PENNSYLVANIA GEOLOGY

PENNSYLVANIA GEOLOGICAL SURVEY
150TH ANNIVERSARY
1836 - 1986

COMMONWEALTH OF PENNSYLVANIA
Dick Thornburgh, Governor

DEPARTMENT OF ENVIRONMENTAL RESOURCES
Nicholas DeBenedictis, Secretary

OFFICE OF RESOURCES MANAGEMENT
Patrick J. Solano, Deputy Secretary

TOPOGRAPHIC AND GEOLOGIC SURVEY
Arthur A. Socolow, State Geologist

CONTENTS

ON THE COVER: Arthur A. Socolow, Eighth State Geologist of the Pennsylvania Geological Survey. Photo by Carl Socolow.

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

Editor, Arthur A. Socolow; Associate Editor, Donald M. Hoskins.

VOL. 17, No. 4 **AUGUST 1986**

"QUOTES"

FROM THE DESK OF THE STATE GEOLOGIST

Although Arthur Socolow assumed that his words in the "FROM THE DESK OF THE STATE GEOLOGIST" page of *PENNSYLVANIA GEOLOGY* published in last month's issue would be his valedictory-we thought otherwise. Rather than attempt to emulate his ability to make incisive, timely, and interesting comments on the geologic scene, we decided that some quotes from previous "FROM THE DESK..." columns would be a more appropriate post-valedictory.

Starting in 1976, our files show that the "FROM THE DESK..." page brought forth many comments. In some years nearly each issue of *PENNSYLVANIA GEOLOGY* resulted in letters and telephone calls agreeing with and complimenting the State Geologist's writing. However, it is the written comments that perhaps best indicate the value of his commentaries. It is easy for a colleague or other reader to compliment by telephone, but when one is sufficiently motivated to put the same remarks in writing we can assume that the writer was more deeply affected by Art's statements.

Comments were received from many readers such as geologists, engineers, consultants, etc. who would be expected to respond favorably to a fellow scientist. But many also came from non-technically trained persons such as legislators, educators, and government officials at the state and local level. Both the present Pennsylvania Lt. Governor, William Scranton, and former Lt. Governor, Ernest Kline, found time to write Art in response to a particular "FROM THE DESK..."

We have selected excerpts from four that produced the most comment; two of which were reprinted.

The first is from October, 1977 and was reprinted by the Milton Standard of Milton, PA.

"LEAD TIME — RHYMES WITH NEED TIME"

"In discussions which have taken place amongst the proponents of various proposals to cope with our nation's energy problems, one

aspect frequently tends to be overlooked, namely, lead time. That is the length of time that elapses from the time a decision is made to pursue a certain course of action, until the time when that action can be fully completed and implemented...

"While there is much talk of greatly expanding coal production, to develop a significant new coal mine from the point when a decision is made to do so until production actually starts generally involves between 5 to 10 years...

"The point to this discussion is simply that there are no quick solutions to drastically improve the nation's energy self-sufficiency..."

The October, 1978 "FROM THE DESK..." brought forth the most written comments. As some of us may have observed in recent years not much has changed since Arthur wrote these words.

"WHY NOT SUPPORT THE BASICS?"

"A few weeks ago a staff member of one of the federal agencies came up from Washington. He had called previously to invite our Survey to apply for federal money which was available for a specified type of research. My phone reply was apparently so incredulous to him that he asked to come and explain in person the available monies. After hearing him (and his two colleagues) out, I again replied that the type of exotic research he was urging us to undertake was extremely unlikely to be fruitful within the geological framework of Pennsylvania and, therefore, my responsibility as State Geologist and my conscience as a taxpayer would not permit me to go after this earmarked federal money...

"...While there seems to be federal money available for exotic research projects, there is little or none available for basic resource mapping and data collection. Yet in geology, as in other sciences, the fact is that major advances and breakthroughs have to be built on a base of hard data, accumulated through years of tedious, non-glamourous field and laboratory work..."

In June of 1980 nearly as many comments were received as a result of the following "FROM THE DESK...":

"ACHIEVEMENTS YES, APOLOGIES NO"

"There are some who have been saying in recent years that the United States, with approximately 6% of the world's population, has no right to be consuming some 30% of the world's annual production of mineral resources...

"America's technological and scientific genius which has created the marvels of transportation, communication, housing, disease controls, and scientific agriculture should also not be asked to apologize for their achievements, even as they too have added to our consumption of resources.

"The challenge to our society is not simply to consume less out of some sense of guilt. We should rather eliminate wasteful procedures...

"The underdevelopment nations have every right to aspire to greater use of mineral resources, greater industries, and high standards of living. But the challenge to those nations is to take the initiative to find and develop the resources in their own back yard. Our national achievements or our levels of consumption are not the cause of their underdevelopment and underconsumption....

"Yes, our country is a major consumer. Yes we have challenges to face in order to sustain our standards of consumption. Those challenges call for achievements, not apologies."

And lastly, comments to which all who value the worth of a basic scientific report can relate.

"SO WHAT'S THE WORTH OF A GEOLOGIC REPORT?"

"...How important is a geologic report? How much is the report worth if it enables the highway department to pick a route that saves millions of dollars in construction costs? What's the value if the report identifies the location of mineral deposits needed to provide lime for the farmers, clay for the brickmakers, or coal for the steel industry? To justify its existence, how many copies of a geologic map must be sold which shows the location of geologic faults hazardous to nuclear power plants and the location of sinkholes hazardous to schools and dams? How do you assess the value of a geologic report which identifies the location of groundwater needed to locate a new glass factory employing hundreds, or a sprawling, new multimillion dollar bottling operation? If our reports lead to natural gas occurrences that heat our homes, and dam sites that keep them from being flooded, must we sell as many copies as *Gone With the Wind* to justify their existence?...

"...Whether they provide mineral raw materials for our industries, locate the waters needed for our survival, identify the geologic hazards that can ruin us, or assist the roadbuilders, farmers, and recreation planners, our geologic reports measure up well to the test of time and value."

CHARLES H. BEHRE, JR.
1896-1986

With the death of Dr. Charles H. Behre, Jr., at age 90 last February 18, the geologic community lost a distinguished scientist and the Pennsylvania Geological Survey lost a one-time colleague and long-time supporter. Personally, I lost a friend and mentor who, as my major professor, guided and encouraged me during my graduate studies at Columbia University. All who came in contact with Charles Behre were awed by this dear, gentle soul who in his own quiet and polite manner provided creative inspiration. He also demonstrated the importance of relating the cold facts of science to the needs and concerns of humanity. Truly, Charles H. Behre, Jr., was a great teacher and an outstanding scientist. Never was the phrase, a gentleman and a scholar, more apt.

Born in Atlanta, Georgia, Charles Behre received his B.S. and Ph.D. degrees in geology from the University of Chicago. After serving in World War I he joined the Pennsylvania Geological Survey as a cooperating geologist and began his teaching career at Lehigh University. It was in those years that he conducted his detailed field and laboratory studies of the Martinsburg slate belt in eastern Pennsylvania which resulted in the classic Mineral Resource Report 16, *Slate in Pennsylvania,* still considered the most definitive exposition on the subject.

Subsequently, Charles Behre taught at the University of Cincinnati, Northwestern University, and Columbia University where he served as Chairman of the Department of Geology. In addition to his academic duties, in 1946 he founded the internationally recognized consulting firm of Behre, Dolbear and Co. where, until his retirement in 1971, he served as mineral advisor to the governments of Burma, Haiti, and Algeria. He was a member and officer of all the major geological societies and recipient of distinguished national and foreign awards and citations too numerous to mention here.

We note Charles H. Behre's passing with appreciation for his many contributions and fond memories of his friendship.

Arthur A. Socolow

GEOLOGICAL RESEARCH IN PENNSYLVANIA 1986

INTRODUCTION

This publication is the twenty-ninth annual report on Geological Research and Publications in Pennsylvania. It is an attempt to list all current geologic research in Pennsylvania and includes reports of persons and projects other than those of the staff of the Pennsylvania Geological Survey. Because of the large number of projects reported to us, we editorially condense the description of the research projects to fit available space.

We have also 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. Reports published are listed alphabetically 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.

AREAL GEOLOGY

JAMES ALCOCK, M. E. WAGNER, and S. P. PHIPPS, Univ. of Pa. **Geology, Metamorphism and Structure of the Area Between Avondale, Pa. and Newark, Del.** ACD: 1987.

R. J. ALTAMURA, Conn. Geol. and Natural History Survey. **Radargeologic Interpretation Map of the Everett, Pa. Quad., Scale 1:62,500.** An independent project utilizing the new side-looking airborne radar (SLAR) imagery acquired from the U.S. Geol. Survey; performed under the supervision of Dr. J. Gardner of MARS Associates, Inc. SLAR strip data and quadrangle mosaic and aerial photography were studied and interpreted in order to map rock types and structure. Several previously unrecognized subunits or facies changes within Devonian-aged rocks of the southwestern and southeastern parts of the quadrangle were interpreted, and previously mapped geology was confirmed.

FROELICH, A. J., Project Chief, U.S. Geol. Survey. **Early Mesozoic Evolution of the Eastern United States.** Conversion of analog aeromagnetic data to digital data was completed for the Gettysburg, Culpeper, Newark, and Hartford basins, and truck magnetometer surveys were completed in the Hartford, Newark, Culpeper, Richmond, Taylorsville, and Durham basins during FY 1985. Field geologic mapping in the Newark basin will continue. Stratigraphic and sedimentologic data in all exposed early Mesozoic basins will continue to be gathered in order to complete a coherent regional stratigraphic synthesis. ACD: FY 1987.

J. D. INNERS, Pa. Geol. Survey. **Geology and Mineral Resources of the Hazleton Quad., Luzerne, Carbon, and Schuylkill Cos., Pa.**

CONST. KARYTSAS and ALAN DAVIS, Pa. State Univ. **The Influence on Coal Character of Climatic Variation During the Upper Pennsylvanian** [western Pa.]. ACD: Dec. 1987.

T. J. KUNTZ and N. K. FLINT, Univ. of Pittsburgh. **Regional Study of Vanport Limestone in Elk County, Pa.** ACD: Aug. 1986.

H. W. SCHASSE, Wash. Geol. Survey, and D. B. MacLACHLAN and J. D. INNERS, Pa. Geol. Survey. **Geology and Mineral Resources of the Conyngham Quad., Luzerne and Schuylkill Cos., Pa.** ACD: Dec. 1986.

J. H. WAY, Pa. Geol. Survey, and R. P. NICKELSEN, Bucknell Univ. **Geology and Mineral Resources of the Lewisburg Quad., Union Co., Pa.** Project scope includes geologic mapping of bedrock and surficial deposits, identifying materials with possible economic potential, and evaluating environmental and engineering characteristics of all geologic units in the area. ACD: 1987.

ECONOMIC GEOLOGY

S. W. BERKHEISER, JR., Pa. Geol. Survey. **Preliminary Analyses of Potential Uses of Select Clay-Shale Resources in Pennsylvania.** About 20 clay and shale samples from various underclays, residual

clays, and other sources have been submitted to the U.S. Bureau of Mines for preliminary testing. Physical properties and slow-firing tests are anticipated. ACD: Ongoing.

S. W. BERKHEISER, JR., and R. C. SMITH, II, Pa. Geol. Survey. **Additional Occurrences of Specialty-Use Silica in Pennsylvania.** As a follow-up study to the 1985 high-purity silica study, this investigation identifies and characterizes 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 anticipated. ACD: Dec. 1986.

S. W. BERKHEISER, JR., and R. C. SMITH, II, Pa. Geol. Survey, and J. CULLEN-LOLLIS, Univ. of Cincinnati. **Description and Economic Geology of the Union Furnace Section, Pa. Route 453** [Huntingdon Co.]. Field description, chemical analyses, and environments of deposition will be presented for the Loysburg through Nealmont Formations in the Guidebook of the 51st Annual Field Conference of Pennsylvania Geologists. Clay mineralogy and stratigraphic position of about 20 "bentonitic zones" occurring in the Snyder through Coburn Formations will also be presented. ACD: Oct. 1986.

A. D. GLOVER, C. H. DODGE, J. G. PHILLIPS, J. R. SHAULIS, and V. W. SKEMA, Pa. Geol. Survey. **Coal Resource Maps for All Bituminous-Coal-Bearing Counties, Main Bituminous Field, Western Pa.** This study is an updated coal-resource evaluation for this coal field. The maps include crop lines for each of the principal coal seams, areas of deep and strip mining, and structure contours on a particular coal. Maps for Greene, Allegheny, Butler, and Fayette Counties have been published. Maps for Clarion and Washington Counties are in press, and maps for Cambria, Blair, and Westmoreland Counties are in review. ACD: 1990.

J. A. HARPER, Pa. Geol. Survey. **Iterative Tectonics and Development of Oil and Gas Fields in Pennsylvania.** This project details the relationships between repeated tectonic movement, both basement-related and detached, to the presence of oil and gas reservoirs through effects on sedimentation, fluid migration, and diagenesis. ACD: Summer 1986.

C. D. LAUGHREY, Pa. Geol. Survey, and R. M. HARPER, Pa. Dept. of Environ. Resources, Bur. of Oil and Gas Management. **Oil and Gas Reservoir Rocks of Pennsylvania.** Final report will include detailed petrologic descriptions and interpretations of all of Pennsylvania's major petroleum reservoir rocks along with petrophysical test results and geophysical-log characteristics. ACD: Aug. 1987.

L. J. LENTZ, Pa. Geol. Survey. **NCRDS (National Coal Resources Data System), Part 2.** Data are currently being entered for Cambria County, and corrections are being made to the data base for Greene

and Washington Counties. This program will result in computer-generated resource maps for western Pennsylvania.

R. C. SMITH, II, and J. H. BARNES, Pa. Geol. Survey. **Geology and Mineralogy of the Reading Prong, Berks, Bucks, Lehigh, and Northampton Cos., Pa.** Project has been largely inactive for 5 years, but CIPW norms have now been calculated for mineralized granitic samples. ACD: 1987.

R. C. SMITH, II, Pa. Geol. Survey, and D. T. HOFF, State Museum of Pa. **Mesozoic Cu Occurrences We Have Known and Loved** [Mesozoic basin of SE Pa.]. Organizing existing composite samples and tabulating data collected over the years to stimulate investigations by others of the precious-metal potential. Including Cornwall-type ore, contact skarn, veinlets in diabase, diabase late differentiates, and red-bed-type occurrences. ACD: Dec. 31, 1986.

R. W. STANTON, Project Chief, U.S. Geol. Survey. **Coal Petrology.** The effect of sedimentary units adjacent to the Upper Kittanning coal bed in Pennsylvania on the quality and extent of original peat facies and how these differences affect washability characteristics will be evaluated. ACD: FY 1989.

R. W. STANTON, Project Chief, U.S. Geol. Survey. **Coal Washability.** Reports on the following topics will be prepared in FY 1986: drilling, sampling, and descriptions from the Lucerne No. 9 mine; estimation of coal-bed washability from facies description of the bed; the effect of petrographic composition of facies on washability behavior of samples from Lucerne No. 9 mine; sedimentation and its effect on the formation of facies found in the Lower Freeport coal bed; and nondestructive testing methods to predict the washability of coal. ACD: FY 1986.

A. M. STERNAGLE, Pa. Dept. of Transportation. **History of the Blair County Charcoal Iron Industry** [emphasis on the Frankstown and Morrisons Cove area]. Study and history of early iron-making practices, with emphasis on the rock units mined and particular problems associated with each. To date field work locating furnace sites and the actual mines has begun. ACD: 1987.

ENGINEERING GEOLOGY

N. N. MOEBS and G. P. SAMES, U.S. Bur. of Mines. **The Character of Five Selected LANDSAT Lineaments in Southwestern Pennsylvania.** Five lineaments were investigated using earth resistivity, very low frequency (VLF), and soil moisture traverses, and correlation with mine roof instability. Preliminary results indicate that the lineaments were a surface phenomenon only. ACD: 1987.

ENVIRONMENTAL GEOLOGY

W. R. ADAMS, JR., and N. K. FLINT, Univ. of Pittsburgh. **Landsliding in Allegheny County, Pa.—Characteristics, Causes, and Cures.** Over 200 slope movements were investigated for this Ph.D. research project. Data from field reconnaissance, published materials, and input from a group of experts were used to develop a model to estimate the potential for slope failure. ACD: Aug. 1986.

R. H. CAMPBELL, Project Chief, U. S. Geol. Survey. **Landslide Probability and Risk Methodologies.** Work will continue in an advisory capacity to the School of Urban and Public Affairs at Carnegie Mellon University to evaluate applications of past research to the Pittsburgh area, and to develop a decision-support system to determine whether developers should be required to make site improvements for the purpose of reducing the risk of damage from earthquakes. ACD: FY 1989.

H. L. DELANO and J. P. WILSHUSEN, Pa. Geol. Survey. **Landslide Susceptibility in the Williamsport 1° x 2° Map Area, Pa.** A map of susceptibility zones and text with discussion of known landslide occurrences related to geological and other factors. ACD: 1986.

OMAR GHOWERI and R. A. VARGO, Calif. Univ. of Pa. **Slope Analysis of the Donora, Pa. Quad.** ACD: Summer 1986.

SUSAN GHOWERI and R. A. VARGO, Calif. Univ. of Pa. **Slope Analysis of the California, Pa. Quad.** ACD: Summer 1986.

W. E. KOCHANOV, Pa. Geol. Survey. **Sinkhole Occurrence in the Carbonate Rocks of Lehigh County.** Completion of 7½-minute quadrangles comprising Lehigh County showing carbonate geology, structural data, sinkholes and related karst features, mines, and quarries. Computer inventory in progress. Will be available as an open-file report. ACD: Spring 1986.

JOEL MORRISON, EUGENE WILLIAMS, ALAN DAVIS, and ARTHUR ROSE, Pa. State Univ. **A Study of Factors Controlling the Occurrence and Severity of Acid Mine Drainage in the Allegheny Group of Western Pennsylvania.** ACD: Aug. 1986.

D. A. MOSCONI and R. R. PARIZEK, Pa. State Univ. **The Evaluation of Chloride Transport in Ground Water Within Zones of Fracture Concentration** [Bear Creek, Pa.]. ACD: Dec. 1986.

F. J. VENTO and P. T. FITZGIBBONS, Vendel Enviro-Industrial Consultants, Inc., and P. V. VENTO, Univ. of Pittsburgh. **Phase I Archaeologic and Geoarchaeologic Investigations at Cowanesque Lake, Tioga Co., Pa.** Present studies involve general site geology and geomorphology, site sedimentation and sediment sources,

Holocene paleosol development, soil geochemistry, and petrography of artifactual materials. ACD: May 15, 1986.

GENERAL GEOLOGY

H. L. DELANO, Pa. Geol. Survey. **Guide to Geology of Presque Isle State Park, Pa.** Layman's guide will include origin and history of the peninsula, coastal erosion and deposition processes and features, and history of engineering efforts to limit erosion. ACD: 1986.

J. R. EGGLESTON, Project Chief, U.S. Geol. Survey. **Pennsylvania Anthracite Basin Framework.** A summary report on the age of the youngest rock in the Southern Anthracite field will be prepared in FY 1986. The lateral extent, character, and depositional history of the Mill Creek Limestone in the Northern Anthracite field will be defined, and stratigraphic and structural interpretations in part of the Wyoming basin will be developed. ACD: FY 1989.

C. H. SHULTZ, editor, 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. Coverage is encyclopedic and is organized into 58 chapters grouped into nine parts. It is authored by 73 recognized experts from eight states. Writers are about equally divided among government, industry, and academia. Nearly 80 percent of manuscripts are now in hand, undergoing review and revision. Remaining manuscripts are anticipated by June 1, 1986. ACD: Summer 1988.

GEOCHEMISTRY

MICHAEL BIKERMAN, R. M. FEATHER, JR., MICHAEL HARTLEY, and C. D. McNAUGHTON, Univ. of Pittsburgh. **Uplift Timing in the Appalachians.** K-Ar and fission-track geochronological techniques are to be applied to the determination of uplift ages in the Appalachians and Allegheny Plateau. ACD: 1987–88.

C. B. CECIL, Project Chief, U.S. Geol. Survey. **Geochemical Environments.** Laboratory studies were conducted on the genesis of quartz in the Upper Freeport coal bed in Pennsylvania, and mineralogical analyses were made of selected samples of coal and paleosols. Selected coal-bed samples will be studied in FY 1986 to determine the origin of mineral matter in coal and to evaluate the

geochemical conditions of sedimentation. Paleobotanical and paleoecological investigations to establish correlations among coal quality, paleoecology, and coal petrology are also planned. ACD: FY 1988.

P. G. HATCHER, Project Chief, U.S. Geol. Survey. **Metal-Organic Interactions.** Phytoclasts and shales rich in organic matter were collected from the Hartford, Newark, Taylorsville, Richmond, and Sanford basins in FY 1985. X-ray spectroscopy and scanning electron microscopy studies of Newark basin clay minerals and size separates of the clay minerals are planned in FY 1986. ACD: FY 1988.

P. P. HEARN, Project Chief, U.S. Geol. Survey. **Diagenesis of Authigenic K-Feldspar in Lower Paleozoic Carbonate Rocks of the Appalachian Basin.** Preliminary sampling of Cambrian carbonate rocks was conducted in FY 1985 in the Appalachian Valley and Ridge province of Pennsylvania, Maryland, Virginia, Tennessee, and Georgia, and also in western Vermont. Age-spectrum analyses of authigenic overgrowths on grains of detrital K-feldspar indicate that the rocks in the Valley and Ridge province of the central and southern Appalachians experienced a regionally synchronous fluid-migration event associated with the Alleghanian orogeny. During FY 1986, high-precision radiometric, chemical, and isotopic analyses of 10 to 12 purified K-feldspar and quartz separates from feldspathized rocks from the southern, central, and northern Appalachians and the mid-continent area will be completed. The utility of authigenic K-feldspar in dating fluid-migration events and characterizing the chemical evolution of fluids in sedimentary basins will be evaluated. ACD: FY 1986.

J. M. McNEAL, Project Chief, U.S. Geol. Survey. **Sulfur Isotopes in Triassic Basins.** The results of sulfur-isotopic and chemical analysis of water and rock samples collected in FY 1985 from the York Haven, Zora Ring, and the Newark basin in Pennsylvania will be evaluated in FY 1986. If time permits, NURE stream-sediment and water chemistry data for the Mesozoic basins will be completed and evaluated. Plans for sulfur-isotopic examination of the diabase in all of the Mesozoic basins and groundwater geochemistry studies in areas of specific interest, including those indicated by the examination of the NURE data, will be developed. ACD: FY 1988.

A. W. ROSE and ADAM HUTTER, Pa. State Univ. **Geological and Geochemical/Mineralogical Controls of Radon Concentration in Soil Air** [Pa. and surrounding regions]. ACD: Fall 1986.

NED TILLMAN, Target Exploration, Inc. **Use of Surface Geochemical Surveys for Delineating Natural Gas Reservoirs** [Somerset, Westmoreland, Fayette, Cambria, Clearfield, Centre,

Tioga, and McKean Cos.]. Successfully used a carefully selected suite of surface geochemical tools to explore for, discover, and help develop gas reservoirs. ACD: Ongoing.

GEOMORPHOLOGY

D. D. BRAUN, Bloomsburg Univ. **Large Scale Mass Movement on Shickshinny Mountain** [NE Pa.]. Mapping of mass movement distribution and determination of mode and origin of slope failure. ACD: 1988.

C. R. LEMIEUX and T. W. GARDNER, Pa. State Univ. **Infiltration and Runoff on Strip Mine Soils** [Moshannon, Pa.]. Investigation of mine soil infiltration response to rainfall intensity, antecedent moisture, and soil age. Results to be applied to a watershed runoff model (ANSWERS) and evaluated by comparison of actual runoff data and model predictions. ACD: Dec. 1986.

I. D. SASOWSKY and W. B. WHITE, Pa. State Univ. **Longitudinal Stream Profiles and the Evolution of Karst Drainage Basins in the Appalachian Orogenic Belt** [includes part of Elk Creek drainage basin, Centre Co.]. Eight drainage basins between Pennsylvania and Tennessee are being studied to evaluate the use of longitudinal stream profiles in interpreting geomorphic evolution in karst terranes. ACD: Aug. 1986.

W. D. SEVON, Pa. Geol. Survey. **Pennsylvania Landscape Evolution.** Continuing investigation of age and process of development of the present landscape of Pennsylvania.

GEOPHYSICS

J. D. PHILLIPS, Project Chief, U.S. Geol. Survey. **Geophysical Mapping of Early Mesozoic Basins.** Aeromagnetic maps and interpretive cross sections for the North Hartford, Gettysburg, Newark, and Culpeper basins and gravity maps for the Culpeper, Gettysburg, Farmville, and Richmond basins will be completed in FY 1986. Gravity data will be collected in the Hartford, Newark, and Wadesboro basins. Reports on truck magnetometer data collected in the Newark, Culpeper, and Richmond basins are being prepared, along with a report on diabase intrusions in the Durham basin using truck magnetometer and gravity data. Landsat TM images will be used to define structures and lithology between the Newark and Gettysburg basins. ACD: FY 1987.

N. M. RATCLIFFE, Project Chief, U.S. Geol. Survey. **Northeastern United States Seismicity and Tectonics.** Three VIBROSEIS reflec-

tion profiles of the western margin of the Newark basin and contiguous rocks of the Reading Prong in New Jersey and Pennsylvania reveal that dips of the Mesozoic border faults decrease from 50 degrees in central New Jersey to 30 degrees in Pennsylvania near the Delaware River. These dips are confirmed by continuous core of the border faults on each of the lines. Gentle to moderately dipping reflections beneath or within basement rocks west of the Newark basin are subparallel to faults at the basin margin. At Riegelsville, Pennsylvania, VIBROSEIS data, coring, and surface mapping indicate that the shallow 30-degree dip of the Mesozoic border fault was formed by reactivation of imbricate thrust faults of the Musconetcong thrust system. Plans for FY 1986 include completing the interpretation of VIBROSEIS data collected across the Newark basin and the preparation of reports for publication. ACD: FY 1986.

GLACIAL GEOLOGY

D. D. BRAUN, Bloomsburg Univ., and W. BRENNAN, SUNY, Coll. at Geneseo. **Development of a Secular Geomagnetic Record for Use in Correlating Ice Margin Positions Across the Allegheny Plateau in North Central Pennsylvania.** Proglacial lake rhythmites will be sampled in conjunction with mapping of glacial deposits in selected valleys. Geomagnetic declination values will be examined to see if groupings of similar values can be traced across the Plateau. ACD: 1988.

D. D. BRAUN, Bloomsburg Univ., and J. D. INNERS, Pa. Geol. Survey. **Extent of Pre-Wisconsinan Glaciation in the Anthracite Region of Pennsylvania.** Mapping of glacial deposits and buried valley segments is being undertaken to the southwest of the Wisconsinan glacial limit between the North Branch Susquehanna River and the Lehigh River. ACD: 1989.

G. H. CROWL, Ohio Wesleyan Univ. **Map of the Illinoian Glacial Border in Pennsylvania.** ACD: June 1986.

W. D. SEVON, Pa. Geol. Survey. **Mapping of Surficial Geology North of the Late Wisconsinan Glacial Limit, Northeastern Pa.** Project includes 148 7½-minute quadrangles in northeastern Pennsylvania. Mapping is being done at 1:24,000 scale, and will be supplemented by laboratory analysis of till and sand and gravel. Field work 49 percent completed; 18 percent of maps prepared. ACD: 1989.

W. D. SEVON, Pa. Geol. Survey. **Surficial Geology of Glaciated Valleys, Bradford, Potter, and Tioga Cos.** Mapping of surficial deposits in glaciated valleys for groundwater evaluation project. Map compilation at 1:100,000 scale. ACD: July 1, 1986.

HYDROLOGY

G. M. BANWELL and R. R. PARIZEK, Pa. State Univ. **Helium-4 and Radon-222 Concentrations in Groundwater and Soil Gas as Indicators of the Extent and Depth of Fracture Concentration in Rock** [Lehigh Co.]. The concentration of helium-4 in groundwater from domestic wells appears to increase near lineaments in the Martinsburg Formation in Lehigh County. Groundwater radon-222 activities may decrease near lineaments, but less consistently than helium-4 increases. ACD: May 1986.

R. J. BIERY and ANTHONY VENTELLO, Bradford Co. Planning Comm., and MICHAEL HUFNAGLE, Mansfield Univ. **Ground Water Resources Guide, Bradford Co., Pa.** Existing and original data will be compiled into a representative report for Bradford County. The data will delineate present and future groundwater resources and locate possible land use threats to these valuable resources. ACD: Fall 1987.

MARY HRENDA and R. R. PARIZEK, Pa. State Univ. **The Groundwater Flow System of a Small Drainage Basin on Laurel Hill in Southwestern Pennsylvania, with Special Emphasis on the Neutralization of Acidic Precipitation.** ACD: Dec. 1986.

T. A. McELROY, Pa. Geol. Survey. **Groundwater Resources of Cambria Co., Pa.** ACD: In review.

T. A. McELROY, Pa. Geol. Survey, and D. R. WILLIAMS and J. K. FELBINGER, U.S. Geol. Survey. **Geology and Water Resources of Indiana Co., Pa.** Purpose is to evaluate the surface water and groundwater conditions throughout Indiana County and to determine the effect of coal mining and gas wells on the resources. A geologic map will be included. ACD: 1989.

D. R. WILLIAMS, J. K. FELBINGER, and P. J. SQUILLACE, U.S. Geol. Survey. **Hydrogeology, Water Resources, and the Hydrologic Effects of Coal Mining, Washington Co., Pa.** Data collection phase of the project was completed as of Sept. 30, 1985, and the first draft copy of the report will be completed by May 31, 1986. The report will be of interest to anyone concerned about the water resources of Washington County, in particular the groundwater resources. ACD: Sept. 30, 1986.

IGNEOUS AND METAMORPHIC PETROLOGY

A. L. HOERSCH, LaSalle Univ., and W. A. CRAWFORD, Bryn Mawr Coll. **Metamorphic and Deformational History of the Mine Ridge**

and Honey Brook Upland, Pa. We are developing a model to explain the structural evolution and petrogenesis of the Mine Ridge, Honey Brook Upland, and surrounding Cambro-Ordovician metasediments. In addition we plan to evaluate and correlate models of the evolution of the Pennsylvania, Delaware, and Maryland Piedmonts and the Reading Prong using this data and data of other workers in the area. ACD: 1989.

M. E. WAGNER and LeeANN SROGI, Univ. of Pa. **Taconic Metamorphism at Two Crustal Levels and a Tectonic Model for the Pennsylvania-Delaware Piedmont.** It is suggested that during the Taconic orogeny Grenville crust of the West Chester prong was carried down an east-dipping subduction zone beneath the hot infrastructure of a volcanic arc—now the granulite-facies gneisses and plutonic igneous rocks of the Wilmington Complex. ACD: 1986.

C. D. WITANACHCHI, Bryn Mawr Coll. **Metamorphism and Deformation in the Wissahickon Schist near Bryn Mawr, Pa.** ACD: May 1986.

MINERALOGY

E. G. CHARLES and J. L. HUGHES, Miami Univ. (Ohio). **Unusual Reduction Spot Mineralogy (Hamburg Sequence), Shartlesville, Pa.** Preliminary EDAX and XRD work indicates that an unusual mineralogy exists in small (〈1 mm) two-phase centers in the middle of reduction spots of red shales at Shartlesville. ACD: June 1987.

PALEONTOLOGY

PETER BRETSKY, SUNY, Coll. at Stony Brook. **Morphological Variation in the Middle Devonian Bivalve Mollusk *Eodon bellastriatus* (Conrad)** [Newport/Amity Hall/Girtys Notch]. The distribution of morphological variation within and among stratigraphically contiguous populations of *Eodon bellastriatus* over a 4-m interval of Mahantango mudstones (mid-Devonian) in central Pennsylvania is being examined. The shallow infaunal *E. bellastriatus* colonized muds near the initiation of three coarsening-upward cycles. Colonization was followed rapidly by influx of large numbers, and then decline as the physical regime changed. ACD: Dec. 1986.

S. S. FONDA and R. J. CUFFEY, Pa. State Univ. **Late Pleistocene Vertebrates from a Filled Fissure in Central Pennsylvania.** A Late Pleistocene fauna of 48 species (now extinct) has been recovered. ACD: Nov. 1986.

W. F. KLOSE II, Paleontological Research Inst. **Fossil Floras of the Bernice Basin, Sullivan Co., Pa.** A study of the fossil floras

associated with the post-Pottsville sediments in the Bernice coal basin with correlation between the anthracite coal basins to the east and the bituminous coal fields to the west. ACD: 1990.

W. F. KLOSE II, Paleontological Research Inst. **Fossils of the Anthracite and Semi-Anthracite Coal Fields of Northeastern Pennsylvania.** A revision to the succession of fossil floras and faunas of the anthracite and semi-anthracite coal fields of northeastern Pennsylvania. A monograph and collector's handbook is planned, illustrating the fine specimens in major U.S. museums. ACD: 1995.

W. A. OLIVER, JR., U.S. Geol. Survey. **Corals and Biostratigraphy of the Keyser and Helderberg Limestones and Equivalents in the Appalachian Basin** [N. Y., N. J., Pa., Md., W. Va., Va.]. Rugose corals are being described, and their stratigraphic and areal distribution analyzed from the fine-grained, stromatoporoidal facies of Pridolian-Lochkovian age. ACD: 1986–87.

J. F. TAYLOR, R. W. TRAUT, and P. J. FEDERINKO, Ind. Univ. of Pa. **Trilobite Biostratigraphy of the Stonehenge and Grove Formations in Pennsylvania, Maryland, and Northern Virginia.** Lower Ordovician trilobite biozones are being used to compare the ages of the Stonehenge Formation in the Nittany Arch, the Stonehenge Formation in the Great Valley, and the Grove Limestone in the Frederick Valley of Maryland. ACD: 1987.

ALFRED TRAVERSE, Pa. State Univ., N. G. JOHNSON, Univ. of N. C. at Chapel Hill, and P. K. STROTHER, Boston Univ. **Evidences of Earliest Land Plants in Latest Ordovician and Early Silurian Rocks** [central Pa.]. ACD: Ongoing.

SEDIMENTOLOGY

D. E. COSTOLNICK, SUNY, Coll. at Oneonta. **Sedimentology of the Mississippian-Devonian Spechty Kopf Formation in Northeastern Pennsylvania** [east flank of Lackawanna syncline at intersection of Rtes. 380 and 435]. A detailed lithologic description of the Spechty Kopf along Roaring Brook and Rte. 380 including photos and descriptions of a wide range of sedimentary structures interpreted as representing a slope deposit along the margin of a lake or restricted basin. ACD: June 1986.

EDWARD COTTER, Bucknell Univ. **Medial Silurian Depositional History—Central Pennsylvania.** ACD: 1987.

J. A. DIEMER and PERRI PHILLIPS, Franklin and Marshall Coll. **Sedimentology of Fluvial and Coastal Facies, Upper Devonian of Southcentral Pennsylvania.**

A. L. GUBER, Pa. State Univ. **Facies Analysis of the Middle and Upper Silurian Formations of Central and Western Pennsylvania.** A

geochemical, paleontological, and sedimentological approach to facies definition and analysis of the Mifflintown, Wills Creek, and Tonoloway Formations. ACD: Ongoing.

G. L. LASH, SUNY, Coll. at Fredonia. **Depositional Processes of the Martinsburg Formation of Eastern Pennsylvania.** Preliminary results suggest that the lower two-thirds of the Martinsburg Formation (Bushkill and Ramseyburg Members) was deposited as part of a prograding deep-sea clastic system whereas the upper member (Pen Argyl Member) accumulated in a morphologically restricted basin from confined turbidity currents. ACD: Fall 1987.

C. D. LAUGHREY, Pa. Geol. Survey. **Significance of Ooids in the Speechley Sand (Upper Devonian Bradford Group) of Western Pennsylvania.** ACD: Spring 1986.

S. T. PEES, Samuel T. Pees and Assoc. **The Queenston Formation Erosional Surface in Portions of Northwestern Pennsylvania and Adjacent Areas** [NW Pa., SW N. Y., NE Ohio]. Well log and core study of the Queenston Formation-Medina Group contact to determine relief, surface conditions, and rock competency at the unconformity (or disconformity). ACD: Feb. 1987.

C. D. LAUGHREY and J. A. HARPER, Pa. Geol. Survey. **Geology of Lower Venango Group (Late Devonian) Rocks in Southwestern Pennsylvania.** The stratigraphy and depositional history of Venango Group rocks exposed at Victoria, Fayette County, will be studied and related to reservoir potential in the oil and gas fields of Greene, Washington, and Allegheny Counties. ACD: Summer 1986.

E. L. SIMPSON, Va. Polytechnic Inst. and State Univ., BRUCE ROWELL, Kutztown Univ., and CHARLES HARRIS and KENNETH ERIKSSON, Va. Polytechnic Inst. and State Univ. **Alluvial to Tidal Shelf Transition Within the Lower Cambrian Hardyston Formation of Eastern Pennsylvania.** Our study has characterized facies and facies associations within the Hardyston Formation. Based on these subdivisions, we have interpreted the types of processes that occurred with both alluvial and tidal environments. ACD: Dec. 1986.

RUDY SLINGERLAND and J. P. LOULE, Pa. State Univ. **Sediment Dispersal Processes on the Upper Devonian Catskill Shelf in Northcentral Pennsylvania** [Tioga, Bradford, Lycoming, and Clinton Cos.]. The authors will attempt to determine the mechanisms of emplacement of sublittoral sands in the Lock Haven Formation by characterizing their facies sequences and architecture in selected stratigraphic sections. ACD: Dec. 1988.

SUZANNE WEEDMAN and A. L. GUBER, Pa. State Univ. **Facies Analysis and Petrology of the Upper Freeport Limestone** [Armstrong and Indiana Cos.]. Of special interest in this study are the role carbonate lakes played in the drainage network of the late Allegheny alluvial-deltaic plain and the paleoclimatic implications of floodplain carbonate sedimentation. ACD: 1987.

STRATIGRAPHY

RICK BORKOWSKI, Pa. State Univ./Sun E & P Co. **Depositional and Reservoir Characteristics of the Lower Devonian Oriskany Sandstone** [Appalachian basin]. The Oriskany Sandstone "complex" represents storm-dominated sedimentation within a prograding clastic sequence resulting from progressive erosion of Lower Devonian and Silurian units (down to at least the Tuscarora) to the east. Influx of shield sediments is indicated by the occurrence of fine-grained arkosic sandstones interbedded with coarser calcareous sandstones and orthoquartzites in the western interior portion of the basin. The uppermost Oriskany is interpreted as being reworked during the final stages of transgression (Wallbridge discontinuity). ACD: 1986-87.

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

J. A. HARPER, Pa. Geol. Survey. **Late Devonian Transgressive-Regressive Cycles in Pennsylvania** [western Pa.]. Will be a short, generalized discussion of transgressive-regressive cycles seen in Late Devonian reservoir rocks (the Venango Group) of western Pennsylvania, with speculation on mechanisms and durations. ACD: Summer 1986.

A. G. HARRIS, Project Chief, U.S. Geol. Survey. **Conodont-Based Ages in the Appalachian Orogen.** Field work will continue in Pennsylvania and New York and will include collecting and measuring Upper Silurian-Lower Devonian sections. ACD: FY 1985.

T. W. HENRY, Project Chief, U.S. Geol. Survey. **Appalachian Basin Biostratigraphic and Depositional Framework.** A study to trace the extinction of lycopods in the basal part of the Conemaugh Formation together with clarifying where coal beds of the Lower Pennsylvanian of Ohio correlate with those of the proposed Pennsylvanian System stratotype. The Sciotoville Clay Member of Ohio, considered by general consensus to be Lower Pennsylvanian, needs to be examined for palynomorphs; a limited amount of field work will be undertaken in western Pennsylvania, eastern Ohio, and northeastern Kentucky. ACD: FY 1988.

S. T. PEES, Samuel T. Pees and Assoc. **Distribution of Lumped Net Effective Sand in the Grimsby and Cabot Head Formations, N.W. Pennsylvania, N.E. Ohio** [Crawford Co. and portions of adjacent Erie, Warren, Venango, and Mercer Cos., Pa., and eastern strip of Ashtabula Co., Ohio]. Seventy percent clean sand in the multiple sandstone bodies is isopached as a "unit" over 2,629 mi² using 1,915 well logs for the purpose of determining build-up trends of total sand. ACD: May 1986.

R. C. SMITH, II, and J. H. WAY, Pa. Geol. Survey. **Tioga Ash Zone in the Valley and Ridge of Pennsylvania.** Ten relatively complete and five partial sections of the Tioga Ash Zone have been measured, described, and sampled. At least seven beds are recognizable, several with distinctive characteristics. Precise correlations across the province are possible. The Onondaga-Marcellus contact is time transgressive. ACD: 1986.

STRUCTURAL GEOLOGY

WAYNE BREWER, PAUL HUDAK, and JIM HOLL, Allegheny Coll. **Strain and Subsurface Structure of the Homoclinal Appalachian Plateau in Northwestern Pennsylvania.** ACD: Open.

ROBERT De GRANDIS and THOMAS ANDERSON, Univ. of Pittsburgh. **Subsurface Geology Across a Segment of the Pittsburgh/ Washington Lineament.** ACD: June 1987.

GRETCHEN GILLIS and L. B. PLATT, Bryn Mawr Coll. **Rock Strain at Chickies Rock.** The strain, mostly pressure dissolution and formation of subgrains, in quartzite at Chickies Rock is being evaluated, following D. U. Wise (1960), who determined bulk strain there by measuring orientation and ellipticity of *Scolithus* tubes. ACD: May 1986.

J. M. HULL, Rutgers Univ., Newark. **Displacement Transfer Along the Chalfont Fault** [SE Pa.]. Extended the structural analysis east to the Hopewell fault. ACD: June 1987.

G. G. LASH, SUNY, Coll. at Fredonia. **Progressive Development of Scaly Cleavage in Rocks of the Greenwich Slice, Hamburg Klippe (Eastern Pa.).** Scaly cleavage in deformed zones of the Greenwich slice will be studied using optical petrographic and SEM methods. ACD: Fall 1988.

J. C. PALMQUIST, Lawrence Univ., and S. T. PEES, Samuel T. Pees and Assoc. **Vector Analysis of Linear Features in the Townville 7.5′ Quadrangle, Crawford Co., Pa.** Computer analysis of the frequency of fracture traces by group, azimuth, and length categories. The

linear features were interpreted by remote sensing. ACD: Sept. 1986.

JONATHON PERREGO and RICHARD LOWRIGHT, Susquehanna Univ. **A Study of the Cause of Apparent Offset in Trend at Shamokin Mountain and Montour Ridge in the Vicinity of Lewisburg, Pa.** ACD: May 1986.

V. J. PFAFF, Univ. of Cincinnati. **Forms of Small Folds in the Central Appalachians, Pa.** [along the Juniata River in Perry Co.]. ACD: Aug. 1986.

S. I. ROOT, Coll. of Wooster. **Structure and Hydrocarbon Potential of the Gettysburg Basin, Pa. and Md.** Basin is geochemically overmature and source rocks are lean. Small folds are high-risk structural traps. ACD: 1986.

DAVE WILTSCHKO and R. C. FLETCHER, Texas A & M Univ. **The Mechanics of Contrasting Structural Styles in Fold/Thrust Belts** [Plateau and Valley and Ridge; transect from Pittsburgh toward Philadelphia]. A mechanical investigation into the conditions and controlling parameters of folding as opposed to thrust faulting. We wish to understand why folds rather than thrust faults develop in foreland fold/thrust belts, and vice versa. ACD: Dec. 1988.

C. G. WISWALL, West Chester Univ. **Structural Analysis of a Section Along the Brandywine Creek, Southeastern Pa. and Northern Del.** ACD: 1988.

REPORTS PUBLISHED

BABCOCK, L. E., 1985, Mahantango conulariid considered a hyolithid. Pa. Geology, v. 16, no. 3, p. 14-16.

BANWELL, G. M., and **PARIZEK, R. R.,** 1985, Relationship between ^{4}He, ^{222}Rn, and lineaments [abs.]. EOS, v. 66, no. 46, p. 1115.

BERG, T. M., 1986, A Sesquicentennial story—Early millstone quarry in Tioga County. Pa. Geology, v. 17, no. 1, p. 3-6.

BERKHEISER, S. W., JR., 1985, High-purity silica occurrences in Pennsylvania. Pa. Geol. Survey, 4th ser., Min. Resource Rept. 88, 67 p.

_____, 1985, Pennsylvania's slate industry: alive and well, *in* Glaser, J. D., and Edwards, J., eds., Proceedings, Twentieth Forum on the Geology of Industrial Minerals [Baltimore, Md., 1984]. Md. Geol. Survey Spec. Pub. 2, p. 23-33.

BERKHEISER, S. W., JR., BARNES, J. H., and **SMITH, R. C., II,** 1985, Directory of the nonfuel-mineral producers in Pennsylvania. Pa. Geol. Survey, 4th ser., Inf. Circ. 54, 4th ed., 170 p.

BERMINGHAM, DIANA, 1985, Anchizone metamorphism in Triassic sedimentary rocks of the Newark basin, Pennsylvania-New Jersey [abs.]. AAPG Bull., v. 69, no. 9, p. 1433.

BEUTNER, E. C., and **CHARLES, E. G.,** 1985, Large volume loss during cleavage formation, Hamburg sequence, Pennsylvania. Geology, v. 13, no. 11, p. 803-805.

BOND, R. M., 1985, Conditions of quartz mineralization in the Martinsburg Formation, eastern Pennsylvania and New Jersey. Bethlehem, Pa., Lehigh Univ., Master's thesis.

BRADY, K. B. C., HARPER, J. A., and **INNERS, J. D.,** 1985, Ames or not Ames? An ambiguous Conemaugh marine zone at Ebensburg. Pa. Geology, v. 16, no. 6, p. 7-12.

BRAUN, D. D., and **KAKTINS, TERESA,** 1986, Diamicts from the weathering of pre-Wisconsinan glaciofluvial and fluvial deposits in central Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 6.

BRETSKY, P. W., 1985, Morphological variation in the Middle Devonian bivalve mollusk *Eodon bellastriatus* (Conrad) [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 531.

BUHAY, W. M., 1985, A study of microstructures in a folded section of the Oriskany Sandstone of central Pennsylvania. Hamilton, Ont., Can., McMaster Univ., Bachelor's thesis.

CANICH, M. R., and **GOLD, D. P.,** 1985, Structural features in the Tyrone-Mt. Union lineament, across the Nittany anticlinorium in central Pennsylvania, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 120–137, 199–203.

CARNEY, CINDY, 1986, The Upper Mississippian Greenbrier Limestone (Big Injun-Big Lime) sedimentology and depositional environments [abs.], *in* The Seventeenth Annual Appalachian Petroleum Geology Symposium—"Appalachian Basin Architecture" [Morgantown, W. Va., 1986]. Program and Abs., W. Va. Geol. Econ. Survey Circ. C-38, p. 8–9.

CARNEY, CINDY, and **SMOSNA, RICHARD,** 1985, Sedimentology of Loyalhanna Member ("Big Injun sand") of Mississippian Greenbrier Limestone [abs.]. AAPG Bull., v. 69, no. 9, p. 1434.

CECIL, C. B., DULONG, F. T., WHELAN, J. F., and others, 1986, Stable isotope geochemistry of calcite and pyrite in the Upper Freeport coal bed, west central Pennsylvania [abs.], *in* Carter, L. M., ed., USGS research on energy resources, 1986; program and abstracts. U.S. Geol. Survey Circ. 974, p. 9.

CERUTTI, J. R., 1985, Soil survey of Warren and Forest Counties, Pennsylvania. U.S. Dept. Agric., Soil Conservation Service, 148 p.

CHESAPEAKE EXECUTIVE COUNCIL, 1985, Chesapeake Bay restoration and protection plan. U.S. Environ. Protection Agency, Chesapeake Bay Liaison Off., Annapolis, Md., 2 v.

CHOU, HUE CHUNG, 1985, An analysis of factors controlling the variation in porosity of Pennsylvanian sandstones in the Allegheny plateaus of western Pennsylvania, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 260–262, 287–290.

CHU, C. H., and **JOHNSON, L. J.,** 1985, Relationship between exchangeable and total magnesium in Pennsylvania soils. Clays and Clay Minerals, v. 33, no. 4, p. 340–344.

CIOLKOSZ, E. J., 1985, Geology, *in* Cerutti, J. R., Soil survey of Warren and Forest Counties, Pennsylvania. U.S. Dept. Agric., Soil Conservation Service, p. 86.

CIOLKOSZ, E. J., and **CRONCE, R. C.,** 1986, Pennsylvania State University soil characterization laboratory standard sample data summary. Pa. State Univ. Agronomy Ser. 87, 11 p.

COLLINS, D. J., and **MIDDLETON, G. V.,** 1986, Sediment processes and depositional environments of the Lower Devonian Oriskany Sandstone [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 9.

CONNELLY, J. B., and **ONASCH, C. M.,** 1986, Intragranular strain in Triassic limestone conglomerates of the Gettysburg basin, Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 9.

CONRAD, JOHN, 1985, Shelf sediments above storm wave base in the Upper Ordovician Reedsville Formation in central Pennsylvania. Univ. Del., M. S. thesis.

COTTER, EDWARD, 1986, Silurian storms and sea-level cycles in the northern Appalachian basin [abs.], *in* The Seventeenth Annual Appalachian Petroleum Geology Symposium—"Appalachian Basin Architecture" [Morgantown, W. Va., 1986]. Program and Abs., W. Va. Geol. Econ. Survey Circ. C-38, p. 16.

_____, 1985, The imprint of sea level changes and storms on a cratonic shelf

succession [abs.]. Soc. Econ. Paleontologists and Mineralogists Ann. Midyear Mtg., Golden, Colo., Abstracts Volume 2, p. 20.

_____, 1986, A hierarchy of sea-level cycles in the medial Silurian succession of Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 10.

CRAWFORD, M. L., CRAWFORD, W. A., HOERSCH, A. L., and others, 1985, Taconic collision in SE Penna. and Delaware [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 555.

CRONCE, R. C., and **CIOLKOSZ, E. J.,** 1985, The variability in soil characterization data from laboratories in the northeastern United States. Soil Sci., v. 139, p. 362-368.

CUFFEY, R. J., ABDO, G. N., and **TAYLOR, J. F.,** 1986, Mid-Paleozoic bryozoan reef-rock—cystoporate lettucestone core within a latest Silurian patch reef in central Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 10-11.

CUFFEY, R. J., DAVIDHEISER, C. E., FONDA, S. S., and others, 1985, A mid-Silurian coral-bryozoan reef in central Pennsylvania, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 1-8, 18-19.

_____, 1985, Guide to the Lock Haven reef, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 9-19.

CUSTER, B. H., 1985, Soil survey of Lancaster County, Pennsylvania. U.S. Dept. Agric., Soil Conservation Service, 152 p.

DALY, W. F., and **ABRAMSON, L. W.,** 1985, Mt. Lebanon tunnel; NATM comes to America. Tunneling Technology Newsletter, v. 49, p. 1-11.

DANIELS, D. L., 1985, Gravimetric character and anomalies in the Gettysburg basin, Pennsylvania; a preliminary appraisal [abs.], *in* Robinson, G. R., Jr., and Froelich, A. J., eds., Proceedings of the second U.S. Geological Survey workshop on the early Mesozoic basins of the eastern United States. U.S. Geol. Survey Circ. 946, p. 128-132.

DAVIS, T. L., and **ONASCH, C. M.,** 1986, Regional variations in the nature of cleavage and associated strain in Martinsburg graywackes [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 11-12.

DELANO, H. L., 1985, First mining of the Pittsburgh coal. Pa. Geology, v. 16, no. 3, p. 9-10.

DIECCHIO, R. J., 1986, Syn-depositional deformation of Appalachian basin strata, with special emphasis on the Late Ordovician [abs.], *in* The Seventeenth Annual Appalachian Petroleum Geology Symposium—"Appalachian Basin Architecture" [Morgantown, W. Va., 1986]. Program and Abs., W. Va. Geol. Econ. Survey Circ. C-38, p. 20-21.

DODGE, C. H., 1985, compiler, Coal resources of Allegheny County, Pennsylvania—Part 1, Coal crop lines, mined-out areas, and structure contours. Pa. Geol. Survey, 4th ser., Min. Resource Rept. 89, 68 p.

_____, 1985, compiler, Coal resources of Butler County, Pennsylvania—Part 1, Coal crop lines, mined-out areas, and structure contours. Pa. Geol. Survey, 4th ser., Min. Resource Rept. 90, 112 p.

DONALDSON, A. C., and **BOSWELL, RAY,** 1986, Synsedimentary tectonics indicated by facies of Devonian-Mississippian rocks of central Appalachians [abs.], *in* The Seventeenth Annual Appalachian Petroleum Geology Symposium—"Appalachian Basin Architecture" [Morgantown, W. Va., 1986]. Program and Abs., W. Va. Geol. Econ. Survey Circ. C-38, p. 22-23.

DONALDSON, A. C., and **SKOFF, DALE,** 1985, Lithostratigraphic analysis of Huntersville Chert of central Appalachians [abs.]. AAPG Bull., v. 69, no. 9, p. 1435.

DRAKE, A. A., JR., 1986, Probable Late Proterozoic rocks of the central Appalachian Piedmont [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 14.

ECKENRODE, J. J., 1985, Soil survey of Montour County, Pennsylvania. U.S. Dept. Agric., Soil Conservation Service, 163 p.

_____, 1985, Soil survey of Northumberland County, Pennsylvania. U.S. Dept. Agric., Soil Conservation Service, 178 p.

_____, 1985, Soil survey of Snyder County, Pennsylvania. U.S. Dept. Agric., Soil Conservation Service, 161 p.

EGGLESTON, J. R., 1985, Pennsylvania anthracite mining industry: a past—and a future? [abs.]. AAPG Bull., v. 69, no. 9, p. 1436.

EPSTEIN, J. B., and **LYTTLE, P. T.**, 1986, Chronology of deformation along the Taconic unconformity from eastern Pennsylvania to southern New York [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 15.

ETTENSOHN, F. R., 1985, The Catskill delta complex and the Acadian orogeny: a model, *in* Woodrow, D. L., and Sevon, W. D., eds., The Catskill delta. Geol. Soc. America Spec. Paper 201, p. 39-49.

FARLEY, W. H., 1985, Soil survey of Cambria County, Pennsylvania. U.S. Dept. Agric., Soil Conservation Service, 128 p.

FERGUSSON, W. B., **GLYNN, E. F.**, and **TOTH, D. L.**, 1985, A landslide near Pottstown, Pennsylvania [abs.], *in* Tilford, N. R., chairperson, Site selection, characterization, and design exploration. Assoc. Engineering Geologists Ann. Mtg., 28th, p. 61-62.

FICKLIN, W. H., **McHUGH, J. B.**, and **McNEAL, J. M.**, 1985, Hydrogeochemical exploration in the early Mesozoic basins of southeastern Pennsylvania [abs.], *in* Robinson, G. R., Jr., and Froelich, A. J., eds., Proceedings of the second U.S. Geological Survey workshop on the early Mesozoic basins of the eastern United States. U.S. Geol. Survey Circ. 946, p. 135-136.

FICKLIN, W. H., and others, 1986, Analytical results for 186 water samples collected in Berks, Bucks, Chester, Lancaster, and Montgomery Counties, Pennsylvania. U.S. Geol. Survey Open-File Rept. 85-667.

FLEEGER, G. M., 1986, The West Liberty esker. Pa. Geology, v. 17, no. 1, p. 7-9.

GALEY, J. T., 1985, The anticlinal theory of oil and gas accumulation: its role in the inception of the natural gas and modern oil industries in North America, *in* Drake, E. T., and Jordan, W. M., eds., Geologists and ideas: a history of North American geology. Geol. Soc. America Centennial Spec. Volume 1, p. 423-442.

GANNAN, L., 1985, Pennsylvania's undiscovered reserves. Northeast Oil Reporter, v. 5, no. 1, p. 40-42.

GARDINER, M. A., 1985, Cyclic sedimentation patterns of Middle Ordovician carbonates, central Pennsylvania. Newark, Univ. Del., M. S. thesis.

GARDNER, T. W., **GRYTA, J. J.**, **LEMIEUX, C. R.**, and others, 1985, Geomorphology and hydrology of surface-mined watersheds, bituminous coal fields, central Pennsylvania, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 263-273, 287-290.

GARDNER, T. W., and **WILLIAMS, E. G.**, 1985, Pedogenesis of some Pennsylvanian underclays: groundwater, topographic, and tectonic controls [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 588.

GOLD, D. P., **GUBER, A. L.**, **VOIGHT, B.**, and others, 1985, Field guide—cross-strike and strike-parallel deformation zones in central Pennsylvania, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 165-203.

GOLD, D. P., and **POHN, H. A.**, 1985, The nature of cross-strike and strike-parallel structures in central Pennsylvania, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 138-143, 199-203.

GOODMANN, P. T., **ANDERSON, E. J.**, **GOODWIN, P. W.**, and **SULLIVAN, K. S.**, 1986, Small-scale episodic stratigraphic accumulation of the Upper Silurian-Lower Devonian carbonate sequence in central Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 19.

GOTTFRIED, RICHARD, and **CHANG, L. L. Y.,** 1986, Clay mineralogy of selected eastern Mesozoic basins [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 20.
GROWITZ, D. J., REED, L. A., and **BEARD, M. M.,** 1985, Reconnaissance of mine drainage in the coal fields of eastern Pennsylvania. U.S. Geol. Survey Water-Resources Inv. WRI 83-4274, 54 p.
HARPER, J. A., 1985, Historical marker commemorates early salt well in Crawford County. Pa. Geology, v. 16, no. 5, p. 11-15.
_____, 1985, Oil and gas developments in Pennsylvania in 1984. Pa. Geol. Survey, 4th ser., Prog. Rept. 198, 82 p.
_____, 1986, Diverse fauna at Beaver County fossil locality. Pa. Geology, v. 17, no. 1, p. 13-16.
_____, 1986, Oil and gas developments in Pennsylvania in 1985 [abs.], *in* The Seventeenth Annual Appalachian Petroleum Geology Symposium [Morgantown, W. Va., 1986]. Program and Abs., W. Va. Geol. Econ. Survey Circ. C-38, p. 25-26.
HARPER, R. M., and **LAUGHREY, C. D.,** 1986, Geology and reservoir characteristics of the Bald Eagle Formation in the Texaco-Marathon #1 Pennsylvania State Forest Tract 285 well, Clinton County, Pennsylvania [abs.], *in* The Seventeenth Annual Appalachian Petroleum Geology Symposium—"Appalachian Basin Architecture" [Morgantown, W. Va., 1986]. Program and Abs., W. Va. Geol. Econ. Survey Circ. C-38, p. 27-29.
HARRISON, S. S., 1985, Contamination of aquifers by overpressuring the annulus of oil and gas wells. Ground Water, v. 23, no. 3, p. 317-324.
HAWMAN, R. B., and **PHINNEY, R. A.,** 1985, Crustal structure of southern Maine and eastern Pennsylvania: extremal inversion of wide angle reflections [abs.]. EOS, v. 66, no. 18, p. 308.
HAYS, W. W., and **GORI, P. L.,** 1986, A workshop on "Continuing Actions to Reduce Potential Losses from Future Earthquakes in New York and Nearby States." U.S. Geol. Survey Open-File Rept. 85-0386.
HENDERSON, G. J., and **TIMM, C. M.,** 1985, Ordovician stratigraphic hydrocarbon entrapment potential of Appalachia. Oil and Gas Jour., v. 83, no. 17, p. 118-121, 124-125.
HINES, R. A., and **THOMAS, W. A.,** 1985, Carboniferous stratigraphy of the Appalachians [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 611.
HOFF, D. T., and **SMITH, R. C., II,** 1985, An Adams County copper-gold mine—Doomed to failure. Pa. Geology, v. 16, no. 6, p. 13-16.
HOPEK, J., and **SHARP, W.,** 1986, New constraints on Alleghenian-age deformation of Martinsburg and Shawangunk Formations, Lehigh Water Gap, Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 23.
HOPKINS, D. A., 1985, Refractory dolomite production in southeastern Pennsylvania—the J. E. Baker Company. Pa. Geology, v. 16, no. 3, p. 2-4.
HOSKINS, D. M., 1986, The Pennsylvania Geological Survey—the first fifty years [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 23.
HUDAK, P. F., BREWER, W. M., and **KENNELLY, P. J.,** 1986, Strained crinoid ossicles and decollement tectonics in the Appalachian Plateau of northwestern Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 23.
HUSCH, J. M., 1985, Major and trace element concentrations across a Mesozoic basaltic dike, New Hope, Pennsylvania. Northeastern Geology, v. 7, no. 3-4, p. 144-160.
_____, 1986, The significance of major and trace element variation trends in Mesozoic diabases from west-central New Jersey and eastern Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 24.
INNERS, J. D., 1985, Chlorite-replaced fossils in Union County. Pa. Geology, v. 16, no. 5, p. 7-10.
_____, 1986, Mount Etna iron furnace plantation, Blair County. Pa. Geology, v. 17, no. 2, p. 2-6.

INNERS, J. D., and **WILSHUSEN, J. P.,** 1986, Types of recurrent cut-slope failure in moderately-dipping Rose Hill shale at Allenwood, Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 24.

IRANPANAH, ASSAD, 1986, Structural characteristics of Razak lineament (Zagras fold belt) and Tyron[e]-Mount Union lineament (Appalachian fold belt)—a comparison [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 25.

JOHNSON, N. G., 1985, Early Silurian palynomorphs from the Tuscarora Formation in central Pennsylvania and their paleobotanical and geological significance. Review Palaeobot. Palynol., v. 45, p. 307-360.

JORDAN, W. M., 1985, Application as stimulus in geology: some examples from the early years of the Geological Society of America, *in* Drake, E. T., and Jordan, W. M., eds., Geologists and ideas: a history of North American geology. Geol. Soc. America Centennial Spec. Volume 1, p. 443-452.

KAKTINS, ULDIS, 1986, Conemaugh Gorge near Johnstown, PA [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 25.

KANNO, TAKUJI, 1985, Application of zeolite for treatment of radioactive waste. Nendo Kagaku (Jour. Clay Sci. Soc. of Japan), v. 25, no. 1, p. 1-10.

KERTIS, C. A., 1985, Reducing hazards in underground coal mines through the recognition and delineation of coalbed discontinuities caused by ancient channel processes. U.S. Bur. Mines Rept. Inv. 8987, 23 p.

KILBURG, J. A., PERRY, D. R., and **POSNEY, KAREN,** 1985, Stabilization of potential rock slides, station 66+00 to station 162+00, U.S. Route 51, Beaver County, PA [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 628-629.

KROHN, M. D., JONES, O. D, and **FERRIGNO, J. G.,** 1985, A preliminary analysis of linear features of the Gettysburg basin [abs.], *in* Robinson, G. R., Jr., and Froelich, A. J., eds., Proceedings of the second U.S. Geological Survey workshop on the early Mesozoic basins of the eastern United States. U.S. Geol. Survey Circ. 946, p. 139-147.

LASH, G. G., 1985, Accretion-related deformation of an ancient (early Paleozoic) trench-fill deposit, central Appalachian orogen. Geol. Soc. America Bull., v. 96, no. 9, p. 1167-1178.

_____, 1985, Possible influence of pore fluid on style of deformation of accreted sediments—Example from an ancient accretionary complex, central Appalachians [abs.]. Soc. Econ. Paleontologists and Mineralogists, Midyear Mtg., Golden, Colo., Abstracts Volume 2, p. 53.

_____, 1985, Sedimentologic evolution of an ancient (Early-Middle Ordovician) accretionary complex, central Appalachians [abs.]. Soc. Econ. Paleontologists and Mineralogists, Midyear Mtg., Golden, Colo., Abstracts Volume 2, p. 53-54.

_____, 1985, The Onyx Cave Member of eastern Pennsylvania—an ancient (Late Cambrian) basinal carbonate sequence. Northeastern Geology, v. 7, no. 2, p. 105-116.

_____, 1986, Influence of incomplete suturing on early Paleozoic foreland basin evolution and stratigraphic patterns, central and southern Appalachian fold and thrust belt [abs.], *in* The Seventeenth Annual Appalachian Petroleum Geology Symposium—"Appalachian Basin Architecture" [Morgantown, W. Va., 1986]. Program and Abs., W. Va. Geol. Econ. Survey Circ. C-38, p. 33-34.

_____, 1986, Recognition of trench-fill in orogenic flysch belts: examples from the Appalachian orogen [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 29.

_____, 1986, Sedimentologic and geochemical evidence for Middle Ordovician near-trench volcanism in the central Appalachian orogen. Jour. Geology, v. 94, no. 1, p. 91-107.

LAUBACH, S. E., SIROIS, B., and **RYBERG, P.,** 1986, Evidence of large-scale banded volume-loss structures parallel to cleavage in the Martinsburg slate [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 29.

LEE, JUNG HOO, AHN, JUNG HO, and **PEACOR, D. R.,** 1985, Textures in layered

silicates: progressive changes through diagenesis and low-temperature metamorphism. Jour. Sed. Petrology, v. 55, no. 4, p. 532-540.
LEFEVRE, G. T., 1985, The use and potential impact of the New Austrian tunneling method on the underground excavation industry in the United States [abs.], *in* Tilford, N. R., chairperson, Site selection, characterization, and design exploration. Assoc. Engineering Geologists, Ann. Mtg., 28th, p. 69.
LIVI, K. J. T., and **VEBLEN, D. R.**, 1985, Serpentine and phlogopite intergrowths in "eastonite" from Easton, Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 645.
LUCAS, MARK, MANSPEIZER, WARREN, and **HULL, JOSEPH,** 1985, En-echelon folds: a case history from Jacksonwald syncline of foreland folds in Newark rift basins of eastern North America [abs.]. AAPG Bull., v. 69, no. 9, p. 1440.
LYKE, W. L., 1986, The stratigraphy, paleogeography, depositional environment, faunal communities, and general petrology of the Minnehaha Springs Member of the Scherr Formation, an Upper Devonian turbidite sequence, central Appalachians. Southeastern Geology, v. 26, no. 3, p. 173-192.
McCASLIN, J. C., 1985, Financial risk stymies hunt in Pennsylvania. Oil and Gas Jour., v. 83, no. 11, p. 163.
———, 1985, SE Pennsylvania hosts unusual wildcat. Oil and Gas Jour., v. 83, no. 21, p. 123.
McCOY, H. J., 1985, Pennsylvania; ground-water resources, *in* National water summary 1984; hydrologic events, selected water-quality trends, and ground-water resources. U.S. Geol. Survey Water-Supply Paper 2275, p. 361-366.
McNEAL, J. M., 1985, The use of sulfur isotopes as a geochemical exploration technique in the early Mesozoic basins of Pennsylvania [abs.], *in* Robinson, G. R., Jr., and Froelich, A. J., eds., Proceedings of the second U.S. Geological Survey workshop on the early Mesozoic basins of the eastern United States. U.S. Geol. Survey Circ. 946, p. 136-139.
MIKESELL, J. L., DOTSON, D. W., SENFTLE, F. E., and others, 1985, In situ capture gamma-ray analysis of coal in an oversize borehole, *in* Cross, A. T., ed., Economic geology; coal, oil and gas. Internat. Cong. on Carboniferous Stratigraphy and Geology, 9th, Washington, D. C., and Univ. Ill. at Urbana-Champaign, 1979, Carbondale, Ill., Southern Ill. Univ. Press, Compte Rendu, v. 9, no. 4, p. 683-688.
MILICI, R. C., and **de WITT, WALLACE, JR.**, 1985, Evolution of the Appalachian basin [abs.], *in* The Seventeenth Annual Appalachian Petroleum Geology Symposium—"Appalachian Basin Architecture" [Morgantown, W. Va., 1986]. Program and Abs. W. Va. Geol. Econ. Survey Circ. C-38, p. 42-43.
MILLER, D. S., and **DUDDY, I. R.**, 1986, Burial and uplift history of northern Appalachian basin: apatite and zircon fission-track chronology [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 55.
MILLER, J. D., and **KENT, D. V.**, 1985, Another look at the Catskill [abs.]. EOS, v. 66, no. 18, p. 257.
MORRISON, J. L., 1985, Pre-mining prediction of acid mine drainage in the Allegheny Plateau of western Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 669.
MORRISON, J. L., and **WILLIAMS, E. G.**, 1986, Pyritiferous strata in the bituminous coal measures of western Pennsylvania: the source of acid mine drainage (AMD) [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 4, p. 317.
MOSHIER, S. O., 1986, Carbonate platform sedimentology, Upper Cambrian Richland Formation, Lebanon Valley, Pennsylvania. Jour. Sed. Petrology, v. 56, no. 2, p. 204-216.
NARAHARA, D. K., and **WILTSCHKO, D. V.**, 1986, Deformation in the hinge region of a chevron fold, Valley and Ridge province, central Pennsylvania. Jour. Structural Geology, v. 8, p. 157-168.

NICKELSEN, R. P., 1985, Structural geology of foreland regions [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 677.
NOVAK, J. T., GOLDSMITH, C. D., BENOIT, R. E., and **O'BRIEN, J. H.**, 1985, Biodegradation of methanol and tertiary butyl alcohol in subsurface systems, *in* Arvin, E., ed., Degradation, retention and dispersion of pollutants in groundwater [Seminar of the International Association on Water Pollution Research and Control, Copenhagen, Denmark, 1984]. Water Sci. and Technology, v. 17, no. 9, p. 71-85.
O'CONNOR, J. M., COOKE, G. A., and **KENNEDY, S. K.**, 1985, A study of the detrital components of the Ames shale (Pennsylvanian) for determination of transgressive/regressive sequences. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 680.
OPDYKE, N. D., 1985, The paleomagnetism of the Castanea Formation revisited [abs.]. EOS, v. 66, no. 18, p. 258.
ORKAN, NEBIL, and **VOIGHT, BARRY**, 1985, Regional joint evolution in the Valley and Ridge province of Pennsylvania in relation to the Alleghany orogeny, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 144-163, 199-203.
OWE, M., 1985, Long-term streamflow observations in relation to basin development. Jour. Hydrology, v. 78, no. 3-4, p. 243-260.
PACHTER, J. M., 1985, Permitting and compliance procedures outlined for Consol's Bailey coal mine. Mining Engineering, v. 37, no. 9, p. 1118-1120.
PALMER, A. C., 1986, Wissahickon Creek, Philadelphia, PA [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 60.
PARIZEK, R. R., and **WHITE, W. B.**, 1985, Applications of Quaternary and Tertiary geological factors to environmental problems in central Pennsylvania, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 63-109, 116-119.
_____, 1985, Field guide—on the soils and geomorphic evolution of Nittany Valley, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 110-116.
PATCHEN, D. G., SCHWARZ, K. A., DeBROSSE, T. A., and others, 1985, Oil and gas developments in mid-eastern states in 1984. AAPG Bull., v. 69, no. 10, p. 1518-1533.
PECK, T. J., 1986, Threshold conditions for stream alteration in small urbanized watersheds, SE Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 60.
PEES, S. T., 1985, Early days along Oil Creek, Pennsylvania (1859-1865) [abs.]. AAPG Bull., v. 69, no. 9, p. 1445.
PENNSYLVANIA GEOLOGY, 1985, Geological research in Pennsylvania, 1985. Pa. Geology, v. 16, no. 4, p. 4-31.
_____, 1985, Gross Minerals—A force in the fine phyllite fillers field. Pa. Geology, v. 16, no. 6, p. 2-5..
_____, 1985, Keystone Lime Company, Inc.—Making the most from what's available. Pa. Geology, v. 16, no. 5, p. 2-5.
_____, 1985, Pennsylvania's valuable nonfuel-mineral production. Pa. Geology, v. 16, no. 4, p. 2-3.
_____, 1985, When Mexico shook, Pennsylvania jumped. Pa. Geology, v. 16, no. 5, p. 15-16.
_____, 1986, Building stones from Cumberland County. Pa. Geology, v. 17, no. 1, p. 10-12.
_____, 1986, Limestone production in Pennsylvania's Allegheny Plateau—Allegheny Mineral Corporation. Pa. Geology, v. 17, no. 2, p. 10-13.
PERREGO, J. E., and **LOWRIGHT, R. H.**, 1986, A study of the cause of apparent offset in trend of Shamokin Mountain and Montour Ridge in the vicinity of Lewisburg, Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 61.

PFAFF, V. J., 1985, Development of small, asymmetric folds on the limb of a large anticline, central Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 688.

PHILLIPS, J. D., 1985, Aeromagnetic character and anomalies of the Gettysburg basin vicinity, Pennsylvania; a preliminary appraisal [abs.], *in* Robinson, G. R., Jr., and Froelich, A. J., eds., Proceedings of the second U.S. Geological Survey workshop on the early Mesozoic basins of the eastern United States. U.S. Geol. Survey Circ. 946, p. 133-135.

PIONKE, H. B., and **URBAN, J. B.,** 1985, Effect of agricultural land use on ground water quality in a small Pennsylvania watershed. Ground Water, v. 23, no. 1, p. 68-80.

PROSSER, L. J., SOCOLOW, A. A., and **SMITH, R. C., II,** 1985, The mineral industry of Pennsylvania in 1983. Pa. Geol. Survey, 4th ser., Inf. Circ. 94, 14 p.

PUGLIO, D. G., and **IANNACCHIONE, A. T.,** 1985, Structural deformation of the Allegheny Group of coalbeds in the Appalachian Plateau of central Pennsylvania, *in* Cross, A. T., ed., Economic geology; coal, oil and gas. Internat. Cong. on Carboniferous Stratigraphy and Geology, 9th, Washington, D. C., and Univ. Ill. at Urbana-Champaign, 1979, Carbondale, Ill., Southern Ill. Univ. Press, Compte Rendu, v. 9, no. 4, p. 731-736.

RATCLIFFE, N. M., and **BURTON, W. C.,** 1985, Preliminary results of core drilling of Triassic border faults near Riegelsville, Pennsylvania. U.S. Geol. Survey Open-File Rept. 85-0537, 23 p.

RATCLIFFE, N. M., BURTON, W. C., and **COSTAIN, J. K.,** 1986, Low-angle extensional faulting, reactivated thrust faults and seismic reflection geometry of the Newark basin in eastern Pennsylvania and New Jersey [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 61.

RAYMOND, ROBERT, JR., 1985, Correlating organic sulfur in coal to depositional environments by electron probe microanalysis, *in* Cross, A. T., ed., Economic geology; coal, oil and gas. Internat. Cong. on Carboniferous Stratigraphy and Geology, 9th, Washington, D. C., and Univ. Ill. at Urbana-Champaign, 1979, Carbondale, Ill., Southern Ill. Univ. Press, Compte Rendu, v. 9, no. 4, p. 423-427.

REED, L. A., 1985, Modeling water-discharge and sediment-concentration hydrographs at surface mine sites in Pennsylvania [abs.], *in* Glysson, G. D., ed., Proceedings of the advanced seminar on sedimentation, August 15-19, 1983, Denver, Colorado. U.S. Geol. Survey Open-File Rept. 85-0098, p. 3-5.

REED, L. A., DILISSIO, LOU, and **STUMP, D. E., JR.,** 1985, Trap efficiency of a sediment-control pond below a block-cut mine in Fayette County, Pennsylvania. U.S. Geol. Survey Water-Resources Inv. WRI 84-4223, 16 p.

REED, L. A., WARD, J. R., and **WETZEL, K. L.,** 1985, Calculating sediment discharge from a highway construction site in central Pennsylvania. U.S. Geol. Survey Water-Resources Inv. WRI 83-4216, 12 p.

RENDINA, M. A., and **MARTIN, W. D.,** 1985, Provenance of selected sandstones and mud rocks of Dunkard Group (Upper Pennsylvanian-Permian) in Ohio, West Virginia, and Pennsylvania [abs.]. AAPG Bull, v. 69, no. 9, p. 1445-1446.

RICHARDS, D. B., McCOY, H. J., and **GALLAHER, J. T.,** 1985, Hydrogeology of Erie County, Pennsylvania. U.S. Geol. Survey Open-File Rept. 85-0334, 214 p.

RICHARDS, R. P., 1985, Morphology and twinning of calcite crystals from Winfield, Pennsylvania [abs.], *in* Proceedings of the Twelfth Rochester Academy of Science Mineralogical Symposium [Rochester, N. Y., 1985]. Rocks and Minerals, v. 60, no. 6, p. 287.

RIMMER, S. M., KUEHN, D. W., ALLSHOUSE, S. D., and **DAVIS, ALAN,** 1985, Environments of deposition of the Lower Kittanning seam in Pennsylvania and Ohio and their influence upon coal petrographic, mineralogic, and chemical compositions, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 237-254, 287-290.

RIPP, JOHN, and **VILLAUME, JAMES,** 1985, Monitoring the hydrology and chemistry of a dry fly ash landfill [abs.], *in* Tilford, N. R., chairperson, Site selection, characterization, and design exploration. Assoc. Engineering Geologists, Ann. Mtg., 28th, p. 72.
ROBERTS, A. A., and **ROEN, J. B.,** 1985, Mapping of fracture zones by helium emanometry and possible relationship of helium anomalies to hydrocarbon reservoirs in western Pennsylvania [abs.]. AAPG Bull., v. 69, no. 9, p. 1446.
_____, 1985, Near-surface helium anomalies associated with faults and gas accumulation in western Pennsylvania. U.S. Geol. Survey Open-File Rept. 85-0546, 23 p.
ROBINSON, G. R., JR., 1985, Magnetite skarn deposits of the Cornwall (Pennsylvania) type; a potential cobalt, gold, and silver resource [abs.], *in* Robinson, G. R., Jr., and Froelich, A. J., eds., Proceedings of the second U.S. Geological Survey workshop on the early Mesozoic basins of the eastern United States. U.S. Geol. Survey Circ. 946, p. 126-128.
ROEN, J. B., and **WALLACE, L. G.,** 1986, Hydrocarbon potential of black Ordovician shales in the Appalachian basin [abs.], *in* The Seventeenth Annual Appalachian Petroleum Geology Symposium—"Appalachian Basin Architecture" [Morgantown, W. Va., 1986]. Program and Abs., W. Va. Geol. Econ. Survey Circ. C-38, p. 55.
ROOT, S. I., 1985, Faulting in Triassic Gettysburg basin, Pennsylvania and Maryland [abs.]. AAPG Bull., v. 69, no. 9, p. 1446-1447.
ROSE, A. W., SMITH, A. T., and **GAMMONS, C. H.,** 1985, Regional distribution of facies in the Catskill Formation and the controls on red-bed copper-uranium occurrences, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 37-43, 61-62.
RUMBAUGH, A. J., and **LOWRIGHT, R. H.,** 1986, The origin of some topographic depressions near McElhattan, Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 64.
SALTSMAN, A. L., 1986, Paleoenvironments of the Upper Pennsylvanian Ames Limestone and associated rocks near Pittsburgh, Pennsylvania. Geol. Soc. America Bull., v. 97, no. 2, p. 222-231.
SEVON, W. D., 1985, Pennsylvania landscape development [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 713.
SEVON, W. D., and **BERG, T. M.,** 1986, Polymictic diamictites and associated lacustrine deposits at the Mississippian-Devonian boundary in Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 65.
SEVON, W. D., EDMUNDS, W. E., GANIS, G. R., and **WILSHUSEN, J. P.,** 1986, Selected geology of Dauphin and Northumberland Counties, Pennsylvania. Harrisburg Area Geol. Soc. Ann. Field Trip, 5th, Guidebook, 22 p.
SHANMUGAM, G., WALKER, K. R., and **LASH, G. G.,** 1985, Comment [on "Provenance of the Middle Ordovician Blount clastic wedge, Georgia and Tennessee"]. Geology, v. 13, no. 12, p. 889-891.
SHAULIS, J. R., compiler, 1985, Coal resources of Fayette County, Pennsylvania—Part 1, Coal crop lines, mined-out areas, and structure contours. Pa. Geol. Survey, 4th ser., Min. Resource Rept. 91, 88 p.
SLINGERLAND, RUDY, 1985, Sedimentary processes on the basin margin of the Late Devonian Catskill Sea—storm- or tide-dominated?, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 33-36, 61-62.
SMELTZER, B. L., 1985, Crystal Cave, Berks County, Pennsylvania. York Grotto Newsletter, v. 20, no. 3, p. 45-51.
SMOOT, J. P., 1985, The closed-basin hypothesis and its use in facies analysis of the Newark Supergroup, *in* Robinson, G. R., Jr., and Froelich, A. J., eds., Proceedings of the second U.S. Geological Survey workshop on the early Mesozoic basins of the

eastern United States. U.S. Geol. Survey Circ. 946, p. 4-10.
SMOSNA, RICHARD, 1986, Petroleum exploration in the Lockport Dolomite, *in* The Seventeenth Annual Appalachian Petroleum Geology Symposium—"Appalachian Basin Architecture" [Morgantown, W. Va., 1986]. Program and Abs., W. Va. Geol. Econ. Survey Circ. C-38, p. 63-66.
SOCOLOW, A. A., 1985, Data data everywhere. Pa. Geology, v. 16, no. 4, p. 1, 31.
_____, 1985, Security and knee jerks. Pa. Geology, v. 16, no. 5, p. 1.
_____, 1985, Mapping again pays off. Pa. Geology, v. 16, no. 6, p. 1.
_____, 1986, The Pennsylvania Geological Survey celebrates 150 years. Pa. Geology, v. 17, no. 1, p. 1-2.
_____, 1986, Our Survey, past and present. Pa. Geology, v. 17, no. 2, p. 1.
SOUTHWORTH, C. S., 1985, Central Appalachian cross-strike structural discontinuities and lineaments compiled on side-looking airborne radar image mosaics [abs.]. AAPG Bull., v. 69, no. 9, p. 1448.
STANTON, R. W., PIERCE, B. S., CECIL, C. B., and **MARTINO, FRANCIS,** 1985, Washability characteristics of facies of Upper Freeport coal bed: Homer City, Pennsylvania area [abs.]. AAPG Bull., v. 69, no. 9, p. 1448.
STANTON, R. W., PIERCE, B. S., MOORE, T. A., and **CECIL, C. B.,** 1985, Composition and origin of facies of the Upper Freeport coal bed [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 726.
STANTON, R. W., PIERCE, B. S., MOORE, T. A., and **RUPERT, L. F.,** 1985, Descriptions and correlations of coal bed facies: Lower Freeport(?) coal bed, west-central Pennsylvania. U.S. Geol. Survey Open-File Rept. 85-0393, 54 p.
SUFFET, I. H., GIBS, JACOB, COYLE, J. A., and others, 1985, Applying analytical techniques to solve groundwater contamination problems. Jour. Am. Water Works Assoc., v. 77, no. 1, p. 65-72.
SULLIVAN, K. S., and **ANDERSON, E. J.,** 1986, Punctuated aggradational cycles and the Keyser-New Creek Formation boundary: anatomy of a small-scale unconformity [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 69.
TALKIEWICZ, J. M., and **LASH, G. G.,** 1985, Petrographic trend-surface analysis of Martinsburg sandstones of eastern Pennsylvania and New Jersey: significance and implications [abs.]. AAPG Bull., v. 69, no. 9, p. 1449.
THOMPSON, G. H., 1985, The preglacial Great Falls of the Susquehanna River [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 734.
TURNER-PETERSON, C. E., OLSEN, P. E., and **NUCCIO, V. F.,** 1985, Modes of uranium occurrence in black mudstones in the Newark basin, New Jersey and Pennsylvania [abs.], *in* Robinson, G. R., Jr., and Froelich, A. J., eds., Proceedings of the second U.S. Geological Survey workshop on the early Mesozoic basins of the eastern United States. U.S. Geol. Survey Circ. 946, p. 120-124.
TURNER-PETERSON, C. E., and **SMOOT, J. P.,** 1985, New thoughts on facies relationships in the Triassic Stockton and Lockatong Formations, Pennsylvania and New Jersey [abs.], *in* Robinson, G. R., Jr., and Froelich, A. J., eds., Proceedings of the second U.S. Geological Survey workshop on the early Mesozoic basins of the eastern United States. U.S. Geol. Survey Circ. 946, p. 10-17.
VALENTINO, D. W., 1986, High-temperature deformation of gneiss in Delaware County, southeastern Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 73.
VAN, J. N., 1985, Breached dam [abs.], *in* Tilford, N. R., chairperson, Site selection, characterization, and design exploration. Assoc. Engineering Geologists, Ann. Mtg., 28th, p. 78.
VAN TASSELL, JAY, 1986, Upper Devonian Catskill delta margin cyclic deposition: Virginia, West Virginia and Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 73.
VILLAUME, J. F., 1985, Investigations at sites contaminated with dense, non-aqueous phase liquids (NAPLS). Ground Water Monitoring Review, v. 5, no. 2, p. 60-74.

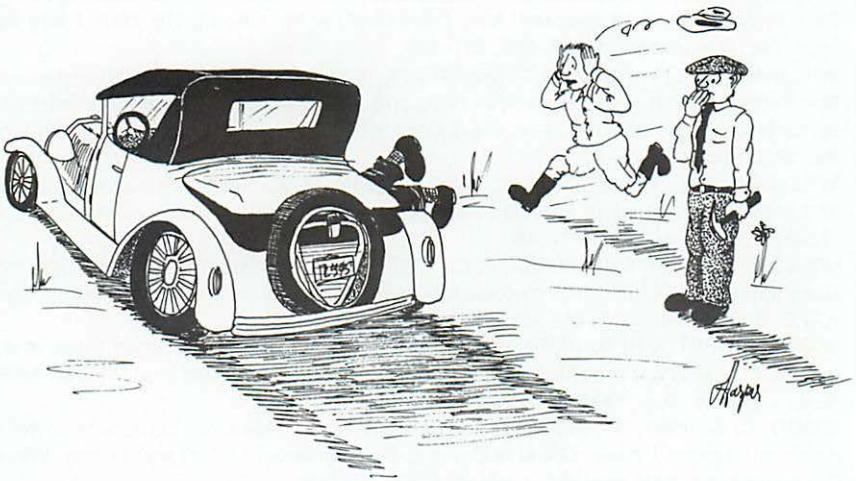
WEBER, M. F., 1986, Olistostromic origin of the "Blue Conglomerate," Lebanon County, Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 18, no. 1, p. 74.
WHELAN, J. F., CECIL, C. B., DULONG, F. T., and **STANTON, R. W.,** 1985, Distribution and isotopic composition of sulfur in the Upper Freeport coal of western Pennsylvania [abs.]. Geol. Soc. America Abs. with Programs, v. 17, no. 7, p. 748.
WILLIAMS, E. G., 1985, Catskill sedimentation in central Pennsylvania, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 20-32, 61-62.
WILLIAMS, E. G., and **BRAGONIER, WILLIAM,** 1985, Origin of the Mercer high-alumina clay, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 204-211, 287-290.
WILLIAMS, E. G., GARDNER, T., DAVIS, A., and others, 1985, Field guide—Economic and mining aspects of the coal-bearing rocks in western Pennsylvania, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 274-290.
WILLIAMS, E. G., and **HOLBROOK, PHILIP,** 1985, Origin of plastic underclays, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 212-225.
WILLIAMS, E. G., HOLBROOK, R., and **LITHGOW, E.,** 1985, Properties and occurrence of bloating shales and clays in the Pennsylvanian of western Pennsylvania, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 255-259, 287-290.
WILLIAMS, E. G., ROSE, A. W., WATERS, S. A., and **MORRISON, J.,** 1985, The distribution of sulfur and carbonate minerals in Pennsylvanian rocks and their significance in predicting acid mine drainage, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 226-236, 287-290.
WILLIAMS, E. G., and **SLINGERLAND, RUDY,** 1985, Field guide—Catskill sedimentation in central Pennsylvania, *in* Gold, D. P., and others, field trip leaders, Central Pennsylvania geology revisited. Ann. Field Conf. of Pa. Geologists, 50th, State College, Pa., Guidebook, p. 45-62.
WILLIAMS, S. L., McLAREN, S. B., and **BURGWIN, M. A.,** 1985, Paleo-archaeological and historical records of selected Pennsylvania mammals. Annals of the Carnegie Museum, v. 54, no. 4, p. 77-188.
WILSON, T. H., and **SHUMAKER, R. C.,** 1985, Three-dimensional structural interrelationships within Cambrian-Ordovician lithotectonic unit of central Appalachians [abs.]. AAPG Bull., v. 69, no. 9, p. 1451.
WNUK, CHRISTOPHER, 1985, Transition from clastic to peat sedimentation in Appalachian basin Pennsylvanian swamps in West Virginia and Pennsylvania [abs.]. AAPG Bull., v. 69, no. 9, p. 1452.
WOOD, C. R., 1985, Ground-water levels in the lower Paleozoic carbonate rocks of western Chester Valley, Chester County, Pennsylvania. U.S. Geol. Survey Water-Resources Inv. WRI 85-4224, 1 sheet, scale 1:24,000.
WOODROW, D. L., 1985, Paleogeography, paleoclimate, and sedimentary processes of the Late Devonian Catskill delta, *in* Woodrow, D. L., and Sevon, W. D., eds., The Catskill delta. Geol. Soc. America Spec. Paper 201, p. 51-63.
YORKE, T. H., 1985, Estimating long-term sediment discharge; which method to use? [abs.], *in* Glysson, G. D., ed., Proceedings of the advanced seminar on sedimentation, August 15-19, 1983, Denver, Colorado. U.S. Geol. Survey Open-File Rept. 85-0098, p. 40-43.
YORKE, T. H., STAMER, J. K., and **PEDERSON, G. L.,** 1985, Effects of low-level dams on the distribution of sediment, trace metals, and organic substances in the lower Schuylkill River basin, Pennsylvania. U.S. Geol. Survey Water-Supply Paper 2256-B, 53 p.

Geochips

Here's one from Mike Shaffner's archives:

I remember one hot summer day. . .we were out in the field with Dr. Ashley.* Late Twenties, I think it was. We were driving one of those old roadsters. Pete Foose was along on that trip. Well, when we got to where we were going, something happened to Ashley's camera. What happened was—the film got stuck and wouldn't move ahead. He got out, went around back of the car and lifted up the trunk lid. He said, "I can just crawl in here and use this for a darkroom and fix the film." Ashley said to us, "You boys go ahead and do what you want to do here. . . ." Well—Pete and I were gone for half an hour or more, I guess. Now, when we got back, all we could see were Ashley's legs stickin' out from the trunk! I guess the lid had gotten stuck somehow. You know—we just got him out in time! He was huffin' and puffin'—just about to breathe his last breath. Oh my! That sure coulda' been disasterous!

*George Ashley was State Geologist of the Fourth Pennsylvania Geological Survey from its beginning in 1919 until he retired in 1947. Mike Shaffner worked as a Geologist for the Survey from 1922 until his retirement in 1962.



GEM AND MINERAL SHOW

The Mineralogical Society of Pennsylvania will hold its 21st Annual "Earth Treasures" Gem and Mineral Show at the South Lancaster County Fairgrounds, Quarryville, PA, on Route 472 just south of 372. Show dates are October 18 & 19, 1986, Saturday - 10 a.m. to 6 p.m. and Sunday - 10 a.m. to 5 p.m. There will be a variety of Minerals, gems, fossils, and jewelry displayed. Entrance will be by a $2.00 donation.

PENNSYLVANIA GEOLOGICAL SURVEY STAFF

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

TECHNICAL SERVICES

Shirley J. Barner, *Clerical Supervisor*
Sandra D. Blust, *Librarian*
Janet L. Wotring, *Administrative Assistant*

Editing Section
Christine M. Dodge, *Geologist Supervisor*
Sherry G. Datres, *Clerk Typist*
James H. Dolimpio, *Cartographic Draftsman*
John G. Kuchinski, *Cartographic Supervisor*
Francis W. Nanna, *Cartographic Draftsman*

ENVIRONMENTAL GEOLOGY DIVISION

John P. Wilshusen, *Division Chief*
Mari G. Barnhart, *Clerk*
Helen L. Delano, *Geologist (Pittsburgh Office)*
William E. Kochanov, *Geologist*
Thomas A. McElroy, *Hydrogeologist*
Michael E. Moore, *Hydrogeologist*
Nikki L. Shatto, *Clerk Typist*
Michael W. Smith, *Hydrogeologist*
Donna M. Snyder, *Administrative Assistant*

GEOLOGIC MAPPING DIVISION

Thomas M. Berg, *Division Chief*

Coal Section
Albert D. Glover, *Geologist Supervisor*
Clifford H. Dodge, *Geologist*
Leonard J. Lentz, *Geologist*
James G. Phillips, *Geologist*
James R. Shaulis, *Geologist*
Viktoras W. Skema, *Geologist*
Rodger T. Faill, *Geologist*
Jon D. Inners, *Geologist*
David B. MacLachlan, *Geologist*
Linda Polk, *Clerk Typist*
William D. Sevon, *Geologist*
John H. Way, *Geologist*

MINERAL RESOURCES DIVISION

Robert C. Smith, *Division Chief*
John H. Barnes, *Geologist*
Samuel W. Berkheiser, Jr., *Geologist*
Leslie T. Chubb, *Laboratory Technician*
Steven A. Haynes, *Geologist*

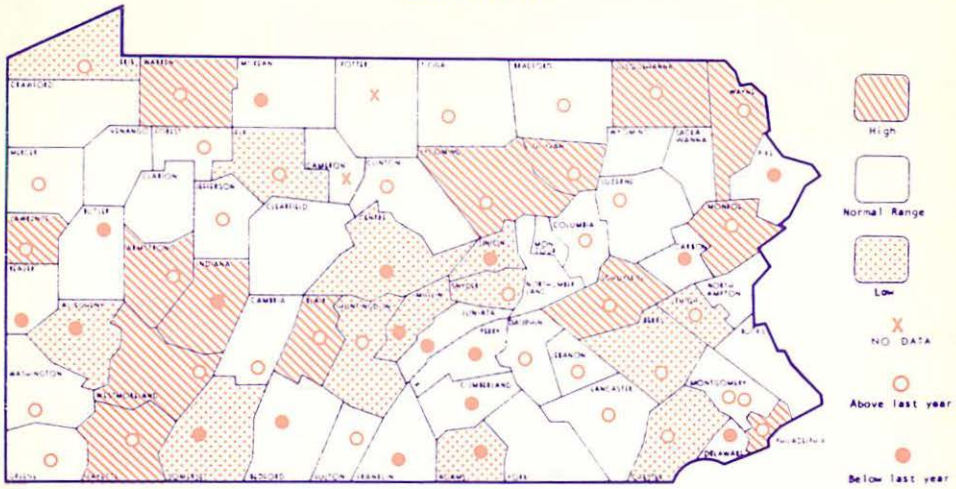
OIL AND GAS GEOLOGY DIVISION

7th Fl., Highland Bldg.
121 S. Highland Ave.
Pittsburgh, PA 15206
John A. Harper, *Division Chief*
Lajos Balogh, *Draftsman*
Cheryl Cozart, *Statistical Asst.*
Robert Fenton, *Laboratory Technician*
Joseph E. Kunz, *Clerk Typist*
Christopher D. Laughrey, *Geologist*
Antoinette K. Markowski, *Geologist*
John Petro, *Draftsman*

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

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

GROUNDWATER LEVELS
FOR
JUNE 1986



Bureau of Topographic and Geologic Survey
Dept. of Environmental Resources
P.O. Box 2357
Harrisburg, Pa. 17120

Address Corrections Requested