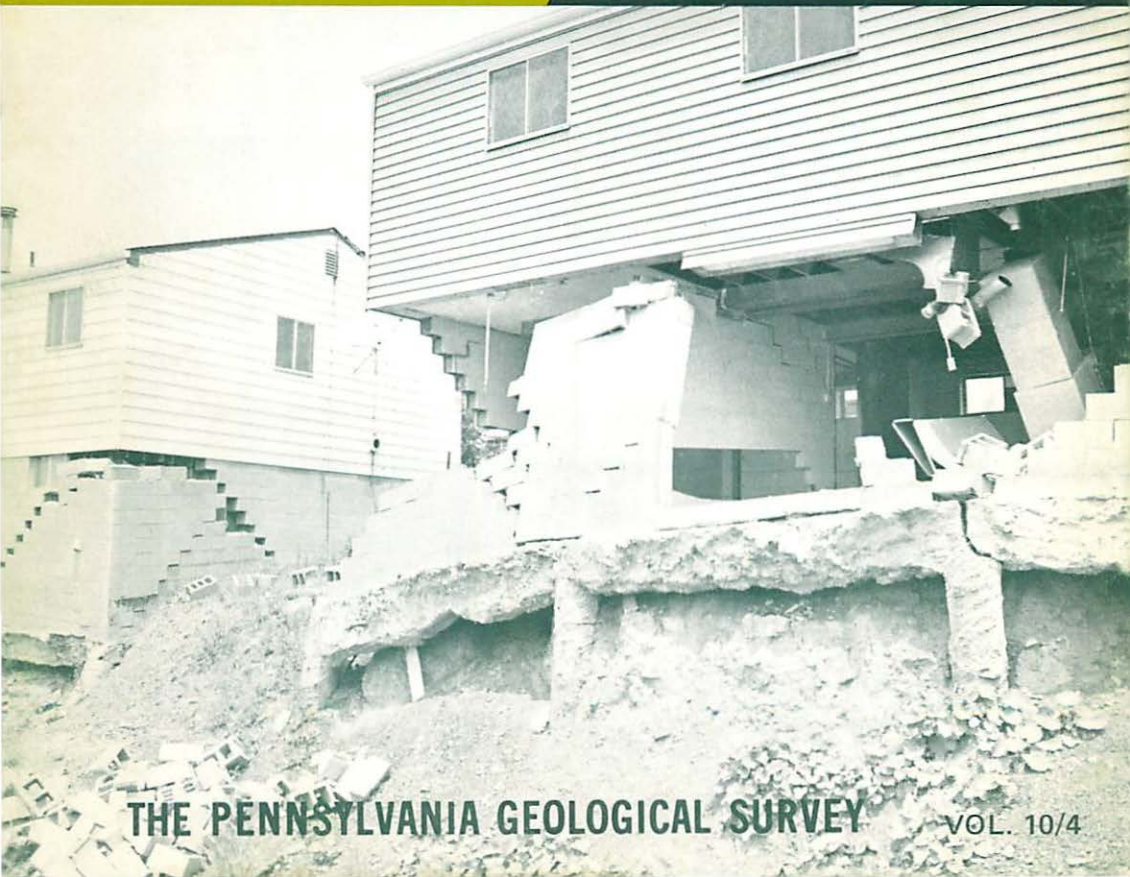
GEOLOGY PENNSYLVANIA



THE PENNSYLVANIA GEOLOGICAL SURVEY VOL. 10/4

COMMONWEALTH OF PENNSYLVANIA
Richard L. Thornburgh, Governor

DEPARTMENT OF ENVIRONMENTAL RESOURCES
Clifford L. Jones, Secretary

TOPOGRAPHIC AND GEOLOGICAL SURVEY
Arthur A. Socolow, State Geologist

CONTENTS

ON THE COVER: A house is not a home! Disastrous result of landsliding at Height Drive, Shaler Township, Allegheny County. Note piers into bedrock; "Pittsburgh red clay shales," Casselman Formation, Conemaugh Group. Slide started spring, 1976. Photo by Jesse Craft.

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AUGUST 1979

FROM THE DESK
OF THE
STATE GEOLOGIST . . .

WANTED: SOLUTIONS

I've never been one for papering my walls with slogans. But events of recent months have caused me to think back to one slogan that made an impression on me years ago: ARE YOU PART OF THE PROBLEM OR PART OF THE SOLUTION? Our society has long been a reactive society; we respond to situations after they arise. And the situations we respond to most vehemently are usually the ones we don't like. And so it has been in recent years that many have vehemently expressed dislike for such events as the mine land spoilage, water pollution, the Vietnam War, government corruption, air pollution, inflation, energy shortages, rising taxes, rising crime rates, nuclear power, declining public and business morality, etc. It is not difficult to support or sympathize with movements which express opposition to such activities which jar our sensibilities, threaten our health or impose upon our lifestyle. There is even a social and psychological lift as we join in a formal or informal group in opposition. People apparently do like to participate in a cause, especially a cause against something.

But being against something does not solve the problem. What is needed is more public response with solutions, with constructive responses. To be against air pollution is trite, unless we as individuals come up with the technology and the willingness to pay for avoiding air pollution. To be against energy shortages is meaningless unless we as individuals come up with specific proposals for either additional energy or less use. To be against declining morality is not constructive unless we as individuals initiate improvements.

Some of the events of recent years to which we have expressed opposition call for new policies or better principles. Some will call for new procedures or new technology. Many call for additional money. Whatever it is that each of us chooses to be concerned about, let's also keep in mind the corollary to the opening phrase above: IF YOU ARE NOT PART OF THE SOLUTION, YOU ARE PART OF THE PROBLEM.

Arthur G. Sacrison

GEOLOGICAL RESEARCH IN PENNSYLVANIA 1979

INTRODUCTION

This publication is the twenty-second 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. Reports published 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, P. O. Box 2357, Harrisburg, Pennsylvania 17120.

RESEARCH IN PROGRESS

AREAL GEOLOGY

S. S. ALBRIGHT, L. E. WILLIAMS, and KAREN FLINN, New Jersey State Museum. Source Identification and Differentiation of Argillite (and Associated Rocks) Used by New Jersey Indian Populations [Triassic Lockatong Fm. in N.J. and exposures of the same adjacent to the Delaware River in Pa.]. Determination of areal variation within the Lockatong Formation of New Jersey and Pennsylvania will permit identification of raw material sources utilized for stone tool manufacture by Indian groups from ca. 4000 B.C. to ca. 1000 A.D. ACD: 1981.

T. M. BERG, A. A. SOCOLOW, D. M. HOSKINS, A. R. GEYER, Pa. Geol. Survey, S. I. ROOT, Esso Products, W. E. EDMUNDS, Consultant, D. B. MacLACHLAN, W. D. SEVON, A. D. GLOVER, and R. T. FAILL, Pa. Geol. Survey. Revision of Pennsylvania State Geologic Map. Compilation maps for the revision have been placed on open file at the Survey's headquarters in Harrisburg. Publication scheduled for 1980.

M. J. BERGIN, U. S. Geol. Survey, Northern Anthracite Field. Investigations under this project are carried on intermittently. Current work consists of geologic map compilation for Kingston, Pittston, and Wilkes-Barre West quadrangles. ACD: Continuing.

HERBERT BLODGET, NASA, GREGORY SMITH and WILLIAM BRAGONIER, R & P Coal Co., and DAVID O'HARA, Island Creek Coal Co. Potential Use of Remote Sensing for Mine Roof Stability, Indiana and Armstrong Cos., Pa. A cooperative project between NASA and R & P Coal Co. to determine if remote sensing techniques can be used to predict mining conditions and patterns of sedimentation. ACD: Dec. 1979.

R. T. FAILL, A. D. GLOVER, and J. H. WAY, Pa. Geol. Survey. Geology and Mineral Resources of the Blandburg, Tipton, Altoona, and Bellwood Quads., Blair, Cambria, Centre, and Clearfield Cos., Pa. Mapping of bedrock units from Cambrian to Pennsylvanian in age, surficial units (alluvium), structures in the Valley and Ridge province and Allegheny Plateau province, with discussion of the stratigraphy, structure, economic deposits, engineering properties, and environmental characteristics. ACD: 1979.

J. D. INNERS, Pa. Geol. Survey. Geology and Mineral Resources of the Bloomsburg and Mifflinville Quads. and Part of the Catawissa Quad., Columbia Co., Pa. ACD: 1979.

P. T. LYTTLE, U. S. Geol. Survey. Newark 2° Quad. Mapped areas will be field checked and reconnaissance mapping will be conducted in unmapped areas of Precambrian and Lower Paleozoic terrane in northern New Jersey. Special detailed studies will be made of klippen in Kittatinny Valley and Precambrian rock-Paleozoic rock interfaces.

Also, detailed investigations will be done of structure and internal stratigraphy of Hamburg klippe in eastern Pennsylvania. ACD: 1982.

D. B. MacLACHLAN, Pa. Geol. Survey. Geology and Mineral Resources of the Reading and Birdsboro Quads., Berks Co., Pa.

H. W. SCHASSE and T. M. BERG, Pa. Geol. Survey. Geology and Mineral Resources of the Conyngham Quad., Luzerne and Schuylkill Cos., Pa. ACD: Dec. 1980.

W. D. SEVON and T. M. BERG, Pa. Geol. Survey, and L. D. SCHULTZ, Gilbert Commonwealth, Inc. Geology and Mineral Resources of Pike Co., Pa. ACD: 1980.

J. H. WAY, Pa. Geol. Survey. Geology and Mineral Resources of the Washington and Millville Quads., Montour, Columbia, and Northumberland Cos., Pa. Geologic mapping of bedrock and surficial deposits, defining and sampling materials with possible economic potential, and describing environmental and engineering characteristics of all geologic units in the area. ACD: Winter 1980.

G. H. WOOD, JR., U. S. Geol. Survey. Southern Anthracite Field. Compilation of geologic map of anthracite-bearing rocks in Nesquehoning quadrangle in Carbon County is in process of being completed. ACD: Continuing.

ECONOMIC GEOLOGY

R. C. ANDREWS and G. H. MYER, Temple Univ. Ground Magnetic and Gamma Ray Spectrometer Survey of Uranium Bearing Pegmatites in the Coatesville–Wagontown, Pa. Area. Gamma ray survey results indicate 3 areas of anomalous radiation, with uranium assay values as high as 60 ppm. Magnetic results indicate these areas may be interconnected at depth, yielding one large continuous body. ACD: May 1979.

T. M. BERG, A. D. GLOVER, C. H. DODGE, J. R. SHAULIS, and V. W. SKEMA, Pa. Geol. Survey. Coal Resources of Greene, Washington, Allegheny, Westmoreland, and Fayette Cos., Pa. Available data for coal-bearing strata of Greene and Washington Counties have been assembled and prepared for computer entry into the National Coal Resources Data System (NCRDS). Data for Allegheny, Westmoreland, and Fayette Counties are now being assembled and prepared for entry. Coal reserve maps and tables, along with a wide variety of other derivative maps, will be produced when the output capabilities of NCRDS at the U. S. Geological Survey in Reston, Va., are operational. ACD for Allegheny, Westmoreland, and Fayette Cos.: June 1980.

E. C. T. CHAO, U. S. Geol. Survey. Coal Petrochemistry and Related Investigations. Upon delivery and installation of an automatic image analysis system, effort will be made toward testing, calibration, and development of procedures for quantitative modal analysis of coal macerals and inorganic components. Routines developed will make possible rapid and more accurate completion of petrologic investigation of Upper Freeport coal in Pennsylvania. ACD: Continuing.

DONALD CONTE and JOHN TOMIKEL, California State Coll. Luzerne Twp.: Fayette Co. Strip Mining. Research project for master's degree concerning extent of stripping and legal problems involved. ACD: May 1979.

J. R. DUNN and G. M. BANINO, Dunn Geoscience Corp. Appraisal, Summit Quarries, Inc. [Summit Station, Pa.]. Quality, quantity, accessibility, and marketability evaluated. Discounted cash flow analysis of probable production used to determine value. Plant, campsite, ponds, buildings also appraised (subcontracted to appraisers). ACD: Mar. 1, 1979.

J. R. DUNN and G. M. BANINO, Dunn Geoscience Corp. Appraisal, Wayne Crushed Stone Co. [Scranton and Lake Ariel, Pa.]. Quality, quantity, accessibility and marketability evaluated. Discounted cash flow analysis of probable production used to determine value. Plant, buildings, real estate also appraised (subcontracted as appropriate).

THOMAS GRIFFITH and DONALD THOMPSON, California State

Coll. Methane Gas in Coal Seams. Thesis project for master's degree. ACD: May 1979.

J. A. HARPER and K. D. ABEL, Pa. Geol. Survey. The Dunkirk and Pipe Creek Organic-Rich Shale Facies (Upper Devonian) of Pennsylvania [NW Pa.]. Study is a portion of the resource evaluation study of the Eastern Gas Shale Project. Involves detailed investigation of the Dunkirk and Pipe Creek facies, their stratigraphic and structural relationships to the Devonian section, and their history and future potential for production of natural gas. Work utilizes geophysical (gamma ray) logs for correlation. Results will be published as cross sections, isopach, structure and lithofacies maps and reports. ACD: Nov. 1979.

A. G. HARRIS, U. S. Geol. Survey. Conodont Maturation Index—Devonian Shales. Project will continue to provide conodont age determinations and organic maturation assessment of samples from Devonian black shales in Appalachian Basin in support of projects within the Eastern Gas Shales program. ACD: Continuing.

J. W. HOSTERMAN, U. S. Geol. Survey. Appalachian Basin Devonian Shale Clay Studies. X-ray diffraction analysis to identify clay mineralogy and bulk semi-quantitative mineralogy is being done on approximately 1,500 samples from Alabama, Tennessee, Kentucky, West Virginia, Virginia, Pennsylvania, Ohio, and New York. ACD: Continuing.

G. W. LENEY, U. S. Dept. of Energy, and BENDIX FIELD ENGINEERING CORPORATION. National Uranium Evaluation Program. Programs include uranium resource evaluation of the Scranton, Harrisburg, and Williamsport quadrangles, and hydrogeochemical and stream sediment reconnaissance of the Newark, Harrisburg, and Williamsport quadrangles. ACD: Mar. through Nov. 1979, depending on project and quadrangle.

B. J. O'NEILL, JR., and J. H. BARNES, Pa. Geol. Survey, and K. J. LILES, U. S. Bureau of Mines. Properties and Uses of Shales and Clays in South-Central Pa. [Bedford, Blair, Centre, Fulton, Huntingdon, Juniata, Mifflin, Perry, Snyder, and Union Cos.]. A continuation of the series of programmed studies to evaluate the economic potential of clay-shale raw materials for ceramic and nonceramic uses. ACD: Dec. 31, 1979.

B. J. O'NEILL, JR., and FIELD MAPPING DIVISION, Pa. Geol. Survey, and U. S. BUREAU OF 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 syn-

thesize the data into publications which will be useful guides to exploration targets. ACD: Continuous.

R. G. PIOTROWSKI, Pa. Geol. Survey. Medina-Tuscarora Stratigraphy and Gas Production [subsurface, western Pa.]. Relationship of the regional stratigraphy of Medina-Tuscarora to known natural gas production to determine the geological constraints upon production and to evaluate future potential. ACD: Oct. 1980.

A. W. ROSE, STEVEN HOWE, SCOTT TREGASKIS, and HIROSHI OHMOTO, The Pa. State Univ. Zinc-Lead Deposits in Lower Paleozoic Rocks of Central Pa. The Zn-Pb occurrences of Morrison Cove, Bedford County, are localized by faulting. Fluid inclusions show temperatures of about 150°C and highly saline brines; sulfur isotopes are similar to Mississippi Valley-type deposits. ACD: Aug. 1979.

A. W. ROSE and A. T. SMITH, The Pa. State Univ. Geology and Geochemistry of Uranium Prospects in the Catskill Fm. of Central and Eastern Pa. The geological and geochemical characteristics of all known uranium prospects in the Catskills are being investigated, with emphasis on regional stratigraphy, regional and detailed sedimentology, geochemical conditions, and other controls of the deposits. ACD: Sept. 1979.

J. W. SCHMOKER, U. S. Geol. Survey. Borehole Gravity Survey, Devonian Black Shale, Appalachian Basin. Will continue to obtain, digitize, and analyze gamma-ray and density logs for about 30 widely scattered locations in New York, Pennsylvania, Ohio, West Virginia, Kentucky, and Virginia. These wire-line data will be used to calculate organic contents for selected stratigraphic units and Devonian shale section as a whole, and will be related to uranium geochemistry, thermal maturity, clay content, and depositional framework of Appalachian Devonian black shales. ACD: Continuing.

R. C. SMITH, II, and J. H. BARNES, Pa. Geol. Survey. Geologic and Mineralogic Interpretation of Gamma Ray Reconnaissance Data for the Reading Prong, Eastern Pa. [portions of Berks, Lehigh, Northampton, and Bucks Cos.]. Aerial gamma ray data, collected as part of the NURE reconnaissance survey for the Dept. of Energy, is being interpreted for the Reading Prong portion of the Newark 1° x 2° quadrangle. Following a ground survey of the anomalous areas, representative samples will be collected for petrographic and trace element studies. ACD: Nov. 1980.

R. C. SMITH, II, Pa. Geol. Survey, and D. T. HOFF, William Penn Memorial Museum. Geology and Mineralogy of Copper-Uranium Occurrences in the Picture Rocks and Sonestown Quads. Each Cu-U occurrence located is being described and channel-sampled. Assays

for Cu and U, as well as semi-quantitative trace element analyses, are in progress. Trace amounts of primary and secondary arsenic minerals have been found to be widespread and trace vanadium secondary minerals have been detected for the first time in the area. ACD: Late 1979.

K. J. WENRICH-VERBEEK, U. S. Geol. Survey. Uranium Daughter Products in Modern Decaying Plant Remains, Soils, and Stream Sediments. Current work includes data interpretation, correlation, and statistical analysis of sediment and organic data from studies conducted in Arizona, New Mexico, Colorado, Utah, Montana, Maryland, Pennsylvania, Virginia, and West Virginia; statistical analysis of available uranium data on stream sediments, soils, and organic material in RASS system and from literature; continued sampling of peat bogs to determine whether they can better be used than water sampling in alpine environments for uranium exploration; soil study to determine if soils are useful for exploration in area where uranium occurrences are known but relatively undisturbed. ACD: 1979.

PETER ZUBOVIC, U.S. Geol. Survey. Collection and Chemical Analysis of Coal Samples from U. S. Coal Resources. During the year, between 600 and 650 coal samples will be collected from major coal-producing areas east of the Mississippi River and chemically analyzed for 60-80 major, minor, and trace elements. X-ray mineral analysis will be performed on about 500 selected low-temperature coal ashes, and about 400 samples will be ashed by low-temperature techniques preparatory to mineral analysis. ACD: Continuing.

ENGINEERING GEOLOGY

A. R. GEYER, JESSE CRAFT, and J. P. WILSHUSEN, Pa. Geol. Survey. Engineering Characteristics of the Rocks of Pa. (2nd ed.). Project covers geologic, engineering, and groundwater characteristics of each rock formation described on the 1980 State Geologic Map. Material will be presented in outline form and is intended as a supplement to the new state geologic map. ACD: 1981.

ENVIRONMENTAL GEOLOGY

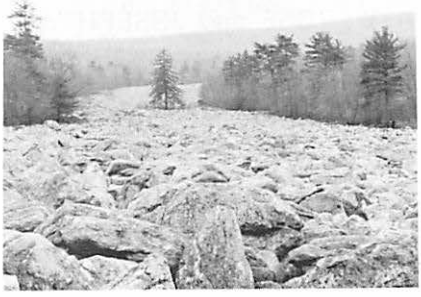
L. J. BACHMAN and R. R. PARIZEK, The Pa. State Univ. Environmental Geology of the Moshannon Valley Region, Centre and Clearfield Cos., Pa. [Philipsburg, Osceola Mills, Pa., and vicinity]. A study relating the geology, hydrology, and soils of a coal mining area to the suitability of parts of that area for different kinds of development, including coal mining, housing, commercial development, and other community development. The report includes a water table map, a geologic map, including new detailed mapping of a portion of the Sandy Ridge quadrangle, and land use suitability maps. ACD: June 1979.

G. M. BANINO and L. M. SETRIGHT, Dunn Geoscience Corp. Hydrogeologic Investigation of Proposed Cement Kiln Dust Disposal Area [Lehigh Valley]. A preliminary geologic and hydrologic study of a thick till sequence has led to preliminary approval. Installation of monitoring wells and design of the facility are in progress. ACD: June 1979.

N. K. FLINT, Univ. of Pitt., and BRUCE FERGUSON, Consultant. Natural Resources Inventory of Fox Chapel Borough, Allegheny County, Pa. ACD: Summer 1980.

S. P. GARABEDIAN and R. R. PARIZEK, The Pa. State Univ. Determining Factors in Streambed Infiltration in the Anthracite Coal Fields [Shenandoah and Mahanoy City, Pa.]. This project entailed gauging two losing streams in the Western Middle Anthracite Coal Field. Correlations were made between estimated streambed permeabilities from sediment analysis and the calculated permeabilities from the seepage runs with some success. ACD: June 1979.

GENERAL GEOLOGY



R. P. FRANKE, Pocono Environmental Education Center. Geology: The Earth in Motion. An introductory geology program for youngsters and adults in an experiential learning curriculum. Presently covers glaciation, weathering, mountain building and fossilization. At a later date it will include soil building and rock identification. ACD: June 1979.

J. P. WILSHUSEN, Pa. Geol. Survey. Geology of the Appalachian Trail in Pa. [SE Pa.]. The geology of the trail includes a description of characteristics of each geomorphic section with detailed, illustrated accounts of points of interest along the trail route. Sketch maps with geologic cross sections and descriptions at specific points are keyed to a geologic map of the trail. ACD: Jan. 1980.

GEOCHEMISTRY

C. B. CECIL, R. W. STANTON, W. CRAIG, R. B. FINKELMAN, and F. DULONG, U. S. Geol. Survey. Geology of Contaminants in Coal [western Pa.]. The project is designed to determine the geologic factors that control major, minor and trace element variation in the Upper Freeport coal of western Pa. Tentatively, the bulk of the nonpyritic ash content is of plant origin. ACD: Oct. 1980.

G. E. CLAYPOOL, U. S. Geol. Survey. Organic Geochemical Source-Bed Studies, Devonian Black Shale, Appalachian Basin. Amount and composition of natural gas generated from organic matter in Devonian black shale of Appalachian Basin will be estimated, and thermal stability of methane at high temperatures in these rocks will be investigated. Simulation of gas generation will be done by laboratory experiments. ACD: 1981.

A. W. ROSE and ELLEN KARASEVICH, The Pa. State Univ. Radium and Uranium in Limonites as a Guide to Uranium Ores [eastern and north-central Pa.]. ACD: Sept. 1979.

A. W. ROSE and JOSEPH McNALLY, The Pa. State Univ. Groundwater as a Geochemical Prospecting Medium for Lead-Zinc Ores in Carbonate Rocks [Chambersburg-Waynesboro area]. About 100 groundwaters are being analyzed for lead-zinc, fluorine and major elements and compared with waters from zinc prospects near Lancaster to test this exploration technique. ACD: Mar. 1980.

A. W. ROSE, SIMON PIRC, CHRISTY BELL, and PETER TOLE, The Pa. State Univ. Uranium and Thorium in Sedimentary Rocks Near Sandstone-Type Uranium Deposits [Pa. and Colo.]. The upper-

most Catskill Formation near Jim Thorpe is slightly enriched in uranium and thorium relative to lower units of the Catskill and laterally equivalent beds, and was apparently formed of U and Th-rich detritus. ACD: Dec. 1979.

GEOMORPHOLOGY

W. B. WHITE, The Pa. State Univ. Pa. Caves. A catalog of the known caves of Pennsylvania including physical description maps and geologic interpretation is being prepared. The chapters on Centre and Huntingdon Counties were completed during the year. ACD: Fall 1979.

W. B. WHITE and E. L. WHITE, The Pa. State Univ. Studies of the Appalachian Karst [all Appalachian limestone terrains]. Unique landforms are developed on limestone terrains whose physical characteristics vary systematically with rock type, structure, and climate. The forms of Appalachian karst landforms are measured, the measures analysed, and related to the process of solutional modification of the landscape. Study regions are chosen from the entire Appalachian highlands, Pennsylvania to Alabama. ACD: 1984.

GEOPHYSICS

S. S. ALEXANDER, The Pa. State Univ. Pennsylvania Seismic Monitoring Network (NE U.S. seismic network). Principal objectives of contract are: to establish a regional seismic network centered in Pennsylvania to monitor local seismic activity; to collect base-line data on spatial and temporal distribution of seismic events; to identify and distinguish local earthquakes from quarry blasts; to calibrate the region with regard to travel-time curves; to construct seismicity maps for Pennsylvania and surrounding areas and relate patterns to structural features and tectonic stresses; and to work cooperatively with other network operators to establish overall patterns of seismicity.

B. F. HOWELL, JR., The Pa. State Univ. Earthquake Expectancy in Pa. Predictions are being calculated of average return periods of earthquakes of different intensities in whole state and individual locations. ACD: 1979.

C. K. SCHARNBERGER, Millersville State Coll. Seismicity of Southeastern Pa. Location of epicenters by seismograph and intensity reports; correlation with geologic structure. ACD: Open-ended.

VICTOR SCHMIDT, H. B. ROLLINS, JACK DONAHUE, MICHAEL PAYNE, STEVE SHULIK, and RICHARD LEE, Univ. of Pitt. Carboniferous Magnetostratigraphy of the Appalachian Basin. Main purpose of the project is to locate excursions (i.e. reversals, secular variation) within the magnetic record suitable for intra- and interbasinal time correlations; coupled with characterization of magnetization as a function of different lithologies.

GLACIAL GEOLOGY

E. B. EVENSON and JIM COTTER, Lehigh Univ., LES SIRKIN, Adelphi Univ., and W. D. SEVON, Pa. Geol. Survey. Wisconsinan Deglaciation Chronology of Northeastern Pa. and Northwestern N.J. The study concentrates on mapping Wisconsinan deglaciation deposits in the investigation area. The project will attempt to establish a radiocarbon controlled deglaciation chronology by dating organic matter recovered from bogs and lakes in the study area. Palynology will be used in an attempt to obtain the oldest organic matter for dating.

R. P. FRANKE, Pocono Environmental Education Center. Glacial Features Around PEEC. A display consisting of charts, posters, and a 350 pound striated rock shows the role which glaciers played in shaping the land. A model showing land and water features during glacial periods is under construction. ACD: June 1979.

F. T. HSU, Gilbert Associates, Inc. A Landslide Study in the Vicinity of the Tioga-Hammond Lakes, Tioga Co., Pa. This study was undertaken to evaluate potential landslide areas adjacent to the Tioga and Hammond dams, outlet works and reservoirs that could jeopardize the safety of the foregoing features or cause damage to contiguous areas. ACD: May 1979.

D. E. MARCHAND, U. S. Geol. Survey. Quaternary Studies, Central Susquehanna Valley [not an official U.S.G.S. project]. ACD: 1979.

JACK RIDGE, and E. B. EVENSON, Lehigh Univ. The Quaternary Geology of the Great Valley in Pa. and N.J. Near the Terminal Moraine [Northampton Co., Pa.; Warren Co., N.J.]. A morphologic sequence mapping of the glacial deposits has revealed evidence for one pre-Wisconsinan and at least five Wisconsinan "sequences." Provenance (pebble, gravel) and ice striation data will provide information on Wisconsinan ice flow. Clay and heavy mineral weathering in soil groups will hopefully provide a relative age differentiation and correlation with deposits of the Pocono Plateau. ACD: June 1980.

W. D. SEVON, Pa. Geol. Survey, and G. H. CROWL, Ohio Wesleyan Univ. The Late Wisconsinan Border in Northern Pa. ACD: July 1979.

HYDROLOGY

E. S. BAIR and R. R. PARIZEK, The Pa. State Univ. Numerical Simulation of the Effect of Open-Pit Anthracite Mining on the Ground-Water Flow System in Part of the Southern Anthracite Field [Southern Anthracite Field, Tamaqua region]. Pumping-test data, base-flow recession data, core porosity and permeability data, and water-level data were used in both a 2-D finite difference map-view model and a 2-D finite difference cross-section model to predict the effect a proposed 5700' x 3200' x 900' open-pit anthracite mine would have on the local and regional ground-water flow system in part of the Southern Anthracite Field. The model is being used to calculate ground-water inflow rates into the pit, estimate seepage forces on the pit floor, and the possible dewatering effects on local and municipal water supplies. ACD: Dec. 1979.

A. E. BECHER, U. S. Geol. Survey, and L. E. TAYLOR, Pa. Geol. Survey. Hydrogeology of the Great Valley in Franklin Co., Pa. ACD: Jan. 1980.

D. F. KIBLER, E. L. WHITE, W. R. DeTAR, and E. J. PARTENHEIMER, The Pa. State Univ. Irrigation Study III [Pa.]. A water availability map based on minimum flow data is being constructed. This map should indicate the maximum water which may be mined from surface streams for use in irrigation. ACD: Dec. 1979.

SHEILA ROEBUCK and R. R. PARIZEK, The Pa. State Univ. Predicting Groundwater Flows to Underground Coal Mines in Pa. Geologic and hydrologic variables will be related to mine discharge data. Statistical analyses will determine significant associations and be used to develop regression equations that can estimate groundwater inflow rates to mines for various settings of western Pennsylvania. ACD: Dec. 1979.

D. W. ROYER and L. E. TAYLOR, Pa. Geol. Survey. Summary Groundwater Resources of Adams Co., Pa. ACD: Sept. 1980.

R. A. SLOTO, U. S. Geol. Survey. Effect of Urbanization on the Quantity and Quality of Ground Water and Low Streamflow in Warminster Twp., Bucks Co., Pa. The effects of urbanization in southeastern Pennsylvania on the quantity and quality of ground water and low streamflow and their relationship will be examined. ACD: Sept. 1980.

R. A. SLOTO and L. J. McGREEVY, U. S. Geol. Survey. Development of a Digital Model of Ground-Water Flow in Deeply Weathered Crystalline Rock, Chester Co., Pa. A digital model of ground-water flow in the Upper Pickering Creek basin, Chester County, has been developed. The model simulates the effects of potential development on the hydrologic system. ACD: Mid 1979.

J. H. WILLIAMS and R. R. PARIZEK, The Pa. State Univ. Hydrogeology of the Danville Area, Pa. Study includes mapping of bedrock and surficial geology, water-table mapping, aquifer evaluation, and delineation of hazards to the hydrologic environment. ACD: Aug. 1979.

C. R. WOOD and G. N. PAULACHOK, U. S. Geol. Survey. Ground-Water Quality and Flow in the Coastal Plain Aquifer, Philadelphia, Pa. ACD: Sept. 1981.

IGNEOUS AND METAMORPHIC PETROLOGY

W. A. CRAWFORD, Bryn Mawr Coll. Geology of the Honey Brook Upland, Piedmont, SE Pa. A mapping petrologic, geochemical study to aid in the unraveling of the geologic history of this metamorphic terrain.

A. A. DRAKE, JR., R. I. TILLING, and P. T. LYTTLE, U. S. Geol. Survey. Petrochemistry and Radiogenic Heat Producing Minerals in Precambrian Rocks of Reading Prong [Pa., N.J., N.Y.]. Work this year will be concentrated in the north-central part of the Prong. ACD: 1982.

WILLIAM SCHRYBA and G. H. MYER, Temple Univ. Amphibolite Units of the Wissahickon Fm. [Delaware and Philadelphia Cos.]. ACD: Jan. 1980.

MINERALOGY

J. H. BARNES, Pa. Geol. Survey, W. F. DOWNEY, JR., and R. B. FINKELMAN, U. S. Geol. Survey. Mineralogy Associated with Burning Anthracite Deposits [Luzerne, Schuylkill, and northern Dauphin Cos.]. Study of minerals forming from sublimation of gases produced by subsurface fires in anthracite mines and waste piles. ACD: 1979.

R. B. FINKELMAN and M. E. MROSE, U. S. Geol. Survey. Characterization of New Minerals from the Surfaces of Burning Culm Banks [anthracite and bituminous regions]. ACD: 1981.

M. E. MROSE, U. S. Geol. Survey. Mineralogical Investigations. Will continue mineralogical and crystallographic study of minerals found

associated with burning culm banks in Pennsylvania and study of Nd-rich carbonate hydrate from Saucon Valley, originally described as "lathanite." Search for suitable crystal of ajoite for crystallographic and structural studies continues. ACD: Continuing.

PALEONTOLOGY

E. B. GIFFIN, Wellesley Coll. Lower Silurian Gnathostomes from Pa. [Perry Co.]. ACD: 1980.

D. M. HOSKINS, Pa. Geol. Survey. Fossil Collecting in Pa. (2nd ed.). Progress on reexamining sites in the first edition is slow; many have been constructed over and many are now not publicly available. Search for alternate sites has not been very rewarding.

W. F. KLOSE, II, Paleontological Research Inst., and FRANK CARPENTER, Curator of Paleozoic Insects, Museum of Comparative Zoology, Cambridge, Mass. Contributions to the Pennsylvanian Age Flora and Fauna of the Anthracite and Semi-Anthracite Coal Fields of NE Pa. Collection of Pennsylvanian age flora and fauna with deposition of prepared specimens in the William Penn Memorial Museum, Harrisburg. ACD: Ongoing.

W. A. OLIVER, JR., U. S. Geol. Survey. Systematics and Biostratigraphy of Corals from Keyser Limestone [Pa., Md., Va., W.Va.]. ACD: 1982.

D. C. PARRIS and S. S. ALBRIGHT, New Jersey State Museum. Silurian and Devonian Fossils and Fossil Sites in the Delaware Water Gap National Recreation Area. This project will be a compilation of paleontologic information for use in the interpretive activities of the National Park Service. ACD: Sept. 30, 1980.

ALFRED TRAVERSE and V. F. MUTTI and other students, The Pa. State Univ. Palynological Zonation of Middle and Upper Devonian Rocks of Central Pa. ACD: Uncertain.

ALFRED TRAVERSE, The Pa. State Univ., and P. K. STROTHER, Harvard Univ. Plant Remains from Silurian Rocks of Pa. [central Pa.]. ACD: 1980.

SEDIMENTOLOGY

EDWARD COTTER, Bucknell Univ. Environments of Deposition of the Tuscarora Fm. and Clinton Group (Silurian) in Central Pa. ACD: Spring 1981.

J. C. FERM, Univ. of S. Car., W. A. BRAGONIER, Rochester & Pittsburgh Coal Co., and GEORGE PEDLOW. Guide to Cored Rocks of the Pittsburgh Basin. Several thousand core samples from diamond drill holes were sampled and grouped into lithologically similar groups. Samples from each lithologic group were photographed and assigned a 3-digit lithologic code. A guidebook to the cored rocks will be assembled from the photographs. ACD: Dec. 1979.

ED HOHOS, Rochester & Pittsburgh Coal Co. A Paleoenvironmental Model of the Upper Freeport Coal Seam and Associated Rocks, Indiana and Armstrong Cos., Pa. Developed a model that describes the depositional environment at the time of Upper Freeport coal formation. Related the thickness, extent, and quality of the coal to the depositional environment. Model used to predict coal character. ACD: May 1979.

W. D. MARTIN, L. L. Y. CHANG, D. C. BENTON, M. A. THOMSEN, and D. J. WEIMER, Miami Univ. Petrology of the Mudstones and Shales of the Dunkard Group (Upper Pennsylvanian and Permian) of Pa., W.Va., and Ohio. The rock facies, paleoslope and environments of accumulation of the Dunkard sediments have been delineated. Two belt-type, and some smaller, sandstone units have been mapped and petrology determined. This research is directed to the fine clastics. ACD: Aug. 1980.

S. T. PAXTON and E. G. WILLIAMS, The Pa. State Univ. Textural and Mineralogical Modifications in Sediments as a Function of Coal Rank [Pa.]. ACD: 1980-81.

A. M. THOMPSON, DAVID GOLIKE, and SUSAN HALLAM, Univ. of Delaware. Sedimentological Studies of Upper Ordovician Clastic Lithologies in Central Pa. [Valley and Ridge belt west of Susquehanna River]. Project (1) uses sandstone lithology and paleon-

tology to interpret Martinsburg-Reedsville basin evolution, and (2) traces lithofacies in relation to Juniata-Tuscarora color boundary. ACD: 1980.

STRATIGRAPHY

T. M. BERG, Pa. Geol. Survey, and W. E. EDMUNDS, Consultant. The Huntley Mountain Formation of North-Central Pa. A new formation including the nonmarine transitional sequence between the Catskill Formation and the Burgoon Sandstone is being named. The formation has its type section at Huntley Mountain near Waterville, Pa. It has been mapped over about 4,000 square miles for the new state geologic map. ACD: Late 1979.

PING-FAN CHEN, W. Va. Geol. & Economic Survey. Lower Paleozoic Stratigraphy, Tectonics, Paleogeography, and Oil/Gas Possibilities in the Central Appalachians. Paleogeography. ACD: 1979. Oil and gas possibilities. ACD: 1981.

W. J. CLARK, Rochester & Pittsburgh Coal Co. Upper Freeport Depositional Model [western Pa.]. A depositional model for the Upper Freeport coal has been developed for a 14 x 26 mile study area. Patterns emerge to explain splitting, thinning/thickening, and/or absence of coal. ACD: June 1979.

A. D. GLOVER, C. H. DODGE, V. W. SKEMA, and J. R. SHAULIS, Pa. Geol. Survey. TASIC (Temporarily Available Stratigraphic Information Collection). This project is a continuing program for the recovery of stratigraphic data from active coal and clay strip mines while exposures are available. The long-term project is designed to provide data for future mapping and regional mineral resource evaluation. ACD: Continuing program.

P. W. GOODWIN, E. J. ANDERSON, R. R. LEE, and GABRILLE LaROCHE, Temple Univ. Punctuated Aggradational Cycles (PAC's) in Ordovician, Silurian, and Devonian Sequences [central Pa.]. Application of PAC hypothesis to Appalachian Paleozoic stratigraphy. Primary emphasis on Helderberg carbonates. One goal is detailed event-correlation from W. Va. to Mohawk Valley, N.Y. ACD: Long-term project.

J. C. GRIESEMER and J. D. RYAN, Lehigh Univ. A Petrographic Study of the Sandstones and Conglomerates in the Mauch Chunk-Pottsville Transition in NE Pa. Objectives are to better assign the Mauch Chunk-Pottsville contact and to better understand the source(s) of these rocks. ACD: Summer 1979.

J. A. HARPER and R. G. PIOTROWSKI, Pa. Geol. Survey. Stratigraphic Correlation of Surface and Subsurface Middle and Upper Devonian, SW Pa. Middle and Upper Devonian stratigraphic units in the subsurface of Pennsylvania are correlated to surface units by use of geophysical (gamma ray) and lithologic logs. Subsurface nomenclature is taken largely from Eastern Gas Shales Project studies. Explanations are given for delineating strata on gamma ray logs. ACD: Oct. 1979.

LOUIS HEYMAN, Pa. Geol. Survey. The Ridgeley Formation in the Subsurface of Pa. The subsurface Ridgeley Formation is defined by geophysical log markers. Delineation of the unit, a subsurface section showing lithic variations in the unit, and map showing the extent and thickness of the unit and percent sandstone are planned. ACD: Sept. 1979.

M. R. RODGERS, Univ. of Pitt. Stratigraphy and Structural Geology in the Broadtop Coal Field of Pa. The purpose of this master's thesis is to determine stratigraphic and structural relationships within the Broadtop coal field, with emphasis on the coal units. ACD: Apr. 1981.

J. B. ROEN, U. S. Geol. Survey. Stratigraphy of the Devonian Black Shales in the Appalachian Basin. Studies are still continuing in order to establish a regional stratigraphic framework and delineate areal extent, thickness, and structure of Devonian black shales and related rocks of Appalachian Basin to facilitate a complete characterization study and hydrocarbon resource appraisal. ACD: Continuing.

T. O. WRIGHT, Allegheny Coll., and G. C. STEPHENS, George Washington Univ. Clastic Ordovician Rocks of Pennsylvania [Martinsburg outcrop belt, Pa.]. Project involves detailed mapping of the

Martinsburg Shale and associated rocks in Pennsylvania to establish biostratigraphic and lithostratigraphic frameworks for these rocks. Petrographic and sedimentologic analyses are being done to refine the area's geologic history. ACD: 1980.

STRUCTURAL GEOLOGY

P. W. G. BROCK, Queens Coll. of CUNY. Structural Relationships between the Precambrian and Paleozoic Rocks in and Adjacent to the Reading Prong [mostly on the N.J. side but including the west bank of the Delaware River]. Structural data are being accumulated in the course of teaching geology field courses in the area.

A. A. DRAKE, JR., P. T. LYTTLE, G. A. SCARNAUACK, MICHAEL TAYLOR, and J. E. REPETSKI, U. S. Geol. Survey, and G. G. LASH and ROBERT KASTELIC, Lehigh Univ. Central Appalachian Tectonic History (Newark 1° x 2° quad.). A study of the evolution of the central Appalachians as a type mountain range, particularly the role played by each of the major orogenies, their interrelations, and possible plate models. ACD: 1982.

R. T. FAILL, Pa. Geol. Survey. Tectonic Map of Pa. Map will display: 1) location, extent and name of each of the major folds and faults; 2) prominent joint orientations; 3) contours on top of basement; 4) outcrop trace of Old Port Formation, and important angular unconformities; 5) structure contours on top of Onondaga in western and north-central Pennsylvania; 6) igneous bodies; 7) tectonic and metamorphic boundaries; 8) radiometric dates with locations; and 9) earthquake epicenters. ACD: June 30, 1980.

L. D. HARRIS, U. S. Geol. Survey. Structural Studies of the Devonian Black Shale in the Appalachian Basin. Compilation and analysis of regional joint data, Landsat lineaments, and their relationship to the regional structural pattern are continuing. ACD: Continuing.

L. D. HARRIS, U. S. Geol. Survey. Thrust Fault Deformation and Hydrocarbon Entrapment. Initial work under this reactivated project will be analysis of thrust fault deformation in Valley and Ridge and in adjacent Appalachian Plateau in order to document and establish geologic controls for present-day distribution and changes in structural style, and to construct a regional tectonic model that will be used in evaluating location and geometry of structural traps available for hydrocarbon accumulation. ACD: Continuing.

G. G. LASH, Lehigh Univ., A. A. DRAKE, JR., and P. T. LYTTLE, U. S. Geol. Survey. Structure and Stratigraphy of the Autochthonous and Allochthonous Rocks of the Hamburg and Kutztown Quads. A three-pronged structural analysis of the parautochthonous Lehigh Valley sequence, allochthonous Hamburg Klippe, and post-Ordovician rocks in order to differentiate different deformational phases. ACD: June 1980.

C. K. SCHARNBERGER, Millersville State Coll. Geologic Structure and Magnetic Anomalies in Southern Lancaster Co., Pa. Detailed mapping of magnetic anomalies using ground-based magnetometer and investigation of relationship to structure along the "Martic Line." Also, mapping and structural interpretation of diabase dikes in the same area.

A. M. THOMPSON, Univ. of Delaware. Modern Seismicity and Brittle Structural Evolution of the Piedmont-Coastal Plain Boundary in Mid-Atlantic States [eastern Pa., Del., Md., N.J.]. Project is coordinating geological, geophysical and photolineament information with distribution of modern seismicity to establish probability of Recent faulting in area of high density of nuclear reactors. ACD: 1981.

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GROUND-WATER LEVELS
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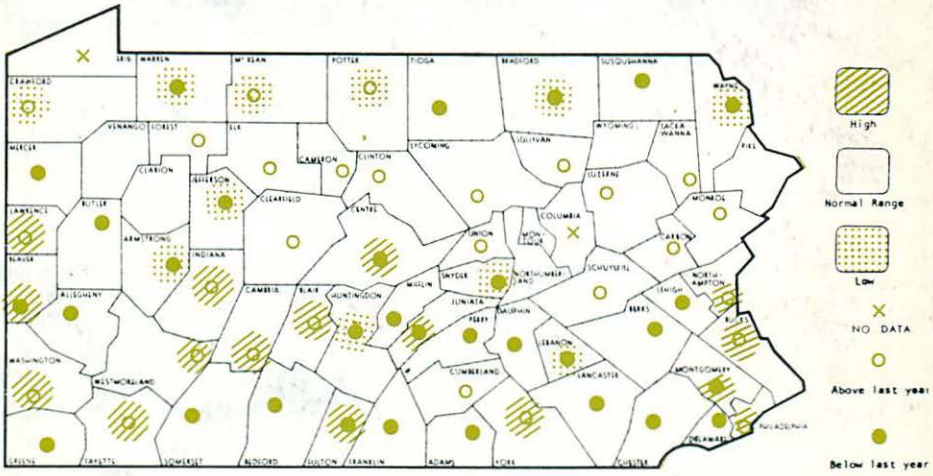
JULY 1979



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Address Corrections Requested