107TH ANNUAL REPORT OF THE STATE GEOLOGIST

of

INDIANA GEOLOGICAL SURVEY
DEPARTMENT OF NATURAL RESOURCES

for

July 1, 1982 - June 30, 1983
PERSONNEL

Permanent Personnel

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Maurice E. Biggs ...................................... Assistant State Geologist
Mary E. Fox ........................................... Mineral Statistician
E. Coleen George ..................................... Principal Secretary

Coal and Industrial Minerals Section

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Curtis H. Ault .......................................... Geologist and Associate Head
Donald L. Eggert ....................................... Geologist
Gordon S. Fraser ....................................... Geologist
Denver Harper .......................................... Geologist
Nancy R. Hasenmueller ................................ Geologist
Walter A. Hasenmueller ................................ Geologist
Paul Irwin (Div. of Reclamation) ....................... Geologist
Nelson R. Shaffer ....................................... Geologist
Michele Wright (NRC) .................................. Geologist
(To May 12, 1983)

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Kathryn Shaffer ....................................... Secretary

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Helmut Beierke .......................................................... Electronic Technician
(From January 27, 1983 to February 25, 1983)
Jimmy J. Johnson .......................................................... Electronic Technician
(From March 14, 1983)
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Henry H. Gray .......................................................... Head Stratigrapher
Edwin J. Hartke .......................................................... Environmental Geologist
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Joseph F. Whaley .......................................................... Geophysicist
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Stanley J. Keller .......................................................... Geologist
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Sherry Cazee .......................................................... Geological Assistant
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Patsy Starks .......................................................... Secretary and Curator of Records
Donald R. Wilds .......................................................... Geological Assistant
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(August 29, 1982 to April 23, 1983)

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(September 12, 1982 to April 23, 1983)

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(July 1, 1982 to June 30, 1983)

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(May 8, 1983 to June 30, 1983)

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Amy Roberts (OSM) ................................................ Laboratory Assistant
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(June 19, 1983 to June 30, 1983)

Christopher Schubert (USGS) ................................. Geological Assistant
(July 1, 1982 to June 30, 1983)

Randall Sippel (USGS) .......................................... Geological Assistant
(May 8, 1983 to June 30, 1983)

Tom Skirvin ........................................................ Laboratory Assistant
(May 8, 1983 to June 30, 1983)

Eugene Spicer ..................................................... Geological Assistant
(June 19, 1983 to June 30, 1983)

James Sullivan (USGS) .......................................... Geological Assistant
(May 8, 1983 to June 30, 1983)

Laurie Sullivan ................................................... Laboratory Assistant
(August 29, 1982 to April 23, 1983)

George Thompson (USGS) .................................... Laboratory Assistant
(May 8, 1983 to June 18, 1983)

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(July 18, 1982 to October 23, 1982)

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(June 19, 1983 to June 30, 1983)

Licia A. Weber (OSM) .......................................... Geological Assistant
(July 1, 1982 to June 30, 1983)

Mike Zoeller ...................................................... Laboratory Assistant
(September 12, 1982 to May 7, 1983)
Maureen Zrobek (USGS) .................................. Geological Assistant
(May 8, 1983 to June 18, 1983)

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(July 1, 1982 to June 30, 1983)

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(August 29, 1982 to April 23, 1983)
Robert Autio (COM) .................................. Field Assistant
(July 1, 1982 to August 28, 1982)
Joy Beier ................................................ Laboratory Assistant
(May 8, 1983 to June 30, 1983)
Marsha Bode .......................................... Laboratory Assistant
(August 29, 1982 to May 7, 1983)
Michael Bohlen ...................................... Laboratory Assistant
(August 29, 1982 to April 23, 1983)
Jean Brown .......................................... Laboratory Assistant
(August 29, 1982 to January 29, 1983)
Jim Brown ............................................ Laboratory Assistant
(August 29, 1982 to December 4, 1982)
David Burke (COM) ................................ Field Assistant
(August 1, 1982 to October 9, 1982)
Mark Cage ............................................. Laboratory Assistant
(July 1, 1982 to June 30, 1983)
Michael Campbell ................................. Laboratory Assistant
(January 16, 1983 to May 7, 1983)
Stan Carpenter ...................................... Laboratory Assistant
(September 12, 1982 to March 26, 1983)
Lynn Devine ........................................ Laboratory Assistant
(August 29, 1982 to May 7, 1983)
Prodip Dutta ......................................... Geological Assistant
(July 1, 1982 to October 9, 1982)
James Fox ............................................ Laboratory Assistant
(May 8, 1983 to June 30, 1983)
Darrell Gilmore ..................................... Laboratory Assistant
(August 29, 1982 to June 18, 1983)
Gregory Griffith ................................... Laboratory Assistant
(July 1, 1982 to August 14, 1982)
Robert Hickner ...................................... Laboratory Assistant
(August 29, 1982 to February 26, 1983)
Randy Kline .......................................... Laboratory Assistant
(August 29, 1982 to November 6, 1982)
Alvin Wayne Malcolm, Jr. ......................... Laboratory Assistant
(May 8, 1983 to June 30, 1983)
Jeanne Monday ...................................... Laboratory Assistant
(July 1, 1982 to August 14, 1982)
Randy Oakley ........................................ Laboratory Assistant
(August 29, 1982 to May 7, 1983)
<table>
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<tr>
<th>Name</th>
<th>Position</th>
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<tr>
<td>Doug Opell (COM)</td>
<td>Field Assistant</td>
<td>(July 1, 1982 to August 14, 1982)</td>
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<td>Steve Owens</td>
<td>Laboratory Assistant</td>
<td>(July 1, 1982 to July 31, 1982)</td>
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<td>Susan Pappas</td>
<td>Laboratory Assistant</td>
<td>(August 29, 1982 to October 23, 1982)</td>
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<td>Ruth Ryan (COM)</td>
<td>Laboratory Assistant</td>
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<td>Tom Skirvin (COM)</td>
<td>Laboratory Assistant</td>
<td>(July 1, 1982 to September 25, 1982)</td>
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<td>Tom Specht</td>
<td>Laboratory Assistant</td>
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<td>Timothy Sult</td>
<td>Laboratory Assistant</td>
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<td>Susan Taylor</td>
<td>Laboratory Assistant</td>
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<td>Rick Truex</td>
<td>Laboratory Assistant</td>
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<td>Lori Victory</td>
<td>Laboratory Assistant</td>
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<td>Christy Wrightsman</td>
<td>Laboratory Assistant</td>
<td>(July 1, 1982 to June 18, 1983)</td>
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<td>Geology Section</td>
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<td>Robert Autio</td>
<td>Field Assistant</td>
<td>(September 26, 1982 to June 30, 1983)</td>
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<td>Anna Marie Berry</td>
<td>Laboratory Assistant</td>
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<td>David Brewster</td>
<td>Laboratory Assistant</td>
<td>(June 19, 1983 to June 30, 1983)</td>
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<td>Timothy Canfield</td>
<td>Laboratory Assistant</td>
<td>(February 27, 1983 to April 23, 1983)</td>
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<td>Stephen Dean</td>
<td>Laboratory Assistant</td>
<td>(July 1, 1982 to August 14, 1982)</td>
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<td>Jeffrey Frey</td>
<td>Field Assistant</td>
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<td>Samuel Frushour</td>
<td>Laboratory Assistant</td>
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<td>Julie Gordon</td>
<td>Laboratory Assistant</td>
<td>(January 2, 1983 to April 23, 1983)</td>
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<td>Paul Hickner</td>
<td>Laboratory Assistant</td>
<td>(June 19, 1983 to June 30, 1983)</td>
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<td>Steven Holland</td>
<td>Laboratory Assistant</td>
<td>(September 12, 1982 to April 23, 1983)</td>
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<td>John Johnson</td>
<td>Laboratory Assistant</td>
<td>(January 16, 1983 to May 7, 1983)</td>
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<td>Robert Kirk</td>
<td>Laboratory Assistant</td>
<td>(January 2, 1983 to April 23, 1983)</td>
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<td>Barry Lebowitz</td>
<td>Laboratory Assistant</td>
<td>(July 1, 1982 to August 28, 1982)</td>
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<td>Field Assistant</td>
<td>(April 24, 1983 to June 18, 1983)</td>
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Juanita Lewis ........................................... Laboratory Assistant  
(August 19, 1982 to December 18, 1982) 
Lisa Nazor ............................................... Laboratory Assistant  
(May 8, 1983 to May 21, 1983) 
Michael Meyer ......................................... Laboratory Assistant  
(October 10, 1982 to April 23, 1983) 
Tina Mirabile ........................................... Laboratory Assistant  
(August 29, 1982 to April 23, 1983) 
Douglas Opell .......................................... Field Assistant  
(May 8, 1983 to June 30, 1983) 
Stephanie Parker ....................................... Laboratory Assistant  
(August 29, 1982 to November 20, 1982) 
William Swanson ...................................... Laboratory Assistant  
(January 2, 1983 to April 23, 1983) 
Jenny Tankersley ...................................... Research Assistant  
(June 5, 1983 to June 30, 1983) 
Donald Tyler ............................................ Laboratory Assistant  
(July 1, 1982 to July 31, 1982) 
Helena Warburg ........................................ Research Assistant  
(June 19, 1983 to June 30, 1983) 
Julie Warren ............................................ Laboratory Assistant  
(September 26, 1982 to April 23, 1983) 

Geophysics Section

Steven Duncan .......................................... Keypunch Operator  
(July 1, 1982 to June 30, 1983) 
Patricia Fentress ..................................... Keypunch Operator  
(July 1, 1982 to August 14, 1982) 
David Loudenback ..................................... Laboratory Assistant  
(August 29, 1982 to December 18, 1982) 
Maureen 'Robek ....................................... Keypunch Operator  
(July 1, 1982 to May 7, 1983) 

Petroleum Section

Gregory Brown .......................................... Laboratory Assistant  
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Jerry Burton ........................................... Geological Assistant  
(June 6, 1983 to June 30, 1983) 
James Cheesman ....................................... Field Assistant  
(July 19, 1982 to August 16, 1982) 
Ed Clements ............................................ Field Assistant  
(May 16, 1983 to June 30, 1983) 
Robert Dulmes .......................................... Laboratory Assistant  
(February 2, 1983 to March 29, 1983) 
Larry Enochs ........................................... Field Assistant  
(July 1, 1982 to August 13, 1982) 
Adam Feldman .......................................... Laboratory Assistant  
(August 31, 1982 to April 15, 1983)
Mike Hackman ........................................ Laboratory Assistant  
(July 1, 1982 to August 20, 1982)

Andy Hodek ........................................ Field Assistant  
(May 9, 1983 to June 3, 1983)

Cynthia Love ....................................... Laboratory Assistant  
(July 8, 1982 to August 12, 1982)

Myra McCotry ..................................... Laboratory Assistant  
(July 1, 1982 to December 18, 1982)

Doug Montgomery ................................ Field Assistant  
(November 15, 1982 to January 7, 1983)

Melody Montgomery .............................. Clerical Assistant  
(January 20, 1983 to April 25, 1983)

Dianna Moss ....................................... Clerical Assistant  
(July 1, 1982 to June 30, 1983)

Evelyn Ogborn .................................... Keypunch Operator  
(July 1, 1982 to December 17, 1982)

Stephanie Parker ................................ Laboratory Assistant  
(November 30, 1982 to April 25, 1983)

William Phillips ................................ Laboratory Assistant  
(August 30, 1982 to November 23, 1982)  
(May 9, 1983 to June 30, 1983)

Dave Schulte ..................................... Laboratory Assistant  
(August 30, 1982 to April 14, 1983)

Beth Schwartz .................................... Laboratory Assistant  
(August 31, 1982 to February 28, 1983)

Timothy Strauser ................................ Laboratory Assistant  
(September 10, 1982 to February 15, 1983)

Steve Werner ..................................... Laboratory Assistant  
(October 14, 1982 to November 2, 1982)
INTRODUCTION

Most of the people and organizations requesting information or counsel from the geologists of the Coal and Industrial Minerals Section can be placed in four broad categories: individuals, commercial, government, and academic. More than half of the requests come from commercial interests, which range from coal companies to diamond companies and whose mineral discoveries and eventual exploitation of those discoveries in an environmentally acceptable manner is the most tangible evidence of our efforts.

The other three categories combine many varied interests, and our consultations with such persons as landowners, private citizens, government officials, attorneys, university researchers, and students of all ages perhaps exemplifies the widespread service and counsel provided each year. This year we received 1,129 requests for service, and we spent much effort helping many companies as well as individuals search for and evaluate the state's mineral resources. Without the extensive files of mineral data compiled by the Survey in Indiana over more than 100 years of service, the search would have been much more difficult and would have failed much more often.

To keep abreast of the increasing need for geologic data on coal and industrial minerals, members of the Section continued intensive efforts this year to collect and organize technical data gathered from fieldwork, laboratory analyses, published sources, Survey files, and commercial companies. Our geologists conducted research on 35 projects on subjects ranging from ancient reefs to modern dune sands. As always, we found that the information generated by our projects is put to practical use nearly as fast as it becomes available. This year we continued work on large projects to gather and map mine data and to locate and map the extent of abandoned coal mines. All of this information is needed for environmental planning, for reserve calculations, and for future exploration for both shallow and deep coal. Our deep drilling program and county studies of coal resources also aid this exploratory effort, especially for thick coal that will eventually have to be mined underground. We increased our knowledge of much of the state's other mineral resources through such studies as those of high-purity limestone and dolomite, deposits of sand and gravel, composition and distribution of clays and shales, and quality and extent of oil shale in Indiana.

The professional activities of the geologists of the Section reflect the research and expertise necessary to effectively carry out our programs. Our geologists published 22 professional papers, presented 20 papers at professional meetings, and gave six public lectures. They served on four professional committees and were officers in two large professional organizations. Our geologists were also involved in preparation of technical papers, posters, and field guidebooks for a major professional meeting, the annual meeting of the Geologic Society of America, to be held in Indianapolis in November 1983.
Some industrial developments this year resulting in part from current and past research of the Section

A near-surface reefal limestone deposit of high purity and high brightness in Grant County, discovered more than a decade ago, is being evaluated by two companies for the possible production of limestone extenders and high-brightness fillers, the latter of which is a mineral product not previously produced in Indiana. Several other companies have shown an interest in the deposit for similar products. The owners of the deposit, Pipe Creek, Jr., have quarried the reefal limestone for 11 years for crushed-stone aggregate and high-calcium agricultural limestone, which is shipped to points as far away as Michigan and Illinois. The Survey has counseled with the operators from the discovery of the deposit to the present day, and the Survey's detailed study and chemical analysis of cores from the reef have been a large factor in the industrial development of the limestone.

Survey research of the New Albany oil shale in southeastern Indiana has been the primary basis for industrial investigation of the possibilities for petroleum from Indiana shale. Southern Indiana Shale Oil Co. (SISO) has opened an experimental pit and has cleared a site near Marysville, Clark County, for a pilot plant to produce petroleum from the shale, and two other companies, Phillips Petroleum Co. and Mobil Oil Co., have acquired tracts of acreage for possible development. The Survey's information on test drilling, mapping, and geochemical testing of the shale and overburden has provided much of the basis for the interest and activities of the companies in the area.

COMPLETED PROJECTS OR MAJOR PARTS OF PROJECTS

Geologic map of Indiana
Sources of construction materials in Indiana
Alluvial deposits of the Ohio River
Coal resources of Vigo County
Oil-shale prospects in southeastern Indiana
Proceedings of the 18th Forum on Geology of Industrial Minerals
Directory of crushed stone, ground limestone, cement and lime producers in Indiana
Locations of underground mines
High-brightness limestones of Indiana

RESEARCH PROJECTS

CLAY AND SHALE

General

A large number of cores were described and sampled. Analysis of samples from outcrops and cores were made for minerals by X-ray diffraction, and several papers about the mineralogy and geochemistry of the New Albany Shale were presented. A cooperative project with the U.S. Bureau of Mines on
ceramic properties of clays continued, and a new project to investigate organic-rich shales of Pennsylvanian age was started.

**New Albany Shale (DOE funded)**

Two cores of the New Albany were drilled to obtain samples for chemical, mineralogic, and organic carbon content. A field trip to observe and study the stratigraphic and lithologic relationships was organized, and a field guidebook was written. A paper describing the thickness and nature of overburden on the New Albany Shale in southeastern Indiana was completed as part of the contract with the DOE for this project.

**Oil shale prospects in southeastern Indiana (Indiana Department of Commerce)**

Maps showing the thickness of overburden on the New Albany Shale in Clark, Scott, and Jackson Counties were completed and submitted for the project, and copies were made available through the Indiana Geological Survey. An annotated bibliography of publications relating to the New Albany was also compiled and submitted.

**COAL**

**Deep drilling program for coal**

About 10 years ago the Survey began a drilling project to gather information on Indiana's deep coal reserves. Through the drilling of thirteen holes in five counties for this project we have obtained information on thickness, depth, quality, and reserves of coal; on properties of rock associated with the coal for underground mining purposes; and on the methane content of coal. This year we drilled two additional holes: one in Sullivan County (SDH-321) to a total depth of 490 feet and one in Gibson County (SDH-322) to a total depth of 368 feet. The hole in Sullivan County had partial funding from the U.S. Geological Survey.

**Preliminary coal maps of Posey, Greene, and Owen Counties**

These projects continue our county reconnaissance mapping of the distribution, structure, and mined areas of coal. Correlation of marker beds and collection of drilling data were continued for the Owen County map. The mapping for Green County is complete, and only a final compilation of mine data is needed to complete this project. Some progress was made on correlation of geophysical logs for the maps in Posey County.

**Coal resources of Gibson County**

Maps showing distribution, structure, and thickness of selected coals and associated strata in Gibson County were completed. Several areas of low-sulfur and of thick coal were identified, and a report on the project was presented at a meeting of the International Association of Sedimentologists.
Coal slurry

Although this project is essentially complete, the results of analyses of samples collected during the year were integrated with the previous results, and a summary report was presented at the Eighth Kentucky Coal By-Products Symposium.

Coal resources of Vanderburgh County

A preliminary review of geophysical logs in the county was conducted to determine thickness and distribution of coals.

Subsidence caused by underground mining of coal

A study of the fluid content of abandoned underground mines was begun by examining maps of abandoned mines for indications of drill holes where waters in the mines could be sampled. Field searches for some of the holes were conducted.

Roof stability and geologic discontinuities in coal seams

Fieldwork was continued to collect data on a variety of geologic discontinuities encountered in an underground mine now active in Indiana.

Coal resources of Vigo County

A report, "Coal mining in Vigo County, Indiana," which includes coal geology, the mining history of the county, and many maps showing thickness and structures of the coal beds in the county, was submitted for publishing as a Special Report of the Survey.

Demethanization of coal

This continuing study will determine the methane content of coal beds in Indiana using desorption methods developed by the U.S. Bureau of Mines. As cores of coal are drilled with the Survey's drilling rig, degassification of the coal is conducted.

Coal resources of Sullivan County

Data were compiled from maps of abandoned coal mines, and maps were drawn showing the structure, thickness, and geologic irregularities of major coals in the important mining districts of Sullivan County.
Annual mine check

The annual check of mines in Indiana began in June.

Indiana coal data system

Much progress was made on computerization of all of the files included in this overall project, which includes two separate projects, discussed below, the point-source data project for the USGS and the project on abandoned mines supported by the Indiana Division of Reclamation and the U.S. Office of Surface Mining. In addition to the data being added by these two projects, analytical values from the Survey's files of chemical analyses of Indiana coals were recomputed from original data and entered into the data system. This latter part of the project is about one-fourth done.

Point-source data for the National Coal Resources Data System (USGS funded)

Point-source coal data, including information from drilling records, coal samples, outcrop data, mine maps, published maps, and miscellaneous maps, were coded for entry into the USGS's computer files in preparation for calculations of Indiana's coal resources. Data collection and entry into the system were completed for Vermillion, Warren, Fountain, and Parke Counties, and much data were collected for several other counties.

Mine map project (Division of Reclamation-OSM funded)

This project to map location and extent of mines in southwestern Indiana made much progress during the year. A draft set of county maps was completed that show location of underground mines on a scale of one inch to one mile. Mapping of surface coal mines continued with many quadrangles in the mining districts now showing surface mining through 1980. The bulk of entry of data into the computer data base was completed, and the task of updating, revising, and correcting the data is underway.

Coals of the Mansfield and Brazil Formations.

This new project to map and evaluate the resources of coals in the Mansfield and Brazil Formations focused on compiling data on structure and distribution of the Lead Creek Limestone Member of the Mansfield Formation, which is a marker bed in the study interval.

Reference section of the Survant and Houchin Creek Coal Members (Linton and Petersburg Formations.)

Drilling data was compiled from near the type sections of these coals, where SDH 306 was drilled as a reference well. We are continuing to establish stratigraphic relationships among these coals and the more extensively mapped Springfield and Colchester Coal Members (Petersburg and Linton Formations.).
Geologic map of Indiana

All mapping for this project, a joint effort of three geologists from three Sections of the Survey, was completed this year. The map is now being critically read before being published by the Survey.

Maps of Indiana showing structure on top of the Muscatuck Group and rocks of Silurian age

Both of these maps were nearly completed.

Faulting in mines and outcrops of southwestern Indiana (NRC funded)

This study to determine the nature and location of post-Pennsylvanian faults and other displacement structures in mines and outcrops of southwestern Indiana continued this year with examination and recording of evidence of faulting in highwall exposures in active and abandoned coal mines. Mapping and description of faulting in the Georgetown area was a major part of the project this year.

Annotated bibliography of Indiana Geology

Work was begun this year on compilation of the annotated bibliography for the period 1971 to 1975.

LIMESTONE AND DOLOMITE

Silurian reefs in northern Indiana

Information and mapping of reefs in northern Indiana continued through study of deepened sections in active quarries and samples from core holes. The field search for outcrops of reefal limestone and dolomite continued.

Carbonate rock fillers and whiting

A report on this project was completed and published. We continue to collect samples and make measurements of brightness, which are added to our files. We continue to receive inquiries from commercial interests concerning resources of high-brightness limestone and dolomite in Indiana.
Underground mining of limestone and dolomite in Indiana

Although not a formal project, we continue to develop information on underground mining for limestone and dolomite because of the industrial interest. A report on the "Potential for Deep Underground Limestone Mining in Indiana" was published this year in the American Institute of Mining Metallurgical and Petroleum Engineers Transactions.

Stylolite minerals

About 10 samples of stylolites were collected. Detailed mineralogic and geochemical analyses of the stylolite fillings were made as the samples were collected.

Tabulation of abandoned quarries

We continue to compile data on abandoned quarries in conjunction with other research and service duties. Location and field examination of abandoned quarries in several counties were conducted this year. Our files on abandoned quarries are regularly consulted for reclamation and mineral resource information.

METAL DEPOSITS

Hydrogeochemical reconnaissance of two southern Indiana counties were completed and writing of reports started. A special investigation of potentially metal-rich shales associated with coals was begun.

METEORITES

A project to gather information on meteorites was started, and several talks for the general public were made on the subject.

MINERAL RESOURCES OF INDIANA

Mineral resources map of Indiana

This map is complete and awaits drafting before publication.

SAND AND GRAVEL

Lake Michigan sedimentation

Grain-size analyses of sediments collected by the USGS in the study area were completed, and interpretations of the environments of deposition were made. A proposal was prepared for cooperative work with the National Park Service and work was begun. A field reconnaissance of the study area was
made, auger holes were drilled and logged by gamma-ray, and additional samples were collected.

**Terrace deposits of the Eel River**

Survey supervision of study for a graduate student at Indiana University resulted in a Master's thesis describing the characteristics and origin of the sand and gravel deposits along the Eel River.

**Surficial geology Vanderburgh County**

Eight additional drill holes were completed this year. Samples collected during the drilling were being analyzed at the end of the year.

**Alluviation of the Middle Wabash River**

Maps showing the distribution, thickness, and amount of overburden covering the sand and gravel deposits along the middle Wabash River were nearly completed. Fieldtrip guidebooks were prepared describing the history of the Wabash River for Indiana Geologists and the Friends of the Pleistocene, and a manuscript was prepared for a field trip sponsored by the Geological Society of America. Fieldwork was concentrated along Deer Creek, one of the major tributaries of the Wabash River in this area, where sections were measured and described, samples collected, and auger holes drilled.

**Terrace deposits along the Whitewater River**

Survey supervision was supplied for a Master's thesis describing the characteristics and origin of the sand and gravel deposits along the Whitewater River. Work was begun to collect subsurface information concerning the extent of these deposits.

**Kankakee dune sands**

A project was started to describe the grain size and mineralogy of the aeolian sediments associated with the Kankakee Outwash Plain. Auger holes were drilled, samples collected, and grain-size analyses begun.

**DRAFTING AND PHOTOGRAPHY SECTION**

The primary function of the Drafting and Photography Section is to provide service to the commodity and research sections of the Geological Survey. The services consist mainly of the final preparation of maps and illustrations for publishing, preparation of displays, mounting and framing of
maps and photographs, phototypesetting, diazo printing, photocopier, film processing and printing, photomacrography, field photography, color proofing of maps and artwork, and preparation of projection slides.

Jobs completed for publication by the Geological Survey are: Special Report 32, Atlas of Early and Middle Paleozoic Paleogeography of the Southern Great Lakes Area; Occasional Paper 37, Proceedings of the 18th Forum on the Geology of Industrial Minerals; Occasional Paper 39, Conodonts from the Everton Dolomite and the St. Peter Sandstone (Lower Middle Ordovician) in a Core from Southwestern Indiana; Occasional Paper 40, Computer Calculation of Two-Dimensional Gravity Fields; Occasional Paper 41, Analyses of Subsurface Brines of Indiana; Mineral Economics Series 28, Oil Development and Production in Indiana During 1981; Directory of Crushed Stone, Ground Limestone, Cement, and Lime Producers in Indiana; Petroleum Exploration Map 76, Well Location Map of Huntington County, Indiana; Petroleum Exploration Map 76A, Map of Huntington County, Indiana, Showing Total Depth of Wells; Misc. Maps 35 and 36, Map of Indiana Showing Topography of the Bedrock Surface (scale 1:500,000); Misc. Maps 37 and 38, Map of Indiana Showing Thickness of Unconsolidated Deposits (scale 1:500,000); Misc. Map 39, Map of Indiana Showing Topography of the Bedrock Surface (scale 1:1,774,000); Misc. Map 40, Map of Indiana Showing Thickness of Unconsolidated Deposits (scale 1:1,774,000); and revision of the petroleum exploration maps of Indiana counties.

Other jobs completed include the illustrations for a guidebook for the Friends of the Pleistocene and for 9 field trips for the GSA-83 Guidebook, base maps of Blackford and Huntington Counties (scale 1:63,360), a map showing published petroleum exploration maps, 3 displays, sketches for 7 sets of 6 items for the newspaper series, slide drawings for 17 talks, and illustrations for 6 papers for publishing in journals and proceedings of geologic organizations.

Other jobs in progress include: Special Report 31, Environmental Geology of Vigo County, Indiana—An Aid to Planning; Special Report __, Geology and Coal Deposits of the Clinton Area, West-Central Indiana; Misc. Map 41, Map of Indiana Showing Locations of Coal and Industrial Minerals Operations; a base map of Delaware County scale 1:63,360); and a display for the 1983 Indiana State Fair.

Photographic items produced consist of 1239 camera copies, 66 field photographs, 34 photomacrographs, 926 black and white prints, 243 film positives and duplicate negatives, 76 stripping film prints of stick-up type and symbols, 13 scribesheets, 55 peelcoat films, 18 color proofs of maps and artwork for covers, 371 color slides, and 53 black and white slides.

Approximately 61,000 sq. ft. of prints were produced on the diazo printer.
EDUCATIONAL SERVICES

The Office of Educational Services was established by the State Geologist of Indiana to aid in the coordination of the Geological Survey's efforts in providing information about Indiana geology and mineral resources to the public. This office assists in the preparation of materials for newspapers, magazines, public schools, youth groups and adult groups, and all other groups and individuals who are interested in rocks, minerals, fossils, and the earth. On request, he participates in radio and television programs which involve something about Indiana geology, minerals, etc. By means of news releases to Indiana's newspapers and articles sent to appropriate magazines, the Office of Educational Services not only aids in informing the public about the activities of the Indiana Geological Survey but also aids in the distribution of educational information to the public. In addition to giving public lectures and conducting special field trips, when requested, the Educational Services works directly with teachers in public schools, in college classes, with geology clubs, civic groups, rockhound clubs, Scout groups, 4-H clubs and adult leaders, conservation clubs and children and adults throughout the state on programs or projects concerning Indiana's geology and mineral resources. On occasion, when requested, he serves as guest lecturer and conducts special field trips for college classes. He identifies many of the rock, mineral, or fossil specimens sent through the mail or brought in to the Geological Survey by Indiana citizens and other visitors. The geologist in charge of Educational Services also aids in the preparation and installation of exhibits and displays for fairs, for professional meetings, for amateur rock shows, and for displays in the Geology Building. He also serves as judge of geology and weather exhibits at fairs, rock shows, etc.

During the fiscal year 1982-83, the geologist in charge of Educational Services spent 35½ days in the field and traveled more than 6,800 miles. In answer to requests received from the public, 9 public lectures were given and 5 educational field trips and 6 tours of the Geology Building were conducted during the 12-month period.

During the past fiscal year, the program for providing illustrated news items for Indiana's newspapers was continued and, with the assistance of Survey personnel and the Survey artist, 18 additional units were added to the series and were mailed to nearly all newspapers throughout the state. The total number of the series is 195 and another 11 units are in process.

Public lectures were made to the following groups: 5th grade class, Childs School, Bloomington; Martinsville Weeblo Scouts; Junior High School group, Graceland Christian School, New Albany; 3 sections of 5th and 6th graders, Edgewood Elementary School, Ellettsville; Boy Scout troop, Marlin School, Bloomington; 5th and 6th grade classes, Schmitt Elementary School, Columbus; and a Lawrence county 4-H group.

Special field trips (educational) were conducted for the following groups: a geology class from Manchester College, North Manchester; Pike High School science class from Marion County (2 field trips); gold panning trip for 2 Indianapolis rockhounds to Brown County; and a tour of local geologic points of interest for Dr. Ault, I.U. Science Education Department.
The Educational Services geologist again served as the Geological Survey's representative on the Department of Natural Resources State Fair Committee for the 1983 Indiana State Fair.

Tours of the Geology Building were conducted for the following groups: Two groups of 3rd and 4th graders from Childs School, Bloomington; members of an economic geology class from I.U.P.U.I.--Fort Wayne; Ms. Deborah Hastings, visitor; members of the 5th and 6th grades from Schmitt Elementary School, Columbus; and members (or participants) of the 1983 High School Science Institute, Indiana University.


Exhibits prepared by and installed by the Indiana Geological Survey for public display included an exhibit showing some of Indiana's scenic features for the 1982 Indiana State Fair. This exhibit was later installed at the Wesselman Park Nature Center, Evangsville. The Trenton exhibit was installed at the Energy Conference held at the Indianapolis Conference Center. A revised strip mine reclamation exhibit was installed at the 1983 City-Community Fair, Indiana University Assembly Hall. The Survey's historical geology exhibit was taken to the Oilmen's Outing held at Robinson, Illinois.

During the past fiscal year, the Educational Services geologist submitted news releases about Geological Survey activities and the availability of new Survey maps and publications.

During the 1982 4-H Fair season, 4-H geology and weather exhibits were judged by the Educational Services geologist for the Martin County 4-H Fair, the Jefferson County Fair, the Decatur County Fair, the Bartholomew County Fair, the Jackson County Fair, and the Morgan County 4-H Fair.

Three editions of the Survey Newsletter were compiled and distributed to all Survey personnel by the Educational Services geologist during the past fiscal year.

The Educational Services geologist attended only one professional meeting during the past fiscal year. It was the annual Oilmen's Outing held in Robinson, Illinois last June.

GEOCHEMISTRY SECTION

The section upgraded its X-ray diffraction capabilities by the installation of a more powerful X-ray tube. A result of the change is the promise of less expensive replacement when the new tube becomes old or fails.
The computer used with the X-ray equipment also has been upgraded to increase its versatility. After 5 years of operation of the carbon-hydrogen-nitrogen analyses, several components failed in sequence. Repair was achieved only to be followed by an additional failure. Finally, correct diagnosis led to a more lasting repair.

The sampling of old cores stored in the basement of the Department wing of the building has been completed. More than 7,000 samples were taken during nearly 4 years. Of these nearly all have been crushed and reduced in bulk and nearly half have been completely prepared for analysis. About one-fourth have been analyzed for carbon, hydrogen, nitrogen, and sulfur. Because of the large number of samples of oil shale on hand, additional work on the backlog has not been done. In addition to providing general characterization of the materials available, the analytical program is to seek source rocks for petroleum and possible economically significant sandstones. Generally, cores of economically significant carbonates have been analyzed shortly after receipt of the core.

The coal chemistry laboratory made 2,786 analytical determinations during the year; of these 1,631 were total sulfur and 849 were carbon dioxide determinations. Except for approximately 50 determinations of sulfur, all analyses of sulfur and carbon dioxide were on non-coal materials. A new study to investigate the chemical and mineralogical composition of ash and to determine the form of chlorine and sulfur in coal also was begun. Lou Miller coauthored a paper on the energy content of wastes from coal-preparation plants in Indiana and gave four talks.

Some work in organic geochemistry was done during the year to investigate organic-rich rocks as possible source rock for petroleum and to study the biochemical processes that led to their formation. This work has been aimed at oil from the Trenton Field and carbon isotopes from the New Albany Shale.

Members of the section organized a computer file of groundwater chemistry data for 3,000 Indiana water wells; identified material brought in by the public; studied samples of Indiana limestone that have spalled or become stained in buildings; and analyzed some copper artifacts brought in by archaeologists.

GEOLOGY SECTION

General Functions

The Geology Section is oriented in keeping with the State's most basic geologic aspects, meaning in stratigraphy, including Quaternary stratigraphy, and paleontology, especially stratigraphic paleontology. Thus, the Section collects, stores, and disseminates information on the nature and distribution of rock and fossil materials in the earth's crust at and below the surface of Indiana.
Interpretive synthesis of collected information in a framework of geologic time perhaps expresses best the purest form of scientific research that the Section carries on. Dissemination of both factual information and interpretive syntheses in response to requests and in publications for potential users is the applied part of the Section's activities.

During the 1982-83 year, the Section recorded 590 conferences and special field trips and 1323 items of correspondence with public, private, industrial, business, educational, environmental, governmental, and professional individuals and groups. The majority of these activities was in response to requests of the section for information and advice. Further, 95 environmental questionnaires were completed in relation to projects using local governmental and federal funds and including road, street, highway, bridge, sewer, storm-drain, industrial park, lakefront, airport, and motel-convention center works. Also, 11 open-file reports (memorandum reports) were completed as responses to extra-Survey needs, and they ranged greatly in diversity, for example, from placer-gold mining in Brown County (for county planning group) to hazardous waste disposal (for State Board of Health).

Mapping is one activity that spans well the functions of the Section that range in nature from research to applied. A notable achievement in 1982-83 was publication of four state maps showing topography of the bedrock surface and thickness of unconsolidated materials; also, the near completion of a new bedrock geologic map of the state and a beginning for the new Quaternary (unconsolidated materials) map of Indiana.

Also notably during 1982-83, the Section was heavily involved with extra-Survey needs of the geologic profession at large, both regionally and continentally. For example, it had the organizational-leadership role in completing the midwestern stratigraphic correlation chart as part of a project on "Correlation of Stratigraphic Units of North America, auspices American Association of Petroleum Geologists and U.S. Geological Survey; also in example, the same role in preparing 16 field trips, including embracive articles, for the 1983 annual meeting of the Geological Society of America (Indianapolis, November 1983).

During the year the Section actively furthered 12 separately listed formal projects, two being new and two being completed. Among these, six are more or less applied and service projects and pertain to mapping, environmental concerns, and service to the geologic profession. The rest are basic research projects, although each has obvious practical applications, for example, to water supplies and environmental concerns. Two other projects that are data-gathering projects (Character of Indiana Tills and Engineering Properties of Unconsolidated Deposits) are not included in the number given above, but they were carried on largely through sample collection from many sources and through work done in the sedimentation laboratory. Two thousand eighty-three compositional, textural, magnetic, and physical tests were made during the year in this laboratory for purposes of these projects; they were also heavily drawn upon for projects of several kinds.
Status of Projects

Hazardous waste disposal

The purpose of this project, begun in 1979-80 and sponsored by the State Board of Health, was detailed in the 1980-81 annual report. During the year ended, the project was completed with submission of six separate memorandum reports (two completed in 1981-82).

COSUNA-LOBAR project

This project (Correlation of Stratigraphic Units of North America-Lowland Basins and Arches Region), begun in 1977-78 under auspices mentioned in the introduction above, was completed with submission of a 29-column stratigraphic correlation chart for the whole or parts of eight states, Michigan to Alabama and Illinois to Ohio, and including the earth's crust from ancient, deeply buried Precambrian crystalline rocks to modern Quaternary unconsolidated deposits; also, completion was effected by submission of perhaps some 2000 data sheets on named rock units for deposition in a computer data bank in Norman, Oklahoma. The subproject name was changed upon completion to Midwestern Arches and Basins Region—see "Reports and Maps Submitted for Publication." The Ross item listed under "Miscellaneous Publications" had input from this project.

Bedrock geology map of Indiana

At year's end, this project, begun and described in 1978-79, was within one month of completion. It will be the first bedrock map of the State to be published at a scale of 1:500,000 as a single sheet. It is based on both the completed series of eight 10 \times 20 bedrock maps (scale, 1:250,000) and on considerable new data. Related to this map in what will be a series of 1:500,000 maps are two already-published maps on bedrock topography and thickness of unconsolidated deposits (see "Introduction" and "Reports and Maps Published by the Geological Survey"); also, the bedrock map is related to the Quaternary geology map now in production (see next below).

Quaternary map of Indiana

As noted above, this map was begun in 1982-83 and is to be companion map of three others already noted as single sheets at a scale of 1:500,000. It also is to be based on both the already-completed 8-sheet series of 10 \times 20 maps and on much new data. Perhaps 5 to 10 percent of the work was accomplished during 1982-83, but no completion date was yet established.

GSA 1983 field trips

This project was begun in 1980-81 with assignment to Geology Section personnel the major part of the task to both organize and conduct 16 field trips, one day to four days each, in conjunction with the 1983 (November) annual meeting of the Geological Society of America and affiliated societies.
in Indianapolis. Host organizations for this 4500-person meeting are the Indiana Geological Survey, Indiana University, Purdue University, and IU-PU Indianapolis. During 1982-83, the greater bulk of the field-trip work was accomplished, including the planning, field work, and manuscript preparation and editing for two volumes of field-trip articles (see "Reports and Maps Submitted for Publication").

**Middle and Upper Silurian conodonts of northern Indiana**

The project title above is a scope-narrowing revision of an old title, "Middle Paleozoic geology of northern Indiana," which was last listed in the 1981-82 annual report. Begun in 1966-67, this project has seen many papers published and submitted (present status) on Silurian and Devonian stratigraphy, paleontology, paleoecology, and sedimentation in northern Indiana and closely adjacent parts of neighboring states. Activities for 1982-83 are embodied in a paper on Silurian reefs at Celina, Ohio, in various published and submitted abstracts, a Silurian field-trip article (1983 GSA meeting), and in a Middle Paleozoic paleogeographic atlas for the southern Great Lakes area (see "Miscellaneous Publications" and "Reports and Maps Submitted for Publication"). The new title reflects the fact of one remaining report yet to be completed, per present plans, among the many that were contemplated in 1966. Mostly, conodont-processing work was accomplished during the year, and a new completion date of December 1986 was set.

**Beaver Bend-Reelsville biostratigraphy**

This project, begun in 1981-82 with cooperation of an Indiana University Department of Geology staff member (Alan Korowitz), was designed to produce a published study on the fossil conodont assemblages of the Beaver Bend and associated rocks (Upper Mississippian) of Indiana, including their application to interregional stratigraphic correlation and to paleoenvironmental reconstruction for Mississippian time. One impetus was the 1983 meeting of the Pander Society (with North-Central Section Geological Society of America) and inclusion of the Beaver Bend study in a Pander Society symposium volume. Two formal results for the current year are noted under "Miscellaneous Publications" and "Reports and Maps Submitted for Publication." Completion date is set for December 1984.

**Middle Ordovician conodonts**

This project was begun in 1981-82 and was first outlined (briefly) in the annual report for that year. Although the project is classified as research, the greater impetus for this effort has come through requests from the Petroleum Section for development of a correlative tool for subsurface stratigraphic work in relation to petroleum occurrence and exploration. Current-year activities are noted in one item under "Reports and Maps Published by the Geological Survey." Completion of other parts of the project is planned for December 1985.
**Miscellaneous paleontologic investigation**

During 1982-83, the Section submitted for publication a rather extensive report on fossil byrozoans of the Dillsboro Formation (Upper Ordovician) of southeastern Indiana (see Brown and Daly item under "Reports and Maps Submitted for Publication"). Although by far the greater effort was expended by extra-Section personnel, the work originally was peripheral to and supported by our Ordovician mapping project of the 1960's and 1970's that culminated with publication of three 10 x 20 sheets in the 8-sheet state map series. This report will complete a modern systematic appraisal of Upper Ordovician byrozoans and their stratigraphic relations in Indiana (other reports having been completed in the 1960's and possibly later).

**Quaternary stratigraphic and geomorphic investigations**

Three formal projects are grouped under the heading above, each of them having been explained in earlier annual reports. Although they are slow to reach formal completions, a wealth of data has been produced that has found application to several environmental geology and State Quaternary mapping projects and to many extra-Survey requests for information of a practical nature, including that pertinent to water supplies and to construction needs. Collectively, these projects (Pleistocene stratigraphy west-central Indiana, begun 1968-69; Teays Valley of Indiana, begun in 1976-77; and Tills of northwestern Indiana, begun in 1970-71) directly embody 1982-83 activities noted as three items under "Miscellaneous Publications" and "Reports and Maps Submitted for Publication."

**Environmental geology activities**

Only one formal project was listed during 1982-83 in this category, "Environmental geology of Monroe County" (begun in 1972-73, renewed in later years, and seeing modest progress during 1982-83), but a great deal of environmental effort was expended as noted in the introduction in a variety of ways. Altogether, 14 items in the publications and reports categories represent deliberately directed environmental geology activities. These include, in the geographically defined series of publications, two items (on Starke County and Koontz Lake) under "Reports and Maps Submitted for Publication."

Both the Starke County and Koontz Lake reports began as memorandum reports requested by state planning groups, and the Section upgraded them to publications (submitted) without benefit of organization as formal projects.

**Miscellaneous Activities**

Section personnel made 14 formal oral and poster presentations, conducted 4 field trips, and served as chairmen or members of technical sessions and professional committees for 5 extra-Survey occasions or activities. Other miscellaneous activities were mentioned in the introduction as examples of the functions of the sections, and they are not repeated here.
GEOPHYSICS SECTION

A geophysics field party headed by Joe Whaley worked in Bartholomew, Jackson, and Scott Counties during the summer of 1982. Twenty-eight refraction seismograms were taken to define the thickness and eastern extent of the New Albany Shale in that region.

In preparation for an extensive new gravity survey over a multi-county area north of 40° in east-central Indiana, Joe has selected points of known elevation spaced approximately 1 mile apart. As part of the review, Joe has upgraded our gravity file extensively to place all data on a common datum. All gravity stations located south of 40° latitude that were tied to the International Gravity Standardization Net-1971 have been plotted by our computer program "INDYMAP" to show their pattern of distribution. The gravity survey north of 40° will be tied to the Indiana Gravity Base Network that was established in 1981 and 1982.

Joe completed a draft of a manuscript on the Indiana gravity network. The report is now in editorial review.

Bob Blakely continued efforts to develop a technique for measuring the thermal characteristics of stone. Despite a serious need for data on the thermal behavior of stone used in construction, no reliable methods presently are available for measuring these coefficients. Bob has acquired a device for providing controlled temperature changes with which he hopes to make laboratory tests shortly. In addition to his work on measurements of thermal properties, he has supervised routine testing of modulus of rupture, crushing strength, specific gravity, and coefficient of absorption for samples of Salem Limestone as part of a continuing program of physical tests on Indiana samples.

In his role as the Geological Survey's computer expert, Bob worked with Peg Sibert during the year to put the finishing touches to the petroleum well information file. He also was involved in a similar project for the Coal Section to develop a coal mine location information file and a coal point source data file. In addition, Bob had an active role in the computerization of a record and invoicing system for the Publications Section.

Bob participated in projects of a geophysical nature as he worked with Jim Hewlett of Wright State University on the use of Vacquier's method of magnetic interpretation and reviewed a paper dealing with a computer program on gravity interpretation for the editor of Computers and Geoscience. He also gave newspaper and television interviews on seismic and meteorological events.

MINERAL STATISTICIAN

As production figures for minerals are reported largely on a calendar year basis by producers, and are so tallied by the Indiana Geological Survey, the U.S. Bureau of Mines, and other agencies that collect and compile such data, this report covers calendar 1982.
For the first time the total value of minerals produced reached and surpassed the billion dollar mark (at first stage of salability) -- increasing 5.88 percent, from $991,409,816.00 in 1981 to $1,049,729,075.00 in 1982. Coal continued to be by far the major commodity produced and was almost solely responsible for this increase. According to the Indiana Bureau of Mines and Mining, production of 30,387,315 tons of coal was reported, but data were not furnished for several mines. Reported production indicated an increase of 4.26 percent in volume and 11.05 percent in value. The fuels -- coal, petroleum, and natural gas -- accounted for 88.28 percent of the total value of mineral production, with coal alone accounting for 71.47 percent. Operations in Pike and Warrick Counties produced slightly more than half of all the coal reported for 15 counties.

Increased drilling, both in number and depth of holes, resulted in 17.82 percent more oil produced in 1982.

Slightly increased production of crushed limestone and sand and gravel near some metropolitan areas was not sufficient to offset a continued decline for the state overall.

Although 18.61 percent less dimension limestone was quarried and a smaller total amount of stone was shipped from the district, several large contracts for furnishing fabricated stone from Lawrence and Monroe Counties held the value higher than it would otherwise have been.

Construction materials -- crushed limestone, dimension limestone, sand and gravel, and clay and shale -- declined in amounts ranging from 11.23 percent to 23.45 percent in volume and 8.81 percent to 19.36 percent in total value.

As data on cement production are no longer available to us from the U.S. Bureau of Mines, it was necessary to estimate based on materials reported produced for cement manufacture. As was the case for all other construction materials, cement manufacture declined -- approximately 12.5 percent both in quantity and value.

The manufacture of cement and clay products, and the processing of building limestone, contributed more than an additional $90,000,000.00 to the value of minerals produced in the state. The value of the mineral industries in Indiana was further increased by more than $30,000,000.00 through the production of lime, the recovery of sulfur, and the processing of perlite, all from materials imported from out-of-state.

The following counties led in production of minerals (exclusive of oil and gas):

<table>
<thead>
<tr>
<th>County</th>
<th>Value at first stage of salability</th>
<th>Mineral commodity (in alphabetical order)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Warrick</td>
<td>$250,175,425.00</td>
<td>Coal</td>
</tr>
<tr>
<td>Pike</td>
<td>134,107,883.00</td>
<td>Coal</td>
</tr>
</tbody>
</table>
$50-100 million

Knox 67,518,460.00 Coal, crushed limestone, sand & gravel
Daviess 64,542,993.00 Coal
Vermillion 56,852,753.00 Coal, sand & gravel
Sullivan 50,279,697.00 Coal, crushed limestone

$25-50 million

Clay 37,201,039.00 Clay & shale, coal
Spencer 30,024,793.00 Coal
Greene 26,794,065.00 Coal, sand & gravel

$5-25 million

Dubois 16,677,543.00 Clay & shale, coal
Martin 13,560,261.00 Coal, gypsum
Crawford -C- Crushed limestone
Lawrence 8,217,052.00 Crushed limestone, dimension limestone, dimension sandstone
Marion 6,486,505.00 Crushed limestone, sand & gravel
Vigo 6,272,264.00 Coal, sand & gravel
Hamilton 6,247,412.00 Crushed limestone, peat, sand & gravel
Putnam 5,620,682.00 Clay & shale, crushed limestone, sand & gravel
Owen 5,271,984.00 Coal, crushed limestone, sand & gravel

PETROLEUM SECTION

Members of the Petroleum Section are occupied with duties which fit into five general categories: (1) services to the public, (2) projects which are performed annually, (3) projects related to records maintenance and improvement, (4) projects involving the study of the subsurface stratigraphy of Indiana, and (5) special projects which arise due to a special need or request.

Services

The services performed by the Petroleum Section for the public consisted of conferences, requests for availability of information, correspondence, and interpretations made from subsurface well information. Visitors to the section seeking information in one form or another numbered 660, up from the 502 visitors of a year ago. In addition to the visitors, requests for subsurface information are received daily by telephone or correspondence.

Annual Projects

Indiana Drilling Statistics -- Drilling statistics were compiled for wells drilled in Indiana during the year. These statistics comprise a part of the nationwide totals compiled by the American Association of Petroleum Geologists and the American Petroleum Institute.
Indiana Exploration Development -- An annual review of exploration activity in the state was compiled for inclusion in the Bulletin of the American Association of Petroleum Geologists.

Indiana Oil Production -- Preparation of the annual oil production statistics by fields in the Geological Survey's Mineral Economic Series was completed.

Indiana Oil Reserves -- Reserves statistics for Indiana's oil fields were prepared and maintained as a part of the information file on Indiana's oil industry.

Indiana's Potential Gas Supply -- Preparation of statistics for the undiscovered potential gas supply in Indiana was completed and submitted to the Potential Gas Committee for inclusion as part of national statistics compiled by that committee.

Review of Petroleum Exploration Map Series -- The individual county petroleum map transparencies were updated at year's end. Sixty-six maps were revised, one new map was published, and forty were checked with no revision necessary.

Records Improvement

Trenton Field Wells Record -- Continued effort was spent in evaluation, acquisition, and preparation of miscellaneous well records for inclusion in the master file of well information. Records evaluation was conducted in Blackford, Delaware, Huntington, and Jay Counties during the year.

Maintenance of Microfilming of Master File Well Data -- A continuing process of filming records of newly drilled wells provides a current microfiche file of well data available at the Petroleum Section.

New Petroleum Exploration Map -- A new petroleum exploration map for Huntington County was prepared from well data which has been upgraded in quality. The map replaced the old preliminary map for this county, giving a much higher assurance of accuracy for the information shown.

Subsurface Studies

Oilfield Brines of Indiana -- Stanley Keller completed compilation of analyses of the composition of oilfield brines taken from various stratigraphic units from different localities throughout Indiana. Results of the compilation were published as Occasional Paper 41 during the year.

Natural Gas in Indiana -- Because of concentration of attention to preparation of new Petroleum Exploration maps in east-central Indiana, Dan Sullivan was unable to report any progress on the study of natural gas fields in Indiana during the year.

Geology of the Trenton Field in Indiana -- Progress continued on the ongoing study of the Trenton Field in Indiana. Among other aspects of the study, Brian Keith examined the stratigraphic relationship between the Trenton
and Black River Limestones, studied the results of analyses of Maquoketa shales as potential source rocks for the Trenton oil, and prepared a structure map on top of the Black River Limestone. Also Brian prepared an isopach map of the Trenton Limestone in Indiana as part of his overall study.

Pennsylvanian-Mississippian Unconformity Map -- As an adjunct to preparation of the map showing the stratigraphic units of the Mississippian System in contact with the Pennsylvanian System, Stanley Keller prepared a map showing the structural position of the unconformable contact. The map is to be published as one in the Miscellaneous Map Series. Work on the original project of mapping units present at the unconformity is progressing.

Atlas of Thickness and Structure Maps of Indiana Stratigraphy -- John Rupp, who joined the staff of the Petroleum Section in August 1982, began preparation of an atlas of maps to show the structural position and thickness of the major stratigraphic units in Indiana. The atlas is being compiled from existing published maps as well as various unpublished maps in the files of different sections of the Geological Survey. Contributions are being made by various geologists in the Survey for maps which have not previously been prepared. When completed, the maps of the atlas will be published as an atlas whose dimensions will be 8 1/2 X 11 inches. A total of 41 maps is planned for the published atlas.

Special Projects

Short Contributions to Indiana Geology -- Brian Keith prepared a manuscript detailing the stratigraphic relationship of the Trenton and Lexington Limestones as a contribution to an occasional paper edited by Gordon Fraser.

PUBLICATIONS SECTION

During the past fiscal year the Publications Section sold 7,839 reports and 17,215 maps. The section sent 918 reports and 709 maps on exchange to institutions in the United States and in foreign countries. It also distributed without charge 2,111 reports and 1,546 maps to members of its own organization and to individuals, libraries, and companies in the United States and abroad. The Publications Section served 5,087 office customers, handled 3,243 incoming and 1,264 outgoing letters pertaining to geologic reports and maps, and sent out 2,510 announcements of new publications.

Seven reports, eight new maps, and 85 revised maps were issued during the fiscal year, and four reports and two maps were reprinted.

Six manuscripts of Survey reports, 16 abstracts and 34 manuscripts prepared by Survey personnel for outside publication, and eight news releases, newsletters, exhibits, and similar material were edited during the fiscal year. Thirty-five news releases, "Our Hoosier State Beneath Us," were also edited, and camera copy for them and for 42 miscellaneous projects was prepared.
The depressed economy in Indiana and in the nation had a significant effect on the sale of publications during 1982-83. In 1982-83, compared with 1981-82, the sale of reports was down 27 percent, the sale of maps was down 19 percent, the number of letters received was down 29 percent, and the number of office customers was down 15 percent. Fewer customers bought fewer publications and undoubtedly bought them more selectively.

An IBM personal computer and a Diablo 630 communications terminal were installed in the Publications Section. Before the end of the fiscal year Robert F. Blakely and Patricia Davis began preparing programs for invoicing and for maintaining accounts receivable and inventory records by computer. Programs will also be prepared in 1983-84 for maintaining the general announcement file and the gratis and exchange files by computer.
REPORTS AND MAPS PUBLISHED BY THE GEOLOGICAL SURVEY

Directories


Mineral Economic Series


Miscellaneous Maps

Gray, H. H., 1982, Map of Indiana showing topography of the bedrock surface: Miscellaneous Map 35. Scale, 1:500,000, in color. Contours are printed in black with shades of color between 100-ft. lines.

Gray, H. H., 1982, Map of Indiana showing topography of the bedrock surface: Miscellaneous Map 36. Scale, 1:500,000, in color. Contours are printed in color on a white background.

Gray, H. H., 1983, Map of Indiana showing thickness of unconsolidated deposits: Miscellaneous Map 37. Scale 1:500,000, in color. Contours are printed in black with shades of color between 100-ft lines.

Gray, H. H., 1983, Map of Indiana showing thickness of unconsolidated deposits: Miscellaneous Map 38. Scale, 1:500,000, in color. Contours are printed in color on a white background.


Gray, H. H., 1983, Map of Indiana showing thickness of unconsolidated deposits: Miscellaneous Map 40. Scale, 1 inch equals approximately 28.5 miles, in color. Modified from Miscellaneous Map 37.

Occasional Papers

Individual papers by Section authors in above volume


Fraser, G. S., Sand and gravel resources of the Wabash Valley: causes of variability, p. 27-42.


Petroleum Exploration Maps


Sullivan, D. M., Enochs, L. G., and Cazee, J. T., 1983, Well location map of Huntington County, Indiana, showing total depth of wells: Petroleum Exploration Map 76A.

Revised Petroleum Exploration Maps (as of December 31, 1982): 3A, 3B, and 3C (Warrick County); 4A, 4B, and 4C (Sullivan County); 5A and 5B (Vigo County); 12, 12A, and 12C (Martin County); 13A, 13B, and 13C (Greene County); 14A and 14B (Clay County); 18A (Owen County); 19A (Putnam County); 21A, 21B, and 21C (Dubois County); 23, 23A, 23C (Knox County); 25, 25A, and 26C (Daviess County); 27A (Orange County); 28A and 28C (Crawford County); 29A (Washington County); 30 and 30A (Harrison County); 32A (Bartholomew County); 39, 39A, and 39C (Spencer County); 40, 40A, and 40C (Perry County); 42A (White County); 47A (Jefferson County); 51, 51A, and 51C (Pike County); 52, 52A, 52C (Vanderburgh County); 53, 53A, and 53C (Gibson County); 54, 54A, and 54C (Posey County); 59A (Allen County); 60A (Whitley County); 62A (Elkhart County); 63A (St. Joseph County); 67A (Pulaski County); 69A (LaPorte County); 70A (Porter County); 71A (Jasper County); 72A (Newton County); 73A (Lake County); 74A (Miami County); 75A (Wabash County); 76 (Huntington County); 77 and 77A (Wells County); 78 and 78A (Adams County); 79 (Jay County); 80 (Blackford County); 81 (Delaware County); 82 and 82A (Grant County); 88A (Franklin County); 91A (Wayne County); 92A (Randolph County); 93A (Henry County); 94A (Hancock County); 95A (Decatur County); 96A (Shelby County); 97A (Rush County); and 99A (Madison County).

Checked Without Revision Petroleum Exploration Maps (as of December 31, 1982): 15A (Parke County); 16A (Vermillion County); 17A (Fountain County); 20A (Montgomery County); 22A (Jackson County); 24A (Monroe County); 25A (Lawrence County); 31A (Brown County); 32A (Hendricks County); 34A (Marion County); 35A (Morgan County); 36A (Johnson County); 37A (Tippecanoe County); 38A (Warren County); 41A (Benton County); 43A (Carroll County); 44A (Clinton County); 45A (Boone County); 46A (Jennings County); 48A (Scott County); 49A (Clark County); 50A (Floyd County); 55A (Steuben County); 56A (Lagrange County); 57A (Noble County); 58A (DeKalb County); 61A (Kosciusko County); 64A
(Marshall County); 65A (Fulton County); 66A (Cass County); 68A (Starke County); 83A (Howard County); 84A (Switzerland County); 85A (Ohio County); 86A (Dearborn County); 87A (Ripley County); 89A (Union County); 90A (Fayette County); 98A (Harrison County); and 100A (Tipton County).

Special Reports


Hill, J. R., Moore, M. C., and Mackey, J. C., 1982, Bedrock geology and mineral resources of Putnam County, Indiana: Special Report 26, 38 pages, 12 figures, 3 tables.

MEMORANDUM REPORTS

Ault, C. H., April 1983, "The search for Indiana's minerals" (for James Ridenour, Director of the Indiana Department of Natural Resources).


Bleuer, N. K., July 20, 1982, Glacial geology of the Pine and Stone Lakes (LaPorte County) and Sousley Lake (St. Joseph County) areas, northern Indiana: 6 pages, 3 figures (for William J. Andrews, Department of Natural Resources).

Gray, H. H., July 27, 1982, Geology of three potential reservoir sites in Jennings County: 4 pages, 2 figures (for Division of Water, Department of Natural Resources).

Hasenmueller, W. A., May 1983, "Coal resources of the Glendale State Fish and Wildlife Area, Daviess County, Indiana" (for William Andrews, Indiana Department of Natural Resources).

Hill, J. R., April 27, 1983, A preliminary geologic evaluation of two urban industrial park sites near Rochester, Indiana: 3 pages, 1 figure (for Ouabache Regional Planning Commission).


Hill, J. R., and Hartke, E. J., July 26, 1982, Geologic materials as potential confinements for hazardous wastes in Indiana (Danville sheet): 18 pages, 5 figures, 1 plate, 1 chart (for Indiana State Board of Health).

Hill, J. R., and Hartke, E. J., September 16, 1982, Geologic materials as potential confinements for hazardous wastes in Indiana (Indianapolis sheet): 7 pages, 3 figures, 2 tables, 1 plate, 1 chart (for Indiana State Board of Health).

Hill, J. R., and Hartke, E. J., September 16, 1982, Geologic materials as potential confinements for hazardous wastes in Indiana (Cincinnati sheet): 10 pages, 3 figures, 1 table, 1 plate (for Indiana State Board of Health).

Hill, J. R., and Hartke, E. J., September 16, 1982, Geologic materials as potential confinements for hazardous wastes in Indiana (Vincennes sheet): 14 pages, 3 figures, 1 table, 1 chart (for Indiana State Board of Health).

Hill, J. R., and Hartke, E. J., September 16, 1982, Geologic materials as potential confinements for hazardous wastes in Indiana (Louisville sheet): 11 pages, 3 figures, 1 table, 1 plate (for Indiana State Board of Health).

MISCELLANEOUS PUBLICATIONS


Fraser, G. S., 1982, Triassic shelf sedimentation - Prudhoe Bay, Alaska (abs.): Abstracts of papers, Eleventh Int. Cong. on Sedimentology, Int. Assoc. of Sedimentologists, Hamilton, Ontario, Canada, p. 98.


REPORTS PUBLISHED IN OUTDOOR INDIANA


REPORTS AND MAPS SUBMITTED FOR PUBLICATION


Droste, J. B., and Shaver, R. H., Patterns of sedimentation in the Sauk and Tippecanoe sequences of the midwestern cratonic area: Geological Society of America Abstracts with Programs, v. 15, 1 page.


Harper, Denver, Environmental report of Vigo County; Spec. Rept.

Hartke, E. J., Environmental geologic considerations in Koontz Lake, Starke County, Indiana, and its six-mile fringe: Indiana Geological Survey Short Contributions in Geologic Research in Indiana, 10 pages, 8 figures.


Rexroad, C. B., and Horowitz, A. S., An examination of conodont biofacies in the Beaver Bend Limestone (Chesterian, Carboniferous) in Indiana, in Clark, David (ed.), Conodont biofacies symposium volume: Madison, Wisconsin, North-Central Section Geological Society of America, Madison, Wisconsin, 7 pages, 3 figures.


Ault, C. H., April 23, 1983, Economic geology of the Silurian, Devonian, and Mississippian Systems in Indiana; NAGT, Fort Wayne, IN.

Ault, C. H., and Wright, M. A., April 27, 1983, Progress report on faulting in mines in southwestern Indiana; New Madrid Study Group, Madison, WI.


Bleuer, N. K., Load and slide deformation of Wisconsinan substrates in the central Indiana till plain; North-Central Section Geological Society of America, Madison, Wisconsin, April 28.

Bleuer, N. K., and Fraser, G. S., Late Wisconsinan jökulhlaup at Delphi, Indiana; North-Central Section Geological Society of America, Madison, Wisconsin, April 28.


Carr, D. D., December 6, 1982, Coal and shale resources of Indiana; Farm Bureau annual meeting.

Carr, D. D., March 4, 1983, Oil shale resources of Indiana; Oil Shale and Petroleum Study Committee, Indiana Energy Board, Bloomington.


Counterman, R. C., Saines, S. J., Krothe, N. C., and Shaffer, N. R., April, 1983, Effects of well systems on groundwater samples; Geological Society of America, Madison, WI.


Eggert, D. L., March 4, 1983, Differential compaction as a controlling factor in the deposition of the Springfield Coal Member, Petersburg Formation, Carbondale Group, in Gibson County, Indiana; Illinois Geological Survey colloquium, Champaign, IL.

Fraser, G. S., August, 1982, Triassic shelf sedimentation - Prudhoe Bay, Alaska; International Congress on Sedimentology, Hamilton, Ontario.

Fraser, G. S., March, 1983, Wabash River stratigraphy and sedimentation; U.S. Geological Survey, Indianapolis, IN.
Fraser, G. S., April 13, 1983, History of the Wabash River; Indiana Geologists, Indianapolis, IN.

Fraser, G. S., April 28, 1983, Paleohydraulics of meltwater streams in north-central Indiana during the late Woodfordian subage; Geological Society of America, Madison, WI.

Fraser, G. S., and Bleuer, N. K., April 28, 1983, Late Wisconsinan jökulhlaup at Delphi, Indiana; Geological Society of America, Madison, WI.


Hartke, E. J., General geology of Indiana; Indiana Chapter of Farm Managers and Rural Appraisers, Purdue University, February 10.

Hasenmueller, N. R., October 12, 1982, Thickness and nature of overburden on the New Albany Shale (Devonian and Mississippian) in southeastern Indiana; Eastern Oil Shale Symposium, Lexington, KY.

Keith, B. (with T. Partin, consultant), The Renault Sandstone in Posey County, Indiana -- an overlooked reservoir: Kentucky Oil and Gas Association meeting, Lexington, Kentucky, June 3, 1982.


Keith, B., Detailed correlations in the Trenton and Lexington Limestones and their implications: North-Central Section, Geological Society of America meeting, Madison, Wisconsin, April 27, 1983.

Keith, B., The Trenton Limestone in Indiana from a petroleum perspective -- past, present, and future: East-Central Section National Association of Geology Teachers, Fort Wayne, Indiana, April 27, 1983.


Miller, L. V., and Eggert, D. L., September 14, 1982, Composition and energy content of wastes from coal-preparation plants in Indiana; Eighth Kentucky Coal By-Products Symposium, Lexington, KY.

Rexroad, C. B., and Horowitz, A. S., An evaluation of conodont facies in the Beaver Bend Limestone (Late Mississippian) in Indiana: North-Central Section Geological Society of America, Madison, Wisconsin, April 28.

Shaffer, N. R., December 8, 1982, Gourmet geomicrobes; Indiana Geologists, Indianapolis.

40
Shaver, R. H., Development of the Silurian System--including a remarkable suite of reefs--in the northeastern United States: Eastern Section National Association of Geology Teachers, Fort Wayne, April 23.

PROFESSIONAL ACTIVITIES AND COMMITTEES

As a member of the Potential Gas Committee of the Potential Gas Agency, Stanley Keller prepared a report on Indiana's potential gas supply. His report was a contribution to the publication of that committee entitled Potential Supply of Natural Gas in the United States.

Gerald Carpenter is a member of the American Association of Petroleum Geologists - American Petroleum Institute committee on Statistics of Drilling. He attended a meeting of the committee in Dallas, Texas April 22 and 23. Following this he attended the Annual National meeting of the AAPG, also in Dallas, as a representative of the Indiana-Kentucky Geological Society to the AAPG House of Delegates. Gerald also acted as a judge to select the winner of the Matson Award for best paper presented at the convention.

Stanley Keller, Brian Keith, John Rupp, Dan Sullivan, and Gerald Carpenter all are members of the Illinois Basin Chapter of the American Petroleum Institute, Division of Production.

The Tri-State Committee on Co-relations in the Pennsylvanian System of the Illinois Basin conducts studies to confirm and establish correlations of coals and related rocks in the Illinois Basin and to promote a uniform nomenclature. Don Carr, Curtis Ault, Walt Hasenmueller, and Henry Gray served on the committee this year. Members of the committee from Indiana, Illinois, and Kentucky completed a report on recommended Pennsylvanian correlations and submitted it for publication in the AAPG bulletin and prepared a poster for presentation at the Indianapolis GSA meeting in November 1983.

Most of the members of the Section were involved in preparing and organizing various activities, papers, posters, and field trips for a major professional meeting, the GSA annual meeting to be held in Indianapolis in November 1983. Curt Ault, Don Carr, Don Eggert, Gordon Fraser, Denver Harper, Nancy Hasenmueller, and Nelson Shaffer wrote parts of field guidebooks and organized field trips for the meeting. Gordon Fraser organized a short course on applied organic geochemistry, Nelson Shaffer organized a symposium on stable isotopes, and Don Carr put together a technical session on coal geology. Several papers were also being prepared for the meeting.

Nelson Shaffer helped review tenure for a faculty member at the University of Missouri at Kansas City.

Nelson Shaffer judged 4-H geology exhibits for the Marion County Fair and the Indiana State Fair August 5 and August 13.

Walt Hasenmueller attended an Indiana University management seminar at McCormicks Creek State Park, March 31-April 1.
Don Carr was nominated for the Distinguished Member Award of the Society of Mining Engineers of American Institute of Mining and Metallurgical Engineers. The award will be presented at the October meeting of Society of Mining Engineers in Salt Lake City, Utah.

Gordon Fraser was named to chair the nominating committee of the Great Lakes Section, Society of Exploration Paleontologists and Mineralogists.

Curtis Ault served on the Geologic Names Committee of the Survey.

Don Carr was first Vice Chairman of the Coal Geology Division of the Geological Society of America.

Nelson Shaffer was elected a Fellow in the Geological Society of America.

Don Carr served on the IndMD Scholarship Committee and the Education Planning Committee of the Society of Mining Engineers. He also served on the Membership Committee of the Long-Range Planning Commission of Society of Mining Engineers.

Don Carr completed his duties as subject editor for Pergamon's Encyclopedia of Materials Science and Engineering.

Don Carr served on the Coal Study Committee of the Indiana Energy Board.

Gordon Fraser is chairman of the Nominating Committee of the Great Lakes Section, Society of Exploration Paleontologists and Mineralogists.

Gordon Fraser served as President of the Great Lakes Section Society of Exploration Paleontologists and Mineralogists until October 1982.

Ned BLEUER and Henry Gray attended the annual U.S. Department of Agriculture Soil Conservation Service review and planning session, Speedway, July 12.

John Patton, Edwin Hartke, and John Hill attended a meeting of the Hazardous Waste Site Approval Authority, Indianapolis, October 13, each presenting oral summaries of the Survey's hazardous waste disposal project.

Carl Rexroad co-chaired one session of the Third European Conodont Symposium in Sweden, August 29-September 6.

Robert Shaver served as a member of the Presidential Advisory Committee, Society of Economic Paleontologists and Mineralogists.

Robert Shaver served as member of the 1983 Indianapolis Convention Committee, Geological Society of America.

Robert Shaver chaired the 1983 Geological Society of America Field Trip Committee for the Indianapolis Convention.

Robert Shaver served as a member of the Committee on Long-Range Planning for Meetings, Geological Society of America.

Nancy Hasenmueller and Dick Leininger presented talks on the stratigraphy and geochemistry of the New Albany Shale in southeastern Indiana to a graduate class in the School of Public and Environmental Affairs at Indiana University on September 13, 1982.

Don Carr gave a talk on the coal geology of the Illinois Basin for a coal geology class on September 7, 1982.

On December 9, 1982, Nelson Shaffer lectured on geochemical exploration to about 50 people in the Indiana University Geology Department hydrogeology course.

On January 12, 1983, Don Carr gave a talk at Columbus, Indiana, on "Geology of the New Albany Shale" for a group of landowners from Jackson and Bartholomew Counties. Dr. Patton and Dick Leininger also participated in the program.

Nelson Shaffer presented lectures about industrial minerals to an Indiana University economic geology class on March 28 and 30, 1983.

Nelson Shaffer lectured to a class in hydrogeology at Indiana University about aragonite, calcite, and dolomite on March 25, 1983.

Ned Bleuer and Gordon Fraser lectured to U.S. Geological Survey personnel on glacial geology pertinent to development of the Wabash River valley, March 9, Indianapolis.

Henry Gray lectured to a graduate class in coal geology, Indiana University, on "Stratigraphy of Pennsylvanian rocks with emphasis on the Illinois Basin," November 2.

Carl Rexroad gave a Geological Survey Colloquium address on the Mt. Saint Helens aftermath, July 1.

Carl Rexroad gave a talk to the Indiana University Department of Geology Brown Bag Seminar on "Paleoecology of Beaver Bend (Chesterian) conodonts," January 12.

Carl Rexroad delivered two lectures to the High School Sunday School Class of Trinity Episcopal Church, Bloomington, on "Creationism and Evolution," January 23 and 30.

Robert Shaver (with Thomas Straw, Western Michigan University) gave a Brown Bag Seminar discussion on the controversy over Silurian stratigraphy in the Michigan Basin and Indiana platform, Indiana University Department of Geology, November 8.
Robert Shaver lectured to an Indiana University freshman geology class on the development of the Silurian System in northeastern North America, March 22.

Robert Shaver gave a talk on "Silurian reef and interreef strata as responses to a cyclical succession of environments—southern Great Lakes area" to the Indiana University Department of Geology Paleobiology Brown Bag Seminar, March 23.

Robert Shaver lectured to the Indiana University Mini University '83 on "Frozen portraits of the past: fossil reefs as midwestern communities of 400 million years ago," June 21.

Brian Keith presented a talk to the Department of Geology colloquium titled "Rudists, ooids, and petroleum -- a look at the Lower Cretaceous of the Gulf Coast" on March 7.

Gerald Carpenter presented a talk on current oil and gas activities in Indiana to the 1982 organizational meeting of the Underground Storage Subcommittee of the Indiana Gas Association held at the Inn of the Fourwinds on September 24, 1982.

John Rupp presented an invited talk to undergraduate students of geology at Purdue University in Lafayette on September 28, 1982. The subject of his presentation described careers in geology and functions of state geological surveys.

ATTENDANCE AT PROFESSIONAL MEETINGS

On July 7-9, John Patton attended the Fourth International Congress on Deterioration and Preservation of Stone Objects in Louisville and presented an invited paper "Moisture — The Enemy of Masonry".


On April 16-20, 1983, Dr. John Patton attended the American Association of Petroleum Geologists annual meeting in Dallas, where he was the recipient of the Public Service Award and served as a judge for the Matson Award.

John Patton attended the North-Central Section, Geological Society of America, meeting in Madison, Wisconsin on April 28 and 29. He participated in the U.S. Geological Survey cluster meeting while there.

Dr. Patton attended the annual meeting of the Association of American State Geologists in Anchorage, Alaska on June 5-9, 1983.

Nelson Shaffer attended a rock show in Lawrence County on August 5.

Gordon Fraser and Don Eggert attended the 11th International Congress on Sedimentology at Hamilton, Ontario, August 23-27.
On September 8, Don Carr, Gordon Fraser, and Nelson Shaffer attended the meeting of Indiana Geologists.

On September 16, Don Carr attended the meeting of Indiana Mining and Technical Society.

On September 17, Nelson Shaffer attended an earth-sciences mineral show in Greenfield.

On October 4, Don Carr attended a meeting of the Tri-State Committee on Correlations of the Pennsylvanian System in Urbana, Illinois.

On October 11-13, Nancy Hasenmueller and Nelson Shaffer attended the 1982 Eastern Oil Shale Symposium in Lexington, Kentucky.

On October 13, Gordon Fraser and Nelson Shaffer attended Indiana Geologists.

On October 18-20, Don Carr attended the Geological Society of America annual meeting in New Orleans. On October 20, he attended the Coal Geology Division luncheon and business meeting and conducted the duties of 1st Vice Chairman.

Curt Ault, Michele Wright, and Denver Harper attended a report meeting of the New Madrid Study Group on November 9 at Washington, D.C.

Nelson Shaffer and Gordon Fraser attended a meeting of Indiana Geologists November 10 at Indianapolis.

Michele Wright, Curt Ault, Nelson Shaffer, and 5 other Survey geologists attended a seminar by Paul Potter on depositional environments of sandstone at a meeting of the Indiana-Kentucky Geological Society on November 19 at Indiana State University-Evansville.

Nelson Shaffer attended Indiana Geologists on December 8.

Curt Ault attended an in-house review of the current projects of the Branch of Coal Resources of the U.S. Geological Survey on December 8 and 9 at Reston, Virginia.

On December 9, Don Carr, Dick Leininger, and Paul Irwin attended a meeting of the Illinois-Indiana Section of American Institute of Professional Geologists in Mt. Vernon, Illinois.

Gordon Fraser and Michele Wright attended a meeting of Indiana Geologists on January 12.

Members of the Coal and Industrial Minerals Section all participated in a project review meeting at the Survey on January 25.

Nelson Shaffer attended a seminar by Phillips Electronics on automated X-ray diffraction and energy-dispersive element analyses in Cincinnati on January 31.
On February 8, Don Carr met with the Coal Study Committee of the Energy Development Board at Purdue University.

Nelson Shaffer and Don Carr attended a meeting of Indiana Geologists on February 9.

Curt Ault attended a meeting of the Geologic Names Committee February 10.

Nelson Shaffer attended a meeting of the Precambrian Paleontology Research Group February 20.

Gordon Fraser attended Indiana Geologists on March 9.

Walt Hasenmueller attended the Indiana Coal Mining Institute on March 24-26 in Owensboro, Kentucky.

On April 5, Curt Ault, Henry Gray, Walt Hasenmueller, and Don Carr attended a meeting of the Tri-State Committee on Correlations in the Pennsylvanian System of the Illinois Basin at Owensboro, Kentucky.

On April 8, Dr. Patton, Dick Leininger and Don Carr attended a meeting of the Petroleum and Oil Shale Committee of the Energy Development Board at Indianapolis.

On April 8, Nelson Shaffer attended a mineral show at Richmond, Indiana, and a show at Columbus, Ohio, on April 9.

Gordon Fraser attended a meeting of Indiana Geologists on April 13.

On April 25, Don Carr attended the annual meeting of the Indiana Limestone Institute of America, which was held at the Pointe at Lake Monroe.

Nelson Shaffer attended an industrial exposition at Indiana University April 26th and answered questions concerning several Survey geologic posters displayed at the meeting.

On April 27, Curt Ault and Michele Wright attended the meeting of the North-Central Section of the Geological Society of American on April 28-29 at Madison, Wisconsin.

On May 7, Don Carr attended a field trip and meeting sponsored by the Oil Shale and Petroleum Study Committee of the Energy Development Board.

On May 10, Don Carr attended a meeting of the Coal Study Committee of the Energy Development Board.

On May 20, Don Carr and Tom Reynolds attended a meeting of the Illinois-Indiana Section of American Institute of Professional Geologists at Terre Haute.

On May 16, Nelson Shaffer attended the Society of Applied Spetroscopists meeting at Indianapolis.
On May 24-27, Curt Ault attended the 19th Forum on Geology of Industrial Minerals at Toronto, Canada, which included two days of papers and two days of field trips.

On June 20, Don Carr, Dick Leininger, and John Patton attended a meeting of the Energy Development Board in Indianapolis.

In June Nelson Shaffer and Joe Hailer attended a meeting on organic geochemistry of midwest sediments with participants from the USGS and the Kentucky and Illinois Surveys.

Gordon Fraser presided at a meeting of the Great Lakes Section-Society of Exploration Paleontologists and Mineralogists nominating committee in June.

Gerald Carpenter, Dan Sullivan, and Dee Rarick attended the annual meeting of the Illinois Oil and Gas Association in Robinson, Illinois on June 23. An invited display prepared by the Geological Survey was erected for the occasion.


John Rupp, Stanley Keller, and Gerald Carpenter attended the May meeting of the Indiana-Kentucky Geological Society in Evansville.

John Rupp, Brian Keith, Dan Sullivan, and Gerald Carpenter attended the February meeting of the Indiana-Kentucky Geological Society on February 10.

Stan Keller attended the Indiana Geologists meeting on February 9.

John Rupp and Gerald Carpenter attended the annual meeting of the Illinois Oil and Gas Association as guests of the Association. The meeting was held March 3 and 4 in Evansville.

John Rupp, Gerald Carpenter, and Stanley Keller attended the January meeting of the Indiana-Kentucky Geological Society held in Evansville.

Brian Keith attended a meeting on December 9, 1982 of the American Institute of Professional Geologists in Mt. Vernon, Illinois.

Gerald Carpenter, Stanley Keller, John Rupp, and Dan Sullivan attended the meeting of the Indiana-Kentucky Geological Society held in Evansville on November 19, 1982.


John Rupp attended the national annual meeting of the Geological Society of America held in New Orleans, LA October 18-22, 1982.
Dan Sullivan and John Rupp attended the annual outing of the Independent Oil Producers Association held in Mt. Vernon, Indiana on September 16, 1982.

Dan Sullivan, John Rupp, and Brian Keith attended the September 1982 meeting in Evansville of the Indiana-Kentucky Geological Society.

Gerald Carpenter attended the annual meeting of the American Association of Petroleum Geologists in Dallas, Texas in April.

FIELD TRIPS

On August 19, Don Carr, Dick Leininger, and Nancy Hasenmueller toured the coal-liquification pilot plant at Catlettsburg, Kentucky.


Michele Wright helped lead a field trip for Bob Hattery (Continuing Studies) through Shades State Park and Pine Hills Nature Preserve in Montgomery County on September 25 and 26.

Gordon Fraser and Michele Wright attended the Great Lakes Section-Society of Paleontologists and Mineralogists field trip at Morehead, Kentucky, on October 29-31.

Gordon Fraser led the Indiana Geologists annual field trip on May 21.

Gordon Fraser attended a SOHIO-sponsored field trip to Sapelo Island, Georgia, on May 5-12.

Gordon Fraser assisted on a field trip for the Midwest Friends of the Pleistocene on May 21-22.

Ned Bleuer, with Purdue University personnel, conducted the 30th Annual Friends of the Pleistocene Field Trip on "Interlobate stratigraphy of the Wabash Valley, Indiana," May 21-22.

Robert Shaver conducted a field trip on Silurian reefs of northern Indiana and northeastern Illinois for a group of geologists from the Chinese National Oil Company who were being hosted at that time by the Mobil Corporation, July 10-11.

Robert Shaver led a field trip on "Silurian reef and interreef strata as responses to a cyclical succession of environments--southern Great Lakes area" for the Louisiana Land and Exploration Company, New Orleans, May 12-14.

Robert Shaver led a field trip on same subject as given above for the Shell Oil Company, Houston, May 24-27.
Gerald Carpenter and John Rupp accompanied Henry Gray on a field trip examining stratigraphic exposures ranging from the Ramp Creek-Harrodsburg section upwards through exposures of Hardinsburg sandstone. The trip was conducted by Henry in June following the request of two representatives of Texas Oil and Gas Corp. of Dallas, Texas. The firm is interested in the potential of the Illinois Basin as an area of exploration activity.

Gerald Carpenter accompanied Charles Hardy and Wayne Fix of the Indiana University Real Estate office on an inspection trip to a well drilling site located on IU property in McLean County, Kentucky on June 29.

John Rupp attended a field trip to central Missouri in April with the Indiana University geology department. He also attended a sedimentological conference in northern Ohio.

REVIEWs

Nelson Shaffer reviewed a paper on trace elements in black shale for Economic Geology in July 1982.

In August, 1982, Nelson Shaffer reviewed a report on white limestones for S. Burkheiser at the Pennsylvania Geological Survey and reviewed a paper about trace elements in carbonaceous shale and pyrite in India for Economic Geology.

In August, 1982, Gordon Fraser reviewed a paper on fluvial sediments for the Journal of Sedimentary Petrology.

In August, Walt Hasenmueller reviewed two papers on the petrology of coal in the Sturgis Formation of western Kentucky for the Geological Society of American Bulletin.

In November 1982, Don Carr reviewed 1) a Master's thesis for Lori Zinn on Subsurface Stratigraphy of the Ste. Genevieve Limestone (Meramecian) and relations to underlying Silurian reefs, Greene county, Indiana," 2) a manuscript for the Society of Mining Engineers on "Limestone resources of Hawaii," by Daniel Lum, and 3) a manuscript for the Society of Mining Engineers on "State companies in international industrial minerals trading" by W. G. Prost and A. M. Radigan.

In November 1982, Curt Ault reviewed an "Atlas of Early and Middle Paleozoic paleogeography of the southern Great Lakes area" by John Droste and Robert Shaver. He also reviewed a manuscript on "The Leslie Cementery and Francisco Channels in the Petersburg Formation (Pennsylvanian) in Gibson County, Indiana, U.S.A." by Don Eggert.

Gordon Fraser and Curt Ault reviewed a field-trip manuscript for the 1983 Geological Society of America meeting, "Silurian reef and interreef strata as responses to a cyclical succession of environments--southern Great Lakes area," by Robert Shaver and Jack Sunderman in February 1983.
In March 1983, Don Carr reviewed galley proofs of the chapter on "Limestone and dolomite" for the 5th edition of *Industrial Minerals and Rocks*. Don and Larry Rooney are authors of this chapter.

In March 1983, Gordon Fraser reviewed a National Science Foundation proposal for a study of the St. Peter Sandstone.

In April 1983, Don Carr reviewed a paper that had been submitted for publication to the Society of Mining Engineers Transactions on "Interrelationship of major-element limestone chemistry to depositional environments -- an exploration technique."

Nelson Shaffer completed a review of a manuscript on bryozoans in May 1983.


In June 1983, Gordon Fraser reviewed a National Science Foundation proposal on carbonate lithofacies of the Ordovician of the upper Mississippi Valley.

In June 1983, Don Carr reviewed 32 abstracts that had been submitted for presentation at the Coal Geology Division sessions. His evaluations were sent to Geological Society of America headquarters in Boulder.

In June 1983, Don Carr reviewed a report of the Coal Study Committee and made comments. The report is being prepared to submit to the new Corporation for Science and Technology.

Ned Bleuer reviewed a manuscript on sedimentology and genesis of a drumlin substage moraine, County Down, Ireland, for *Journal of Sedimentary Petrology*.

Henry Gray reviewed the new North American Stratigraphic Code for American Commission on Stratigraphic Nomenclature.

Henry Gray reviewed a report on geotechnical characteristics of the Ohio Valley soils for Indiana Power and Light Company.

Henry Gray reviewed a manuscript on *Foerstia* in the New Albany Shale, for the Eastern Oil Shale Symposium.

The following were reviewed by Henry Gray for Survey personnel: a paper on thickness of overburden on New Albany Shale, an article on glacial Lake Flatwoods, and a series of newspaper items.

Edwin Hartke reviewed a road log that was prepared for one of the 1983 Indianapolis Geological Society of America field trips.

Edwin Hartke reviewed a file report on "The supply and quality of ground water in abandoned coal mines in Indiana."

For other members of the Survey, John Hill reviewed a paper on exploration of Seelyville,Survant, and other coals in Vigo County and a manuscript on "Indiana gravity base network 1981."

Carl Rexroad reviewed two proposals to the National Science Foundation for funds, one for conodont research and the other on Upper Silurian conodonts in the midcontinent.

Carl Rexroad reviewed a manuscript on "Botanical composition of the Indiana cuticular coals."

Robert Shaver critically read an article for popular consumption on the nature of fossil and modern reefs, for a British geographical magazine.

Gerald Carpenter reviewed a technical evaluation compiled by Subsurface Disposal Corp. of the General Electric waste disposal well in Posey County at the request of Mr. Gary Summers of the Indiana State Board of Health. The well is being reviewed for a renewal of its operating permit which is due every five years.

John Rupp and Gerald Carpenter reviewed data concerning underground disposal of liquid waste produced by the Farm Bureau Refinery at their plant in Mt. Vernon, Indiana in response to a request of Gary Summers of the Indiana State Board of Health. Renewal of a permit for waste disposal (renewal due every five years) was being sought by Farm Bureau Refining Company.

NEWS RELEASES

On September 23, an interview with Don Carr about his trip overseas to promote Indiana Coal appeared in the Herald-Telephone, Bloomington, Indiana.

A news release describing the maps showing thickness of overburden on the New Albany Shale in Clark, Scott, and Jackson Counties was prepared in October 1982, and issued. It appeared in the Bloomington Herald-Telephone.

After an interview with Nancy Hasenmueller, several articles describing the investigations by the Survey of the oil potential of the New Albany Shale were published in local newspapers in November.


On December 15, Dee Rarick sent out a press release describing Special Report 26 on "Bedrock Geology and Mineral Resources of Putnam County, Indiana." Later in the month Don Carr sent copies of the report to members of the mineral industry in Putnam County.

In February 1983, Curt Ault was interviewed about faulting in Indiana on WTTV, Channel 4, for the Indiana Outdoors program, which was aired in March.
Nelson Shaffer submitted text and helped with illustrations for illustrated news items on the scanning electron microscope, the electron microprobe, and geochemical exploration in June, 1983.

Brian Keith spent considerable time answering requests for information concerning potential production capabilities of the old Trenton oil field. These inquiries resulted from a new release by the IU News Bureau concerning Brian's Trenton study. Inquiries included a videotaped interview for a South Bend television station, an Indianapolis radio station, an Indianapolis newspaper, and a Muncie newspaper as well as numerous conferences with landowners and oil operators.

MISCELLANEOUS ACTIVITIES

Sam Frushour and Carl Rexroad prepared copy for articles for the newspaper series "The Hoosier State Beneath Us."


Henry Gray chaired the Geological Survey's Bedrock Geologic Map Committee.

Edwin Hartke served as the illustrations editor of the Geological Survey.

John Hill organized the Survey's colloquium series.

Robert Shaver chaired the Geologic Names Committee for the Survey.

Robert Shaver prepared a biography on John B. Patton for publication in the American Association of Petroleum Geologists Bulletin and for the occasion of his (Patton) receiving the association's Public Service Award at its Dallas (April 1983) meeting.

Robert Shaver collaborated with the U.S. Army Corps of Engineers, Louisville, in their acquisition and interpretation of data for their forthcoming report on the streambank erosion problem along the Wabash River at New Harmony, a problem with which the Section first became centrally involved in 1978. Publicity on this problem and on our involvement got into regional and national press, television, and magazine services and networks.

At the request of Henry Gray, Stan Keller proofed and revised two cross sections prepared by Henry for publication as part of the new geologic map of Indiana.

Andy Hodek, a student at Hanover College, completed a month-long internship with the Petroleum Section on May 18. During his tenure with the Section he posted the values of the structural position of the Renault Limestone on the large (2"=1 mile) base maps for Posey, Gibson, and Vanderburgh Counties. About 90% of the work was completed by Andy during his stay.

52
Gerald Carpenter conducted a tour of Petroleum Section facilities for the Economic Geology class of Jack Sunderman and arranged for the group to visit an active drilling operation in Posey County.

Stan Keller had a conference with Bud Fick of the IU Alumni Office concerning the possibility of obtaining a natural gas supply at the Lake Monroe Alumni Camp.

Brian attended the March 3 meeting of the State Energy Board's Shale Oil and Petroleum Committee in Bloomington. Brian gave a presentation which discussed the historical development and potential of the Trenton Field as a possible energy source.

Gerald Carpenter was interviewed by a reporter from the Bloomington-based Herald-Telephone newspaper for an article concerning the oil industry in Indiana.

Brian Keith prepared a summary article on leasing and drilling activity in Indiana for the annual petroleum issue of the Evansville Press Newspaper. The article was in response to a request from Richard Bogan, Manager of the Petroleum Information office in Evansville.

OUTSIDE PROFESSIONAL PUBLICATIONS

A summary article on the drilling and exploratory activity in Indiana was prepared by Gerald Carpenter and appeared in the May issue of The Northeast Oil Reporter.

Gerald Carpenter prepared a report on oil development and drilling in Indiana as a contribution to a world-wide report on oil and gas development published in the Bulletin of the American Association of Petroleum Geologists.
## COAL AND INDUSTRIAL MINERALS SECTION
### STATISTICAL SUMMARY FOR THE
#### FISCAL YEAR 1982-1983

<table>
<thead>
<tr>
<th>Activity</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Projects in progress</td>
<td>34</td>
</tr>
<tr>
<td>Projects completed</td>
<td>9</td>
</tr>
<tr>
<td>Conferences with visitors to the Survey</td>
<td>249</td>
</tr>
<tr>
<td>Telephone conferences</td>
<td>652</td>
</tr>
<tr>
<td>Total service requests</td>
<td>1,129</td>
</tr>
<tr>
<td>Man days of fieldwork</td>
<td>169</td>
</tr>
<tr>
<td>Incoming letters</td>
<td>1,405</td>
</tr>
<tr>
<td>Outgoing letters</td>
<td>569</td>
</tr>
<tr>
<td>Thickness of stratigraphic sections measured (ft.)</td>
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</tr>
<tr>
<td>Public lectures</td>
<td>6</td>
</tr>
<tr>
<td>Papers and posters presented at professional meetings</td>
<td>20</td>
</tr>
<tr>
<td>Papers reviewed</td>
<td>21</td>
</tr>
<tr>
<td>Field trips (Total)</td>
<td>9</td>
</tr>
<tr>
<td>In connection with conferences</td>
<td>5</td>
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<tr>
<td>Educational</td>
<td>2</td>
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<tr>
<td>News releases</td>
<td>7</td>
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<tr>
<td>Attendance at professional meetings</td>
<td>60</td>
</tr>
<tr>
<td>Samples received or collected (Total)</td>
<td>694</td>
</tr>
<tr>
<td>Clay samples</td>
<td>232</td>
</tr>
<tr>
<td>Rocks, minerals</td>
<td>105</td>
</tr>
<tr>
<td>Sand &amp; gravel</td>
<td>174</td>
</tr>
<tr>
<td>Coal samples</td>
<td>12</td>
</tr>
<tr>
<td>Water samples</td>
<td>171</td>
</tr>
<tr>
<td>Brightness tests</td>
<td>33</td>
</tr>
<tr>
<td>Mineralogic analyses</td>
<td>45</td>
</tr>
</tbody>
</table>
X-ray mineralogic analysis
Core described (ft.)
Auger footage
Grain-size analyses
Thin sections prepared
Area mapped (sq. mi.)
Isotope analyses
Scanning electron photos

502
2,389
335
240
45
29
20
35
PETROLEUM SECTION
STATISTICAL SUMMARY FOR THE
FISCAL YEAR 1982-83

<table>
<thead>
<tr>
<th>Description</th>
<th>Quantity</th>
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<tbody>
<tr>
<td>Projects in progress</td>
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<tr>
<td>Projects completed</td>
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</tr>
<tr>
<td>Visitors</td>
<td></td>
</tr>
<tr>
<td>Visitor days</td>
<td></td>
</tr>
<tr>
<td>Outgoing letters</td>
<td></td>
</tr>
<tr>
<td>Incoming letters</td>
<td></td>
</tr>
<tr>
<td>Man days in field</td>
<td></td>
</tr>
<tr>
<td>Talks at technical programs</td>
<td></td>
</tr>
<tr>
<td>Well cutting sets catalogued and filed</td>
<td></td>
</tr>
<tr>
<td>Cores (wells)</td>
<td></td>
</tr>
<tr>
<td>Strip logs made (wells)</td>
<td></td>
</tr>
<tr>
<td>Feet of well cuttings represented on strips</td>
<td></td>
</tr>
<tr>
<td>Wells field checked (current drilling only)</td>
<td></td>
</tr>
<tr>
<td>Published petroleum exploration maps:</td>
<td></td>
</tr>
<tr>
<td>New</td>
<td>1</td>
</tr>
<tr>
<td>Revised</td>
<td>66</td>
</tr>
<tr>
<td>Checked without revision</td>
<td>40</td>
</tr>
<tr>
<td>Number of vehicles</td>
<td>2</td>
</tr>
<tr>
<td>Total miles traveled (total of all vehicles)</td>
<td>26,992</td>
</tr>
<tr>
<td>Reproduction-Logs</td>
<td>$36,557.00</td>
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<tr>
<td>Reproduction-Xerox</td>
<td>$5,684.20</td>
</tr>
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</table>
**EDUCATIONAL SERVICES SECTION**

**STATISTICAL SUMMARY FOR THE**

**FISCAL YEAR 1982-83**

<table>
<thead>
<tr>
<th>Activity</th>
<th>Quantity</th>
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</thead>
<tbody>
<tr>
<td>Conferences</td>
<td>92</td>
</tr>
<tr>
<td>Man day of field work</td>
<td>35</td>
</tr>
<tr>
<td>Incoming letters</td>
<td>272</td>
</tr>
<tr>
<td>Outgoing letters</td>
<td>283</td>
</tr>
<tr>
<td>Special Mailings (series of Indiana's newspapers)</td>
<td>682</td>
</tr>
<tr>
<td>Total number of Survey vehicles</td>
<td>1</td>
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<tr>
<td>Total number of miles traveled</td>
<td>6,866</td>
</tr>
<tr>
<td>Public Lectures (Total)</td>
<td>9</td>
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<tr>
<td>Civic</td>
<td>0</td>
</tr>
<tr>
<td>School</td>
<td>6</td>
</tr>
<tr>
<td>Other</td>
<td>3</td>
</tr>
<tr>
<td>Field trips (educational)</td>
<td>5</td>
</tr>
<tr>
<td>News releases submitted</td>
<td>2</td>
</tr>
<tr>
<td>Special rock sets prepared for teachers, et al</td>
<td>4</td>
</tr>
<tr>
<td>Identification of specimens (rock, mineral, and fossil)</td>
<td>104</td>
</tr>
<tr>
<td>Information packets mailed</td>
<td>103</td>
</tr>
<tr>
<td>Rock sets mailed to students</td>
<td>26</td>
</tr>
<tr>
<td>Attendance at professional meetings</td>
<td>1</td>
</tr>
<tr>
<td>Exhibits installed for special occasions, etc</td>
<td>5</td>
</tr>
<tr>
<td>Reports completed and sent to editors for outside publication</td>
<td>6</td>
</tr>
<tr>
<td>Tours of the Geology Building conducted</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>1981</td>
</tr>
<tr>
<td>---------------------</td>
<td>--------------------------</td>
</tr>
<tr>
<td><strong>Coal</strong></td>
<td>29,146,453 tons</td>
</tr>
<tr>
<td>Value</td>
<td>$675,614,781.00</td>
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<tr>
<td><strong>Petroleum</strong></td>
<td>4,721,396 bbls</td>
</tr>
<tr>
<td>Value</td>
<td>174,278,000.00</td>
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<tr>
<td><strong>Limestone, crushed</strong></td>
<td>25,042,037 tons</td>
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<tr>
<td>Value</td>
<td>78,308,394.00</td>
</tr>
<tr>
<td><strong>Sand and Gravel</strong></td>
<td>17,613,423 tons</td>
</tr>
<tr>
<td>Value</td>
<td>44,902,259.00</td>
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<tr>
<td><strong>Limestone, dimension</strong></td>
<td>1,658,207 cu.ft.</td>
</tr>
<tr>
<td>Value</td>
<td>6,165,362.00</td>
</tr>
<tr>
<td><strong>Clay and Shale</strong></td>
<td>654,361 tons</td>
</tr>
<tr>
<td>Value</td>
<td>1,435,508.00</td>
</tr>
<tr>
<td><strong>Natural Gas</strong></td>
<td>357,000,000 cu.ft.</td>
</tr>
<tr>
<td>Value</td>
<td>1,143,100.00</td>
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<tr>
<td><strong>Undistributed</strong></td>
<td></td>
</tr>
<tr>
<td>(includes dimension sandstone, gypsum, marl, peat, whetstones)</td>
<td>9,662,412.00</td>
</tr>
<tr>
<td><strong>TOTAL</strong></td>
<td>$931,409,816.00</td>
</tr>
<tr>
<td>Value added for additional processing of dimension limestone, and manufacture of clay products and cement</td>
<td>$ 92,661,839.00</td>
</tr>
</tbody>
</table>