WINTER 1984

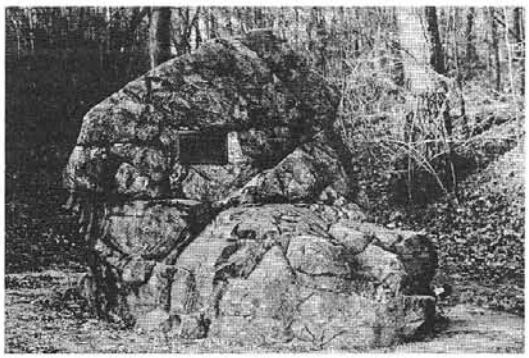
Ohio Geology Newsletter

Division of Geological Survey

GLACIAL ERRATICS, OR "WHAT'S THE BIGGEST ROCK IN OHIO?"

What's the biggest rock in Ohio? This geologically ambiguous question is among the inquiries frequently received by the Survey. A few leading questions are generally sufficient to establish that the caller has in mind one of the large crystalline glacial erratics that dot the glaciated portion of Ohio. These rocks serve as driveway markers, landscape ornaments, a nuisance to farmers, and, in the case of very large erratics, topics of conversation and speculation. Less well known is the fact that these erratics have been and still are of scientific value to geologists.

The term erratic, from the Latin word for wanderer, refers to a rock that has been removed and redeposited some distance from its place of origin. In Ohio, the principal agent for transportation of these erratic boulders was glacial ice during the Pleistocene Ice Age, between about 1.5 million and 14,000 years ago. What is commonly thought of as a glacial erratic is a boulder of igneous or metamorphic rock that has been transported hundreds of miles from an area to the north known geologically as the Canadian shield.



Twenty-five-ton gneissic erratic (correctly identified as such by an embedded bronze plaque) in Wyman's Woods park, Grandview Heights, Franklin County.

Also included in the erratic category are boulders of sedimentary rocks that may have been transported a considerable distance or in many cases only a few miles. In fact, most Ohio glacial erratics are sedimentary rocks—an observation that is immediately apparent when the rock types of boulders are recorded at an exposure of glacial till. And to be precise about the definition of a glacial erratic, size is not a factor. Erratics can be tiny rock fragments—as in the case of the much sought after gold and diamonds from glacial sediments—or they can be huge boulders.

Glacial erratics in a sand and gravel pit, Lawrence Township, Stark County. The erratic upon which the mattock is resting is a Precambrian tillite boulder—a fragment of lithified glacial till formed during an ancient glaciation and brought to Ohio from Canada by the comparatively recent Pleistocene glaciers. Survey Deputy Chief Robert Van Horn in the background.

Glacial erratics have long held an interest for geologists and, before the advent of the glacial theory by Louis Agassiz about 1840, were the subject of considerable speculation. The diluvial origin of erratics—testimony to the biblical flood—was a commonly espoused thought. These boulders did not escape the attention of the members of the First Geological Survey of Ohio. John Locke, one of its most able scientists, expressed the opinion that attention should be given to their probable origin. Locke, in his observations in the Second Annual Report (1838), did not connect these erratics to a glacial origin, but such thoughts may have been in his mind because, in a commentary on limestone surfaces that were polished and scratched, he attributed these features to having been formed by the "progress of some heavy mass, propelled by a regular and heavy motion." Locke also correctly ascertained that this mass had moved from north to south.

By the latter part of the nineteenth century the glacial theory was widely accepted. The Canadian source areas of the igneous and metamorphic erratics were of considerable interest to geologists in order to determine the points of origin of the great continental ice sheets and the southward paths that they took on their slow journeys to Ohio. In order to have a coordinated effort, the Ohio Academy of Science established a "Boulder Committee" under the leadership of G. Frederick Wright, professor of geology at Oberlin College and one of the leading students of glacial geology in North America. This apparently

continued on next page

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

Richard F. Celeste, Governor • Lt. Gov. Myrl H. Shoemaker, Director

Chief's corner by Horace R. Collins

1984 should be a banner year for the Geological Mapping Program. As has been noted before in *Ohio Geology*, the development and funding for a county-by-county mapping program was a significant step forward for geology and for the users of geologic information in Ohio. Funding for this program was established with a sunset clause effective at the end of 1991. The year ahead will be especially significant because it will be the first year in which major additions to the staffing of the program have been made.

It is anticipated that from 10 to 15 mappers will be in the field during 1984. Glacial mapping will continue in north-central Ohio with the initiation of work in Erie, Morrow, and Seneca Counties. Bedrock mapping will be initiated in southwest Ohio in Brown, Clermont, and Hamilton Counties. Glacial-drift-thickness and top-of-bedrock mapping will be carried on in Brown, Butler, Clermont, Crawford, Erie, Hamilton, Huron, Ottawa, and Wyandot Counties. In addition to the basic geologic mapping, the Division hopes to complete sand and gravel evaluations of Butler and Montgomery Counties. Coal-resource evaluations are expected to continue in eastern Ohio in Belmont and Guernsey Counties.

Maps and technical information of the type to be developed in each county are eagerly sought by a wide cross section of our society. The mineral industry uses these data in the search for and development of valuable mineral resources. The production of mineral resources in turn provides jobs and materials for a healthy economy. Government at many levels uses geologic maps and reports for planning, zoning, regulation, and protection of the environment. Realtors use these materials for home and commercial construction siting, lawyers use them for the resolution of problems involving mineral value or potential, and engineers use them for foundation and site engineering for structures requiring specific drainage, load-bearing, or safety considerations. Individual citizens can gain information on the presence or absence of mineral resources, ground water, or other geologic conditions which may affect their personal use, purchase, or sale of private property.

The examples listed above are but a very few of the uses for the maps, reports, and other technical data to be developed through the Geological Mapping Program. Wise use, efficient development and management, and informed policy decisions affecting Ohio's mineral resources will all materially benefit by the availability of accurate, objective reports and maps created through the Geological Mapping Program.

OHIO ACADEMY OF SCIENCE MEETING

The 1984 Ohio Academy of Science meeting will be held April 27-29 at Case Western Reserve University and the Cleveland Museum of Natural History in Cleveland. The theme for this year's meeting is "Industry/academia relations." A total of 32 papers will be presented in Section C, Geology in technical sessions Saturday, April 28. A field trip to examine the Cleveland Member of the Ohio Shale, the Bedford Shale, and the Berea Sandstone will be led by Mike Williams (Cleveland Museum of Natural History) and Tom Lewis (Cleveland State University) on Sunday, April 29. For information on registration for the meeting, contact the Ohio Academy of Science, 445 King Ave., Columbus, Ohio 43201, telephone 614-424-6045.

OHIO GEOLOGY

A newsletter published quarterly by the Ohio Department of Natural Resources, Division of Geological Survey, Fountain Square, Columbus, Ohio 43224.

Editor: Michael C. Hansen
Secretary: Donna M. Swartz
Layout and design: Philip J. Celnar
Phototypist: Jean M. Lesher

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.

continued from page 1

short-lived committee attempted to match the rock types of erratics from Ohio and adjacent areas to outcrops in Canada. Samples of these Ohio boulders were exhibited at the 1893 Columbian Exposition in Chicago.

WHAT *IS* THE BIGGEST ROCK IN OHIO?

Without question the honor of the largest glacial erratic, in the broad sense of the definition, goes to the famous Brassfield erratic near Oregonia in Warren County. This erratic was described in detail by J. J. Wolford in 1932. The Brassfield erratic was named because of its composition—Brassfield Limestone, of early Silurian age (about 430 million years ago). This massive chunk of limestone ranges in thickness from about 5 to 17 feet and covers an area of about an acre along the north fork of Olive Branch, a tributary of the Little Miami River, about ½ mile southeast of Oregonia, Washington Township, Warren County.

Wolford noted that the Brassfield erratic rests on glacial till of Illinoian age and is about 125 feet lower than the projected elevation of the Brassfield Limestone. This huge mass of limestone was transported by Wisconsinan-age glacial ice at least 4.5 miles and possibly farther. A small limestone quarry, known as the Betty Heidy quarry, utilized the limestone from this erratic at about the turn of the century.

No one questions the position of the Brassfield erratic as the largest in the state, but somehow this huge chunk of native limestone fails to capture the same sort of exotic spirit as the igneous or metamorphic erratics that were transported hundreds of miles and are very unlike any native Ohio rock. With this qualifier added to the original question—what is the largest rock in Ohio—the contest becomes somewhat more narrow.

The state champion erratic of igneous or metamorphic origin may have been the one reported by M. C. Read in his 1878 report of the Second Geological Survey of Ohio. Read reported that this granite boulder, located in the village of Ashland in Ashland County, had original dimensions of 25 x 15 x 12 feet with an estimated weight of 350 tons; however, he also stated that the boulder had occasionally been quarried for foundation stone over a period of 30 or 40 years prior to 1878. The dimensions of the boulder could not be verified by Read, so the reported size must be regarded with some caution because such figures are commonly exaggerated by local residents. A recent check with the Ashland newspaper and

local historians was unsuccessful in confirming that any of the original erratic remains in this community today.

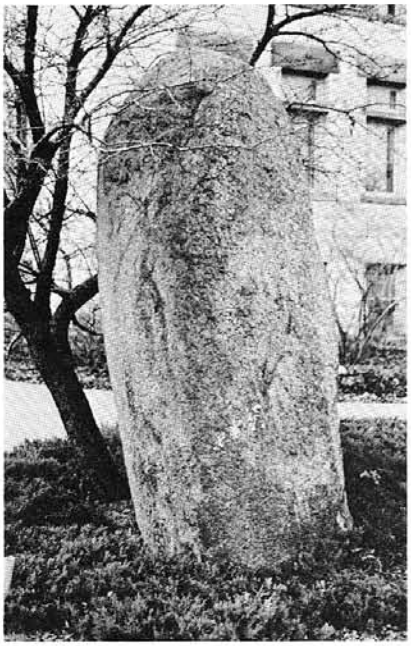
The state championship of crystalline erratics, both because of size and verifiable existence, must pass to the Sunbury erratic, located near the community of Sunbury in Delaware County. This large, oval-shaped granite boulder is 22 feet long, 18 feet wide, and 8 feet high and has a circumference of 72 feet. The weight of the exposed portion of the erratic is about 200 tons. The portion of the boulder below ground level is unknown. The Sunbury erratic is located 1 mile east of Sunbury on the north side of Croton Road and approximately 1/10 mile north of this road.

Sunbury erratic east of Sunbury, Delaware County. This granite boulder is thought to be the largest crystalline erratic in Ohio. Survey publications editor, Merrianne Hackathorn, for scale. Merrianne is - - medium. (See Historical Vignettes, *this issue, p. 7).*

Today, Ohio's premier erratic lies in obscurity, surrounded by high weeds at the northwest corner of a beech-maple woodlot. During the 1930's, however, this erratic was relatively well known and was even marked as a point of interest on road maps of that era. According to Robert Skeens, a nearby resident with a lifelong interest in this boulder, a tombstone company once expressed interest in the Sunbury erratic but apparently decided that it would be too expensive to remove. So it now marks its own last resting place instead of contributing that function to a lot of people who probably never heard of glaciers in Ohio and always thought the term erratic referred to behavior.

There are several other erratics in Ohio that are worthy of note. G. F. Wright, in his 1889 book, *The Ice Age in North America,* mentions two particularly large erratics from Ohio. Near Leetonia, in Columbiana County, is a granite boulder with dimensions of 13 x 11 x 8 feet. In Fairfield County near Lancaster, Wright gave the dimensions of another granite boulder as 18 x 11 x 6 feet. This latter erratic is apparently the same one referred to by Frank Leverett in his 1902 U.S. Geological Survey monograph, *Glacial formations and drainage features of the Ohio and Erie basins.* Leverett gives the dimensions of this boulder as 18 x 12 x 6 feet and states that it is "hornblendic in character" (referring to the presence of the mineral hornblende) and located in the valley of Baldwin's Run between Lancaster and Pleasantville.

Edward Orton, third State Geologist of Ohio, in an 1878 Survey report, referred to a boulder of gneiss that measured 17 x 13 x 8 feet. This erratic is located in the NE¼, Sec. 22, Turtle Creek Township, Warren County, just north of Interstate 71 and west of Ohio Route 123 and Bethany Church. Nearby was located "Rock School," a turn-of-the-century one-room school that took its name from this locally well known erratic. A 1976 newspaper story by Cleveland *Plain Dealer* reporter Richard G. Ellers quoted local residents as remembering this erratic as once being much larger; indeed, one recalled the boulder as being 42 feet high. The resident added that "around here we assume that it sinks." Orton's 1878 measurements of the Rock School erratic would suggest that childhood memories tend to take on embellishment as the years pass.



Orton erratic in front of Orton Hall on the Ohio State University campus.

A large, oblong granite erratic serves as a prominent landmark in front of Orton Hall (home of the Department of Geology and Mineralogy) on the campus of the Ohio State University. This erratic, with dimensions of 7 x 7 x 8 feet, was discovered near the turn of the century during excavations at the corner of 16th and Iuka Avenues near the OSU campus in Columbus. Edward Orton, Jr., fourth State Geologist of Ohio, arranged to have the erratic transported to its present location by someone with a heavy-duty wagon. Apparently the weight of the boulder (about 16 tons) was more than the hauler anticipated and he demanded that Orton pay him more than the $40 that had originally been agreed upon. So the story goes, Orton told the man that if he did not like the price he could take the boulder back to where he found it. The outcome of the disagreement is obvious from the present location of the boulder. More recently, the Orton erratic was dated radiometrically by Peters and Faure (1972) at 998±82 million years, a date that indicates that this erratic was derived from an area known geologically as the Grenville province of Canada.

Another central Ohio granite erratic caused considerable difficulty during the construction of the Ohio National Bank plaza in downtown Columbus. During excavation for the foundation of this building a boulder with dimensions of 12 x 12 x 14 feet was discovered. The boulder was a particular problem because it was on the margin of the excavation and interfered with the pilings for the building's tieback system and would have projected several feet into the proposed underground parking garage. Apparently the erratic had caused problems for previous construction activities at the site, according to a 1974 article by Judi Willgren in *Ohio Contractor* magazine. The rock was incorporated into the foundation of the Columbus

Dispatch building, a sewer line had been laid around it, and a large, underground electrical conduit was bowed 2 feet over the top of the boulder. The erratic was finally removed by splitting it into small pieces with a hydraulic rock splitter.

DISTRIBUTION OF ERRATICS

Locations of large erratic boulders discussed in the text.

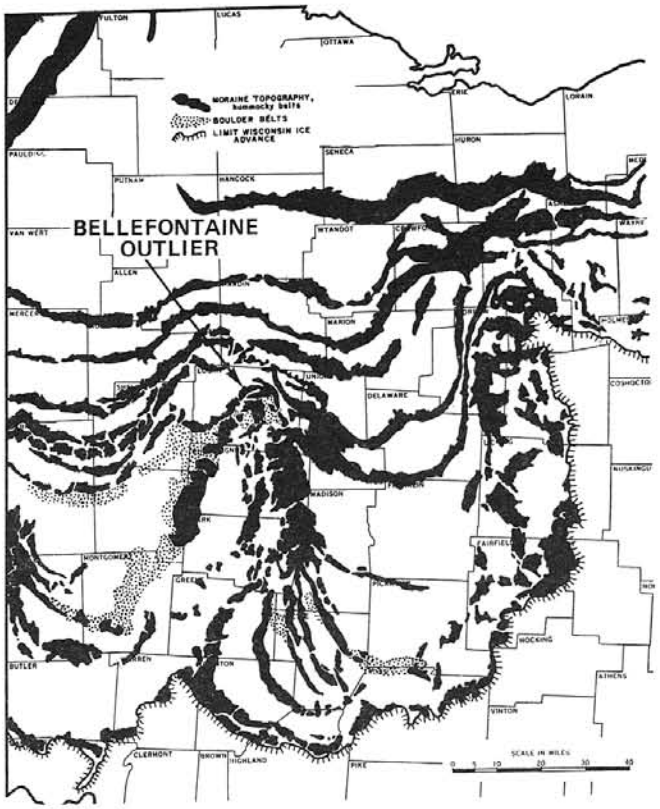
Glacial erratics can be found nearly anywhere in the glaciated two-thirds of the state, although most of them are quite small and very large boulders are comparatively rare. There is a concentration of erratics in western Ohio coinciding with several prominent end moraines. These areas of concentration are known as boulder belts, and frequencies as high as 100 boulders per acre are not uncommon.

A glance at the glacial map of western Ohio reveals that the boulder belts, and the moraines with which they generally coincide, appear to emanate from an area of bedrock upland known as the Bellefontaine outlier. This upland, which includes the highest point in Ohio, split the Erie lobe of the Wisconsinan-age glacier into the Miami lobe on the west and the Scioto lobe on the east. It is probable that these boulder belts are the result of the Bellfontaine outlier acting as a topographic barrier which impeded ice flow, causing the ice to well upward and concentrate boulders at points where the ice front was stationary.

Erratics, including large numbers of crystalline varieties, can be found in abundance beyond the glacial border along major meltwater drainageways such as the Scioto, Hocking, and Ohio Rivers. Most of these are small in size and form a major component of sand and gravel deposits. The great variety of erratics found in these outwash deposits provides a splendid laboratory for the beginning geology student to test newly acquired skills in rock identification.

CRYSTALLINE ERRATICS BEYOND THE GLACIAL BORDER

A final comment on igneous and metamorphic erratics concerns the occasional boulders that are reported beyond the glacial boundary, as it is now recognized, and outside major meltwater drainageways. These enigmatic boulders, most of modest size, have been reported from various parts of southeastern and southern Ohio in areas commonly ranging from a few to 15 miles beyond the glacial border and where no glacial drift is recognized.



Distribution of Wisconsinan-age end moraines and boulder belts in western Ohio. Erratic boulders are as common as 100 per acre in the boulder belts (modified from R. P. Goldthwait, 1959, Ohio Journal of Science, v. 59, p. 193-216.)

Much speculation has been generated as to how these "orphan" erratics came to be in their present locations. Suggestions include (1) transport by Indians or early pioneers, (2) ice rafting when the Teays drainage system was blocked by an early Pleistocene glacier, and (3) deposition of the erratics in glacial till of an early glaciation, possibly the Nebraskan, that extended well beyond the currently recognized glacial boundary and of which all deposits have been removed by erosion, except for a few resistant granitic boulders.

This latter hypothesis has been given some credence by L. L. Ray in a 1969 report of the U.S. Geological Survey. Ray cites as evidence of this early glaciation two famous erratics in northern Kentucky. The first of these, the Epworth boulder, is granite gneiss and had original dimensions of 8 x 6 x 4 feet. This boulder, located about 15 miles south of the Ohio River, in Lewis County, Kentucky, weighed about 16 tons, a mass that apparently would have been too large for Indians to transport the more than 20 miles from the glacial border over rugged terrain.

The second boulder, known as the Farmers boulder, is schistose quartzite and has dimensions of 6 x 3 x 2 feet. This specimen is located 20 miles south of the Epworth boulder near the community of Farmers in Rowan County, Kentucky. Ray speculates that these two erratics may have been emplaced by ice rafting when a lobe of Nebraskan-age ice extended into northern Kentucky and dammed the Licking River. He further suggests that future detailed mapping of southeastern and southern Ohio may reveal additional evidence of a more

extensive early Pleistocene ice sheet. This mystery may never be satisfactorily solved but the Survey's mapping program will at least provide an opportunity to scan this disputed terrain once again.

There are other glacial erratics in the state that perhaps compete with or even surpass the Sunbury erratic in size and perhaps also glacial erratics located beyond the glacial boundary as it is now recognized. The Survey always appreciates notification about such occurrences.

FURTHER READING

Leverett, Frank, 1902, Glacial formations and drainage features of the Erie and Ohio basins: U.S. Geological Survey Monograph 41, 802 p.

Orton, Edward, 1878, Report on the geology of Warren County: Ohio Geological Survey, v. 3, p. 381-391.

Peters, R. L., and Faure, Gunter, 1972, Age determination of a glacial erratic in Columbus, Ohio: Ohio Journal of Science, v. 72, no. 2, p. 87-90.

Ray, L. L., 1969, Glacial erratics and the problem of glaciation in northeast Kentucky and southeast Ohio—a review and suggestion: U.S. Geological Survey Professional Paper 650-D, p. D195-D199.

Read, M. C., 1878, Report on the geology of Ashland County: Ohio Geological Survey, v. 3, p. 519-528.

Willgren, Judi, 1974, 110 ton rock is uncovered in downtown Columbus by Davis-McKee, Inc.: Ohio Contractor, v. 13, no. 8, p. 14-21.

Wolford, J. J., 1932, A record size glacial erratic: American Journal of Science, v. 24, no. 143, p. 362-367.

Wright, G. F., 1889, The Ice Age in North America: New York, D. Appleton and Company, 622 p.

For further information on the Pleistocene Ice Age in Ohio the Survey has available Educational Leaflet No. 9, *Ohio's Glaciers.* Single copies are free.

—Michael C. Hansen

1984 OHIO GEOLOGY SLIDE CONTEST

The popular Ohio Geology Slide Contest will again be sponsored by the Survey in 1984. Winners will receive attractive award plaques at ceremonies at the 1984 Ohio State Fair.

Any 35-mm color slide that portrays some aspect of Ohio geology is eligible for entry in the contest, and individuals may submit up to two slides. Popular topics include mineral industries, scenic outcrops, mineral and fossil specimens, and geomorphic features. For a list of rules and an official entry form, write: Ohio Geology Slide Contest, Ohio Department of Natural Resources, Division of Geological Survey, Fountain Square, Bldg. B, Columbus, Ohio 43224. Entries must be submitted by May 31, 1984.

NEW STRATIGRAPHIC CODE AVAILABLE

The North American Commission on Stratigraphic Nomenclature has recently adopted a new code for the classification of rock units and unconsolidated sediments. The new code replaces the 1970 edition and is a reflection of a continually evolving attempt to develop a classification scheme that accurately reflects the relationships and distributions of rocks and sediments.

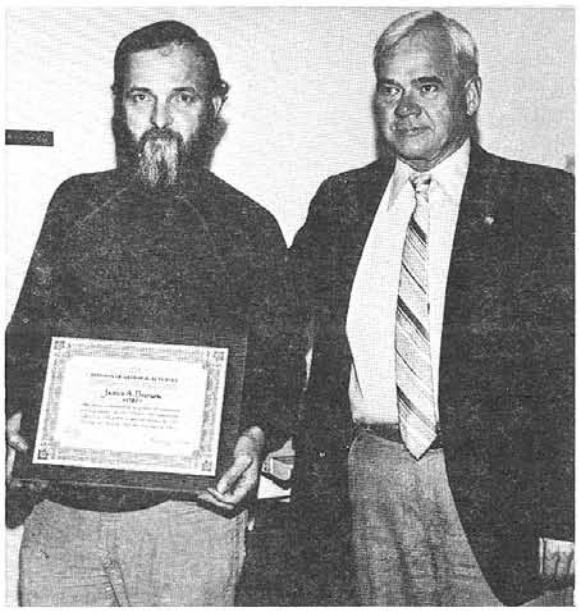
Such a document is a necessity to any geologist who must classify rock units and is a handy reference guide for anyone who uses geologic data. The new code was published in the May 1983 Bulletin of the American Association of Petroleum Geologists (v. 67, no. 5, p. 841-875). Copies of the code are available for $1 each from the American Association of Petroleum Geologists (AAPG), Box 979, Tulsa, Oklahoma 74101.

QUARTERLY MINERAL PRODUCTION, JULY—AUGUST—SEPTEMBER 1983

Commodity	Tonnage sold this quarter[1] (tons)	Number of mines reporting sales[1]	Value of tonnage sold[1] (dollars)
Coal	7,894,400	209	249,655,341
Limestone/dolomite[2]	8,963,989	96[3]	32,524,736
Sand and gravel	8,595,665	200	25,302,693
Salt	415,484	5	4,042,084
Sandstone/conglomerate[2]	402,322	22[3]	5,143,138
Clay[2]	330,322	19	1,370,712
Shale[2]	217,173	13	464,665
Gypsum[2]	58,316	1	488,394
Peat	523	2	4,522

[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.

JIM BROWN RECEIVES EMPLOYEE OF THE YEAR AWARD FOR 1983



James A. Brown receiving "Employee of the Year" award from Division Chief Horace R. Collins.

James A. Brown, Cartographer Supervisor in the Technical Publications Section, was the recipient of the first annual Division of Geological Survey "Employee of the Year" award in ceremonies held during the Survey's annual holiday luncheon. Jim was selected by a committee composed of heads of the various Survey sections from nominations submitted by employees.

His cartographic abilities have made Jim an invaluable member of the Survey staff and his technical expertise is admired both by his fellow cartographers and by staff geologists, many of whom are continually amazed by Jim's ability to transform a rudimentary sketch into an artistic and professional diagram or map. In addition to his innovative technical abilities, Jim is admired by his fellow employees for his good humor, positive attitude, and his willingness to assist others.

Jim came to the Survey in 1965 after previous experience as a draftsman. He is married and has three children. Jim's hobbies include landscape painting, fishing, and collecting pocket watches, pocket knives, and "carp" cartoons.

GEOLOGIC MAPPING— ANECDOTES FROM THE PAST

John Locke (1792-1856)

Numerous geologists, many of them of considerable professional repute, have traversed the Ohio countryside for more than a century and a half in pursuit of geologic information. The total of the publications resulting from these endeavors constitutes an impressive record of the geology of Ohio and the progressive evolution of thought and understanding on many geologic problems of the state. Seldom recorded, however, are the day-to-day trials and tribulations endured by our predecessors in their quests for geologic information. A few of the older publications of the Survey contain brief asides concerning difficulties or incidents during the progress of field work. Overall, however, the record in this regard is scanty. Below are several accounts repeated from the Survey literature and Survey tradition.

John Locke, geological assistant for the Second Geological District (southwestern Ohio) during the first Geological Survey of Ohio, made several observations (Geological Survey of Ohio 2nd Annual Report, 1838) on the progress of his field work that give an insight into the methods employed in 1838 and the problems encountered by a traveler in rural Ohio. Locke left Cincinnati for Butler County on May 7, 1838, with the following equipment:

> horse and light wagon, portable barometer, thermometer, clinometer, pocket sextant, microscopic compass, level and stand, case of drawing instruments, microscope, balance and weights, tape measure, camera lucida, hammer, leather valice [sic], several chemical tests, and several portable engineering instruments.

Locke commented upon the lodgings generally available and their effect on field work:

> Arriving at Dayton I took lodgings at the National Hotel, a very respectable house, where the name *national* is less inappropriate than to two taverns in the woods between this and Eaton, and three or four between Dayton and Columbus. Almost every log shanty with a whiskey cage in the corner, is denominated "United States Hotel" or "National Hotel." Although this is not geology, yet being compelled often to lodge at a nasty drunkery, nauseated with tobacco smoke, and kept awake by nocturnal bacchinals, had much to do with the comfort of a geologist, and his being sufficiently refreshed to be able to continue his laborious duties.

Locke further commented upon the distrust of the local citizens of a "government man" making observations in their area, many regarding him suspiciously as a speculator. Locke related the following incident in Adams County in this regard:

> In preparing to ascend we had driven the wagon quite out of the road and tied the horse securely to a tree. On descending we found the horse had been untied and led into the road, while a long-nosed, lank-sided species of hog common to this region, was a little ahead with a sheaf of oats in his mouth. It appeared as if the plan had been laid by some "native" to have the hog with its oats entice the horse, and the horse pursue and impel the hog. This exhibited a grade of wit certainly not very high in the scale, but yet quite as high as a large proportion of that which seems to be very self-satisfying to its author. The horse being too well disiplined in his duty of eighth geological assistant to be guilty of any such insubordination, kept his ground. We seated ourselves and proceeding a few rods, met a man with a load of oats who seemed not inclined to give an inch of a road which was only 6 feet wide, but beckoned to us to turn out upon the side hill. Having been in a habit of driving over almost every thing, I thought I could safely do it. But being heavily laden with boxes of specimens, and, having my little son in the wagon with me, I was unable to keep its balance, and in turning again into the road it upset. Having my barometer slung to my back, and taking care of it and my son I received the shock upon my hip bent laterally, which, although the bones were neither broken nor dislocated, was so much injured as to give acute pain, and disable me from walking. The climbing of hills to take their altitudes was therefore interrupted for sometime. Fortunately neither my son nor my engineering assistant, the barometer, had received the least injury.

Apparently the luxury of horse and wagon transport enjoyed by Locke and his colleagues on the first geological survey did not carry over to later workers. D. Dale Condit, author of the still valuable volume on the Conemaugh in Ohio (OGS Bulletin 17, 1912), was required to walk the length of the outcrop (from Lawrence County to Columbiana County). A letter from Condit to State Geologist J. A. Bownocker requested that a horse and wagon be made available for Condit's use. The request was apparently denied. Condit also related the quality of local accommodations during his work on the Conemaugh. Facilities for public lodging were apparently few and far between so Condit was often required to seek lodging for the night with a farmer in the vicinity at the end of the day's field work. In a letter to Bownocker, Condit relayed his experience at one local farm house where the bed bugs were so bad that he spent the night under a tree.

Considerable controversy arose in the Survey during the 1920's over the use of an automobile for field work, as related by Raymond Lamborn to Richard DeLong. Wilber Stout (State Geologist, 1928-1946) disdained the use of automobiles in any way for field work and was a great advocate of what he termed "two cylinder Munson's" as the principal means of propulsion from one point to another ("Munson" referring to the shoe last used to make field boots during World War I). It was finally decided that an automobile could be used for field work but it was only to be used as a means of transport to the area where field work was to be done for the day. Stout's "two cylinder Munson's" were to be the only means of travel until the day's work had concluded.

These brief glimpses of geologic field work in bygone days give us some feeling of our heritage as geologists for the Survey. Readers who are aware of other anecdotes in earlier days of Ohio geology are encouraged to submit them to the editor of this newsletter.

—Michael C. Hansen

SURVEY STAFF CHANGES

COMINGS

Douglas C. Coll, Assistant Driller, Regional Geology Section.
Rene L. Fernandez, Geologist, Regional Geology Section.
Richard R. Pavey, Geologist, Regional Geology Section.

MAXVILLE FAUNA PAPERS AVAILABLE

The reallocation of warehouse space at the Ohio State University resulted in the availability of more than 100 copies of William Clifford Morse's classic paper, *The fauna of the Maxville Limestone.* This 67-page report was issued in 1911 as Special Paper No. 17 of the Ohio Academy of Science. Thirty-six photos and drawings of invertebrate fossils from the Maxville Limestone (Middle and Late Mississippian in age) accompany the text.

The Survey will distribute single copies of this report to individuals or institutions as long as the supply lasts. Mail requests should be accompanied by $1.00 for postage and handling.

REVISION OF OIL AND GAS PIPELINES MAP

The data-collection phase of the revision of the *Oil and gas pipelines in Ohio* map has begun. The previous edition of this popular 1:500,000-scale map was published in 1973 and is greatly in need of updating.

Numerous companies and municipalities involved with oil and gas pipelines have been contacted by letter by the Survey; however, there may be new companies not on our list or perhaps some that were inadvertently missed. Any organizations that were not contacted are requested to furnish the Survey with maps of their pipeline operations.

In order to insure an accurate revision of the state map, data furnished to the Survey should include: current locations of pipelines; commodity carried in the line (oil or gas); pumping stations; terminals; refineries; propane-storage facilities; underground gas-storage facilities; and liquid-petroleum storage areas.

All information and communications should be addressed to Philip Celnar, Head, Technical Publications Section, ODNR, Division of Geological Survey, Building B, Fountain Square, Columbus, Ohio 43224.

—Philip Celnar, Head
Technical Publications Section

AGGREGATE STUDY PUBLISHED

As part of the Survey's continuing program on Ohio aggregates, results of a study of carbonate aggregates have been published. This report, *Physical properties of carbonate aggregate from Ohio,* was authored by David A. Stith, head of the Survey's Geochemistry Section.

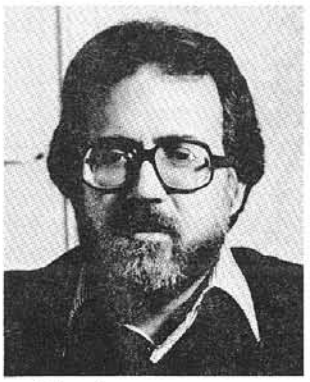
Twenty-six large (150-250 lbs) samples of carbonate aggregate were collected from quarries in 19 Ohio counties and subjected to an array of analyses of physical properties including size analysis, sodium sulfate and freeze-thaw soundness, Los Angeles abrasion, specific gravity, and absorption. The samples also were chemically analyzed. These samples represent currently quarried limestones and dolomites of Ordovician, Silurian, Devonian, Mississippian, and Pennsylvanian ages.

Carbonate aggregate is used in Ohio as an important constituent of concrete, in asphalt, and for fill and railroad ballast. Construction practices and requirements have become increasingly complicated and sophisticated; it is therefore necessary for industry to have detailed information on the properties of various carbonate aggregates in the state. This study, Report of Investigations No. 121, gives an important overview of the properties of commonly used carbonate aggregates in Ohio. RI 121 is available from the Survey for $1.16, which includes tax and mailing.

Historical vignettes

The Sunbury erratic, located east of Sunbury, Delaware County, is thought to be the largest nonsedimentary glacial erratic in Ohio. This photograph was taken by Arthur L. Burgess in 1936 and sent to Wilber Stout, 6th State Geologist of Ohio. Burgess, using his children for scale in the photo, supplied the following caption, in part: "Son, Laurance is 6 feet 1 inch. Daughter, Marilyn is - - large."

SURVEY STAFF NOTES



Phil Celnar

Doug Crowell

Phil Celnar is Head of the Survey's Technical Publications Section. His responsibilities include overseeing all production and printing aspects of Survey publications and the supervision of seven cartographic and production personnel. Phil is an accomplished cartographer and graphic designer whose talents are reflected by many Survey publications. He also handles all aspects of design, layout, and production of *Ohio Geology.*

Phil came to the Survey in 1966 as a cartographer after receiving a Bachelor of Fine Arts degree from Ohio State University and serving two years in the U.S. Army as an illustrator at the Pentagon. He was appointed head of the Technical Publications Section in 1976. Phil is married and enjoys golf and occasional jogging.

Doug Crowell is a Geologist in the Regional Geology Section and has principal responsibilities in the areas of coal, clay, and shale. Doug also has seen considerable service as Project Geologist with the Survey's core-drilling rig and can probably claim the honor of having logged more core than any geologist currently on staff.

Doug, who is from Hudson, came to the Survey in 1977 after completing bachelor's and master's degrees in geology at Miami University in Oxford, Ohio. He has enjoyed the variety of projects he has been involved with at the Survey, but Doug was particularly stimulated by his work on the forthcoming coal atlas of Ohio. Doug is married, has two children, and enjoys photography and soccer as leisure-time activities.

FIREBALLS IN SOUTHWESTERN OHIO

The Scientific Event Alert Network (SEAN), located at the Smithsonian Institution in Washington, D.C., reported to the Survey the passage of three fireballs or bolides across southwestern Ohio this past fall. A large bluish-green to green fireball was observed for about 2 seconds over Waynesville in Warren County on October 27, 1983, at 10:08 P.M. (EDT) by Jim Reist of the Dayton Museum of Natural History. This fireball was visible in the northeast sky and was travelling to the north towards the horizon. The fireball brightened, dimmed, and then brightened again during its passage. No sounds or fragmentation of the meteoroid were observed.

Another fireball, which was reported to be very bright, passed overhead from north to south in Cincinnati on November 27, 1983, at 2:45 A.M. (EST). This fireball fragmented into two pieces.

A third fireball was observed in the southern sky over Troy, Miami County, on November 30, 1983, at 5:58 P.M. (EST). This bright fireball, which varied from bluish white to green, fragmented into at least two pieces, which appeared to follow one another.

All of these fireballs apparently were witnessed by a limited number of observers, making it difficult to track the luminescent path of the fireballs. None were seen to disappear directly overhead and no sounds or sonic booms were reported, phenomena which are characteristic of the terminal point of a meteoroid's atmospheric passage. The occurrence of such phenomena can pinpoint probable impact areas of meteorites. *Ohio Geology* readers are encouraged to report any observations of fireballs to the Survey.

WHAT'S YOUR LINE?

Research in Ohio geology, a biennial report on current research on the geology of Ohio, will be compiled again in 1984 and will cover the 1982-1983 period. The report is based on responses to a questionnaire sent to university professors, government and industry geologists, and other researchers. Letters and questionnaires will be sent out late in January 1984; response deadline is March 1, 1984. Anyone who has a current research project on Ohio geology to report but who may have been missed in the mailing is asked to write or call for a copy of the questionnaire. Please contact Merrianne Hackathorn, ODNR Division of Geological Survey, Fountain Square, Building B, Columbus, Ohio 43224, telephone (614) 265-6590.

1981 MINERAL INDUSTRIES REPORT AVAILABLE

The Survey recently published the *1981 report on Ohio mineral industries,* compiled by Survey geologist and mineral statistician Margaret R. Sneeringer. This report lists all Ohio mineral producers by commodity and reports production figures for each of these commodities.

Data for the 1981 report were collected by the Ohio Department of Industrial Relations, Division of Mines and were transferred to the Survey in mid-1982 for compilation and publication. The basic format for the 1981 report is similar to previous Division of Mines reports. Beginning with the 1983 report, the first year the Survey has had complete control of the data, there will be changes in both format and concept for the mineral industries report.

Single copies of the 71-page *1981 report on Ohio mineral industries* are available free of charge from the Survey.

Ohio Department of Natural Resources
Division of Geological Survey
Fountain Square, Building B
Columbus, Ohio 43224

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