

G E O L O G Y **PENNSYLVANIA**



THE PENNSYLVANIA GEOLOGICAL SURVEY

VOL. 19/4

COMMONWEALTH OF PENNSYLVANIA

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ON THE COVER: Quartzite beds in the Tuscarora Formation exposed along the crest of Brush Mountain. The view is toward the south, just north of the road over the mountain at Skelp Gap, about 3 miles northeast of Bellwood, Blair County. Photograph by R. T. Faill.

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AUGUST 1988



Science Versus Pseudoscience

Early in the spring of 1988 we were exposed to various media treatments of a circumstance of pseudoscience. There were television, radio, and newspaper accounts about the conclusions credulously reached by the Orson Welles film *The Man Who Saw Tomorrow*, a portrayal of the poetic prognostications of Nostradamus, a 16th-century astrologer. Over 2,000 Californians ordered the videotape of the film to see for themselves the conclusion that an earthquake would strike "New City," supposedly a California city, in April. Geophysicists and geologists are confident that earthquakes *will* occur in California, but all of the best science they perform will not allow prediction of exact dates. Only seers, astrologers, and other paranormals are willing to predict such events.

While California may have its share of residents willing to set aside rational acceptance of the limitations and ambiguities of geology, we, too, in Pennsylvania have our believers in the occult—in the secret of water smelling. A substantial portion of our population will accept the induced bending of hand-held twigs as indicating the location of waters hidden beneath the twig-holder's feet. No connection is made with the pervasive rain that they see fall on the earth's surface and the porous nature of the soil into which it percolates. Rather there is a preferred belief that hidden streams are rushing beneath our feet.

If we geologists are to reduce the popular acceptance of pseudoscience we must assist people in learning to understand the connection between natural events, such as the falling of rain with its disappearance into the soil, and its reappearance as water in a spring or well. Pseudoscience and the occult will flourish unless we translate the complexities of geology into understandable knowledge for all, not for just a few.

Donald M. Hooker

State Geologist



GEOLOGICAL RESEARCH IN PENNSYLVANIA 1988

Introduction

This publication, the thirty-first annual report in its series, contains a listing of all known current geological research in Pennsylvania and all known reports published during the past year pertaining to Pennsylvania geology. Because of the large number of projects reported to us, we editorially condense the descriptions to fit available space.

We have requested each person to estimate an anticipated completion date (ACD) for each project. The anticipated completion date is the author's estimate of the date when the project will be finished; additional time should be allowed for publication of the report.

If you wish more information on a project described herein, please write directly to the author; most of these projects will not be published by the Pennsylvania Geological Survey inasmuch as most are not Survey-sponsored projects.

The listings are grouped into major categories of research to facilitate your search for information on a particular subject. 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, PA 17120.

Areal Geology

T. M. BERG and C. M. DODGE, Pa. Geol. Survey. **Map 61, Atlas of Preliminary Geologic Quadrangle Maps of Pennsylvania** (2nd ed.). The very popular "Map 61 Atlas" is being revised to include all quadrangles of Pennsylvania, and many corrections, additions, and changes are being included. This will provide users with a single, desktop source for all of the bedrock geology of the Commonwealth. ACD: 1990 or 1991.

T. M. BERG, Pa. Geol. Survey, and M. L. O'NEAL, C. B. CUBBISON, JACQUELINE LUNDY, and J. B. LESSMAN (all student interns, Pa. Geol. Survey). **Geologic Map of Warren County, Pennsylvania**. This map is being prepared for the Warren County groundwater report being compiled by M. E. Moore (Pa. Geol. Survey) and T. F. Buckwalter (U.S. Geol. Survey, Water Resources Division). ACD: Summer 1988.

R. T. FAILL and D. W. VALENTINO, Pa. Geol. Survey. **Geological Investigations in the Pennsylvania Piedmont**. Reconnaissance of the Piedmont province continues, which will soon lead to projects addressing specific geologic, petrologic, structural, and sedimentologic problems, such as the nature of the Peach Bottom syncline and Cream Valley fault, terrane boundaries within the Wissahickon, relations among the Grenville massifs and cover rocks, and other such matters.

J. D. INNERS, Pa. Geol. Survey. **Geology and Mineral Resources of the Hazleton Quadrangle, Luzerne, Carbon, and Schuylkill Counties, Pennsylvania**.

D. B. MacLACHLAN, Pa. Geol. Survey. **Geology of the Freeburg Quadrangle, Snyder County, Pennsylvania**. ACD: 1988.

W. D. SEVON, Pa. Geol. Survey. **Surficial Geology of the Conestoga, Holtwood, Quarryville, and Wakefield Quadrangles, Lancaster and York Counties, Pennsylvania**. ACD: 1988.

Economic Geology

S. W. BERKHEISER, JR., and R. C. SMITH, II, Pa. Geol. Survey. **Additional Occurrences of Specialty-Use Silica in Pennsylvania**. The pur-

pose of the investigation is to identify and characterize Cambrian-age clastic resources within the South Mountain area of Adams, Cumberland, and Franklin Counties. Additional data concerning the thickness and quality of selected quartz veins and a few other sandstones are also included. Results of the analyses will be open-filed when reproducible Fe and Al values are available. A core hole anticipated to penetrate about 850 feet of sandstone and quartzite will be drilled in the 1988–89 winter season. ACD: Mid-1989.

S. W. BERKHEISER, JR., and R. C. SMITH, II, Pa. Geol. Survey. **Mineral Fillers of the Piedmont Physiographic Province of Pennsylvania.** Reconnaissance investigations of potential mica, talc, silica, and carbonate mineral fillers in the Piedmont physiographic province of Pennsylvania. These studies are preliminary in nature and support anticipated new mapping programs in the region. ACD: Ongoing.

S. W. BERKHEISER, JR., and R. C. SMITH, II, Pa. Geol. Survey. **Reconnaissance Investigations and Analyses of High-Purity Carbonate Resources in Pennsylvania.** Preliminary reconnaissance investigations with the object of updating and identifying new high-purity carbonate resources for use in the acid-mitigation fields. The Valley and Ridge physiographic province contains numerous carbonate sequences of Cambrian through Devonian age. ACD: Ongoing.

W. A. BRAGONIER, Rochester and Pittsburgh Coal Co., and A. D. GLOVER and J. G. PHILLIPS, Pa. Geol. Survey. **Coal Resources of Armstrong County, Pennsylvania—Part 1, Coal Crop Lines, Mined-Out Areas, and Structure Contours.** Published and unpublished data will be used to prepare a series of maps including (1) separate crop-line maps for each principal coal seam showing areas of strip and deep mining, and (2) composite maps showing the crop lines of all principal coals, as well as structure contours and fold axes. ACD: 1989.

W. A. BRAGONIER, Rochester and Pittsburgh Coal Co., and A. D. GLOVER and J. G. PHILLIPS, Pa. Geol. Survey. **Coal Resources of Indiana County, Pennsylvania—Part 1, Coal Crop Lines, Mined-Out Areas, and Structure Contours.** Published and unpublished data will be used to prepare a series of maps including (1) separate crop-line maps for each principal coal seam showing areas of strip and deep mining, and (2) composite maps showing the crop lines of all principal coals, as well as structure contours and fold axes. ACD: 1988.

C. H. DODGE, Pa. Geol. Survey. **Coal Resources of Elk County, Pennsylvania—Part 1, Coal Crop Lines, Mined-Out Areas, and Structure Contours.** Detailed geologic mapping of the coal-bearing strata (Pottsville, Allegheny, and Glenshaw Formations) of Pennsylvanian

age. Emphasis is on the major coal-bearing structural basins. A series of maps will be prepared including (1) separate crop-line maps for each principal coal seam showing areas of strip and deep mining, and (2) composite maps showing the crop lines of major and minor coals, as well as structure contours and fold axes. ACD: 1990.

A. D. GLOVER, Pa. Geol. Survey. **Coal Resources of Jefferson County, Pennsylvania—Part 1, Coal Crop Lines, Mined-Out Areas, and Structure Contours.** Published and unpublished data will be used to prepare a series of maps including (1) separate crop-line maps for each principal coal seam showing areas of strip and deep mining, and (2) composite maps showing the crop lines of all principal coals, as well as structure contours and fold axes. ACD: 1991.

S. A. HAYNES, Pa. Geol. Survey. **Compilation of Rock and Soil Uranium Analyses and Occurrences in Pennsylvania.** All known uranium occurrences in Pennsylvania are being compiled on a single topographic map base at a scale of 1:500,000. This map will include information on host rock type, approximate tonnage of mineralized rock, high-grade occurrences, and references for each occurrence. ACD: June 1988.

L. J. LENTZ, Pa. Geol. Survey. **Coal Resources of Greene County, Pennsylvania—Part 2, Overburden Thickness, Coal Quality, and Coal Reserve Estimates.** Computer compilation and manipulation of coal data for Greene County continues. Data base includes point and line data, stratigraphic data, and chemical data in files managed by the U.S. Geological Survey in Reston, Virginia. ACD: Ongoing.

L. J. LENTZ, Pa. Geol. Survey. **Coal Resources of Washington County, Pennsylvania—Part 2, Overburden Thickness, Coal Quality, and Coal Reserve Estimates.** Computer compilation and manipulation of coal data for Washington County continues. Data base includes point and line data, stratigraphic data, and chemical data in files managed by the U.S. Geological Survey in Reston, Virginia. ACD: Ongoing.

A. K. MARKOWSKI, Pa. Geol. Survey, JIM ULERY, U.S. Bureau of Mines, JOAN HAWK, Rochester and Pittsburgh Coal Co., and DAVE DANON, Consolidated Natural Gas Co. **Preliminary Feasibility Study of the Coal-Bed Methane Resource in Pennsylvania.** ACD: June 1989.

S. T. PEES, Samuel T. Pees and Assoc. **Mapping the Main Sandstone Bundle of the Grimsby-Cabot Head Formations for Horizontal Drilling Purposes in Northwest Pennsylvania.** Project involves techniques of mapping the objective section of the Lower Silurian Medina Group for targeting horizontal penetration. Structural, stratigraphic, and geometric factors are applied in developing this methodology. ACD: May 1989.

G. R. ROBINSON, Project Chief, U.S. Geol. Survey. **Metallogeny of the Early Mesozoic Basins of the Eastern United States.** Two core holes in a diabase sheet in the Gettysburg basin have been logged and sampled for petrographic and geochemical analysis, and are currently being studied. Field work and other geologic studies in the Newark basin of New Jersey and Pennsylvania, the narrow neck area between the Newark and Gettysburg basins of Pennsylvania, and the Culpeper basin of Virginia are continuing. We are in the process of bringing to completion many of the ongoing topical studies. We hope to complete preliminary versions of a suite of maps covering all of the exposed early Mesozoic basins of the eastern United States and expect to have many of these maps ready for review by Summer 1988.

C. B. SCLAR and P. H. BENOIT, Lehigh Univ. **Comparative Chemical Study of the "Vein" Chromite and the Massive Chromite from the Wood's Chrome Mine, State Line District of Pennsylvania-Maryland.** The chromite deposit at the Wood's chrome mine consists of massive chromite and "vein" chromite. The origin of the latter has been the source of much controversy. A comparative electron microprobe analysis of "vein" and massive chromite should yield chemical clues as to the origin of the "vein" chromite. ACD: June 1990.

V. W. SKEMA, Pa. Geol. Survey. **Coal Resources of Clearfield County, Pennsylvania—Part 1, Coal Crop Lines, Mined-Out Areas, and Structure Contours.** Detailed geologic mapping of the coal-bearing strata of Pennsylvanian age. Emphasis is on the major coal-bearing structural basins. A series of maps will be prepared including (1) separate crop-line maps for each principal coal seam showing areas of strip and deep mining, and (2) composite maps showing the crop lines of major and minor coals, as well as structure contours and fold axes.

R. C. SMITH, II, and S. W. BERKHEISER, JR., Pa. Geol. Survey. **Reconnaissance for Precious Metals in Southeastern Pennsylvania.** Plan to conduct a whole-rock and stream heavy-mineral reconnaissance of two test 7½-minute quadrangles. Representative rock composites will be analyzed for trace Ag-Au-Pb-Pt. Frantz separates of panned concentrates will be identified. ACD: Ongoing.

R. W. STANTON, Project Chief, U.S. Geol. Survey. **Petrology of North American Coals.** Goals include evaluating geologic effects on the geometry and controls on quality and petrographic composition of the Lower Freeport coal bed, west-central Pennsylvania. Focus of the work will be to evaluate what effect the adjacent sedimentary units contributed to the quality and extent of peat facies and how these differences affect washability characteristics of the resulting coal.

A. M. STERNAGLE, Pa. Dept. of Transportation. **History of the Blair and Huntingdon Counties Iron Industry.** History of early charcoal and coke-fueled iron furnaces with special emphasis on the rock units utilized. To date furnace sites have been located and ore banks are being studied in relation to mining practices. ACD: Ongoing.

TIM WHITE and ALAN DAVIS, Pa. State Univ. **An Evaluation of Sulfur Forms and Pyrite Morphology in the Upper and Lower Clarion Coals** [Piney Twp., Clarion Co.]. The need to reduce sulfur levels in cleaned coal requires a better understanding of the distribution of sulfur forms and pyrite morphology in the seams. This project characterizes these parameters in a high-volatile bituminous coal. ACD: Mid-summer 1988.

TIM WHITE and ALAN DAVIS, Pa. State Univ. **Regional Topographic Controls on the Modes of Occurrence and Distribution of Sulfur in the Lower Kittanning Seam** [north-central and central Pa.]. A series of sampling traverses were made from paleotopographic low areas onto the Kane High. Sulfur forms, sulfur distribution, and modes of occurrence of pyrite will be determined to establish any regional trends. Local variations will be identified. ACD: Fall 1988.

Engineering Geology

D. D. BRAUN and NORMAN GILLMEISTER, Bloomsburg Univ., and J. D. INNERS, Pa. Geol. Survey. **Dip Slope Rock Block Slides in the Valley and Ridge of Northeastern Pennsylvania.** Rock block slides as large as 20,000,000 m³ occur at four sites where dip slopes are undercut by rivers or by man. Slippage occurs within mudstone units, and the blocks are bounded by joints or the ground surface. Historic slides are associated with high-moisture conditions. Work continues at additional sites. ACD: Summer 1989.

W. B. FERGUSON and E. F. GLYNN, Villanova Univ. **Engineering Characteristics of the Unconsolidated Rocks and Bedrock Beneath the City of Philadelphia.**

K. D. SVITANA, Benatec Assoc. **Design Considerations for Underground Storage Tank Installations Requiring Secondary Containment: A Case Study** [Middlesex Twp., Cumberland Co.]. Soil and bedrock characteristics were analyzed to determine the best method

of secondary containment for an underground storage tank farm. The design goal was for total containment of petroleum product spillage and leakage. ACD: June 1987.

Environmental Geology

H. L. DELANO, Pa. Geol. Survey. **Preliminary Characterization of Lake Erie Bluff Sediments.** Reconnaissance mapping and sample analysis of selected areas of Pennsylvania's lake shore. Results will be used to design a work plan for a larger, comprehensive study of the environmental geology of the lake shore area. ACD: Summer 1988.

S. A. HAYNES, R. C. SMITH, II, L. T. CHUBB, and M. A. GLENN (summer assistant), Pa. Geol. Survey. **Assessment of Potential Radon-Prone Areas in the Triassic-Age Sedimentary Rocks of Bucks County, Pennsylvania.** Airborne gamma-ray data for Bucks County have been field investigated and interpreted. A carborne gamma-ray survey covering 40 percent of the county has been completed. Thirty-one previously undescribed uranium enrichments have been discovered, sampled, and analyzed for uranium and selected trace elements. ACD: June 1988.

W. E. KOCHANOV, Pa. Geol. Survey. **Karst, Sinkholes, and Engineering Considerations in the Carbonate Terrains of Pennsylvania.** ACD: Winter 1989.

W. E. KOCHANOV, Pa. Geol. Survey. **Sinkholes and Karst-Related Features of Cumberland County, Pennsylvania.** ACD: Fall 1988.

W. E. KOCHANOV, Pa. Geol. Survey. **Sinkholes and Karst-Related Features of Dauphin County, Pennsylvania.** ACD: Fall 1988.

W. E. KOCHANOV, Pa. Geol. Survey. **Sinkholes and Karst-Related Features of Franklin County, Pennsylvania.** ACD: Fall 1988.

A. W. ROSE, JOHN WASHINGTON, DANIEL GREEMAN, EDWARD CIOLKOSZ, and WILLIAM JESTER, Pa. State Univ. **Generation and Migration of Radon in Soils** [eastern U.S.]. The controls on radon in soil gases and the geochemistry of radium in soils are being investigated in about 12 soil profiles representing a range of soil types and conditions typical of the eastern United States. ACD: 1990.

J. P. WILSHUSEN and staff members, Pa. Geol. Survey. **Scenic Geological Features of Pennsylvania.** A revision of Pennsylvania Geological Survey Environmental Geology Report 7, *Outstanding Scenic Geological Features of Pennsylvania*. ACD: June 1990.

General Geology

T. M. BERG, Pa. Geol. Survey. **Pennsylvania Geology Summarized.** This revision of Bradford Willard's famous educational pamphlet (Pennsylvania Geological Survey Educational Series 4) will provide all age groups with a modern understanding of the geology of the Commonwealth, and will relate the geology as seen in visible geomorphic features to dynamic earth processes ranging from erosion and deposition to the movement of continental plates. ACD: Late 1988.

T. M. BERG, Pa. Geol. Survey, THOMAS BALDWIN, Pa. Dept. of Environ. Resources, Bur. of Inf. Resources Mgt., and ROBERT AGNEW, Pa. Dept. of Environ. Resources, Bur. of Mining and Reclamation.

Geographic Information Systems in the Department of Environmental Resources. This three-man committee has assessed all of the potential areas within the Department of Environmental Resources (DER) where a Geographic Information System (GIS) would have application and impact on map production. When a GIS is established in DER, the Pennsylvania Geological Survey will have greatly enhanced capabilities in the production of bituminous-coal maps and aquifer-characteristics maps. ACD: Ongoing.

H. L. DELANO, Pa. Geol. Survey. **Presque Isle State Park.** This layman's park guide will include a discussion of the origin and history of the peninsula, coastal erosion and depositional processes and features, and engineering efforts to limit erosion. ACD: Summer 1988.

J. A. HARPER, Pa. Geol. Survey. **Geology of the Pittsburgh Area.** The popular *Geology of the Pittsburgh Area* (Pennsylvania Geological Survey General Geology Report 59) will be revised and updated to provide new information and new localities. ACD: 1988.

J. A. HARPER, Pa. Geol. Survey. **Oil Creek State Park.** ACD: 1988.

D. M. HOSKINS, Pa. Geol. Survey. **William Darby, Pennsylvania Geographer and Map Maker of the 1820's.** Although not a geologist, William Darby traveled throughout Pennsylvania and the states of the Ohio and Mississippi making geological observations. Using the

1817 Maclure map of the eastern United States, Darby prepared the first geologic map of a state and included on it the newly mapped contact between the Martinsburg and subjacent limestones, the first mapping of a modern formation contact. ACD: 1989.

JOHN REPETSKI and J. T. DUTRO, JR., U.S. Geol. Survey, A. R. PALMER, Geol. Soc. of America, G. R. GANIS, Tethys Consultants, Inc., and D. A. HOPKINS, J. E. Baker Co. **New Cambrian Fossil Localities and a Revised Geology of the York Valley.** New Cambrian fossil localities in the West York quadrangle indicate that all of the formations in that area are of Early or Middle Cambrian age. The indicated time-transgressive nature of the rock units in the Conestoga Valley between York and Lancaster Counties supports the model proposed by John Rodgers in 1968. The "Conestoga" Formation of the York area appears to be the time equivalent of the upper Kinzers Formation in Lancaster County. An unconformity below the "Conestoga" is not indicated in the York area. ACD: 1989.

C. H. SHULTZ, ed., Slippery Rock Univ. and Pittsburgh Geol. Soc. **The Geology of Pennsylvania.** This book-writing project is being developed and managed by the Pittsburgh Geological Society. The book will be published by the Pennsylvania Geological Survey; it will be of large format and about 600 pages long with 16 pages of color. Writers are about equally divided among government, industry, and academia. Most writing units have undergone editorial review and have been revised or revisions are pending.

Geochemistry

MICHAEL BIKERMAN, RALPH FEATHER, and C. D. McNAUGHTON, Univ. of Pittsburgh. **Uplift Chronology of the Pennsylvania Appalachians by K-Ar and Fission-Track Methods.** Sample collecting and laboratory preparation are underway. ACD: 1990.

K. R. CERONE and J. F. TAYLOR, Indiana Univ. of Pa. **Preservation of Metastable Skeletal Carbonates in the Missourian Brush Creek Marine Interval, Indiana and Armstrong Counties.** Thin section and SEM studies of the Brush Creek marine interval have shown that both metastable aragonite and calcite are preserved as skeletal fragments in shale. Total organic carbon contents of these shales range from 0.8 to 2.0 percent. Preservation of metastable carbonates appears

to correlate with increased amounts of amorphous-sapropelic organic matter. ACD: Ongoing.

R. K. KOTRA, Project Chief, U.S. Geol. Survey. **Organic Geochemistry.** Work is currently in progress on a number of black shale samples from Bucks County (Lockatong Formation, Newark basin). The samples provided by the Pennsylvania Geological Survey are being analyzed for organic carbon content and other parameters to determine their source rock quality. Results of the analyses will be evaluated during the latter part of FY 1988 and in FY 1989. This data set will contribute to the overall understanding of the quality and distribution of organic-rich strata in the early Mesozoic basins of the eastern United States.

C. D. LAUGHREY, Pa. Geol. Survey. **Geochemistry of Petroleum Source Rocks in Pennsylvania.** ACD: 1989.

J. M. McNEAL, Project Chief, U.S. Geol. Survey. **Geochemical Exploration Techniques for the Eastern Triassic Basins.** The NURE data and geochemical maps for the Newark basin will be completed hopefully in Winter 1988-89 and for the Gettysburg basin in Spring 1989. Reports on groundwater chemistry for portions of the Newark basin and the Gettysburg basin (Zora Ring complex) are expected to be completed by October 1989.

M. K. RODEN and D. S. MILLER, Rensselaer Polytechnic Inst. **Thermal History of the Central and Southern Appalachian Basin (Pennsylvania, Maryland, Virginia, and West Virginia) Based on Apatite Fission-Track Thermochronology.** Thirty-two samples of Tioga Ash Bed and Upper Devonian sediments were collected from the Appalachian basin in Pennsylvania for apatite fission-track analysis. Preliminary results indicate apatite fission-track apparent ages younger than depositional age (390 Ma). This shows that the sediments were subjected to temperatures greater than 100°C prior to approximately 250 Ma ago. ACD: Sept. 1988.

Geomorphology

T. M. BERG, J. H. BARNES, W. D. SEVON, V. W. SKEMA, and J. P. WILSHUSEN, Pa. Geol. Survey. **Physiographic Provinces of Pennsylvania.** In this project, the page-sized *Physiographic Provinces of*

Pennsylvania (Pennsylvania Geological Survey Map 13) is being revised to more accurately delineate the geomorphic regions of the state. ACD: Summer 1988.

T. W. GARDNER, JOHN RITTER, JAY BELL, KATHY CONNORS, CHRIS SHUMAN, and NICK PINTER, Pa. State Univ. **Deposition Environments of Grezes Litees in Pennsylvania.** Geographic distribution, hillslope properties, and depositional environments of grezes litees (shale-chip rubble) are being described for these deposits in central Pennsylvania. ACD: Fall 1988.

M. D. GUEBERT and T. W. GARDNER, Pa. State Univ. **Relationship of Remotely Sensed SPOT Data to Infiltration Capacity of Surface-Mined Land in Central Pennsylvania** [northwestern Centre Co.]. Comparison of infiltration capacity and SPOT data for mined-land surface features indicates that SPOT imagery provides a spatially extensive and detailed characterization of infiltration properties on spatially complex surface-mined land. ACD: May 1988.

J. V. HAMEL, Hamel Geotechnical Consultants, and R. B. JACOBSON, U.S. Geol. Survey. **Archeo-Geological Investigation of a Monongahela River Terrace South of Masontown.** Geological and pedological investigations showed that a large terrace along the Monongahela River south of Masontown formed by slackwater deposition when the river was temporarily ponded by a dam of glacial outwash near Pittsburgh circa 80,000 to 60,000 years B.P. ACD: Sept. 1988.

J. B. RENK, III, and R. A. VARGO, Calif. Univ. of Pa. **Structural Control in the South Fork Drainage Basin, Greene County, Pennsylvania.** ACD: Dec. 1988.

J. B. RITTER and T. W. GARDNER, Pa. State Univ. **Temporal Variation in Water and Sediment Discharge from Disturbed Watersheds, Central Pennsylvania** [Centre and Clearfield Cos.]. The variation in water and sediment yield from disturbed basins is examined as a function of time since reclamation. Surface-water models and preliminary field observations suggest variation due to time-dependent changes in infiltration properties and drainage network expansion. ACD: 1990.

T. W. SMALL, Frostburg State Univ., and RANDY SCHAETZL, Michigan State Univ. **Spatial Redistribution of Gravels Within Soils by Tree Uprooting** [Potter Co.]. Stone and gravel concentrations are being examined within and adjacent to treethrow mound sites. Stone concentrations "armor" the mound to surficial erosion processes and in the long run are left as surficial lag deposits. ACD: Spring 1989.

Geophysics

K. P. KODAMA and JOHN STAMATAKOS, Lehigh Univ., and ART GOLDSTEIN, Colgate Univ. **Effects of Simple Shear Strain on Remanence** [Middle Paleozoic units, central Pa.]. We will be studying the effects of simple shear strain during folding on magnetic remanence. ACD: 1990.

J. D. PHILLIPS, Project Chief, U.S. Geol. Survey. **Geophysical Mapping of Early Mesozoic Basins**. Work performed included magnetic-susceptibility logging of diabase core from the York Haven diabase sheet at Reesers Summit, New Cumberland, Pennsylvania. The magnetic-susceptibility log was used to correlate stratigraphic positions in the core hole with surface outcrops. Compilation of gridded digital aeromagnetic data for the Gettysburg and Newark basins and vicinity was completed, and photographic images of the data were prepared.

Glacial Geology

D. D. BRAUN, Bloomsburg Univ. **Glacial Geology of the Anthracite Region Outside of the Late Wisconsinan Border** [Middle and Southern Anthracite basins]. Pre-Wisconsinan glacial deposits are buried by as much as 20 m of colluvium and are only exposed in strip mines. The maximum extent of glaciation crosses the Southern basin at Tuscarora and wraps around the east end of the Western Middle basin at Delano. As much as 50 m of glacial sediment is present within or next to the Eastern Middle basin. ACD: First stage, Fall 1988.

D. D. BRAUN, Bloomsburg Univ. **Testing the Use of Secular Changes in Geomagnetic Declination for Correlation of Ice Margins Across the Appalachian Plateau** [north-central Pa.]. An insufficient number of undeformed glacial-lake sediment sites have been found to develop a usable geomagnetic declination record. Nearly all streams in the region have been walked out, and that field data will be used

to develop a glacial-lake and ice-margin sequence across the area. ACD: 1989-90.

W. D. SEVON, Pa. Geol. Survey. **Surficial Deposits of the Wellsboro and Towanda 30- by 60-Minute Quadrangles, Pennsylvania and New York.** The surficial geology, mainly glacial deposits, colluvium, and alluvium, of sixty-four 7½-minute quadrangles has been mapped and compiled at 1:100,000 scale. ACD: May 1988.

D. W. WATSON, Slippery Rock Univ. **Glacial Evolution of the Slippery Rock Creek Gorge, McConnells Mill State Park, Pennsylvania.** ACD: June 1988.

Hydrology

T. F. BUCKWALTER, U.S. Geol. Survey, and M. E. MOORE, Pa. Geol. Survey. **Groundwater Resources of Warren County, Pennsylvania.** Countywide groundwater conditions will be evaluated. Extensive water-quality data will be used to determine impacts of oil and gas production on the resource. A revised geologic map will be included. ACD: Dec. 1988.

S. J. LANG, Erie County Health Dept./Environ. Services, and D. B. RICHARDS, Acting Project Chief, U.S. Geol. Survey. **Groundwater of Erie County, Pennsylvania.** The objective is to compile data on the quality and quantity of the groundwater in Erie County. Activities include well drilling, aquifer tests, seismic studies, and water sampling (general, pollution sites, and pesticide survey). ACD: 1990.

RICHARD LOWRIGHT and PATRICIA SCHNEIDER, Susquehanna Univ. **Concentrations of Selected Ions in Groundwater from the Tonoloway and Keyser Formations in Snyder County, Pennsylvania.** Published data on water chemistry from these rock units in the region are few. Preliminary analysis of the data indicates three possible sources for the contaminants. Further work should help to begin to discriminate the sources. ACD: Dec. 1988.

D. R. WILLIAMS, U.S. Geol. Survey, and T. A. McELROY, Pa. Geol. Survey. **Geology and Water Resources of Indiana County, Pennsylvania.** Approximately 500 wells and 100 springs have been inventoried throughout the county, many of which were sampled for water-quality characteristics. The 31 surface-water sites were sampled three times for low and high base flow water-quality characteristics. ACD: Sept. 1989.

D. S. YANNACCI, Pa. Geol. Survey, and DENNIS LOW and DANIEL HIPPE, U.S. Geol. Survey. **Aquifer Characteristics of the Rocks of**

Pennsylvania. A comprehensive summary of the hydrogeologic characteristics of Pennsylvania will be developed. The study will include an investigation of hydrogeologic characteristics of individual formations as well as regional flow systems. ACD: June 1989.

Igneous and Metamorphic Petrology

T. H. BRICE, Bryn Mawr Coll. **Relationship Between the Springfield Granodiorite and the Wissahickon Schist** [predominantly in the Lansdowne quad., extending into adjacent quads.]. ACD: May 1989.

JOSEPH HULL, Univ. of Rochester, and JOHN PUFFER and BOB KOTO, Rutgers Univ. **Ordovician "Group 4" Alkalic Magmatism in the North-Central Appalachians** [Pa., N. J., and N. Y.]. The age relationships, petrology, and geochemistry of Ordovician alkalic diabase dikes from Pennsylvania, New Jersey, and New York have been described. These dikes and related plutons form a syntectonic to late tectonic, collision-related alkalic suite ("Group 4").

Paleontology

CAROL FAUL and CHI KIM, Univ. of Pa. **A Study of the Eurypterids of the Shawangunk Formation (Silurian) of Pennsylvania and New Jersey.** ACD: Sept. 1988.

A. G. HARRIS, Project Chief, U.S. Geol. Survey. **Lower Paleozoic Conodont Studies, Appalachian Basin.** Ongoing investigations of Middle and Upper Ordovician rocks involve occasional field work in Pennsylvania to refine the conodont biostratigraphy of sections previously sampled or to add new paleontologic information to the existing data base.

R. LITWIN, Project Chief, U.S. Geol. Survey. **Mesozoic Palynology of the Atlantic Continental Margin.** This study is underway to examine the possibility that the Jacksonwald syncline in the Newark basin (Berk County) contains a nearly continuous sedimentary sequence through the Triassic-Jurassic boundary interval. To date, 10 palyniferous stratigraphic levels in the first 20 m immediately below the Jacksonwald Basalt, plus one above the basalt, have been identified. The fossil assemblages examined so far do not conclusively confirm the boundary, and additional samples are being sought from both lower and higher in the section. Auxiliary work has also begun in the Gettysburg basin to identify and collect palyniferous horizons in order to compare its palynological sequences with those of the Culpeper basin immediately to the south.

W. A. OLIVER, JR., U.S. Geol. Survey. **Corals and Biostratigraphy of the Keyser and Helderberg Limestones in the Appalachian Basin** [N. Y., N. J., Pa., Md., W. Va., and Va.]. Rugose corals are being described, and their stratigraphic and areal distribution analyzed, from the fine-grained, stromatoporoidal facies of Pridolian-Lochkovian age. ACD: Ongoing.

C. WNUK, Project Chief, U.S. Geol. Survey. **Paleoecology of Coal and Coal-Bearing Rocks.** The objective is the development of an improved understanding of the environmental, edaphic, ecological, and climatological factors that influence the development of peat-forming plant communities, and, consequently, affect coal quality, thickness, and distribution. The investigations are concentrating on the *in situ* floras found in the underclays beneath coal beds. Intensive study of a fossil assemblage that occurs in the underclay of the Mammoth #8 coal bed in the Shamokin quadrangle has led to the reconstruction of the growth form and ontogeny of the lycopod *Bothrodendron punctatum*. Additional studies and field work are expected to continue throughout the year.

PAUL ZELL. **Paleontology of the Lower Ordovician Nittany Dolomite in Central Pennsylvania.** ACD: Ongoing.

Sedimentology

EDWARD COTTER and JOHN LINK, Bucknell Univ. **Clinton Ironstones in Their Sedimentologic Context** [central Pa.]. ACD: 1990.

J. A. DIEMER, Univ. of N. C. at Charlotte. **Sedimentology and Paleohydraulic Reconstructions of the Catskill Formation, South-Central Pennsylvania.** The sedimentology of the Sherman Creek, Clarks Ferry, and Duncannon Members of the Catskill Formation have been described in detail. The depositional environments have been interpreted qualitatively. Paleohydraulic reconstructions are underway using point-bar deposits. ACD: Dec. 1989.

RICHARD GROLL and R. A. VARGO, Calif. Univ. of Pa. **Crossbedded Sandstone Formations of the Pittsburgh Group in Southwestern Pennsylvania** [California quad. and adjacent quads.]. ACD: May 1988.

T. M. MURIN, Univ. of Pittsburgh. **Sedimentology and Structure of the First Bradford Sandstone in the Pennsylvania Plateau Province** [southwestern Pa.]. ACD: Aug. 1988.

RUDY SLINGERLAND, DAVID SMETLAND, MARK ERIKSEN, and DIDIER MARSON, Pa. State Univ. **Circulation and Sediment Transport Modelling in the Late Devonian Catskill Epeiric Sea** [central and western Pa.]. A three-dimensional hydrodynamic computer model of the Late Devonian Catskill Sea has been constructed to better understand the fluid and sediment circulation processes along the Catskill coast. Early results suggest net wind- and tide-driven flows were to the southwest, consistent with outcrop paleocurrent data. Additional simulations with density stratification are planned for the next year. ACD: 1990.

S. D. WEEDMAN and A. L. GUBER, Pa. State Univ. **Depositional Environment of the Upper Freeport Limestone** [Armstrong and Indiana Cos.]. ACD: Summer 1988.

D. L. WOODROW, Hobart and William Smith Colls. **Shoreline Facies and Processes in the Catskill Delta, New York and Pennsylvania** [Tioga, Pike, and Warren Cos.]. ACD: June 1989.

Stratigraphy

J. R. EGGLESTON, Project Chief, U.S. Geol. Survey. **Framework of the Pennsylvania Anthracite Region.** Project efforts are concentrated on the Northern Anthracite field, where stratigraphy and structure are being developed. The project also includes paleobotanical studies, characterization of the Mill Creek Limestone, and depositional interpretations.

A. D. GLOVER, C. H. DODGE, L. J. LENTZ, J. G. PHILLIPS, J. R. SHAULIS, and V. W. SKEMA, Pa. Geol. Survey. **TASIC (Temporarily Available Stratigraphic Information Collection)**. A continuing program to collect stratigraphic data and coal samples for analysis in active coal and clay mines in north-central and western Pennsylvania. The project will provide data for future mapping and regional resource evaluation. ACD: Ongoing.

W. M. GOODMAN and C. E. BRETT, Univ. of Rochester. **Stratigraphic Dynamics of the Silurian Northern Appalachian Basin** [Ont., N. Y., and Pa.]. We are conducting a small-scale stratigraphic analysis of the Wenlockian Series of the northern Appalachian basin, utilizing models of cyclic and event stratification to establish correlations between the New York and Pennsylvania outcrop belts. ACD: May 1988.

P. C. LYONS, Project Chief, U.S. Geol. Survey. **Physical Stratigraphy of the North-Central Appalachian Basin**. Regional coalification and diagenesis in the Pennsylvanian of the northern Appalachian basin is being studied using vitrinite reflectance, H:C and O:C atomic ratio data, illite crystallinity, conodont coloration, and argon geochemistry of feldspar from carboniferous sandstone. This study will relate coalification and diagenesis to structure, deposition, and tectonics. Work will be extended in 1988 and 1989 into the Broad Top and Northern Anthracite fields of Pennsylvania.

G. R. MCGHEE, Rutgers Univ., and A. G. WARNE, Univ. of N. C. at Chapel Hill. **Stratigraphic Subdivisions of the Upper Devonian Scherr-Foreknobs and Lock Haven Formations near the Allegheny Front of Central Pennsylvania, U.S.A.** ACD: Mid-summer 1988.

R. C. SMITH, II, and S. W. BERKHEISER, JR., Pa. Geol. Survey, and J. H. WAY, Lock Haven Univ. **Lower Devonian and Other Bentonites and Ash Beds** [Valley and Ridge of central Appalachians]. Three distinctive bentonite beds have been correlated from Cherry Valley, New York, to New Creek, West Virginia. At nine Pennsylvania localities, they have been observed at or very near the traditional New Scotland-Mandata contact. ACD: Ongoing.

Structural Geology

A. E. GATES, Rutgers Univ. at Newark. **Shear Sense Indicators in the Kirkwood-Rising Sun, Pennsylvania-Maryland, State Line Area**. Project involves mapping of shear zones in the State Line ultramafic body

and relating them to the multiple deformations in the Peters Creek Schist to the north. Field work is essentially complete; structural analysis is in progress. ACD: June 30, 1988.

M. B. GRAY, Univ. of Rochester. **Structural Evolution of the Central and Southern Anthracite Region.** I plan to identify and better constrain the geometry and topology of the regional detachments, and determine the relative timing of folding, metamorphism, and the movement on major thrust faults. ACD: 1990.

M. L. HILL and GEORGE MEYER, Temple Univ., and D. W. VALENTINO, Pa. Geol. Survey. **Structure of the Martic Zone, Pennsylvania Piedmont** [Quarryville, Pa., to Trenton, N. J.]. The Martic Zone, a major ductile shear zone with dextral transcurrent displacement, strikes N70°E across the Piedmont. A goal of this investigation is to assess the magnitude and timing of displacement. ACD: 1990.

R. P. NICKELSEN, Bucknell Univ. **Structural Evolution of Northwest Limbs of First-Order Anticlines in the Valley and Ridge Province—Area 1, McConnellsburg area** [McConnellsburg, Meadow Grounds, Burnt Cabins, and Big Cove Tannery quads.]; **Area 2, Williamsburg area** [Williamsburg, Frankstown, and Spruce Creek quads.]. Northwest limbs of first-order anticlines west of both McConnellsburg and Williamsburg show imbricate faults, perhaps formed as duplexes in horizontal strata prior to being folded to their present attitude. I am doing this research to see if the evolutionary model already used to interpret such structures on the northwest limb of the Kishacoquillas Valley anticline can also be applied in these two other areas. ACD: Jan. 1988.

S. T. PEES, Samuel T. Pees and Assoc. **The Structural Configuration of the Upper Ordovician Queenston Formation Surface in Northeastern Ohio, Northwestern Pennsylvania, Southwestern New York, and the Lake Erie Portion of the Province of Ontario.** Detailed regional contours of the disconformable (locally unconformable) Queenston Formation surface will be presented with a description of the lithology of beds immediately above and below the contact. Structural deformation patterns are shown and discussed. ACD: Sept. 1988.

L. B. PLATT, Bryn Mawr Coll., and D. H. HARRISON, Arizona State Univ. **Compressive Strain in a Fold in Mesozoic Rocks near Reading, Pennsylvania.** Pencil cleavage and deformed mud cracks far from the border fault show compressive strain of about 10 percent.

L. B. PLATT and STACEY TYBURSKI, Bryn Mawr Coll. **Reconnaissance of Strain in Fossils in the Valley and Ridge Province.** ACD: May 1988.

S. I. ROOT, Coll. of Wooster. **Structure and Hydrocarbon Potential of the Gettysburg Basin, Pennsylvania and Maryland.** ACD: Completed.

D. W. WATSON, Slippery Rock Univ. **Structural and Joint Study of Slippery Rock Creek Gorge Area, McConnells Mill State Park, Pennsylvania.** ACD: Ongoing.

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A Change on the Map of Groundwater Levels

by Michael E. Moore
Pennsylvania Geological Survey

Most readers of *Pennsylvania Geology* have been introduced to the state's observation-well network via the map of monthly groundwater levels that has appeared on the back cover since the first issue in 1969. Pennsylvania has a long history of groundwater monitoring, having first employed a network of observation wells in 1931. Today the network is operated cooperatively by the U.S. Geological Survey and by two bureaus within the Pennsylvania Department of Environmental Resources—Water Resources Management and Topographic and Geologic Survey. Although the size and mission of the network have changed in its 57 years of existence, these modifications have been minor compared to the changes in data-collection methods. Periodic measurements using steel tape and chalk eventually gave way to the continuous records from graphic recorders and digital punch tapes. Today 19 of 57 wells have had the

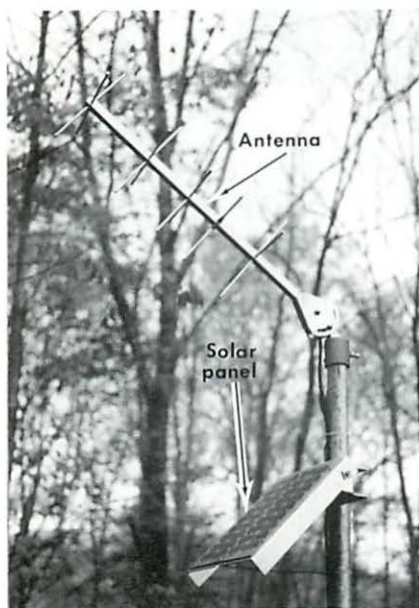


Figure 1. Equipment for monitoring water levels at network well Da-350, Dauphin County.

continuous recorders either replaced or supplemented with electronic data-collection platforms (DCP's) (Figure 1). Each DCP transmits digital water-level data every 4 hours, via satellite, to the Water Resources Division of the U.S. Geological Survey. Starting with this issue, observation wells equipped with data-collection platforms are identified on the map.

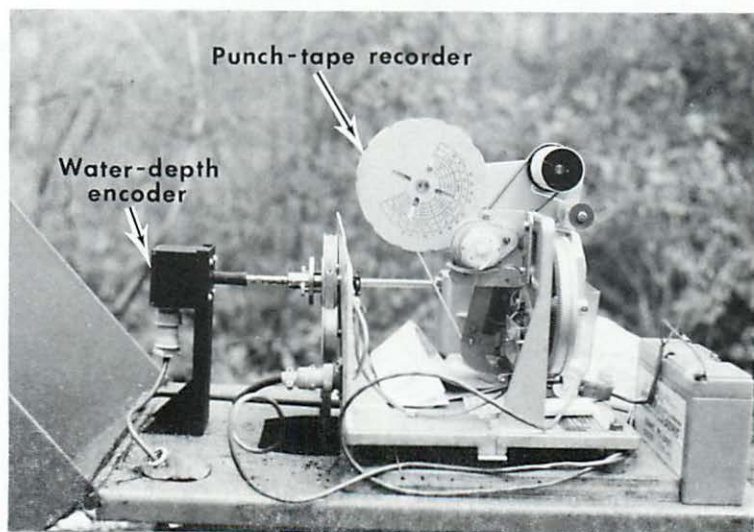
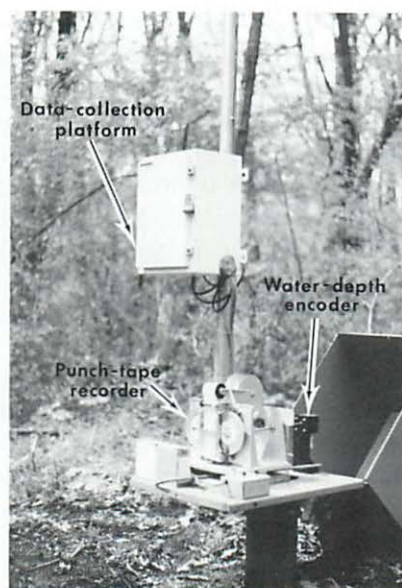


Figure 1. (Continued).

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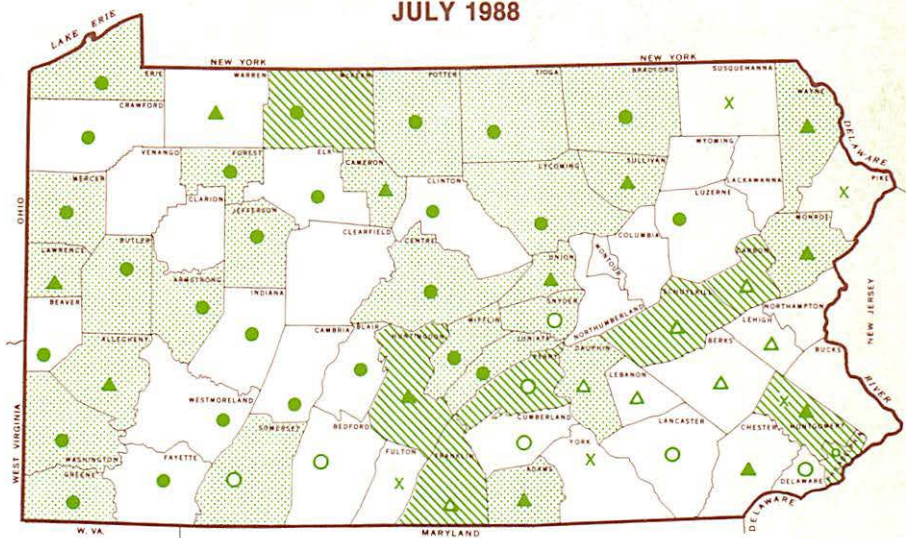
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GROUNDWATER-RESOURCE MAPPING

GROUNDWATER LEVELS FOR JULY 1988



EXPLANATION

- | | | | | | | | |
|------------------|-----------------|---|-----------------|---------|------|--------------|-----|
| | | | | | | | |
| Above last year | Below last year | Above last year | Below last year | No data | High | Normal range | Low |
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