SUMMER 1985

Ohio Geology Newsletter

Division of Geological Survey

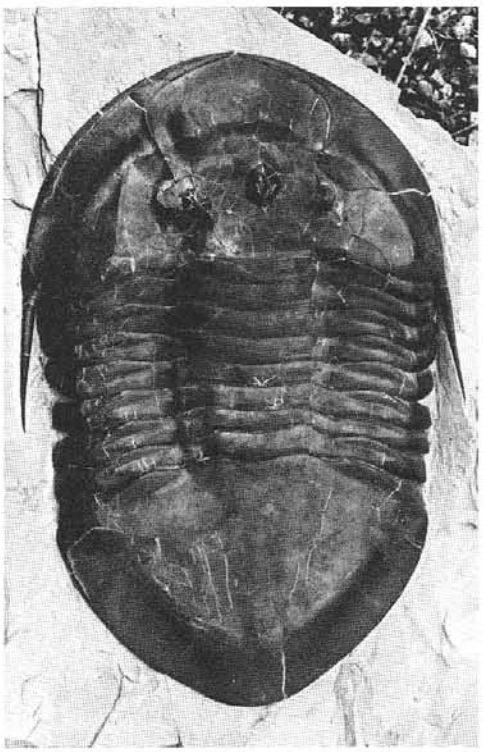
ISOTELUS—OHIO'S STATE FOSSIL

Governor Richard F. Celeste accepts a brass-plated cast of Isotelus *from Division of Geological Survey Chief Horace R. Collins during signing ceremonies at the Ohio State House.*

Ohio is now one of a dozen states to have an official state fossil. Governor Richard F. Celeste signed House Bill 145 into law on June 20, 1985, making *Isotelus*, a well-known Ordovician trilobite, a companion of other state symbols such as the cardinal, carnation, ladybug, and, of course, flint, Ohio's official gemstone.

Many individuals involved in geologically related activities in Ohio, either as professionals or as hobbyists, have long thought that the state should have an official fossil, particularly because Ohio is so well-known for both abundant and well-preserved fossils and because fossil collecting is a popular activity. As testimony to this popularity, the Survey each year receives numerous requests for information on fossils and fossil collecting from residents of the state and from individuals throughout the country. Survey Bulletin 54, *Ohio fossils*, has traditionally been our best seller and is now in its 11th printing, with more than 30,000 copies sold since 1955.

It was through the efforts of two Dayton-area elementary school classes, Doris Swabb's third graders at Beavertown School in Kettering and Virginia Evers' fourth graders at St. Anthony School in Dayton, that legislation was introduced to designate a state fossil. The two teachers attended a summer class at the Dayton Museum of Natural History and were captivated by trilobites, particularly a large specimen of *Isotelus* that was found during the construction of Huffman Dam, near Dayton, in 1919.



Nearly perfect specimen of Isotelus, *9½ inches in length, from the Arnheim Formation in Highland County, Ohio. Dan Cooper collection.*

The enthusiasm of Mrs. Swabb and Mrs. Evers for trilobites was transmitted to, and perhaps multiplied by, their energetic students, and the idea was spawned to make the trilobite *Isotelus* the official fossil of the State of Ohio. Representatives Robert L. Corbin and Robert E. Hickey of Dayton agreed to sponsor legislation, House Bill 145, to make *Isotelus* the official fossil. Diana Morse of the Dayton Museum of Natural History and personnel from the Survey served as technical consultants for this legislation.

The proposal of a state fossil received widespread publicity in newspapers and on television and Repre-

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ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

Richard F. Celeste, Governor • Joseph J. Sommer, Director

Chief's corner by Horace R. Collins

We recently were amazed by a news article reporting that a major petroleum company had let a contract to build an offshore drilling tower which, with drilling rigs in place, will be 1,615 feet tall. The unit will be placed in 1,350 feet of water in the Gulf of Mexico. The structure will be 161 feet taller than the Sears Tower in Chicago. Those who keep up on such facts will recall that the Sears Tower is the world's tallest building. Although Ohio has nothing as spectacular as a 1,615-foot drilling tower, there is plenty to take notice of in the state's oil and gas industry.

In 1984 over 5,000 wells were drilled in Ohio in the search for oil and gas. This places Ohio in the top five states in the nation in well completions. The footage drilled for these wells, if added together, would equal almost 3,500 miles! By any calculation that's a lot of drilling. For the past 10 years Ohio has experienced a generally upward trend in the number of oil and gas wells drilled. The drilling level has increased as much as sixfold and currently is over fourfold greater than 1975. Increased drilling has paid off particularly in natural gas. Not too many years ago Ohio produced only about 11 percent of its gas needs. Increased drilling coupled with conservation and greater usage of less expensive self-help gas has enabled locally produced gas to supply 16 percent of current demand. There is clearly a potential for this share of the market demand to go even higher.

Production of oil in 1984 was slightly over 15 million barrels and was valued at more than $420,000,000. Natural gas production exceeded 186 billion cubic feet and was valued at over $588,000,000. The total combined value of both oil and gas is slightly over $1,000,000,000. Other states produce much more oil and gas than Ohio does. However, it is clear that production of our native oil and gas resources is contributing significantly not only to our energy needs, but also, through jobs and dollar value added, to our economy.

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sentative Corbin remarked that this bill received more attention than any other legislation that he has sponsored during his long career in the Ohio General Assembly. The state fossil bill passed the House of Representatives with a vote of 90-2. House Bill 145 was sponsored in the Senate by Senator Charles Horn of Dayton and passed this branch of the General Assembly by a vote of 30-0.

The state fossil bill received little opposition from legislators or from those presenting testimony during legislative hearings. There was some informal debate, however, among some members of the geological community as to whether *Isotelus* was the best fossil to represent the state. Several other trilobites and a large Devonian arthrodire fish, *Dunkleosteus*, were mentioned as candidates worthy of consideration. That such a debate would even arise is testimony to the wealth of spectacular fossil remains known from Ohio's rocks and sediments.

OHIO GEOLOGY

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News items, notices of meetings, etc. should be addressed to the attention of the editor. Change of address and new subscriptions should be addressed to the attention of the secretary.

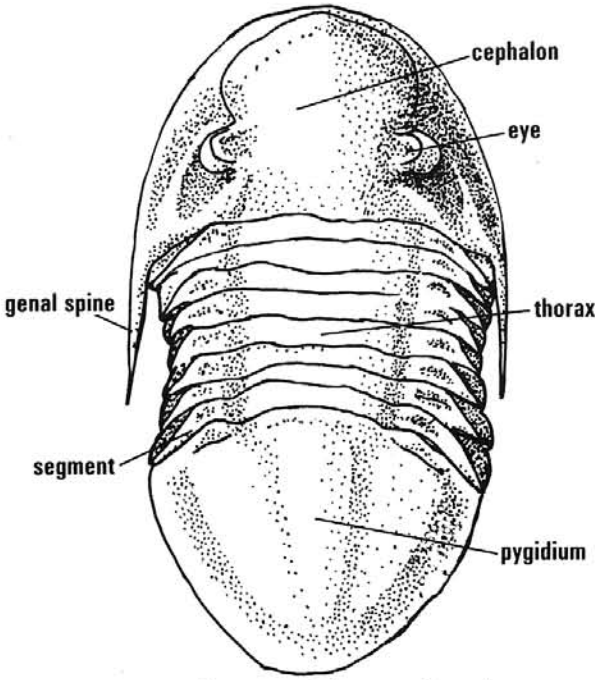
Regardless of the worthiness of other fossils from Ohio, *Isotelus* is a most suitable representative. Not only is this trilobite moderately abundant (at least fragments of them), but it is also represented by the Huffman Dam specimen, reported to be the largest known complete trilobite. *Isotelus* specimens are highly prized by collectors. Certainly not to be overlooked in this matter is the initiative and enthusiasm of the Dayton-area students and teachers in getting *Isotelus* introduced in the legislature. Without their efforts it is doubtful that Ohio would have any state fossil.

TRILOBITES

Although trilobites are among the best known invertebrate fossils recognized by the general public, few individuals other than geologists and serious amateur fossil collectors know very much about these extinct animals. Trilobites are arthropods, an extraordinarily diverse and successful group of animals that includes insects, crabs, lobsters, centipedes, millipedes, and a host of less familiar creatures. Arthropods constitute perhaps three-fourths of the species of animals—invertebrate as well as vertebrate—that have ever lived on the earth. They have conquered the sea, the land, and the air and the extremes of inhospitality within each of these environments. As a group, arthropods are characterized by a tough, rigid outer covering or exoskeleton composed of chitin, a substance similar in composition to the human fingernail. This exoskeleton is divided into segments which are less mineralized at the joints, allowing movement.

Trilobites derive their name from the fact that in most specimens the body is divided longitudinally into three distinct segments or lobes. The trilobite body can also be divided horizontally into three major segments: the head, known as the cephalon; the middle portion with many flexible segments, known as the thorax; and the tail, known as the pygidium. The head bears well-developed compound eyes and commonly has defensive spines that project rearward. The body is flattened for dwelling on the sea floor. Trilobites had numerous pairs of segmented walking legs, although these structures are rarely preserved on fossils.

These remarkable creatures lived exclusively in the sea and most of them probably made their living ingesting mud as a source of organic nutrient or perhaps as scavengers. Trilobites were mostly small animals, an inch or two in length, although



Principal anatomical features of Isotelus.

some, such as *Isotelus*, reached lengths of 20 inches or more. Many fossil trilobites are found "enrolled," that is, coiled into a ball shape. This was probably a defensive mechanism against predators and is similar to that exhibited by modern pill or sow bugs.

Trilobites are among the earliest invertebrates with a rigid skeletal covering to appear in the fossil record. They were an abundant and diverse group of animals when they first appeared during the Cambrian Period (570 million years ago), indicating a long history prior to their acquisition of an exoskeleton capable of being readily fossilized. Cambrian trilobites are very useful as index fossils for zonation and correlation of these rocks. Trilobites reached their zenith during the Cambrian and Ordovician Periods, but they persisted for more than 300 million years, until the Permian Period (240 million years ago).

ISOTELUS

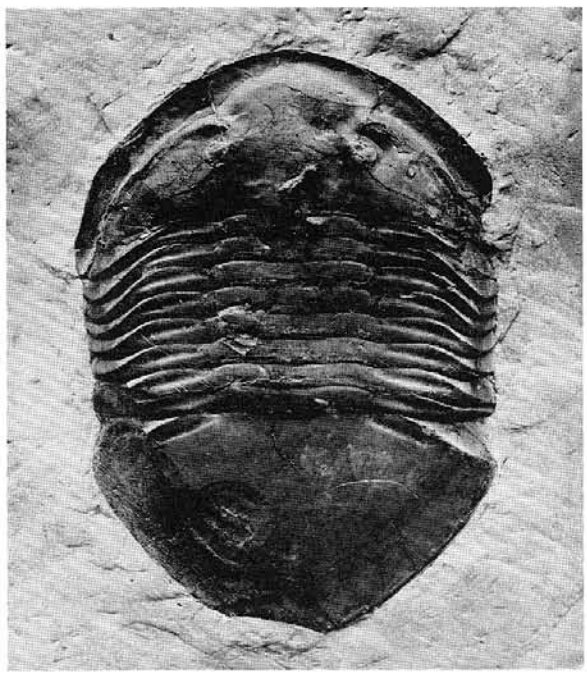
The trilobite *Isotelus* has had a long and illustrious history in Ohio, in terms of both geologic time and scientific study, and the Survey played a role in the early studies of this fossil. *Isotelus* is known from rocks of Ordovician age (about 440 million years ago) which, in Ohio, crop out in the southwestern portion of the state. These rocks consist of a series of comparatively thin, alternating layers of limestone and shale that were deposited as limy mud and clay on the floor of a warm, shallow, tropical sea that covered Ohio during the Ordovician Period.

Serious study of these rocks began during the First Geological Survey of Ohio (1837-1838); John Locke (see *Ohio Geology*, Winter 1984) was the geologist in charge of the southwestern portion of the state. Among Locke's many discoveries during this brief period of investigation was the partial remains of a large specimen of *Isotelus*, which Locke named *Isotelus maximus*. Locke found only the tail (pygidium) of this trilobite but, by proportional comparison, he was able to reconstruct the specimen as 21 inches in length. He illustrated this reconstruction at natural size in a fold-out plate in the Second Annual Report (1838) of the Survey. This specimen and another were found by Locke near the mouth of Treber's Run, southwest of Dunkinsville in Adams County. Locke, in his characteristically colorful manner, indicated that local residents referred to trilobites as "petrified locusts, butterflies, bugs, and frogs." Interpreting the body form and functions of *Isotelus*, Locke stated that this specimen, "with a kind of shovel shaped termination at both ends, was well calculated for making his way in the mud, either backwards or forwards."

In an 1842 article in the *American Journal of Science*, Locke described and figured another specimen of *Isotelus* found by William Burnett in the hills near Cincinnati. This specimen, 9¾ inches in length, was named *Isotelus megistos*, but later workers have referred it to Locke's original species, *Isotelus maximus*.

Perhaps the most famous of the many fine *Isotelus* specimens collected in Ohio was found in 1919 during construction of Huffman Dam on the Mad River, northeast of Dayton. Workmen discovered the specimen while digging the outlet tunnel for the dam and immediately summoned the chief engineer of the Miami Conservancy District, Arthur E. Morgan. This remarkable individual, noted for his broad scientific interests, immediately recognized the significance of this large trilobite.

The giant specimen of *Isotelus*, measuring 14½ inches in length and 10¼ inches in width, was given to Arthur Morgan's son, Ernest, for the school museum. However, the trilobite was very soon taken to Dr. August F. Foerste, physics teacher at Steele High School in Dayton and one of the most renowned and prolific paleontologists in Ohio. Foerste's research connections with the U.S. National Museum (Smithsonian Institution) in Washington D.C. resulted in the specimen being transferred to that institution for permanent display. This



Type specimen of Isotelus brachycephalus, *collected from Huffman Dam, near Dayton, in 1919. This specimen is 14½ inches in length and is on display at the Smithsonian Institution in Washington, D.C.*

specimen still occupies a prominent position in the paleontological exhibits at the Smithsonian and is thought to be the largest complete trilobite ever found (pieces of apparently larger specimens have been found, however).

Foerste lost no time in calling the attention of the scientific community to this giant *Isotelus* and in 1919 named it *Isotelus brachycephalus*, the specific name referring to the broad head. There has been no modern study of the various proposed species of *Isotelus* and at this time the validity of Foerste's species is uncertain. Nevertheless, this magnificent specimen, which has been viewed by many thousands of people during its nearly 70-year reign at the Smithsonian, will always stand out in the annals of paleontology.

No additional specimens approaching the size of the Huffman Dam specimen have been found, although several specimens approaching 10 inches in length have been collected in the intervening years. Bits and pieces of *Isotelus* turn up frequently in blocks of Ordovician limestone from southwestern Ohio. Occasionally, complete specimens, from as small as ¼ inch to intermediate-sized specimens several inches in length, are found, much to the delight of the collector.

Perhaps the most significant collection of *Isotelus* specimens to ever have been assembled is in the possession of Dan Cooper of Fairfield, Ohio. Several years ago this dedicated collector purchased a 5-acre site in Highland County underlain by the Ordovician-age Arnheim Formation, which contains a 12-inch-thick layer of shale that is unusually rich in specimens of *Isotelus*. Using a bulldozer to uncover the fossil-bearing layer, Cooper then digs by hand to uncover the trilobites. The specimens are tediously cleaned of clinging rock and glued back together. Cooper's more than 500 specimens of *Isotelus* include one perfect individual that is nearly 9½ inches long.

In the complexity of the modern world a state fossil is perhaps a trivial matter to many people, particularly in the vernacular connotation of the word "fossil" as something old and out-of-date. In a broader context, however, this new state symbol represents both practical and esthetic concepts. On the practical side, *Isotelus* is emblematic of the exciting hobby of collecting fossils, an activity enjoyed by many residents of Ohio and other states. In addition, *Isotelus* represents the importance of fossils in deciphering complex lateral and vertical relationships of rocks, an activity pursued by professionals but important to all citizens because of its utility in the successful exploration for mineral resources. From the esthetic viewpoint, *Isotelus* symbolizes the importance of geology and mineral resources to the state of Ohio and the wondrous diversity of past life preserved in Ohio's rocks during the past 450 million years of earth history.

—Michael C. Hansen

FURTHER READING

Eckert, A. W., 1961, The mammoth trilobite of Dayton: Science Digest, July, p. 67-70.

Foerste, A. F., 1919, Notes on *Isotelus, Acrolichas, Calymene*, and *Encrinurus*: Denison University Scientific Laboratories Journal, v. 19, p. 65-82.

Locke, John, 1838, Geological report (on southwestern Ohio): Ohio Geological Survey, 2nd Annual Report, p. 201-286.

_____ 1842, On a new species of trilobite of very large size (*Isotelus megistos*): American Journal of Science, v. 42, no. 2, p. 366-368.

ISOTELUS COMMEMORATIVE ITEMS

Brass-plated cast of Isotelus.

To commemorate the naming of *Isotelus* as the state fossil of Ohio, the Survey is offering a brass-plated, actual-size (about 3 inches long), metal cast of a nearly perfect specimen of this trilobite. These heavy, paperweight-style casts have excellent detail and make attractive gifts. The casts have a green felt covering on the base and come boxed with a label providing details about the specimen. These *Isotelus* casts are available from the Survey for $5.00 plus $1.50 tax and handling ($6.50 total).

Also available are lapel pins/tie tacks that are miniature versions of the larger trilobite casts. These items are approximately ¾ inch long and are available in either brass or pewter finish. The lapel pins/tie tacks are $1.25 each, which includes tax and handling. When ordering these items please specify which finish is desired.

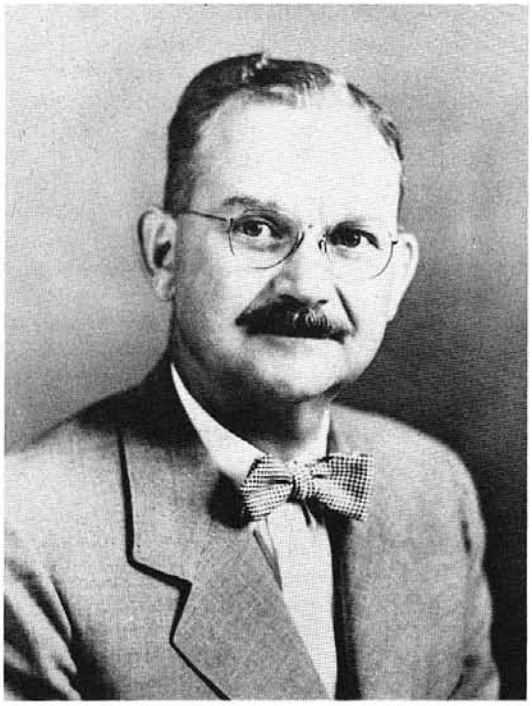
In addition to the trilobite casts, the Survey has produced a postcard which features a color photograph of the spectacular 9½-inch-long specimen of *Isotelus* from the collection of Dan Cooper. Single copies of the postcard are available for 50¢ each; 10 postcards are available for $3.00 (both prices include tax and handling).

RADIOMETRIC MAPS

The U.S. Geological Survey, in cooperation with the Ohio Geological Survey, recently published three radiometric maps for the state. This publication, USGS Map GP-968, *Aerial radiometric contour maps of surface concentrations of uranium, potassium, and thorium in Ohio*, by Joseph S. Duval, is available from the Ohio Geological Survey for $7.20 plus tax and mailing ($9.35 total).

The three separate maps in the package are at a scale of 1:500,000 and were compiled from radiometric data collected by the U.S. Department of Energy as part of the National Uranium Resource Evaluation Program (NURE). These reconnaissance maps utilized aerial data obtained from east-west flight lines spaced at a distance of 6 miles. Such maps, particularly those depicting low-level concentrations of uranium, are useful in oil and gas exploration.

GEORGE W. WHITE, 1903-1985



It is with considerable sadness that we report the death of Dr. George W. White, former State Geologist of Ohio and long-time research associate of the Survey. Dr. White passed away on February 20, 1985, in Champaign, Illinois, from pneumonia. He had been in failing health for the past two years, although his keen intellect persisted until very near the end. A memorial service was held in Champaign on April 10th. Dr. White is survived by his wife, Mildred.

George White was a native Ohioan, born July 8, 1903, at North Lawrence in Stark County. He spent most of his youth in the cities of Delaware and Westerville in central Ohio. He received the A.B. degree from Otterbein College, Westerville, in 1921 and the M.A. and the Ph.D. degrees from the Ohio State University in 1925 and 1933, respectively.

After teaching at the University of Tennessee (1925-26) and the University of New Hampshire (1926-41), Dr. White returned to Ohio State University in 1941 as professor of geology. In 1946, upon the retirement of Wilber Stout, George White was appointed State Geologist of Ohio, a position he held only until 1947, when he became professor and chairman of the Department of Geology at the University of Illinois. Dr. White remained at the University of Illinois throughout the remainder of his career, becoming research professor emeritus upon his retirement from active teaching in 1971.

Although George White spent his formative years in his native Ohio, most of his professional career was in employment outside the state. Nevertheless, Dr. White maintained his principal research in Ohio throughout his long career. He spent nearly every field season in northeastern Ohio investigating glacial geology under the sponsorship of either the Ohio Geological Survey or the U.S. Geological Survey.

The publications of George White on the geology of Ohio number more than 70 and deal with a variety of subjects. His first publication, in 1926, was on the limestone caves and caverns of the state. This work, the results of his master's thesis, still remains the most comprehensive published work on this subject. During the 1940's—the war years and the period of his tenure as State Geologist of Ohio—Dr. White devoted his efforts to reports on mineral industries, coal, shore erosion along Lake Erie, coal-bearing rocks of eastern Ohio, and a major report (Ohio Geological Survey Bulletin 47) on the geology of Holmes County.

Beginning in the 1950's and continuing into the 1980's, Dr. White's efforts were devoted to the systematic, county-by-county mapping of the glacial geology of northeastern Ohio. Most of these county reports have been published by the Ohio Geological Survey, and they culminated in the 1982 compendium, *Glacial geology of northeastern Ohio* (Bulletin 68). The report on the glacial geology of Summit County (Report of Investigations 123) was published just before his death; reports on Columbiana and Mahoning Counties, the final ones by Dr. White in the series, await publication.

George White developed and used stratigraphic principles for glacial sediments that were formerly applied only to consolidated rocks. His investigative methods set the standard for glacial geologists working in the north-central United States. The legacy of his work and his methods will long endure in Ohio and elsewhere.

George W. White maintained two intellectual loves throughout his long career. The glacial geology of northeastern Ohio has been described. The second passion was the history of geology, a field in which he maintained an international reputation and in which he published more than 50 papers. Dr. White was a founding member and first chairman of the U.S. National Committee for the History of Geology and the first American to hold high office in the International Committee on the History of Geology. In 1982, he was presented with the first History of Geology Award by the Geological Society of America. Dr. White was an avid collector of early geological publications and, with his wife, Mildred, travelled the world in search of rare and unusual volumes for his personal library and for the geology library at the University of Illinois. Recently, this library was named in Dr. White's honor.

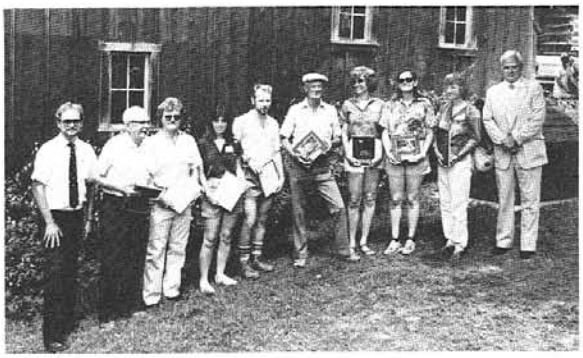
George White received many additional awards and accolades during his long and distinguished career including honorary degrees from Otterbein College, the University of New Hampshire, and Bowling Green State University and the Orton Award from the Ohio State University. In 1981, the Ohio Department of Natural Resources recognized Dr. White's significant contributions to his native state by presenting him with a Conservation Achievement Award.

Those of us who knew George personally will remember his enthusiasm and eagerness for knowledge, his keen perception of geologic problems, and his support and encouragement to achieve our goals. Dr. White perhaps had the satisfaction that few enjoy, of achieving at least one of his lifelong goals—complete mapping of the glacial geology of northeastern Ohio. He wrote, in the prologue to the *Glacial geology of northeastern Ohio*, "The next 50 years will be as productive as the past 50 years. May our successors feel as we do, that State Geologist Newberry and his corps of assistant geologists between 1870 and 1878 and Frank Leverett in 1902 saw the 'big picture,' but we are glad they left parts of the canvas to be completed."

George White left little of the northeastern Ohio canvas uncompleted and his successors will only be required now and then to perhaps do a bit of touching up. Many Ohioans, most of them unknowingly, will be the beneficiaries of George W. White's remarkable ability and persistence. We will all miss him both personally and professionally.

—Michael C. Hansen

1985 SLIDE CONTEST WINNERS



Ohio Geology Slide Contest winners at awards ceremony at the Ohio State Fair. L. to r.: Mike Hansen, contest coordinator; George Bell, John Pocse, Ann Story, James Sellers (Honorable Mention awards); Preston Fettrow, Sr. (5th); Melinda Rinehart (4th); Janet Province (2nd); Trudy Beal (1st); Horace R. Collins, Division Chief and State Geologist.

1st PLACE —Trudy Beal, Stow: Fossils in rock.
2nd PLACE —Janet Province, Columbus: Waterfall, Greene County.
3rd PLACE —Horton Hobbs, III, Springfield: Reif's Cave, Ross County.
4th PLACE —Melinda Rinehart, Tallmadge: Old Man's Cave, Hocking County.
5th PLACE —Preston Fettrow, Sr., Columbus: Concretions, Franklin County.

HONORABLE MENTION—George Bell, Zanesville; Steve Dow, Medway; John Pocse, Oregon; James Sellers, Bedford; Ann Story, Claysville.

The 1985 Ohio Geology Slide Contest drew a large number of high-quality entries, making the job of the judges a difficult one. Award plaques and certificates were presented to the winners in ceremonies held on August 10, 1985, at the Natural Resources Area of the Ohio State Fair. Prints of the winning slides were displayed at the fair and are now on display in the Survey lobby. The awards for the 1985 contest were sponsored by the Ohio Coal and Energy Association. Judges for this year's competition were: David B. Buchanan, geologist, ODNR, Division of Reclamation; Charles R. Grapes, geologist, Mitchell Energy Corporation; and Alvin E. Staffan, nature photographer, ODNR, Office of Public Information and Education.

GLACIAL GEOLOGY OF SUMMIT COUNTY

The glacial geology of Summit County is the subject of a recent Survey publication by the late Dr. George W. White. This report, Report of Investigations No. 123, includes a color map, at a scale of 1:62,500, of glacial deposits in Summit County and a 25-page text that describes these deposits in detail. The glacial stratigraphy in Summit County is among the most complex in the state and Dr. White's report represents the results of his many years of investigation.

RI 123 is one in a series of county glacial maps and reports on northeastern Ohio by Dr. White and his colleagues. Previous reports in this series have proven to be particularly valuable for land-use planning activities in this densely populated portion of the state.

Report of Investigations No. 123, *Glacial geology of Summit County, Ohio,* is available from the Survey for $17.00, which includes tax and mailing.

"BIG INJUN" AND "MAXTON" REPORT

The Survey recently released Report of Investigations No. 124, *Geology and formation-water quality of the "Big Injun" and "Maxton" sandstones in Coshocton, Guernsey, Muskingum, and southern Tuscarawas Counties, Ohio.* This report, authored by former Survey geologist Frank L. Majchszak, is a subsurface study of the Mississippian-age Black Hand Sandstone and its equivalents (known to drillers as the "Big Injun") and the Pennsylvanian-age Sharon sandstone (known to drillers as the "Maxton").

The report delineates the subsurface distributions and thicknesses of these sandstone bodies and evaluates these horizons in Coshocton, Guernsey, Muskingum, and southern Tuscarawas Counties in terms of the potential for subsurface disposal of brines. The study concludes that the sandstone body in Guernsey County, commonly identified by drillers as the "Big Injun," is actually the Sharon sandstone ("Maxton") and is the most suitable horizon in the study area for subsurface brine disposal. It is further suggested that the subsurface continuation of the Sharon sandstone southward into Noble and Washington Counties is also a potentially suitable area for brine disposal.

Copies of this 36-page report, which includes 12 figures, 2 tables of chemical analyses of formation-water quality, and 6 separate maps and cross sections, are available from the Survey for $6.00 each, which includes tax and mailing.

NEW SAMPLE LIBRARY AND LAB FACILITY

The Survey is converting a 27,000-square-foot warehouse into a storage facility to house cores generated by our core-drilling rig and cores donated by industry. Sample cuttings from oil and gas wells also will be processed and stored in this facility. In addition, there are plans to convert a portion of the warehouse into rock-preparation labs and a coal-washing lab.

The warehouse provides, for the first time, the opportunity to house all Survey cores and rock samples in a single facility and, when completed, will permit easy and quick access to individual cores for study by Survey geologists and outside researchers. The facility is located on Phillipi Road, on the west side of Columbus, and is easily accessible from Interstates 70 and 270. A great amount of Survey core has been moved to the warehouse, and construction of shelving for core boxes and installation of laboratory facilities is expected to begin in the near future.

—Dennis N. Hull
Head, Regional Geology Section

OHIO'S NATURAL HERITAGE

Ohio's Natural Heritage, a widely acclaimed 374-page hardbound book published by the Ohio Academy of Science and the Ohio Department of Natural Resources, is now available for the reduced price of $15.95. Copies of this book may be ordered from the Ohio Academy of Science or from the Survey. Please add $3.13 for postage and handling ($19.08 total) to mail orders from the Survey.

TRACE METALS IN OHIO BRINES

There is currently considerable interest in brines produced as a by-product of Ohio's oil and gas wells. Much of this concern has been focused on the presumption that these brines contain a high concentration of trace metals that could create potential hazards. However, a literature search recently conducted by the staff of the Survey's Geochemistry Section indicated that, although an extensive body of chemical analyses exists for brines, most of these analyses have been economically oriented towards major-element salt content rather than towards trace metal content. This literature search revealed little information nationwide on heavy metals in brines and virtually nothing on these metals from Ohio brines. The scanty available information suggests that the concentrations of most heavy metals in most brines are very low.

Because of this lack of information on trace metals in Ohio brines, the Survey is currently unable to adequately respond to inquiries from the public and industry. Consequently, the Geochemistry Section is undertaking a program of chemical analyses of certain trace metals in Ohio brines. The elements to be analyzed for are aluminum, cadmium, chromium, cobalt, copper, iron, lead, manganese, mercury, molybdenum, nickel, titanium, vanadium, and zinc. The program is expected to last about two years and to provide chemical analyses on four to seven brine samples each month.

This program is expected to be of great benefit to the citizens and the oil and gas industry of Ohio by providing a body of information from which reliable decisions can be made in regard to the handling and disposal of brines. The Survey would greatly appreciate the cooperation of Ohio's oil and gas industry in obtaining brine samples for this study. Where possible, brine samples will be collected directly from the wellhead in operating wells rather than from storage tanks or pits in order to prevent any contamination of the brine from lines, tanks, or separators.

—David A. Stith
Head, Geochemistry Section

PORTAGE COUNTY SOLID-WASTE DISPOSAL

The Survey recently released Report of Investigations No. 126, *Geologic evaluation of land areas in Portage County, Ohio, for solid-waste disposal*, by Dennis N. Hull, Head of the Regional Geology Section. This map is part of the Survey's county mapping program.

The report consists of a color map at a scale of 1:62,500, with explanatory text and tables on the same sheet. The text outlines the local sequences of bedrock and unconsolidated materials and provides general geologic and hydrologic considerations for determining suitable sites for solid-waste disposal. The county is divided into three major categories in regard to waste-disposal sites—most suitable areas, marginally suitable areas, and generally unsuitable areas. Most suitable areas are those in which 50 feet or more of fine-textured glacial till is present at the surface. The marginally suitable and generally unsuitable categories are further subdivided in regard to specific local geologic conditions that make the sites questionable or unsuitable for solid-waste disposal.

Report of Investigations No. 126 is available from the Survey for $6.53, which includes tax and mailing.

SURVEY STAFF NOTES

Linda Dunbar

Madge Fitak

Linda F. Dunbar is a Public Inquiries Assistant in the Subsurface Geology Section and has responsibility for a wide range of activities pertaining to information on Ohio's oil and gas wells. She helps maintain the voluminous file of oil and gas-well records kept by the Survey and assists the public in placing orders and locating information pertaining to wells. Linda particularly enjoys working with the public, especially senior citizens.

Linda is originally from Roanoke, Virginia, and came to the Survey in 1980 after attending Franklin University in Columbus. She enjoys tennis, aerobic exercising, and gourmet cooking. Linda is a certified mixologist and someday would like to own a restaurant.

Madge R. Fitak is Head of the Public Service Section and supervisor of the Publications Center, which distributes not only Survey publications but also publications of other divisions and offices of the Department of Natural Resources. Madge is a native of Erie, Pennsylvania, and came to the Survey in 1973 after receiving a B.S. degree in geology from Mt. Union College. She enjoys the variety of activities involved with operating the Publications Center and particularly likes meeting the public and answering the many questions she receives on a daily basis.

Madge received the Department of Natural Resources "Employee of the Month" award in 1982. She is married and has two children and enjoys reading, singing in the church choir, and collecting Russian carvings.

BBC FILMS IN OHIO

The Survey recently served in the capacity of guide and coordinator for a film crew from the BBC during filming of sites of geologic interest in Ohio for additional episodes of the award-winning series, *The making of a continent*. The BBC crew was led by independent film makers Neil Rettig and Kim Hayes. Ohio locations included Buckeye, Hope, and Madison Furnaces in the Hanging Rock charcoal iron district of Jackson and Vinton Counties; Flint Ridge in Licking County; the Ohio Power Company's Big Muskie dragline; and the glacial grooves at Kelleys Island. Additional filming of trilobites being excavated from Ordovician rocks in Highland County is scheduled for the near future. The three-part series will be shown on PBS stations, probably in late 1986.

GRAVITY MAP AVAILABLE

The U.S. Geological Survey recently released the *Complete Bouguer gravity anomaly map of Ohio*, authored by T. G. Hildenbrand and R. P. Kucks. This map, GP-962, was prepared in cooperation with the Ohio Geological Survey. The gravity map, at a scale of 1:500,000, is a companion map of the aeromagnetic anomaly map of Ohio (see *Ohio Geology*, Summer 1984).

The density of gravity stations differs considerably across the state and is greatest in northwest Ohio and in Franklin and Noble Counties. Gravity data for the Ohio portion of Lake Erie also are presented. This machine-contoured map has a contour interval of 2 milligals and reveals a number of anomalies characteristic of complex basement geology.

Copies of the gravity map are available from the Ohio Geological Survey for $3.29, which includes tax and handling.

QUARTERLY MINERAL SALES, JANUARY—FEBRUARY—MARCH 1985

Compiled by Sherry L. Weisgarber

Commodity	Tonnage sold this quarter[1] (tons)	Number of mines reporting sales[1]	Value of tonnage sold[1] (dollars)
Coal	8,425,094	207	280,431,199
Limestone/dolomite[2]	4,172,473	78[3]	15,528,206
Sand and gravel[2]	2,708,946	181[3]	8,114,528
Salt[2]	1,499,175	4[4]	17,577,803
Sandstone/conglomerate[2]	402,158	19[3]	4,816,433
Clay[2]	178,611	22[3]	924,062
Shale[2]	257,134	17[3]	344,076
Gypsum[2]	46,735	1	443,980
Peat	3,270	4	15,669

[1]These figures are preliminary and subject to change.
[2]*Tonnage sold* and *Value of tonnage sold* include material used for captive purposes. *Number of mines reporting sales* includes mines producing material for captive use only.
[3]Includes some mines which are producing multiple commodities.
[4]Includes solution mining.

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