

104TH ANNUAL REPORT OF THE STATE GEOLOGIST

of

INDIANA GEOLOGICAL SURVEY
DEPARTMENT OF NATURAL RESOURCES

for

July 1, 1979 - June 30, 1980

GEOLOGICAL SURVEY
ONE HUNDRED AND FOURTH ANNUAL REPORT OF THE STATE GEOLOGIST

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COAL AND INDUSTRIAL MINERALS SECTION

Introduction

A major goal of the Section has always been to bring about a good balance between geological research and service activities, as the quality of our service to the public is directly related to our continued progress in research. The professional accomplishments of the members of the Section have been high this year even though we handled more than 1000 requests for information.

The quality of our service can be measured in several ways, one of which is the actual industrial or private development of mineral resources in Indiana that has been based wholly or in part on our past research. A sampling of some of the industrial development this year includes:

1. The construction and development of a \$6.7-million quarry and crushed-stone plant in Clark County. The location of the quarry site was based in large part on information from Survey drilling and mapping that was completed more than 12 years ago.
2. The continuing construction of an \$8-million underground mine for crushed-stone aggregate in southern Marion County. Geologists from the company consulted with Survey geologists and used Survey file information to help evaluate the geology of the mine site.
3. Requests for information on sources of high-calcium limestone for whiting, fillers, and flux stone. We were able to respond with definitive data that have been gathered on high-calcium limestone reefs in northern Indiana for the past several years.
4. Active leasing efforts for underground coal resources in Posey County (we were told that at least 14 companies held leases for coal in the county). We received several requests for data from our files and from our continuing project to investigate the coal resources of the county. Our discovery of very thick coal in the northern part of the county particularly spurred interest.
5. Development of an underground mine for limestone and construction of a fine-grind plant in Monroe County. This deposit of high-calcium limestone was located with extensive help from Survey geologists.
6. Numerous inquiries from coal producers and property owners to evaluate coal resources on properties in southwestern Indiana. Our coal files are in daily use by visitors.

The quality of our geological research and professional activity is evident. Members of the Section served in leadership roles in national and local professional organizations, published 14 abstracts, papers, and maps through the Survey or in outside publications, gave 7 oral presentations at professional meetings, and helped organize and conduct a major professional conference. We were able to complete 7 research projects or major parts of projects. Three major projects attracted funding from Federal agencies.

Research Projects in Progress

Deep drilling program for coal

This is a continuing project to obtain information on Indiana's underground mineable coals in the deep part of the coal basin in southwestern Indiana. Much data on the thickness, quality, reserves, and mineability of coal is obtained through this program as well as information on roof and floor conditions associated with mineable seams. The discovery this year of a 9-foot thick coal bed in Posey County, the thickest ever reported in the county and the thickest for this bed anywhere in the Illinois Basin, was the direct result of the drilling of SDH 302 as part of the program. Two holes were drilled in Posey County, and an additional hole is scheduled to be drilled in Gibson County in the coming year.

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

These projects are a continuation of our county reconnaissance-type mapping of the distribution, structure, and mined areas of coals. With the completion of the map for Putnam County this year, 18 counties have been mapped and published to date. With the completion of Greene, Owen, and Posey Counties, a complete survey of the Indiana Coal Field will have been realized. Considerable progress was made on the compilation of a set of work maps for Greene County, and some progress was made on correlations and mapping in Owen County this year. Considerable subsurface work yet remains for the Posey County project.

Characterization of potential roof and floor rocks associated with Indiana coals

Most of the comprehensive analyses of core samples from about 30 cores were completed this year for this project, which is a detailed examination of lithologies of coal-bearing formations. The study of petrographic and stratigraphic relationships of the rocks were continued, and physical tests (compression and moisture absorption tests) on selected samples of roof rocks were added to our files. A final report on the project is in preparation as well as a report on methodology for investigation and control of roof falls.

Low-sulfur Springfield Coal Member (V)

This study of the interrelationships of low-sulfur Springfield Coal to roof-rock lithologies and contemporaneous channeling in Warrick County was completed this year, and a final manuscript was submitted for review.

Coal resources of Gibson County

Little is known of the thickness and distribution of the major coal beds in the deep subsurface of Gibson County. This study was undertaken to correlate and map the thickness of the coal beds using the abundant electric logs from petroleum tests that have been drilled in the county since the early 1900's. During the year, more than 1,000 electric logs were correlated and interpreted in the northwestern quarter of the state, and maps showing thickness and structure of several of the coals were under construction.

Slurry ponds

Before this study was begun, the amount, quality, recoverability, and distribution of finely ground coal that has been disposed of in waste slurry ponds in Indiana was essentially unknown. A map of southwestern Indiana showing

locations of coal slurry ponds and preparation plants was compiled during the year and published in the Survey's Miscellaneous Map series. Sampling of coal tailings and gob for analysis was continued and 386 feet of coal tailings and gob were submitted for analyses. All sites were inventoried, and interpretation of the analyses begun.

Indiana coal data system

The transferring of abandoned-mine data to computer storage was nearly completed this year. We also continued transferring trace element data and coal analyses to key cards and magnetic tape for computer use and now have most of the information compiled.

Subsidence caused by underground mining of coal

This study will determine the extent of subsidence in underground mining in Indiana, methods of recognizing subsidence where it has already occurred, possible areas of future subsidence, and the possible effects of subsidence in given areas. A report is being prepared on the identification of subsidence damage and factors affecting the location and severity of subsidence in Indiana. Yet to be accomplished is a determination of the amount of acreage affected by subsidence in the state.

Roof stability

The purpose of this project is to study and summarize the effects of geologic features on roof stability in underground coal mines. We completed a study of the geologic discontinuities affecting part of an underground mine currently operating in Indiana and prepared a manuscript. Future emphasis will be placed on the influence and relationships of faults, joints, and other structural features on roof stability.

Demethanization of coal

This project was started this year to determine as far as possible the methane content of coal seams in Indiana using desorption methods being developed by the U. S. Bureau of Mines. During the year desorption measurements and chemical analyses were made for all coals sampled in the deep-drilling project. We will continue the project with other coal samples and will try to relate the data to coal position near contemporaneous sandstone channels.

Directory of coal producers of Indiana

During the latter part of the year, a directory and map showing locations of active coal mines in Indiana were issued by the Survey. We visited 189 mine sites, potential mine sites (areas with active permits), and gob and slurry recovery operations from Warren County to the Ohio River. One hundred thirty active or idle mines, tipples, and gob and slurry recovery operations were located. Six are underground mines, three are gob and slurry recovery operations, and the rest are surface mines or the tipples or offices of surface mines.

Strippable and underground coal resources

This project to inventory the coal resources of the state was continued this year by adding information from our deep-drilling program and by incorporating mapping from Putnam, Owen, Greene, Posey, and Gibson Counties. Revision of reserve figures will be made as the projects are completed.

Silurian reefs in northern Indiana

Emphasis this year was placed on exploration for high-calcium limestone in reefs in northern Indiana. A paper on the project was presented at a meeting of the Geological Society of America, and a manuscript is in preparation for outside publication. Much of the impetus for the project comes from a continuing industry interest in obtaining high-calcium limestone for flux stone, burning lime, fillers, and whiting in the state. Because high-calcium limestone in northern Indiana is scarce, the importance of the near-surface limestone reefs is of great geologic and industrial interest.

Carbonate rock fillers and whittings

We continued measuring and preparing samples for brightness tests. Industry interest also continued with requests for the data that has been compiled, and we had the opportunity to compare our measurements to those made by industry. Preparation of a report on the project was started, although about 200 more measurements are needed before the compilation of basic data is complete.

Underground mining of limestone and dolomite in Indiana

Although not a formal project, our investigation of possibilities for underground mining for limestone and dolomite increased because of the increased industrial interest in underground mining. A paper was prepared on favorable areas in Indiana for deep underground mining, and a project outline has been submitted for a study of underground mining for dimension stone in south-central Indiana.

Tabulation and description of abandoned quarries

The compilation of geologic data on abandoned limestone and other quarries has continued this year in conjunction with other research projects and service duties. A few quarries were located in northeastern and southeastern Indiana and the information added to our files, which are regularly consulted for reclamation and mineral-resource information.

Industrial minerals applications of underclays

Sampling of underclays from active coal mines and from cores continued on a reduced scale this year. X-ray analyses of samples continued and considerable data were compiled. Part of the data were used in a paper on characterizations of mudstones of Pennsylvanian age.

Fluorite, barite, and sphalerite

The report for this project was completed, but we continue to compile new data as it becomes available. This year a groundwater geochemical survey of Harrison County was completed, and a paper was prepared on the results of the investigation. We continued work on investigation of fluid inclusions for the project and provided data and counsel to industry representatives interested in metals exploration.

Alluviation of the Ohio River near Evansville

This is a study of the nature and history of the alluvial fill of the Ohio

River near Evansville. During the year a series of deep auger holes was drilled in the study area, and samples were taken and analyzed to differentiate between the sediments deposited during different states of Pleistocene alluviation. An oral presentation was made of the results at a meeting of the Geological Society of America. Still needed are some shallow borings and geomorphic analysis of all of the data.

Sand and gravel resources of Vanderburgh County

This study is an offshoot of the above project. During the year samples were collected, and grain size analyses and pebble counts were performed. Isopachous maps of sand and gravel thickness and overburden thickness were prepared, and a draft of a manuscript was written.

Alluviation of the Middle Wabash River

Terrace deposits lining the walls of the Wabash River Valley from Terre Haute to Lafayette are being studied in this project. During the year extensive field work was conducted, including numerous visits to sand and gravel pits on the terraces. Samples were collected and analyzed, and some results of the investigation were presented at professional meetings. Additional subsurface data are still needed for the terraces. Sand and gravel resources of the terraces will also be studied.

Terrace deposits along the Whitewater River

Sand and gravel deposits along the Whitewater River are being studied to determine their nature and origin and to determine their relationship to the sand and gravel deposits of the Ohio River. Field work has begun and some samples have been collected.

Pleistocene lake deposits of Daviess County

The extensive lake deposits of central Daviess County are being investigated to determine their origin. Several auger holes were drilled, samples were collected and analyzed, and a bedrock topographic map was constructed. Additional drilling and sample collection is needed.

Environmental geology of Vigo County

We are participating in this project with the Geology Section by describing the sand and gravel resources of the county. The extent and thickness of the deposits and overburden were mapped and classified by mode of occurrence and origin. Part of a manuscript was written for inclusion in the final report.

Directory of crushed stone, cement, and lime producers of Indiana

Compilation of data for the directory and for a map showing locations of the operations began during the latter part of the year.

Faulting in southwestern Indiana (NRC funded)

Faulting extending from Kentucky into Spencer and Perry Counties, Indiana, was investigated in detail by using subsurface data, primarily geophysical logs of petroleum tests in Spencer County, and extensive surface field surveys in Perry County. Twenty miles of detailed surface mapping of the Mt. Carmel

Fault in Monroe and Lawrence Counties was completed. One report on faulting in Posey and Gibson Counties was published, and several maps and reports are in preparation.

Coal planning information project for Illinois Basin (USGS RALI grant)

The Survey's part of this project is the updating and compilation of maps in the coal-producing part of Indiana to meet planner's needs, and preparation of a summary of coal information useful for planning. We completed maps of surface-mined areas and coal resource maps for three coal beds. Another map set showing abandoned underground mines is being compiled and digitized for computer use. Ultimately these maps can be reproduced for planners for any area at any scale in Indiana. Writing of the final report for the project has begun.

New Albany Shale project (DOE funded)

Members of the Section participated in preparation of technical papers, description of several shale cores of the New Albany Shale, and analysis of numerous samples for clay minerals. An investigation of trace metals in the New Albany was also made. This project is reported in detail separately.

Methane content of deep coal in Indiana (TRW funded)

Members of the coal group participated in collecting gas samples from coal during the drilling of Survey drill holes 301 and 302. A summary report prepared by Paul L. Archer, TRW Energy Systems, Donald D. Carr, and Denver Harper was presented May 18 at the SPE/DOE Symposium on Unconventional Gas Recovery.

MINERAL STATISTICIAN

Because of the vastly increased volume of paperwork required by all of the regulations imposed on the minerals industries by various agencies of government, many companies have declined to provide production data (which is not required). Therefore a greater number of estimates for 1979 are included in this report than in the past.

For 1979, the total value of minerals produced in Indiana increased by 21.2 percent, to \$812,681,815.00, although nearly all commodities except the fuels showed some decline in volume. The manufacture of cement and clay products from materials mined in Indiana, and the fabrication of limestone for building purposes, contributed nearly \$133.5 million additional value to the total for Indiana mineral products. The manufacture of lime, the recovery of sulfur from petroleum, and the processing of perlite, all from raw materials imported from out of state, further increased the value of Indiana's mineral industries by several millions of dollars.

The fuels accounted for 80.34 percent of the total value of minerals produced. Coal is by far the most significant factor in the State's mineral economy, amounting to 66.62 percent of the total value of all minerals produced. Mining took place in 16 counties in the west-central and southwestern sections of the state, with slightly more than 56 percent of coal production coming from Pike and Warrick Counties.

Oil drilling activity declined from that of 1978, but a greater success ratio resulted in a .56 percent increase in production, and the greater unit price resulted in an increase of 78.25 percent in total value, making oil the second largest economic factor in the Indiana mineral industry.

The depressed construction industry is clearly reflected in the quantity of crushed limestone, sand and gravel, dimension limestone, clay and shale, gypsum, and cement produced. Of these, only crushed limestone showed an increase -- 1.06 percent. Declines in other commodities ranged from 1.56 to 23.71 percent. Crushed limestone, gypsum, and cement did show some increase in total value.

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

<u>County</u>	<u>Value at first stage of salability</u>	<u>Mineral commodities (in alphabetical order)</u>
<u>\$100 million+</u>		
Warrick	\$187,893,622.00	Coal
Pike	116,203,829.00	Coal
<u>\$50 - 100 million</u>		
Sullivan	59,706,755.00	Coal, crushed limestone
Vermillion	50,620,603.00	Clay and shale, coal, sand and gravel
<u>\$25 - 50 million</u>		
Clay	39,435,620.00	Clay and shale, coal
<u>\$5 - 25 million</u>		
Spencer	23,715,477.00	Coal
Knox	20,835,084.00	Coal, sand and gravel
Greene	14,794,915.00	Coal, sand and gravel
Daviess	14,642,309.00	Coal, sand and gravel
Hamilton	10,906,105.00	Crushed limestone, peat, sand and gravel
Dubois	10,446,063.00	Clay, coal
Putnam	9,467,426.00	Clay and shale, crushed limestone, dimension limestone, sand and gravel
Crawford	C	Crushed limestone
Clark	7,676,580.00	Clay and shale, crushed limestone, sand and gravel
Lawrence	7,282,389.00	Crushed limestone, dimension limestone
Marion	7,075,531.00	Crushed limestone, sand and gravel
Martin	C	Coal, gypsum
Monroe	6,339,955.00	Crushed limestone, dimension limestone
Allen	5,995,171.00	Crushed limestone, peat, sand and gravel

	1978		1979	
	<u>Quantity</u>	<u>Value</u>	<u>Quantity</u>	<u>Value</u>
Coal	23,941,263 tons	\$454,883,997.00	28,496,886 tons	\$541,440,777.00
Petroleum	4,688,961 bbls	62,316,292.00	4,715,000 bbls	111,085,000.00
Crushed limestone	33,493,349 tons	81,258,182.00	33,849,583 tons	92,539,526.00
Sand and gravel	27,231,072 tons	52,355,465.00	24,734,292 tons	51,783,610.00
Dimension limestone	2,353,812 cu.ft.	6,940,000.00	2,146,468 cu.ft.	6,011,679.00
Clay and shale	1,135,414 tons	2,001,601.00	1,093,194 tons	1,866,370.00
Peat	182,939 cu.yd.	1,689,741.00	76,514 tons	1,242,343.00
Natural gas	163,000,000 cu.ft.	110,840.00	350,000,000 cu.ft.	369,000.00
Undistributed:				
Dimension sandstone, gypsum, marl, whetstones		<u>6,447,434.00</u>		<u>6,343,513.00</u>
TOTAL		\$668,033,552.00		\$812,681,818.00
Value added for additional processing of dimension limestone, and manufacture of clay products, cement		\$122,306,506.00		\$133,404,943.00

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 publication and talks, preparation of displays, mounting and framing of maps and photographs, typesetting, diazo printing, photocopying, film processing and printing, photomicrography, field photography, color proofing of maps and artwork, and preparation of projection slides.

Jobs completed for publication by the Geological Survey are: Bulletin 58, Stratigraphy and Conodont Paleontology of the Cataract Formation and Salamonie Dolomite (Silurian) in Northeastern Indiana; Special Report 18, Middle Devonian Chitinozoa of Indiana; Special Report 19, Geology for Environmental Planning in Marion County, Indiana; Occasional Paper 29, Application of Finite-Element Analysis to Terrestrial Heat Flow; Occasional Paper 30, Subsurface Stratigraphy of Oil Fields in the Salem Limestone and Associated Rocks in Indiana; Miscellaneous Map 26, Map of Indiana Showing Unconsolidated Deposits; Miscellaneous Map 27, Map of Southwestern Indiana Showing Locations of Active Coal Mines; Miscellaneous Map 28, Map of Southwestern Indiana Showing Locations of Coal Slurry Ponds and Preparation Plants; Petroleum Exploration Map 3C, Map of Warrick County, Indiana, Showing Control on Base of Beech Creek Limestone (Barlow); Petroleum Exploration Map 12C, Map of Martin County, Indiana, Showing Control on Base of Beech Creek Limestone (Barlow); Petroleum Exploration Map 28C, Map of Crawford County, Indiana, Showing Control on Base of Beech Creek Limestone (Barlow); Petroleum Exploration Map 40C, Map of Perry County, Indiana, Showing Control on Base of Beech Creek Limestone (Barlow); Petroleum Exploration Map 52C, Map of Vanderburgh County, Indiana, Showing Control on Base of Beech Creek Limestone (Barlow); Petroleum Exploration Map 53C, Map of Gibson County, Indiana, Showing Control on Base of Beech Creek Limestone (Barlow); Petroleum Exploration Map 54C, Map of Posey County, Indiana, Showing Control on Base of Beech Creek Limestone (Barlow); Preliminary Coal Map 16, Outcrop and Mined Areas of Coals in Putnam County, Indiana; Regional Geologic Map 1, Map of the 1° x 2° Indianapolis Quadrangle, Indiana and Illinois, Showing Bedrock and Unconsolidated Deposits; and revision of the petroleum exploration maps of Indiana counties.

Other jobs completed include a display for the 1979 State Fair, sketches for 18 newspaper articles, a group of posters for a demonstration of seismic equipment at Spring Mill State Park, several illustrations for the Governor's water resources report, design and construction of a portable display case, illustrations for 4 outside publications, slide drawings for 10 talks, and revision of a map showing status of published petroleum exploration maps.

Other jobs in progress include a display for the 1980 State Fair; Special Report 20, Aggregate Resources of the Big Blue River Valley in East-Central Indiana; Special Report 21, Possibility of Mississippi Valley-Type Mineral Deposits in Indiana; Special Report 22, Some Environmental Factors as Aids to Planning in Cass County, Indiana; Special Report 23, Environmental Geology of Grant County, Indiana, -- An Aid to Planning; Special Report 24, The Salina Group (Middle and Upper Silurian) of Indiana; Occasional Paper 31, Post-Knox Unconformity -- Significance at Unionport Gas-Storage Project and Relationship to Petroleum Exploration in Indiana; Petroleum Exploration Map 4C, Map of Sullivan County, Indiana, Showing Control on Base of Beech Creek Limestone (Barlow); Petroleum Exploration Map 13C, Map of Greene County, Indiana, Showing Control on Base of Beech Creek Limestone (Barlow); Petroleum Exploration Map 39C, Map of

Spencer County, Indiana, Showing Control on Base of Beech Creek Limestone (Barlow); maps and illustrations for the Department of Energy project; slide drawings for the 2nd European Conodont Symposium; and a set of sketches for the newspaper series.

Photographic items produced consist of 1337 camera copies, 98 field and laboratory photographs, 40 photomicrographs, 880 black and white prints, 469 film positives and duplicate negatives, 102 stripping film prints of stickup type and symbols, 7 scribesheets, 23 peelcoat films, 12 color proofs of maps and covers, 296 color slides, and 111 black and white slides.

Approximately 40,000 square feet of prints were made 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 and adult groups, and all other groups and individuals who are interested in rocks, minerals, fossils, and the earth. On request, the geologist participates in radio and television programs that deal with 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 informs the public about the activities of the Indiana Geological Survey but also distributes educational information to the public. In addition to giving public lectures and conducting special field trips, when requested, the Educational Services geologist works directly with teachers in public schools, in college classes, with geology clubs, rockhound clubs, Scout groups, 4-H clubs and adult leaders, conservation clubs, civic groups, 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 exhibits at fairs, rock shows, etc.

During 1979-80, the geologist in charge of Educational Services spent 23½ days in the field and traveled more than 5,100 miles. In answer to requests received from the public, he gave 6 public lectures and conducted 3 educational field trips and 10 tours of the Geology Building during the 12-month period.

During the past fiscal year, the program for providing illustrated news items for Indiana 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 all newspapers throughout the state. The total number of the series currently is 114 -- another six units are in process.

Public lectures were made to the following groups: participants of the Childs School Science Fair, Bloomington; participants of the 2nd Annual 4-H

Project-O-Rama at the 4-H Fairgrounds, Martinsville; members of the 3rd and 4th grades, Grandview School, Bloomington; members of the 3rd grade class, University Elementary School, Bloomington (2 different talks).

Special field trips (educational) and collecting field trips were conducted for the following groups: members of the physical geology class, Manchester College; members of the Earth Science Teachers Association of Michigan (2 separate trips).

The Educational Services geologist again served as the Geological Survey's representative of the Department of Natural Resources State Fair Committee for the 1980 Indiana State Fair. During the past fiscal year, he was the Survey's representative at a meeting of the Department of Natural Resource's Safety Committee.

Tours of the Geology Building were conducted for the following groups: a group of high school honors students attending a special conference at Indiana State University; members of the 4th grade class, Childs School, Bloomington; members of an economic geology class from IUPU-Fort Wayne; members of the Park Ridge East Cub Scout Pack, Bloomington; members of the Marlin School Cub Scout Pack, Bloomington; members of the 3rd grade class, University Elementary School, Bloomington; and members of a Bloomington cub scout pack (unidentified).

Articles submitted and published in OUTDOOR INDIANA during the past fiscal year included: "The Earth Itself is Historic", by Robert H. Shaver and R. Dee Rarick (September 1979); "Landsat Looks at Indiana", by Henry H. Gray and Donald D. Carr (November 1979); "Earthquakes in Indiana!", by Robert F. Blakely; and "Geology: It Will Help You to Enjoy and Better Understand the Outdoors", by R. Dee Rarick (June 1980).

Exhibits prepared by the Indiana Geological Survey for public display included one for the 1979 Indiana State Fair. Following the close of the Indiana State Fair, this exhibit was installed at the Wesselman Park Nature Center in Evansville.

During the year, the Educational Services geologist submitted 3 news releases about Geological Survey activities and the availability of new Survey publications. Also, he served as a member of the Indiana University Staff Council Scholarship Selections Committee.

During the 1979 4-H Fair season, 4-H geology and weather exhibits were judged for the Jennings County 4-H Fair, the Martin County 4-H Fair, the Jefferson County 4-H Fair, the Jackson County 4-H Fair, the Monroe County 4-H Fair, and the Morgan County 4-H Fair.

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

Conferences attended during the past 12 months included the 1979 Science Careers Day at IUPU-Indianapolis where he served as a guidance counselor in geology. Also, he attended the 1979 North Central Section of Geological Society of America in Bloomington and served as a projection assistant.

GEOLOGY SECTION

The Section's accomplishments for the fiscal year may be summarized as follows: during the year the Section listed ten separate formally designated projects in its monthly reports. Two other projects that are data-gathering projects (Characteristics of Indiana tills and Engineering properties of unconsolidated deposits) were not listed, although they were carried on and were drawn upon by other projects. One of the listed projects was wholly inactive -- environmental geology Monroe County.

Among the nine listed active projects, four are more or less practically oriented, including one geographically defined environmental geology project, two mapping projects, and one problem-oriented environmental project. These include: environmental geology Vigo County, Putnam County mapping (completed April 1980), bedrock geology map Indiana, and hazardous waste disposal (new May 1980).

Five of the active projects consist of efforts to obtain new basic information or to compile and interpret existing basic data (i.e., nonapplied research). These were: Pleistocene stratigraphy west-central Indiana, Middle Paleozoic geology northern Indiana, Teays Valley Indiana, tills northwest Indiana, and correlation of stratigraphic units North America (COSUNA).

As indicated above in parentheses for some projects, one project was completed, and one project is new. The new project (hazardous waste disposal) recognizes the need for an inventory and discussion of geologically acceptable hazardous waste-disposal locales in Indiana. The project proposes a systematic geologic evaluation of the suitability of the State's bedrock and unconsolidated units, both at the surface and in the subsurface (to shallow depths), for hazardous waste disposal. Many kinds of existing data will be utilized, and both new data and evaluation will be acquired, especially through the medium of an extensive augering and analytical program. A part of the study would amount to pilot studies of specific locales; another part is to deal more generally with the State as a whole, and much of the findings pertinent to this phase are to be presented on four maps covering the State's entire area.

Carrying over from 1977-78 but having no activity or support during the period from conception to the present is our proposal for a multifaceted project on (a) Mapping of potential coal-stripping areas, (b) Geologic and reclamational characteristics of Quaternary strata, and (c) Geologic and reclamational characteristics of Pennsylvanian strata.

For the completed project (Putnam County mapping), we submitted one report intended for publication and for the applied or practical projects that remained incomplete, we submitted one abstract for publication. For the basic and/or research-oriented projects that remained incomplete we published five reports and abstracts and submitted four reports and abstracts for publication. In addition, two reports that are closely related to the project dealing with Middle Paleozoic geology of northern Indiana that had the Section's support (both effort and sponsorship) were published.

Nine other reports, abstracts, and maps that resulted from projects completed in earlier years or from miscellaneous research (basic and applied) efforts were published or submitted for publication. Our publication (or submitted) effort also extended to three educational reports and to one professional guidebook.

Summarizing part of the above, we had a total of 19 reports, abstracts, and maps published; six of the 19 are Survey publications. All these publications total 260 pages and 149 illustrative materials, which is up from 1978-79 and from the average for the past several years. Seven reports that had been submitted in earlier years remained in obscurity at the end of the present year. This backlog totaled 246 pages and 67 illustrative materials and is down by about one third from last year's total, which is encouraging.

We submitted eight reports and abstracts that remained unpublished at the end of the year. They total 154 pages and 37 illustrative materials, which, when added to the backlog noted above, bring the total backlog to 400 pages and 104 illustrative materials. This overall total represents a continued, two-year decrease in such totals for previous years.

We prepared six memorandum reports, four being environmentally oriented, one educationally oriented, and one being a report of progress on the project related to the Teays Valley listed above.

We gave or conducted 6 field trips and 24 talks, lectures, or scientific papers. Of the total of 29 items, 12 were essentially scientific or technical and were presented to professional assemblies, and 17 were educational or otherwise informative (classes, colloquia, advisory and amateur groups). These activities increased by 50 percent over 1978-79.

We were involved in 514 conferences and conference-type special field trips of record, of which the greater part consisted of calls on us for information. This total is higher than that for 1978-79 and represents a continuing (several years) increase in calls for our services.

The volume of correspondence (1069 pieces in and out), much of which was to provide information on request, was down by about 15 percent from that for 1978-79. The number (144) of environmental questionnaires completed is about 10 percent higher than that for 1978-79.

We were involved in many special activities that are not classifiable in the categories noted above and are not judged worthy of further classification here.

GEOCHEMISTRY SECTION

Samples of rocks and minerals that are collected by all of the sections of the Geological Survey are analyzed to determine their chemical composition. Various spectrometric, x-ray, atomic absorption, and wet chemical methods are used in routine analyses to learn what minerals and elements are present in the samples, what uses might be made of these materials, and whether potentially dangerous substances are present in them.

Special efforts on the analysis of the New Albany Shale continued during the year. A report was received on the organic geochemistry of the formation and analysis continued with the CHN analyzer. Results of determinations of carbon, carbon dioxide, hydrogen, and nitrogen confirmed previous suspicions that the lower part of the formation is not high in organic matter content. A selection of coring sites has been made to obtain additional samples to characterize the formation more completely.

Twenty-two coal, 276 slurry, and 24 miscellaneous samples were brought in to the coal analysis laboratory. On these and on samples received previously, geochemists made 1,682 determinations, including 288 determinations of moisture and ash, 7 each of carbon, hydrogen, and nitrogen, 335 of sulfate, 222 of BTU values, and 150 of ash fusion.

In the spectrographic laboratory, geochemists worked to produce a synthetic coal standard for use by the coal chemistry laboratory. They also made 3,529 quantitative determinations on 430 samples by spectrometric methods, produced 7 mineralogic determinations by x-ray techniques, ran 130 samples for carbon dioxide, and 251 samples on the CHN analyzer.

Members of the Section also collected and analyzed 58 samples of water from Vigo County for 17 elements by ICP and atomic absorption methods. With geologists from the Coal and Industrial Minerals Section, they sampled water from in and around the Green Valley Mine in order to gain an understanding of the problems encountered in analyzing material from a coal mining region.

GEOPHYSICS SECTION

During the 1979-80 fiscal year, the Geophysics Section continued to maintain a program of field work, laboratory measurements of physical properties, and development of computer programs to assist in the interpretation of geophysical data. The Geophysics Section also was responsible for the operation of the Survey's drilling equipment and program.

A seismic refraction crew worked during the summer field season to measure thickness of glacial deposits in Putnam, Fountain, Warren, and Vigo Counties in connection with field mapping programs and to coordinate with the Teays Valley drilling project. In early June the seismic party interrupted their mapping program in order to make a series of special traverses across the probable course of a buried bedrock valley in Howard County west of Kokomo. This work was in connection with a water supply project being done by the Division of Water and the U. S. Geological Survey.

A gravity party began work in September to supplement the interpretation from well and seismic data as to the location of the Teays Valley. The gravity survey was done to help geologists locate the deepest portions of the valley to obtain maximum sample material from the drilling program.

During the year the Geophysics Section completed work on INDYMAP, a system of plotting maps by computer from data that has been digitized on the 7½ minute quadrangle sheets that cover the state. Any geographic unit in the state may now be plotted at any selected scale for use as a base map. The system is also ready to accept other data bases, such as coal or petroleum drilling records, which also are in digital form.

During the year four deep coal test holes were drilled, one in Sullivan County and three in Posey County. The total depth of these holes was 3,463 feet, of which 1,569 feet were cored.

PETROLEUM SECTION

The chief functions of the Petroleum Section consist of services, projects

that are performed annually, projects that are related to records, subsurface study projects, and special projects.

Services

The services offered consist mostly of requests, conferences, and correspondence about subsurface records such as well locations, driller's logs, geophysical logs, samples, cores, and interpretations made from these data. The Section handled 384 visitors during the fiscal year. In addition to the visitors, requests for subsurface information are received daily by correspondence or telephone.

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 Survey's Mineral Economic Series was completed.

Indiana Oil Reserves -- The Section participated in the program sponsored by the American Petroleum Institute.

Review of Petroleum Exploration Map Series -- The individual county petroleum map transparencies were updated at year's end. Thirty-six maps were revised and 56 were checked with no revisions necessary.

Records Improvement

Trenton Field Well Records -- A project of evaluating miscellaneous well records associated with the Trenton Field and preparing them for inclusion in the master well data file was continued. The project consisted of associating the proper well record with the appropriate well location and determining the ground elevation for that well location. Records were then prepared in a manner consistent with existing file data prior to insertion in the master file. Larry Enochs was employed to undertake the project. Evaluation of records in Wells County was completed during the year and expansion of the project to include records in Adams County was initiated.

Additional Master File Information -- Total depths of wells and identity of the deepest stratigraphic unit penetrated in wells were added to the master file envelopes for the convenience of visitors during the year. The project was completed during the year.

Subsurface Studies

Structural Control Maps -- Maps for Crawford, Gibson, Martin, Perry, Posey, Vanderburgh, and Warrick Counties showing structural position of the base of the Beech Creek Limestone were published during the year. Maps for all counties in which the Beech Creek Limestone is present are planned and are in preparation. The maps are published as part of the Petroleum Exploration Map Series.

Natural Gas in Indiana -- Dan Sullivan is conducting a study of the natural gas fields in Indiana. An important part of the report will be comments on the future of natural gas exploration in Indiana and determination of areas which are currently productive of gas.

Geology of Unionport Gas Storage Field -- Stanley Keller and graduate student Talal Abdulkareem prepared a paper on the post-Knox erosional unconformity at the Unionport Gas Storage Field in Randolph County, Indiana. The results of the study are to be published as an occasional paper.

Geology of the Trenton Field in Indiana -- Brian Keith is working on a study of the Trenton Field. There has been considerable renewed interest in this old giant field. This study will contribute to the understanding of the field to help answer inquiries from the public and industry.

Study of Borden and Sanders Groups -- A study on the stratigraphy and petroleum possibilities of the Mississippian Borden and Sanders Groups was completed by Stanley Keller during the year. Results of the study will be published as an occasional paper.

Subsurface Mapping of the Rockford Limestone in Indiana -- Nancy Hasenmueller initiated a study of the extent of the Rockford Limestone in Indiana as part of a joint effort with the Illinois State Geological Survey to map the distribution of the Rockford Limestone in the Illinois Basin.

Special Projects

Sample Consolidation -- The project to consolidate well samples in order to create additional storage space in the existing well sample library continued during the year. About 9,648 wells have been converted to the new system. It is estimated that the project is 95 percent complete and has provided sample storage for an additional 26 years.

Geology of the New Madrid Area -- Dan Sullivan is co-principal investigator of a project to study the geology and faulting of the New Madrid seismic area, which includes part of southwestern Indiana. George Tanner replaced Nick Stellavato as geologist for the project and continued mapping faults in various stratigraphic units. The project is under the sponsorship of the Nuclear Regulatory Commission. Maps on Coal V and the Cypress Formation for Posey and Gibson Counties are being prepared and will be published by the Geological Survey as special maps. Also detailed field mapping of the Mt. Carmel Fault in Lawrence and Monroe Counties was started.

DOE Eastern Gas Shale Project -- Geologists Nancy Hasenmueller and John Bassett continued a study of the stratigraphy of the Devonian New Albany Shale in Indiana under sponsorship of the Department of Energy. Selected New Albany data to compile a computer data file were sent to the Illinois State Geological Survey. During the year, cores from a well in Greene County and in Hendricks County, and cores from three wells in Jennings County were obtained and studied. A paper related to the work which was published was: "Distribution and geochemical characterization of the Hannibal Member of the New Albany Shale in Indiana" by P. J. Lechler, N. R. Hasenmueller, J. L. Bassett, and R. K. Leininger. Published in Third Eastern Gas Shales Symposium METC/SP-76/6, p. 511-525.

Eight maps were completed and submitted to the Department of Energy for

publication during the year. They are:

- 805 Map of Indiana showing thickness of New Albany Shale (Devonian and Mississippian) and equivalent strata.
- 806 Maps of northern Indiana showing thicknesses of the Sunbury, Ellsworth and Antrim Shales (New Albany Shale equivalents).
- 807 Map of Indiana showing thickness of the Blocher Member of the New Albany Shale (Devonian and Mississippian).
- 809 Map of Indiana showing thickness of the Clegg Creek-Camp Run-Morgan Trail Members (undifferentiated) of the New Albany Shale (Devonian and Mississippian).
- 810 Map of Indiana showing thickness of the Ellsworth Member of the New Albany Shale (Devonian and Mississippian).
- 812 Map of Indiana showing structure on top of the Maquoketa Group (Ordovician).
- 813 Map of Indiana showing structure on top of the Trenton Limestone (Ordovician).
- 815 Map of Indiana showing locations of selected wells that penetrate New Albany Shale (Devonian and Mississippian) and equivalent strata.

Trenton Core Analysis -- A core of the Trenton Limestone from a well in Wells County was obtained and submitted for analysis to Oilfield Research Corp. in order to gain an understanding of the reservoir and entrapment conditions of the old Trenton oil field of east-central Indiana. The Petroleum Section is continuing to offer core analysis as an inducement to operators to core the Trenton to aid the Trenton Project.

Evaluation of Improvement Projects for the Indiana State Highway Commission -- During the year three different highway bridge projects were reviewed.

Preparation of Display on the Trenton Field -- Brian Keith worked with Bill Stalions to prepare a six-panel display on the Trenton Field to be used at the Indiana State Fair in August 1980 and at the Eastern Section AAPG meeting in Evansville in October 1980.

Paper on Carboniferous Oil in the Illinois Basin -- Gerald Carpenter, Brian Keith, Stan Keller, and Dan Sullivan are working with members of the Illinois and Kentucky Surveys on a paper documenting Pennsylvanian and Mississippian petroleum in the Illinois Basin. This paper will be included in a volume on Worldwide Occurrence of Carboniferous Oil to be published by the American Association of Petroleum Geologists.

Evaluation of Waste-Disposal Well at Valparaiso -- Gerald Carpenter and Dan Sullivan worked with representatives of Pfizer Chemical Co. and the Indiana State Board of Health to determine the feasibility of disposing of NH_4Cl liquid in the Mt. Simon Sandstone near Valparaiso.

Assistance to Graduate Student Research -- Members of the Petroleum Section have provided technical assistance throughout the year to geology graduate students from Indiana University and Ball State University who are

doing subsurface studies in Indiana.

PUBLICATIONS SECTION

During the past fiscal year the Publications Section sold 11,799 reports and 15,131 maps. The Section sent 1,234 reports on exchange to institutions in the United States and in foreign countries. It also distributed without charge 2,947 reports and 1,812 maps to members of its own organization and to individuals, libraries, and companies in the United States and abroad. The Publications Section served 5,501 office customers, handled 3,309 letters pertaining to geologic reports and maps, and sent out 1,274 announcements of new publications.

Eight reports, eight new maps, and 59 revised maps were issued during the fiscal year, and six reports and three maps were reprinted. Four of the six reports reprinted were popular publications: Circular 4, "Guide to Some Minerals and Rocks in Indiana" (14,000 copies printed since 1958); Circular 5, "Let's Look At Some Rocks" (34,000 copies printed since 1958); Circular 6, "Adventures with Fossils" (19,000 copies printed since 1959); and "Gold and Diamonds in Indiana" (9,000 copies printed since 1963).

Six manuscripts of Survey reports, 22 abstracts and 23 manuscripts prepared by Survey personnel for outside publication, and six news releases, newsletters, exhibits, and similar material were edited during the fiscal year. Eighteen news releases, "Our Hoosier State Beneath Us", were also edited, and camera copy for them and for three slides and 32 miscellaneous projects was prepared.

Items of new equipment in the Publications Section were a Pitney Bowes Model 5600 postage meter machine, which replaced a Model 5400 machine, and a Xerox 3400 copier, which replaced a Xerox 2400 copier.

REPORTS AND MAPS PUBLISHED BY THE GEOLOGICAL SURVEY

Bulletins

Rexroad, C. B., 1980, Stratigraphy and conodont paleontology of the Cataract Formation and the Salamonie Dolomite (Silurian) in northeastern Indiana: Bulletin 58, 83 pages, 1 plate, 5 figures.

Directories

Hasenmueller, W. A., 1979, Directory of coal producers in Indiana: Unnumbered Directory, 18 pages.

Mineral Economic Series

Carpenter, G. L., and Keller, S. J., 1979, Oil development and production in Indiana during 1978: Mineral Economic Series 25, 36 pages, 3 figures, 5 tables.

Miscellaneous Maps

Indiana Geological Survey, 1979, Map of Indiana showing unconsolidated deposits: Miscellaneous Map 26.

Hasenmueller, W. A., and Langford, M. A., 1979, Map of southwestern Indiana showing locations of active coal mines: Miscellaneous Map 27.

Eggert, D. L., 1979, Map of southwestern Indiana showing locations of coal slurry ponds and preparation plants: Miscellaneous Map 28.

Occasional Papers

Shaver, R. H., 1979, Geologic story of the lower Wabash Valley with emphasis on the New Harmony area: Occasional Paper 27, 14 pages, 6 figures and frontispiece.

Malott, C. A., 1979, The Flatwoods region of Owen and Monroe Counties, Indiana: with introduction and commentary by H. H. Gray: Occasional Paper 28, 26 pages, 3 figures.

Lee, T. C., Rudman, A. J., and Sjoreen, Andrea, 1980, Application of finite-element analysis to terrestrial heat flow: Occasional Paper 29, 53 pages, 11 figures.

Petroleum Exploration Maps

Carpenter, G. L., and Caze, J. T., 1979, Map of Warrick County, Indiana, showing control on base of Beech Creek Limestone (Barlow): Petroleum Exploration Map 3C.

Carpenter, G. L., and Cazez, J. T., 1979, Map of Vanderburgh County, Indiana, showing control on base of Beech Creek Limestone (Barlow): Petroleum Exploration Map 52C.

Carpenter, G. L., 1979, Map of Gibson County, Indiana, showing control on base of Beech Creek Limestone (Barlow): Petroleum Exploration Map 53C.

Carpenter, G. L., 1979, Map of Posey County, Indiana, showing control on base of Beech Creek Limestone (Barlow): Petroleum Exploration Map 54C.

Revised Petroleum Exploration Maps (as of December 31, 1979): 3A, 3B, and 3C (Warrick County); 4A and 4B (Sullivan County); 5A and 5B (Vigo County); 12 and 12A (Martin County); 13A and 13B (Greene County); 14A and 14B (Clay County); 15A (Parke County); 16A (Vermillion County); 18A (Owen County); 19A (Putnam County); 21A, 21B, and 21C (Dubois County); 23, 23A, and 23C (Knox County); 26, 26A, and 26C (Daviss County); 28A (Crawford County); 39 and 39A (Spencer County); 40 and 40A (Perry County); 42A (White County); 43A (Carroll County); 46A (Jennings County); 51, 51A, and 51C (Pike County); 52, 52A, and 52C (Vanderburgh County); 53, 53A, and 53C (Gibson County); 54, 54A, and 54C (Posey County); 65A (Fulton County); 66A (Cass County); 76 (Huntington County); 77 (Wells County); 82 (Grant County); 92A (Randolph County); 93A (Henry County); 94A (Hancock County); 95A (Decatur County); 96A (Shelby County); 97A (Rush County); 98A (Hamilton County); and 99A (Madison County).

Checked Without Revision Petroleum Exploration Maps (as of December 31, 1979): 17A (Fountain County); 20A (Montgomery County); 22A (Jackson County); 24A (Monroe County); 25A (Lawrence County); 27A (Orange County); 29A (Washington County); 30 and 30A (Harrison County); 31A (Brown County); 32A (Bartholomew County); 33A (Hendricks County); 34A (Marion County); 35A (Morgan County); 36A (Johnson County); 37A (Tippecanoe County); 38A (Warren County); 41A (Benton County); 44A (Clinton County); 45A (Boone County); 47A (Jefferson County); 48A (Scott County); 49A (Clark County); 50A (Floyd County); 55A (Steuben County); 56A (Lagrange County); 57A (Noble County); 58A (DeKalb County); 59A (Allen County); 60A (Whitley County); 61A (Kosciusko County); 62A (Elkhart County); 63A (St. Joseph County); 64A (Marshall County); 67A (Pulaski County); 68A (Starke County); 69A (LaPorte County); 70A (Porter County); 71A (Jasper County); 72A (Newton County); 73A (Lake County); 74A (Miami County); 75A (Wabash County); 78 (Adams County); 79 (Jay County); 80 (Blackford County); 81 (Delaware County); 83A (Howard County); 84A (Switzerland County); 85A (Ohio County); 86A (Dearborn County); 87A (Ripley County); 88A (Franklin County); 89A (Union County); 90A (Fayette County); 91A (Wayne County); and 100A (Tipton County).

Regional Geologic Maps

Gray, H. H., Bleuer, N. K., Hill, J. R., and Lineback J. A., 1979, Geologic map of the 1° x 2° Indianapolis Quadrangle, Indiana and Illinois, showing bedrock and unconsolidated deposits: Regional Geologic Map 1.

Special Reports

Noel, J. A., 1979, The Plummer Field, Greene County, Indiana: Special Report 17, 24 pages, 2 plates, 11 figures, 6 tables.

Wright, R. P., 1980, Middle Devonian Chitinozoa of Indiana: Special Report 18, 24 pages, 5 plates, 2 figures, 1 table

MISCELLANEOUS PUBLICATIONS

Archer, P. L., Carr, D. D., and Harper, Denver, 1980, Favorable coal bed methane resource areas within the Illinois Basin in Proceedings First Annual Symposium on Unconventional Gas Recovery: Society Petroleum Engineers/ U. S. Department of Energy 8928, p. 51-58.

Ault, C. H., and Carr, D. D., 1980, Search for high-calcium limestone in Silurian reefs of northern Indiana (abs): Geological Society of America Abstract with Programs, v. 12, p. 218.

Ault, C. H., and Carr, D. D., 1980, New exploration and evaluation of minable coal resources in complexly faulted area containing old petroleum production (abs): American Association of Petroleum Geologists Bulletin, v. 64, n. 5, p. 672.

Basu, A., McKay, D. S., Moore, C. H., and Shaffer, N. R., 1979, A note on the Apollo 15 green glass vitrophyres: Proceedings Lunar Planetary Science Conference 10th, p. 301-310.

Bleuer, N. K., 1980, Correlation of Pre-Wisconsinan tills of the Lake Michigan Lobe and Huron-Erie Lobe through the Teays Valley Fill (abs): Geological Society of America Abstract with Programs, v. 12, p. 219.

Bleuer, N. K., 1979, Sources of till and ice-sheet erosion and deposition zones for the Wisconsinan Stage (Pleistocene) of Indiana (abs): American Geophysical Union Midwest Meetings, Abstract with Programs, p. 219.

Bleuer, N. K., and Gray, H. H., 1979, The Geology in The Indiana Water Resource: Governor's Water Resource Study Commission, State of Indiana, Indiana Department of Natural Resources, p. 11-21, 8 figures, 2 tables.

Carr, D. D., and Ault, C. H., 1980, Potential for deep underground mining of limestone in Indiana (abs): Society of Mining Engineers Fall Meeting and Exhibit Announcement, p. 12.

Droste, J. B., and Rexroad, C. B., 1980, Paleogeography of Alexandrian rocks in Indiana and adjacent states (abs): Geological Society of America Abstract with Programs, v. 12, p. 223.

Droste, J. B., Rexroad, C. B., and Shaver, R. H., 1980, The Silurian System in Indiana and environs--a key to regional paleogeography and to reef and evaporite controversies (abs): Geological Society of America Abstract with Programs, v. 12, p. 224.

Fraser, G. S., and Fishbaugh, D. A., 1980, Evolution of the Ohio River near Evansville, Indiana (abs): Geological Society of America Abstract with Programs, v. 12, p. 226.

Fraser, G. S., 1980, Fluvial sedimentology, by Andrew R. Miall, ed. (rev.): Journal of Geology, v. 88, no. 3, p. 371.

Gray, H. H., and Collins, M. B., 1980, Floodplain sediments along the Ohio Rivers (abs): Geological Society America Abstract with Programs, v. 12, p. 227.

Horowitz, A. S., and others (including C. B. Rexroad), 1979, Carboniferous paleontological zonation and intercontinental correlation of the Fowler No. 1 Traders core, Scott County, Tennessee, U.S.A.: Southeastern Geology, v. 20, p. 205-228, 2 figures.

Indiana University Paleontology Seminar (including R. H. Shaver), 1980, Stratigraphy, structure, and zonation of a large Silurian reef at Delphi, Indiana: American Association of Petroleum Geologists Bulletin, v. 64, p. 115-131, 8 figures.

Lechler, R. J., Leininger, R. K., Shaffer, N. R., and Ripley, E. M., 1980, Enrichment of heavy metals in the New Albany Shale, southern Indiana (abs): Geological Society of America Abstract with Programs, v. 12, p. 232, 249.

Patton, J. B., and Carr, D. D., 1980, Quarrying and milling of the Salem Limestone in the Bloomington-Bedford District in Field Trips 1980 from the Indiana University Campus, Bloomington: ed. R. H. Shaver, North-Central Section of the Geological Society of America, P. 1-36.

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Rexroad, C. B., and Thompson, T. L., 1979, A spathognathodid lineage of Mississippian conodonts: Lethaia, v. 12, p. 237-245, 1 figure.

Shaffer, N. R., Hailer, J. G., and Amadi, P. U., 1980, Geochemical reconnaissance of ground water in Harrison County, Indiana (abs): Geological Society of America Abstract with Programs, v. 12, p. 255.

Shaver, R. S. (ed), 1980, Field trips 1980 from the Indiana University campus, Bloomington: Indiana University Department of Geology and North-Central Section Geological Society of America, 122 pages, 79 figures, 6 tables.

Sullivan, D. M., and Ault, C. H., 1980, A study of Indiana fault locations, displacements, attitudes and ages within a 200-mile radius of New Madrid, Missouri: annual progress report - fiscal year 1979, T. C. Buschbach, ed: St. Louis University, St. Louis, Missouri, p. 81-90.

REPORTS PUBLISHED IN OUTDOOR INDIANA

Carr, D. D., 1980, Test your Indiana knowledge: Outdoor Indiana, v. 43, n. 4, p. 30.

Gray, H. H., and Carr, D. D., 1979, Landsat looks at Indiana--continuing satellite surveillance: Outdoor Indiana, v. 44, n. 9, p. 4-9.

Shaver, R. H., and Rarick, R. D., 1979, The earth itself is historic-- core drilling gives exciting clues: Outdoor Indiana, v. 44, no. 7, p. 18-21, 4 figures (reprinting with revision of a 1958 Outdoor Indiana article).

REPORTS SUBMITTED FOR PUBLICATION

Ault, C. H., and Moore, M. C., Aggregate resources of the Big Blue River Valley in east-central Indiana.

Eggert, D. L., A fluvial channel contemporaneous with the Springfield Coal Member (V), Petersburg Formation, northern Warrick County, Indiana.

Hartke, E. J., Ault, C. H., Austin, G. S., Becker, L. E., Bleuer, N. K., Herring, W., and Moore, M. C., Geology for environmental planning in Marion County, Indiana.

Hill, J. R., Geologic story of Brown County State Park: State Park Brochure series, 3 pages, 4 figures.

Hill, J. R., Moore, M. C., and Mackey, J., Bedrock geology and mineral resources of Putnam County: Special Report, 58 pages, 13 figures, 3 tables.

Rexroad, C. B., and Droste, J. B., Stratigraphy and conodont paleontology of the Sexton Creek Limestone and Salamonie Dolomite (Silurian) in Northwestern Indiana: Indiana Geological Survey Special Report, 53 pages, 6 figures.

Shaffer, N. R., Possibility of Mississippi Valley Type mineral deposits in Indiana.

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Bleuer, N. K., Recurrent surging (?) of the Wisconsin Huron-Erie Lobe in Indiana (abs): American Quaternary Association Sixth Biennial Meeting, Abstract with Programs, 1 page.

Droste, J. B., and Shaver, R. H., Recognition of buried Silurian reefs in southwestern Indiana: application to the Terre Haute Bank: Journal of Geology, 36 pages, 11 figures.

Droste, J. B., and Shaver, R. H., Structural interpretation of buried Silurian reefs in southwestern Indiana (abs): Eastern Section Association of Petroleum Geologists, 1 pages.

Gray, H. H., and Davis, P. G., Bedrock topographic map of Indiana (abs): Indiana Academy of Science Proceedings, 1 page.

Horowitz, A. S., and Rexroad, C. B., A summary of Chesterian (Carboniferous) conodonts from the Illinois Basin, U.S.A. (abs): European Conodont Symposium II, 1 page.

MEMORANDUM REPORTS

Ault, C. H., memorandum reports on quarries in northern and eastern Indiana.

Bleuer, N. K., April 29, 1980, Report on the status of the project on the form and fill stratigraphy of the Teays Valley of Indiana: 7 pages, 3 figures (for William Andrews, Department of Natural Resources).

Byrnes, W. R., McFee, W. W., and Stockton, J. G., Properties and plant growth potential of mineland overburden.

Carr, D. D., Measured section at the Hy-Rock Product Company underground mine at Marengo, Crawford County.

Carr, D. D., Computer program to print coal reserves in Indiana.

Cukrowicz, Ronald, Coal production in Indiana.

Gray, H. H., November 9, 1980, Geology of unconsolidated deposits at proposed fish hatchery site on lower Mud Creek, Daviess County, 3 pages, 1 figure, (for William Andrews, Department of Natural Resources).

Fraser, G. S., Sand and gravel near Riley, Vigo County.

Fraser, G. S., and Fishbaugh, D. A., Sand and gravel resources of the White River Valley-Muncie to Martinsville.

Harper, Denver, Geologic factors involved in rock falls-a case study from the Pocahontas No. 3 Seam of southern West Virginia.

Hartke, E. J., December 7, 1979, A general geologic evaluation of the Goodland, Indiana, area with emphasis on environmental considerations: 5 pages, 15 figures (for Kankakee-Iroquois Regional Planning Commission).

Hartke, E. J., January 17, 1980, General geologic evaluation of Lake, Lincoln, Kener, and Wheatfield Townships, Newton and Jasper Counties, with emphasis on environmental considerations: 6 pages, 6 figures (for Kankakee-Iroquois Regional Planning Commission).

Hasenmueller, W. A., Summary of geological conditions in the vicinity of the Amax Coal Company Wright Mine, Warrick County.

Hill, J. R., and Wyss, Susan, August 14, 1979, Geologic features of special concern--an initial listing with locations, 20 pages (for Indiana Heritage Program, Division of Outdoor Recreation).

Hobbs, Robert F., Guidelines for logging, describing and sampling cores and cuttings of coal and associated rocks at the drill site.

Orbit IV, An off-line citation list, S.D.C.'s international south search services.

Price, F. T., and Shieh, Y. N., The distribution and isotopic composition of sulfur in coals from the Illinois Basin.

Rexroad, C. B., March 7, 1980, Geologic factors related to a flood-control study of the Marengo area, Crawford and Orange Counties: 7 pages, 3 figures, 2 tables (for William Andrews for Division of Water, Department of Natural Resources).

United States Geological Survey, A list of data bases being developed by the U.S.G.S.

PAPERS AND POSTERS PRESENTED AT PROFESSIONAL MEETINGS

Ault, C. H., and Carr, D. D., 1980, New exploration and evaluation of coal resources in complexly faulted area containing old petroleum production: American Association of Petroleum Geologists, June 10, Denver, Colorado.

Ault, C. H., Sullivan, D. M., and Tanner, G. F., 1979, Faulting in Posey and Gibson Counties, Indiana: Indiana Academy of Science, October 19, North Manchester, Indiana.

Ault, C. H., and Carr, D. D., 1980, Search for high-calcium limestone in Silurian reefs of northern Indiana: North-Central Section Geological Society of America, April, Bloomington.

Bleuer, N. K., September 13, 1979, Sources of till and ice-sheet deposition zones in Indiana: Midwestern Section, American Geophysical Union, Columbus, Ohio.

Bleuer, N. K., April 11, 1980, Correlation of pre-Wisconsinan tills of the Lake Michigan Lobe and Huron-Erie Lobe through the Teays Valley fill: North-Central Section, Geological Society of America, Bloomington.

Carpenter, G. L., October 19, 1979, Illinois Basin oil -- a second and third strike: American Institute of Professional Geologists, West Lafayette, Indiana.

Droste, J. B., (speaker), and Rexroad, C. B., April 11, 1980, Paleogeography of Alexandrian rocks in Indiana and adjacent states: North-Central Section, Geological Society of America, Bloomington.

Droste, J. B., Rexroad, C. B., and Shaver, R. H. (speaker), April 11, 1980, The Silurian System in Indiana and environs--a key to regional paleogeography and to reef and evaporite controversies: North-Central Section, Geological Society of America, Bloomington.

Fraser, G. S., and Fishbaugh, D. A., 1980, Evolution of the Ohio River near Evansville, Indiana: North-Central Section, Geological Society of America, April, Bloomington.

Gray, H. H., and Davis, P. G., October 19, 1979, Bedrock topography map of Indiana: Indiana Academy of Science, North Manchester.

Gray, H. H. (speaker), and Collins, M. B., April 10, 1980, Floodplain sediments along the Ohio River at Louisville, Kentucky: North-Central Section, Geological Society of America, Bloomington.

Keith, B. D., March 21, 1980, The Trenton Field--prospectus for study of reservoir and potential reserves for potential recovery: Indiana-Kentucky Geological Society, Owensboro, Kentucky.

Keller, S. L., April 1, 1980, St. Louis and Salem stratigraphy and oil production in Owensville North and Mt. Carmel Consolidated fields in Gibson County, Indiana: Illinois Basin Chapter of American Petroleum Institute, Evansville, Indiana.

Shaffer, N. R., 1980, Ore deposits in Indiana--where madness lies, Indiana Geologists, January 9, Indianapolis.

Shaffer, N. R., Leininger, R. K., Lechler, P. J., and Ripley, E. M., 1980, Enrichment of heavy metals in the New Albany Shale, southern Indiana: North-Central Section, Geological Society of America, April, Bloomington.

Shaffer, N. R., and Hailer, J. G., 1980, Geochemical reconnaissance of groundwater in Harrison County, Indiana: North-Central Section, Geological Society of America, April, Bloomington.

Shaver, R. H., September 27, 1979, The shapes and sizes of Silurian reefs--in fact and fancy: personnel of Amoco Production Co., Amoco companies and divisions, Houston, Tulsa, and Calgary.

Tanner, G. F., Sullivan, D. M., and Ault, C. H., October 19, 1979, Faulting in Posey and Gibson Counties, Indiana: Indiana Academy of Science.

PUBLIC LECTURES

Curt Ault and George Tanner gave an oral report on the progress of the project on faulting in southwestern Indiana to the New Madrid Study Group at Columbus, Ohio on September 14, 1979.

Nelson Shaffer lectured on industrial minerals to a class of economic geology on November 12 and 14, 1979, and he lectured to a class on groundwater exploration geochemistry on November 15, 1979.

Don Eggert gave a talk on the role of geologists and paleontologists to a class at Arlington School on December 6, 1979.

Nelson Shaffer gave a talk on February 18, 1980 to a geology department seminar on strontium isotopes as indicators of provenance and mixing of sediments in the Ross Sea, Antarctica.

Don Eggert gave a talk to the 4th grade class at University School on February 19, 1980.

Nelson Shaffer lectured on meteorites to the Jackson and Bartholomew County rock club on March 14, 1980.

John Patton, Don Carr, Curtis Ault, and Gordon Fraser gave a one-hour presentation on future sources of aggregate in Indiana on March 14, 1980 to members of the Indiana Minerals Aggregates Association at its annual meeting.

Gordon Fraser gave two lectures on shelf and nearshore sedimentation to an Indiana University Geology graduate class in October.

Ned Bleuer presented a talk on March 12, 1980 to the Indiana Geologists entitled Indiana's old drifts.

Ned Bleuer presented a lecture at the Survey Colloquium on April 30, 1980 on the correlation of pre-Wisconsinan tills of the Lake Michigan Lobe and Huron-Erie Lobe through the Teays Valley fill.

Henry Gray and M. B. Collins presented a lecture on floodplain sediments along the Ohio River at Louisville, Kentucky to the Survey Colloquium on April 16, 1980.

John Hill talked about the general geology of Brown County on October 3, 1979 to the Gnaw Bone Camp (a group of Indianapolis school children).

John Hill presented a lecture on karst hydrology in relation to sewage sludge dispersal on airport site to a neighborhood action group in Monroe County on June 5, 1980.

Carl Rexroad conducted an Indiana University graduate seminar on stratigraphy and conodonts of Early and Early Middle Silurian age in northern Indiana on September 12, 1979.

Robert Shaver lectured to the University of Kentucky Geology Colloquium on the shapes and sizes of Silurian reef--in fact and fancy on November 15, 1979.

Brian Keith presented two lectures on the use of geophysical logs to the Petroleum Geology class in the Indiana University Department of Geology.

Robert Shaver presented a lecture entitled The trouble with the Silurian: American Style for the Turner Distinguished Lecture Series at the Department of Geology and Mineralogy, University of Michigan on March 25, 1980.

Robert Shaver lectured to a Department of Geology and Mineralogy stratigraphy class at the University of Michigan on the interpretation of buried Silurian reefs from structural deformation on March 26, 1980.

Robert Shaver lectured at the Indiana Mini University on June 16, 1980 on the topic: Exploring fossil reefs--frozen portraits of the past.

John Droste, Carl Rexroad, and Robert Shaver presented a lecture entitled "The Silurian System in Indiana and environs--a key to regional paleogeography and to reef and evaporite controversies" to the Survey Colloquium on April 23, 1980.

Brian Keith addressed the IU Geology Department Colloquium on September 17, on using geology to model a reservoir for Tertiary Recovery (Tensleep Sandstone, Bighorn Basin, Wyoming).

Robert Shaver and Joseph Whaley conducted the Survey's demonstration for the Buffalo Riders, Department of Natural Resources, in May.

John Patton appeared in and narrated a film about the history and preservation of buildings in the old crescent of the IU Campus. The film was shown on station WTIU on January 20.

John Patton gave a talk on Indiana mineral resources at a meeting of the IU Annuitants Society on April 16.

FIELD TRIPS

Nelson Shaffer led a trip of eight people from the University of Wisconsin to see dimension-stone mining activities and quarries on August 28, 1979.

Nelson Shaffer and Pei-Yuan Chen attended a field trip sponsored by the Indiana Geologists on November 3, 1979.

Denver Harper and Don Eggert accompanied Tom Phillips from the University of Illinois and two Illinois Geological Survey geologists in a visit to the Wabash Mine in December.

Don Carr and John Patton were co-leaders of a field trip on April 12, 1980, part of the Geological Society of America meeting, to observe quarrying and milling of the Salem Limestone in the Bloomington-Bedford District. Walter Hasenmueller also attended this trip.

Nelson Shaffer attended the Geological Society of America trip to study terra rosa soils in April, 1980.

Curtis Ault attended a field trip in northwestern Colorado in June to examine several coal mines and coal deposits in conjunction with the American Association of Petroleum Geologists meeting in Denver.

Don Eggert made several field trips during June to collect mine samples and examine field exposures with other Survey and university personnel.

Ned Bleuer conducted a field trip of tills and glacial stratigraphy of west-central Indiana for a class in Quaternary geology from Clemson University on October 13, 1979.

Ned Bleuer led a glacial geology class from Purdue University to Carroll County to study glacial stratigraphy and tills of the Adams Mill exposure on October 27, 1979.

John Hill conducted a geology field trip to study glacial features in Fulton County for the Indiana Academy of Science meeting, Geneva Center, on April 26, 1980.

Carl Rexroad, assisted by Scott Lyford and others, conducted a field trip on the Silurian stratigraphy and conodont paleontology of southeastern Indiana for the Pander Society in conjunction with the North-Central Geological Society of America meeting on April 12, 1980.

Robert Shaver conducted a field trip of Middle and Upper Silurian rocks (including reefs) of northern Indiana and adjacent Ohio for personnel of Amoco Production Company, Amoco Research Division, and Amoco Canada, Houston, Tulsa, and Calgary on September 25-27, 1979.

Robert Shaver conducted a field trip of Middle and Upper Silurian (including reefs) of northern Indiana and adjacent Ohio for Gerald Friedman, Rensselaer Polytechnic Institute of New York and a group of his industrial associates on April 17, 1980.

Ned Bleuer participated in the Midwest Friends of the Pleistocene field trip in Burlington, Iowa on May 30-June 1, 1980.

PROFESSIONAL COMMITTEES AND SOCIETIES

Ned Bleuer served on Wildcat Creek Committee, Indiana's Natural River System, under the auspices of the Division of Outdoor Recreation.

Ned Bleuer served as long-continuing consultant to U. S. Geological Survey on the Chicago sheet of the new map on Quaternary Geology of the United States.

Gerald Carpenter developed oil and gas statistics for Indiana for the American Association of Petroleum Geologists' Committee on Statistics of Drilling. In conjunction with this committee, Mr. Carpenter attended the Committee's meeting at Denver on June 12 and 13, 1979.

Don Carr was involved in committee work for the Society of Mining Engineers of AIME. He occupied the positions of Director of SME, past Chairman and member of the executive committee of the Industrial Minerals Division (InMD), and Chairman of the InMD Nominating Committee. He was a member of the InMD Scholarship and Development Committee and the Hardinge Award Committee.

Don Carr was selected as subject editor for industrial minerals for the Encyclopedia of Materials Science and Engineering: Pergamon Press. Curtis Ault and Gordon Fraser accepted assignments to author articles on crushed stone and sand and gravel for a new encyclopedia.

Don Carr, Curtis Ault, and Walter Hasenmueller continued to serve on the Tri-State Committee on Correlations in the Pennsylvanian System of the Illinois Basin, which includes geologists from the Illinois and Kentucky State Surveys.

Don Carr reviewed 30 proposals dealing with reclamation for the Office of Surface Mining, Peer Review Panel.

Don Carr was elected Member at Large, National Advisory Board, and Member of Executive Committee of the Illinois-Indiana Section of the American Institute of Professional Geologists.

Don Carr was appointed to membership of the Research Committee of the Interstate Mining Compact Commission.

Don Carr was appointed to membership of the Energy Resources Committee, Interstate Oil Compact Commission.

Don Carr was a staff member of the Water Utilization Committee on the Governor's Water Resource Study Commission.

Gordon Fraser was elected Treasurer of the Great Lakes Section of the SEPM for a two-year term. During the year he compiled and edited a guidebook for the organization.

Henry Gray served as a member of the Tri-State Committee on Pennsylvanian Correlations in the Illinois Basin.

Henry Gray was elected Chairman-Elect, Geography and Geology Section, Indiana Academy of Science for 1980-81.

Ed Hartke served as long-continuing consultant to Town of Riley in its quest for new water supply, in cooperation with the Division of Water and Amax.

John Hill served as geologic consultant to the U.S. Department of Agriculture Soil Conservation Service in Indianapolis and participated in field reviews.

John Hill served as a member of the Technical Advisory Committee of the City of Bloomington Planning Commission.

John Hill continued to serve as consultant to the Indiana Heritage Program, under the auspices of the Division of Outdoor Recreation.

Stanley Keller is a member of the Potential Gas Committee. He develops potential gas reserve figures for Indiana for publication by the Committee. The committee met at the Indiana Geological survey on April 2, 1980.

Carl Rexroad served as a member of the Working Group on Lower Carboniferous Series Boundaries and Stratigraphy, Society of Economic Paleontologists and Mineralogists.

Nelson Shaffer completed a one-year term as President of Indiana Geologists.

Robert Shaver served as a member of the management committee of the North-Central Section of the Geological Society of America.

Robert Shaver served on the Presidential Advisory Committee, Society of Economic Paleontologists and Mineralogists.

Robert Shaver served as president of the Foundation for the Advancement of Paleontology and Sedimentology.

Robert Shaver served on the R. C. Moore Medal Committee, Society of Economic Paleontologists and Mineralogists.

Dan Sullivan served as a member of the American Petroleum Institute's 13-man national committee on crude reserves. Following the 1980 national meeting, this committee was disbanded.

Dan Sullivan is a member of the committee that gathers reserve data for Illinois, Indiana, Kentucky, and Michigan for the American Institute of Petroleum. He attended the Michigan Subcommittee meeting at Lansing, Michigan in March and the Illinois Subcommittee meeting in St. Louis in January. Stanley Keller assists with the data.

NEWS RELEASES

Don Carr and Denver Harper were interviewed by the IU News Bureau concerning the Survey's deep drilling project and coal gas evaluation. They were also interviewed by WISH-TV concerning this project. The Bloomington Herald-Telephone carried an article about the Coal and Industrial Minerals Section on January 27, 1980.

Photographs were taken in February by the IU News Bureau with Nelson Shaffer for a story about the New Albany Shale.

An announcement about the discovery of a thick bed of coal in the drilling of Survey Drill Hole 302 received widespread news coverage. We received a large number of requests for further information on the hole.

John Patton described Geological Survey activities for the IU News Bureau on July 17.

John Patton was interviewed by Gannett News Service about the Geological Survey's program and activities on July 19.

John Patton was interviewed for a feature article on activities of the Geological Survey by an Indiana Daily Student reporter on September 25.

REVIEWS

Don Carr completed editorial review in December of six manuscripts designated for the Energy/Economics/Coal volume of Compte Rendu.

Don Carr reviewed a manuscript "The great Trenton boom: its place in the development of the petroleum industry in Indiana" in February.

Don Carr reviewed a MS thesis by Kent Mangold on "a linear theory for the casual attenuation of seismic body waves".

Don Carr began reviewing Sam Friedman's manuscript on "Geology and coal deposits of the Clinton area, west-central Indiana".

Don Carr reviewed in June a summary report on "Lithologic, mineralogic, and petrographic characteristics of the New Albany Shale" by Nelson Shaffer and Pei-Yuan Chen.

Gordon Fraser reviewed a paper by John Bacone of the Department of Natural Resources in August concerning the natural history of the beach-ridge area in northwestern Indiana.

Gordon Fraser reviewed a book, "Fluvial Sedimentology", for the Journal of Geology in October.

Gordon Fraser reviewed a paper in November on the geology of the Benne Trough, Nigeria, for the Geological Society of America Bulletin. He also informally reviewed a paper on Lake Michigan sediments by Rea, Myers, and Bourbonniere.

Gordon Fraser reviewed a paper in January on the use of the Chittick apparatus for the Journal of Sedimentary Petrology.

Gordon Fraser reviewed a MS thesis in March on sedimentology of debris flows in Cutler and Fountain Formations of Colorado.

Henry Gray participated in the U.S. Department of Agriculture Soil Conservation Service annual review meeting on soils in Indianapolis and in field reviews.

Henry Gray served as critical reader of stratigraphy abstracts for North-Central Section of the Geological Society of America.

John Hill served as critical reader for an article in Journal of Paleontology.

Robert Shaver served as critical reviewer of biostratigraphic and related proposals for research grants from the National Science Foundation and from the U. S. Geological Survey.

Robert Shaver served as critical reviewer of stratigraphy abstracts for Atlanta meeting of the Geological Society of America.

SYMPOSIA

Ned Bleuer chaired a symposium on "Progress and problems in the pre-Wisconsin Pleistocene stratigraphy of the Midwest" in April.

Don Carr and Haydn Murray presided over the "Symposium on industrial minerals of the Upper Midwest" in April.

Gordon Fraser and Roscoe Jackson II presided over the "Symposium on Pleistocene and Holocene Sedimentation II" in April.

Edwin Hartke attended a symposium on "Water resources and land-use management in Indiana", auspices Indiana Water Resources Association, Indiana University SPEA, U. S. Geological Survey, and Purdue University Water Resources Research Center in June.

John Patton presented at talk "One Step Forward and Two Steps Back: The Ritual Dance of Federal Energy Policy" in an energy symposium at the University of Wisconsin - River Falls.

Nelson Shaffer and Ed Ripley presided over the "Symposium on trace occurrences of economic minerals in the Midwest" in April.

ATTENDANCE AT PROFESSIONAL MEETINGS

Nelson Shaffer: The Midwest Federation of Mineral Society's mineral show at Bedford on August 12.

Pei-Yuan Chen: The annual meeting and field trip of the Clay Minerals Society on August 26-30 at Macon, Georgia.

Denver Harper: The "First conference on ground control problems in the Illinois Coal Basin" at Carbondale on August 22-24.

Curt Ault, Dan Sullivan, and George Tanner: The AGU Midwest Meeting September 13-15 at Columbus, Ohio.

Gordon Fraser: The Great Lakes Section meeting of SEPM September 28-31 at Marietta, Ohio.

Don Carr accompanied Dr. Patton to a meeting of the Interim Study Committee on Coal Mining September 14. Dr. Patton gave a presentation on Indiana's coal resources.

Walt Hasenmueller, Henry Gray, Curt Ault, and Don Carr acted as hosts for the first meeting of the Interstate Correlation Committee in September.

Pei-Yuan Chen, Stanley Keller, and George Tanner: The Annual Field Conference of the Geological Society of Kentucky October 11-13 to examine rocks of Pennsylvanian age.

Don Carr: The fall meeting of the SME at Tucson, Arizona, October 16-18, where he participated in the meeting of the Board of Directors.

Don Carr: The eastern Gas Shales Project and AAPG Eastern Section meeting in Morgantown, West Virginia October 1-3 and the AIPG meeting in Lafayette, October 19.

Walt Hasenmueller: The Coal Conference and Expo V at Louisville, Kentucky, October 23-25.

Nelson Shaffer conducted the Indiana Geologists meeting October 10. Gordon Fraser also attended this meeting.

Don Carr: A meeting of the Indiana Mining and Technical Society in Bruceville on November 2.

Denver Harper, Don Eggert, Walter Hasenmueller, Pei-Yuan Chen, Curt Ault, and Don Carr: The Indiana-Kentucky Geological Society meeting on November 12.

Nelson Shaffer, Gordon Fraser, Curt Ault, and Walter Hasenmueller: The Indiana Geologists meeting at Mooresville on November 14.

Walt Hasenmueller: The Indiana Mining and Technical Society meeting in Bruceville on November 15.

Don Carr, Curt Ault, Gordon Fraser, Joe Hailer, Lou Miller, and Nelson Shaffer: A meeting of the Indiana Geologists on December 12. Nelson presided as President.

Nelson Shaffer and Gordon Fraser: Indiana Geologists on January 9th, where Nelson presided as President and gave a talk.

Nelson Shaffer and Gordon Fraser: Meeting of Indiana Geologists, February 13, where Nelson presided as President.

Don Carr: AIME Annual Meeting in Las Vegas on February 24-28.

Curt Ault, Henry Gray, Walt Hasenmueller, and Don Carr: Meeting of the Tri-State Committee on Correlations in the Pennsylvanian System of the Illinois Basin in Henderson, Kentucky on February 18.

Walt Hasenmueller, Bill Davis and Pat Finamore: Planning meetings for the RALI project with representatives of the state Surveys from Indiana, Illinois, and Kentucky on February 14 and with the same group and the USGS and SPEA on February 19.

Curt Ault: Meeting with Bill Andrews, several other people from the Department of Natural Resources, and representatives of NEWCO Engineering and Webster County Coal Corp to discuss possible underground coal mining on state acreage in Posey County.

Curt Ault, Don Carr, and Gordon Fraser: The Indiana Minerals Aggregates annual meeting March 13-14 at Owensboro, Kentucky.

Denver Harper: Indiana Mining Institute in Evansville, March 28-29.

Curt Ault: Workshop on the Federal Coal Management Program sponsored by the Bureau of Land Management at Evansville, March 21.

Don Carr, Don Eggert, Nelson Shaffer, Gordon Fraser, Pei-Yuan Chen, Walt Hasenmueller, and Curt Ault: GSA Meeting, April 9-12, Bloomington.

Walt Hasenmueller, Gordon Fraser, and Nelson Shaffer: Indiana Geologists on April 16. Joe Hailer was elected secretary-treasurer for the coming year.

Pei-Yuan Chen and Walt Hasenmueller: Indiana Mining and Technical Society meeting April 24, at Vincennes.

Don Carr: Meeting on April 15 of the Indiana-Illinois Section, American Institute of Professional Geologists in Chicago.

Don Carr: Indiana-Kentucky Geological Society meeting in Evansville on April 16.

Don Carr: Indiana Limestone Institute annual meeting on April 21.

Curt Ault, Dan Sullivan, and George Tanner: A progress report meeting for the NRC-sponsored New Madrid Study Group April 8.

Don Carr, Walter Hasenmueller, Bill Davis, Pat Finamore, Kim Hughes-Owens, and Licia Clement: An informal work session of the RALI project held at the Indiana Geological Survey April 8.

Don Carr, Curt Ault, Walt Hasenmueller, and Henry Gray: Meeting on May 12 at Bloomington of the Tri-State Committee on Correlations in the Pennsylvanian System of the Illinois Basin.

Don Carr: Annual meeting of the Interstate Mining Compact Commission in Tulsa on May 20-22.

Nelson Shaffer and Curt Ault: AAPG Conference in Denver, Colorado on June 8-13.

Bill Davis: Session of the First Annual Water Resources Symposium at the Turkey Run State Park June 13.

John Patton and Curt Ault: An Indiana coal utilization meeting sponsored by the State Board of Health, January 16, in Indianapolis.

Denver Harper: The Unconventional Gas Recovery Symposium in Pittsburgh, May 19-20.

Curt Ault, Don Carr, Don Eggert, and Walt Hasenmueller: Short course on coal petrography sponsored by the SEPM April 8 preceding the GSA meeting.

Edwin Hartke and John Hill: The North-Central Section of the Geological Society of America meeting at Indiana University April 10-11.

Robert Shaver: Indiana Geologists meeting at Waverly, Indiana on September 12.

Henry Gray co-chaired a session on "Stratigraphy" at the North-Central Section of the Geological Society of America meeting in Bloomington, April 10-11.

Edwin Hartke served as panelist on ground water, Water Quality Conference, sponsored by the Northwest Indiana Regional Planning Commission, at Merrillville on June 28.

Carl Rexroad convened meeting of the Pander Society, set up a Pander Society workshop, and served as critical reader of Pander Society abstracts for the North-Central Section of the Geological Society of America meeting on April 10-11.

Bob Shaver: Meeting of COSUNA Operating Committee, American Association of Petroleum Geologists in Denver on June 7.

John Patton: Soil Conservation planning meeting in Indianapolis on August 31.

John Patton made presentation regarding Indiana's coal reserves at a meeting in Terre Haute of the Joint Interim Study Committee on Coal Mining on September 14.

John Patton presented proposed rules and regulations regarding certification of geologists in Indiana to Advisory Council on Water and Mineral Resources in Indianapolis on September 14 and to the Natural Resources Commission in Indianapolis on September 21.

John Patton: Meeting of Committee C-18, Natural Building Stone, American Society for Testing and Materials at Winston-Salem, North Carolina on October 7-9 and served as Acting Chairman.

John Patton: Fall meeting of the Indiana Limestone Institute of America in Bloomington on October 15.

John Patton: Annual meeting of the Indiana Academy of Science at Manchester College on October 18-19 and served as moderator for symposium "Science and Public Policy in Indiana".

John Patton: Meeting of the Science and Society Committee, Indiana Academy of Science at Holcomb Institute on November 2.

John Patton: Annual meeting of Geological Society of American in San Diego; meeting of Association of American State Geologists, meeting of American Commission on Stratigraphic Nomenclature and Stratigraphic Code Revision committee; and made presentation address for the Neil Miner Award, November 4-8.

John Patton participated in meeting with representatives of the U. S. Geological Survey, Illinois Survey and Kentucky Survey in Indianapolis on November 26.

John Patton met with group of soil scientists to discuss certification matters on November 30.

John Patton: Meeting in Indianapolis dealing with coal utilization in Indiana on January 16.

John Patton met with representatives of the Illinois and Kentucky Geological Surveys to prepare a report on Carboniferous oil in the Illinois Basin on January 25.

John Patton participated in a workshop on historic preservation sponsored by the Department of Natural Resources in Indianapolis on March 7.

John Patton: Annual meeting of the Indiana Mineral Aggregates Association at Owensboro, Kentucky on March 13-15. He served as moderator for a series of talks presented by Donald Carr, Curtis Ault, and Gordon Fraser on aggregates in the 1980's.

John Patton served as chairman of a meeting on April 3 in Cincinnati of the committee on underground injection of waste water of the Ohio River Valley Water Sanitation Commission. Gerald Carpenter also attended.

John Patton participated in the annual meeting of the North-Central Section of the Geological Society of America in Bloomington April 10-11.

John Patton and Maurice Biggs: Annual meeting of the Association of American State Geologists on South Padre Island, Texas on April 27-May 1.

John Patton and Henry Gray: The U. S. Geological Survey cluster meeting in Reston, Virginia on June 2-4.

John Patton: Annual meeting of American Association of Petroleum Geologists in Denver on June 8-11. He also participated in meetings of Stratigraphic Code Revision Committee of the North American Commission on Stratigraphic Nomenclature.