WINTER 1988

Ohio Geology Newsletter

Division of Geological Survey

THE LAND BENEATH THE LAND— TOP-OF-ROCK AND DRIFT-THICKNESS MAPS

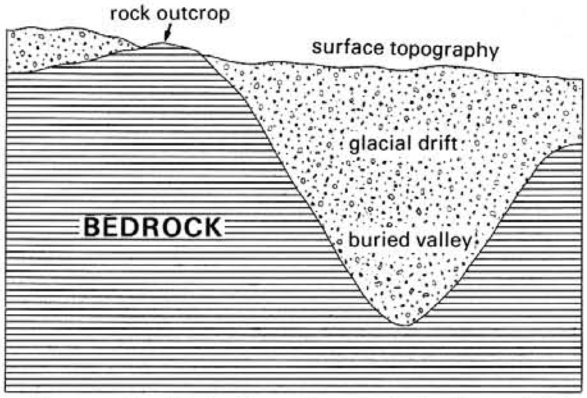
by Michael C. Hansen

Each day thousands of motorists driving Interstate 75 in western Ohio vault across a chasm more than a mile wide and 400 feet deep—and they perform this feat of daring without even the slightest anxiety. This breathtaking chasm is the valley of the preglacial Teays River, and the reason for the calmness (perhaps best termed ignorant bliss) of passing motorists is that the valley is completely filled with unconsolidated sediments. The relatively flat landscape gives no hint of the deep valley far below.

It is probably surprising to most Ohioans to learn that a complex system of hills and valleys lies buried beneath glacial sediments that blanket all but the southeastern part of the state. Indeed, in many areas of Ohio, especially in the western half of the state, a relatively flat, muted topography conceals large, deep buried valleys and steep hills. In other areas, a hummocky, irregular topography created by moraines or kames of glacial origin may overlie a relatively flat, undissected bedrock surface with little relief. In effect, in glaciated areas of the state, the surface topography of the landscape commonly provides little indication of the topographic surface of the bedrock beneath it. Knowledge of the configuration of the bedrock surface and the thickness of the glacial drift obviously has practical applications in construction activities, the search for resources of geologic origin such as minerals and ground water, and many other diverse applications.

It is the job of the geologist to provide this knowledge in the form of specialized geologic maps known as top-of-rock and drift-thickness maps. Such maps are being compiled by the Division of Geological Survey for counties in Ohio that were completely or partially covered by one or more glaciers of the Pleistocene Ice Age. In these counties, unconsolidated glacially derived sediments, collectively referred to as glacial drift, were deposited by or in association with continental ice sheets in an irregular, blanketlike deposit that covered the hills and filled in the valleys in the preglacial bedrock surface.

The bedrock surface in part of Ohio was complexly dissected over several million years by a preglacial drainage system known as the Teays River system.



Cross section illustrating a deep, buried valley and shallow bedrock. Such features commonly are not reflected by surface topography.

Other preglacial drainage systems carried out a similar dissection in other parts of the state (See *Ohio Geology*, Summer 1987, for a discussion of the Teays and other drainage networks). These preglacial drainage networks were destroyed and new drainage systems were established with the advance of glaciers over Ohio at the beginning of the Pleistocene Ice Age about 2 million years ago.

HOW TOP-OF-ROCK AND DRIFT-THICKNESS MAPS ARE COMPILED

A top-of-rock map, sometimes called a bedrock topography map, depicts the configuration and elevation of the bedrock surface as if all unconsolidated sediments had been removed. These maps are, in essence, contour maps of the irregular and dissected topography developed on the bedrock surface. Each contour line connects points of equal elevation. Contour intervals on top-of-rock maps for Ohio counties are commonly 20 feet, 50 feet, or 100 feet, depending on the relief in a particular area.

Drift-thickness maps depict, by means of contour lines, the thickness of unconsolidated sediments overlying the bedrock surface. Contour intervals on drift-thickness maps for Ohio counties utilize a 20-foot contour line to depict areas where unconsolidated sediments are 20 feet or less in thickness, and a 50-foot contour line and additional contour lines at 50-foot increments to depict increasing thickness of sediments. Drift-thickness maps are, in part, a reflection of the irregularities of the underlying bedrock

continued on next page

ODNR
OHIO DEPARTMENT OF NATURAL RESOURCES

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

Chief's corner by Horace R. Collins

The passage of Substitute House Bill 514 in the Ohio legislature was a very significant event for the funding of the Division of Geological Survey's statewide geological mapping program. This bill permanently allocates a portion of the funds collected through mineral severance taxes to the Division of Geological Survey. Regular readers of *Ohio Geology* will recall that in 1981 the Ohio General Assembly passed House Bill 385. That bill provided that a small portion of mineral severance taxes be set aside in a Geological Mapping Special Account. These funds were to be used specifically to develop detailed maps of the geology of Ohio's 88 counties plus other duties such as compiling mineral statistics and upgrading Division facilities. H.B. 385, however, contained a sunset clause which would have stopped funding in 1991. We are now assured through Sub. H.B. 514 that funding for this vital program will continue.

The mineral severance taxes do not, of course, fund the entire operation of the Division, but do supply dollars critical to a program with growing public interest. The mapping program has, as anticipated, proved to be very popular and useful to many segments of society. Developing staff, drilling, and laboratory capabilities to carry out a major mapping program has had many side benefits; the Division now has the flexibility and depth to pursue competitions such as the SSC and other economic development potential while, at the same time, generating a better understanding of complex geological conditions critical to environmental situations such as siting solid- and hazardous-waste disposal facilities and other activities requiring detailed geological knowledge. New and fascinating concerns are coming to light on such diverse areas as radon and crustal geology. The deepest rocks (the crust of the earth) of Ohio, which have scarcely been investigated, hold much promise for revealing important data on which to base new mineral exploration and new concepts on the basic geological framework of the state. Continuation of the mapping program will allow the Survey to expand its inquiries into these exciting areas.

The fact that reliable, objective geological and mineral-resource data help all segments of society in reaching informed decisions has not been lost on the public. As has been stated previously in this column, individuals, industry, and public agencies may disagree on many aspects of public policy, but virtually no one disagrees with the need for gathering reliable geological data on which to formulate opinions.

The vote by the Ohio General Assembly to make permanent a portion of the Division funding from the mineral severance taxes to continue the goal of developing geological and mineral-resource data for all Ohio counties and develop other geological data of value to society will serve all Ohioans well as we prepare to enter the 21st century.

OHIO GEOLOGY

A newsletter published quarterly by the Ohio Department Natural Resources, Division of Geological Survey, Fountain Square, Columbus, Ohio 43224. Telephone (614) 265-6605.

Editor: Michael C. Hansen
Secretary: Donna M. Schrappe
Phototypist: Jean M. Lesher
Pasteup artist: Philip J. Celnar
Halftones: Robert L. Stewart

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

surface, that is, drift is generally thicker over a buried valley and thinner over a buried hill or ridge. However, these maps also reflect surface topography—valleys and hills of unconsolidated sediments such as kames or moraines.

Compilation of top-of-rock and drift-thickness maps is a detailed and time-consuming process. Preparation begins by first locating all water wells (commonly several thousand) in a county and then plotting the locations of the wells on a county base map at a scale of 1:62,500. Either the elevation of the bedrock surface (for a top-of-rock map) or the thickness of the glacial drift (for a drift-thickness map) also are plotted on the base map; the depth to bedrock is determined from the records (drillers' logs) of water wells drilled in the state on file at the offices of the Division of Water of the Ohio Department of Natural Resources. In most cases the precise location of each water well must be field checked in order to minimize potential errors. Other geologic data useful in the compilation of these maps include outcrops of bedrock and glacial drift, bore holes from engineering tests, and logs of oil and gas wells. In short, any information on the depth to and the elevation of the bedrock surface is useful in compiling both of these maps.

After all of this information is compiled and plotted on a base map, a geologist then draws contour lines that connect points of equal elevation or drift thickness, depending upon the type of map. Such contouring requires considerable skill and experience because the distribution of data points across a particular county is almost always very irregular—some areas may have a high density of water wells and other information, whereas other areas may have only a few, widely spaced wells. The geologist must have a detailed understanding of preglacial drainage systems and other aspects of buried topography in order to project and interpolate contour lines. Data from surrounding counties must also be considered in order to insure continuity between adjacent counties.

USES FOR TOP-OF-ROCK AND DRIFT-THICKNESS MAPS

Top-of-rock and drift-thickness maps are fundamental interpretations of geologic information that have important implications for the solution of academic questions of geologic history, which in turn can be utilized in the solution of economic and practical questions facing society. The delineation of pre-Pleistocene and Pleistocene valleys and the drainage history of a region is of great potential value in locating aquifers that may be sources of large quantities of potable water. Detailed knowledge, therefore, of the location of buried valleys and the thickness of glacial drift can be utilized in siting water wells and in selecting building sites for homes and for industries that require a large supply of ground water.

Knowledge of the depth to bedrock in a particular area is valuable information for a variety of users including homeowners, construction companies, and mineral industries—such information can save considerable money and potential frustration. Consider the difficulty and added expense of digging a basement or a ditch for a pipeline and suddenly discovering that blasting or other expensive excavation techniques must be used to remove rock when it was anticipated that only easily removed unconsolidated sediments would be encountered. Obviously, prior knowledge of the depth of the bedrock would result in the selection of a homesite or route for a pipeline that would avoid shallow bedrock.

Top-of-rock and drift-thickness information is also valuable for siting stone quarries, where sites with minimal overburden are most desirable; in anticipating the length of surface casing necessary for oil and gas wells; and in siting landfills and other waste-disposal facilities. Such information is also valuable for zoning of areas of potential seismic risk—areas of shallow bedrock are commonly less prone to severe ground motion than are areas with thick, unconsolidated sediments.

It is apparent that top-of-rock and drift-thickness maps are of great value to a large number of Ohio citizens, and they can be of critical importance in locating homes, businesses, and industries and in insuring that the public health is protected. In recognition of this need and importance, the Division of Geological Survey has been diligently preparing top-of-rock and drift-thickness maps as part of the statewide county geologic mapping program.

Of the 65 counties in the state that were covered completely or in part by continental glaciers, top-of-rock maps have been completed for 26 counties and drift-thickness maps have been completed for 24 counties. Several other counties are now in progress as part of the Survey's long-term mapping program. Completed county maps are at a scale of 1:62,500 and are in open-file (OF) status. Diazo paper copies of these county maps are available from the Survey for $4.95 each, which includes tax and mailing. Please order by county, type of map (top-of-rock or drift-thickness), and OF number.

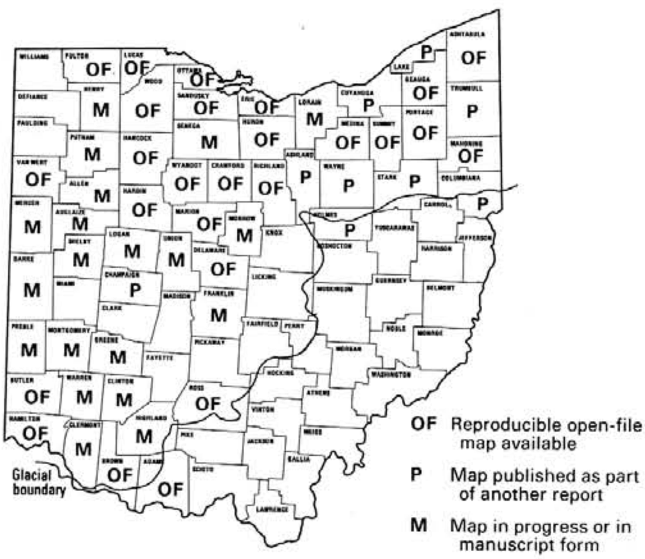
Maps for the following counties are now available:

TOP-OF-ROCK MAPS

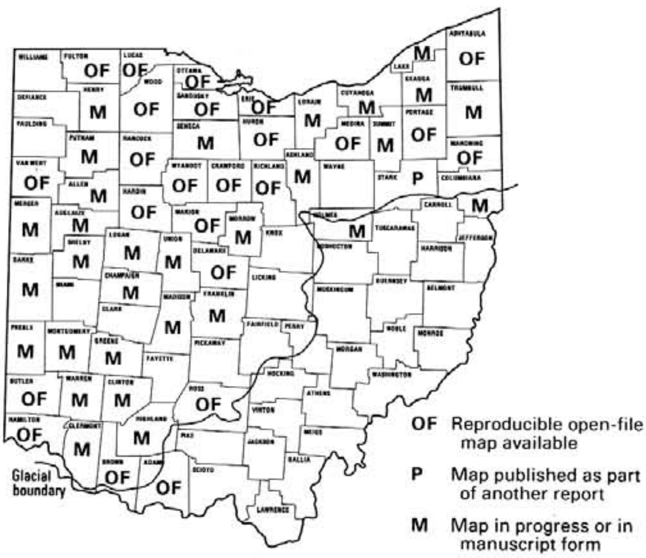
Adams	OF 243	Lucas	OF 241
Ashtabula	OF 206	Mahoning	OF 247
Brown	OF 223	Marion	OF 239
Butler	OF 227	Medina	OF 219
Crawford	OF 221	Ottawa	OF 213
Delaware	OF 119	Portage	OF 204
Erie	OF 208	Richland	OF 224
Fulton	OF 28	Ross	OF 207
Geauga	OF 117	Sandusky	OF 214
Hamilton	OF 229	Summit	OF 116
Hancock	OF 235	Van Wert	OF 115
Hardin	OF 231	Wood	OF 245
Huron	OF 210	Wyandot	OF 217

DRIFT-THICKNESS MAPS

Adams	OF 244	Lucas	OF 242
Ashtabula	OF 122	Mahoning	OF 248
Brown	OF 222	Marion	OF 240
Butler	OF 228	Medina	OF 225
Crawford	OF 220	Ottawa	OF 215
Delaware	OF 120	Portage	OF 205
Erie	OF 209	Richland	OF 121
Fulton	OF 29	Ross	OF 226
Hamilton	OF 230	Sandusky	OF 216
Hancock	OF 236	Van Wert	OF 114
Hardin	OF 232	Wood	OF 246
Huron	OF 211	Wyandot	OF 218

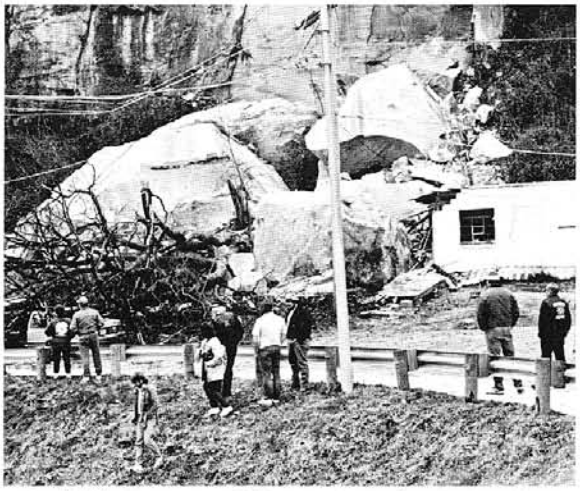


Status of current county top-of-rock mapping in Ohio.



Status of current county drift-thickness mapping in Ohio.

POMEROY ROCKFALL: AGAIN



Rockfall at Pomeroy, Ohio, on November 29, 1987. Large blocks of Pomeroy sandstone (Pennsylvanian) were detached from the lighter colored area of the cliff face. Note the vertical bounding joints in the cliff. The motel building to the right was previously abandoned because of earlier rockfalls at this site. To the left of the area of the photograph is a house trailer that was partially crushed by the sandstone blocks. U.S. Route 33 is in the foreground. Note also the car that was struck by a tree toppled by the rockfall. Photo by Athens Messenger.

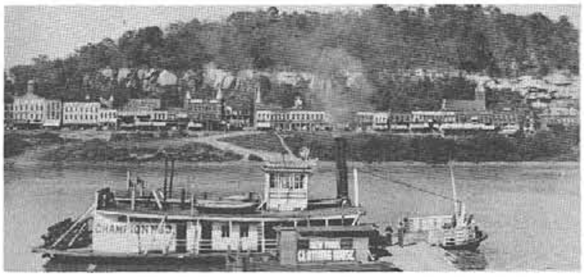
Pomeroy is a Meigs County community on the Ohio River that is literally wedged between a rock and a wet place, and in the not too distant past these two environments periodically merged during spring floods. The problems of the wet place have largely been controlled by an extensive series of locks and dams on the Ohio River, but the rock still presents a periodic and unpredictable danger to the peace of mind of Pomeroy residents.

At 2:35 p.m. on November 29, 1987, several large blocks of massive sandstone tumbled from a cliff bordering U.S. Route 33 in Pomeroy. The annual community Christmas parade had passed by the site only 20 minutes or so before the rockfall occurred. A Mason, West Virginia, woman was slightly injured when her eastbound car was struck by limbs from a large tree uprooted by the crashing boulders. Blocks of sandstone also crushed a house trailer; however, the man occupying the dwelling escaped injury when he heard the slide and ran to safety.

The building of the former Shamrock Motel, reported to have been abandoned previously because of the rockfall hazard, also was damaged. The highway was closed until 10:30 p.m. and about 175 homes were without electricity for nearly 6 hours.

This rockfall is reminiscent of a similar one on December 2, 1971, at the nearby post office on Second Street in Pomeroy (See *Ohio Geology*, Spring 1986). In this rockfall, approximately 830 cubic yards of sandstone fell into the mail-sorting room and parking lot of the post office. Fortunately, this event occurred at 2:00 a.m., when the normally busy parking lot was empty. Local residents of Pomeroy recall other less well documented instances of large blocks of sandstone tumbling onto the community.

The reasons for this seeming scourge are, of course, geologic, but it was a geologic reason that first attracted settlers to construct a town on this site. A thick coal, known as the Pomeroy or Redstone coal, is present locally beneath the



View of Pomeroy from the West Virginia side of the Ohio River. Note the high cliff of Pomeroy sandstone forming the backdrop for the town and the vertical joints and promontories in the sandstone. Photo by Wilber Stout, circa 1928.

massive sandstone. This coal was mined and shipped from this site by boat to Cincinnati beginning about 1805. The proximity of coal deposits to river shipping and the discovery of concentrated brines that could be evaporated into salt led to the growth of a community on a site that had negative geologic aspects as well as positive ones.

Most of the town of Pomeroy is constructed on a narrow terrace along the outside bend of a large meander of the Ohio River. A massive sandstone, of Pennsylvanian age (Monongahela Group) and approximately 50 feet thick, forms the valley wall. Many homes, businesses, public buildings, U.S Route 33, and several secondary roads occupy this narrow terrace. In this crowded situation, many buildings are situated just beneath the sandstone cliff.

Rockfalls are the most dangerous of downslope movements of earth materials because they involve relatively large volumes of massive blocks of rock that move downslope very rapidly and commonly with no warning. They can occur wherever massive, cliff-forming rocks such as sandstone or limestone have vertical cracks, known as joints, and weak basal support. Sufficient removal of basal support through natural processes of weathering and erosion, or through human activities, can set the stage for the occurrence of a rockfall through such triggering mechanisms as vibrations or increase of the weight of the overhanging block of rock by saturation from moisture.

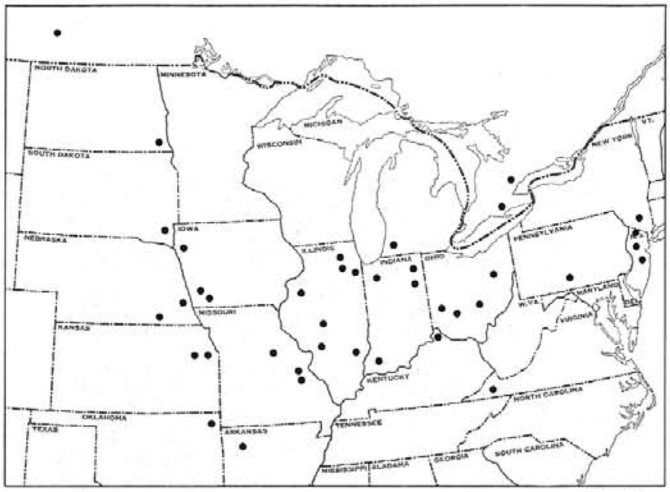
The massive sandstone that forms the backdrop for the community of Pomeroy is named, appropriately, the Pomeroy sandstone. This unit is poorly cemented, especially in the lower part, and is cut by at least two sets of vertical joints or fractures, one perpendicular to the cliff and one parallel to it. The sandstone is underlain by relatively weak, incompetent shale or clay that tends to erode faster than the overlying resistant sandstone. Many joint-bounded promontories of sandstone jut out from the main cliff.

Such conditions are classic prerequisites for a rockfall, which is a normal process of valley widening through mass wasting. Rockfalls are unpredictable as to when and exactly where they might occur, but certainly joint-bounded promontories that lack good basal support are likely candidates for future events. Most alternatives for reducing the hazard are expensive and include scaling off the promontories, bolting the promontories to the main cliff, or providing increased basal support. Installing a line of boulders at the base of the slope can effectively catch the blocks of rock that may come down during a rockfall. Certainly, preventive techniques such as avoiding removal of basal support from the promontories and keeping surface flows of water away from such promontories are helpful.

—Michael C. Hansen

WHEN "BULLWINKLE" ROAMED OHIO

The strange-but-true world of Ice Age animals included a bizarre-looking moose (not that the modern moose is a thing of beauty) known as the stag-moose, or more technically as *Cervalces scotti.* These animals roamed Ohio until about 10,000 years ago and were widely distributed across the northern United States and southern Canada during and immediately after the retreat of continental glaciers of the Pleistocene Ice Age. Remains of stag-moose were unknown in Ohio until a single vertebra was found in excavations by the Dayton Museum of Natural History in Darke County in the early 1970's.



Distribution of stag-moose remains in North America (distributional data courtesy of Gregory McDonald, Cincinnati Museum of Natural History).

Although the stag-moose was probably a common animal in Ohio during the Pleistocene, their remains have been infrequently noted. This circumstance is perhaps an artifact of recognition because the bones of this, and certain other Ice Age mammals, are not all that different in size from bones of domestic horses and cows. It is probable that many individuals encountering such bones during an excavation merely regard them as the mortal remains of "Old Dobbin" or "Bossy," disposed of by a farmer in the recent past. Mastodons and mammoths, which possessed big bones that can hardly be overlooked, are commonly reported; perhaps 200 separate individuals of these proboscideans have been discovered in the state.

The Ohio record of stag-moose began to change when another specimen, consisting of a portion of an antler beam, was recovered by the Dayton Museum in Clark County in 1979. But this specimen was only recently recognized as belonging to *Cervalces scotti,* when Dr. Richard A. Davis of the Cincinnati Museum of Natural History "discovered" it in the Dayton collections.

This small and fragmentary record of stag-moose in Ohio really began to improve dramatically in June 1985 when excavations for a pond on the farm of David and Kay Currens in Jersey Township, Licking County, near Johnstown, yielded numerous bones of this animal. These remains included foot and leg bones, a vertebra, the left lower jaw, and a portion of the skull that had diagnostic parts of the antler beam attached. This specimen, which is now at Orton Museum, Ohio State University, is the largest known specimen of stag-moose, according to Dr. C. R. Harington (National Museums of Canada), an expert on *Cervalces.* Radiocarbon dates on a bone from this specimen and on wood associated with it suggest that the animal died about 11,500 years ago.

The best was yet to come, however. In July 1987, excavations for a pond on the property of Dr. Louis Rodabaugh of Hartville, Stark County, turned up a nearly complete skeleton of *Cervalces scotti.* Not only is this the most complete specimen of stag-moose from Ohio, it is probably one of the most complete skeletons from anywhere and is certainly the best skeleton of a female of this species.

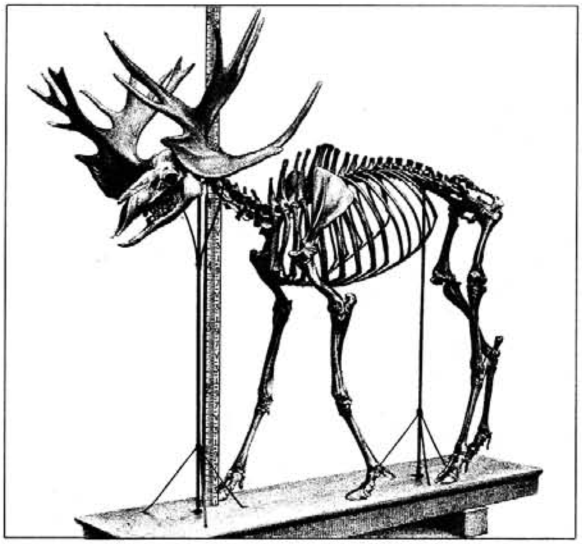
Dr. Carl Albrecht (the Ohio Historical Society) with bones of Cervalces scotti *from Hartville, Stark County, Ohio.*

The Hartville specimen of stag-moose was recovered by Don Bier and Dr. Carl Albrecht of the Ohio Historical Society, Columbus. Michael Angle, a glacial geologist with the Division of Geological Survey, investigated the geology of the site. Interestingly, the skeleton was found about 7 feet below the surface in an upright position. A single bone of a mastodon was also found in the excavations.

Certainly a common thread among the discoveries of bones of *Cervalces scotti* and most other remains of Ice Age animals in Ohio is that they are typically recovered during excavations for farm ponds or drainage ditches. This apparent irony is really not so unusual, however, when it is taken into consideration that a logical place to dig a farm pond is in a topographically low area that is swampy or moist. Such sites generally represent the final stages of former lakes or ponds, known as kettles, that were formed when a block of ice became detached from the main glacier and was buried by sand and gravel outwash. When the ice block melted, a water-filled depression was formed.

The gradual infilling of the kettle lake, progressing from a relatively deep, clear body of water to a swampy, vegetation-choked area, is well illustrated by the sequence of sediments displayed in cross sections revealed during excavations. Commonly, the basal lake sediments consist of bluish clay or marl (if carbonate deposition was dominant) that is overlain by peat. The clay or marl represents relatively deep, clear waters, whereas the peat represents a shallowing stage of lake infilling when aquatic vegetation flourished.

Without doubt, such kettle lakes were attractive watering holes for various Ice Age animals. Some of these animals, including *Cervalces scotti*, must have fed on the lush shoreline and aquatic vegetation that grew in these lakes during the warmer months of the year. Animals such as mastodon, mammoth, and stag-moose must have occasionally become mired in the bottom mud of these lakes and, unable to extricate themselves, died and sank into the soft, preserving sediments. The upright position of the Hartville specimen of *Cervalces scotti* may represent an animal that met just such a fate.



*Skeleton of a male stag-moose (*Cervalces scotti*) discovered in the 1880's in New Jersey. This specimen is at Princeton University and has long served as the standard for comparison of stag-moose remains (from W. B. Scott, 1885, Proceedings of the Philadelphia Academy of Sciences, p. 174-202).*

The stag-moose was an impressive animal, similar in size to a modern moose but with a very different looking rack of antlers. In contrast to the broad, shovel-shaped antlers of modern moose, the stag-moose possessed narrow, palmate antlers with long, sharp tines. These animals inhabited the muskeg environment along the glacial border, as evidenced by the distribution of most specimens in deposits in the north-central United States. Similar to the modern moose, *Cervalces scotti* must have been a browser and probably spent considerable time during the warm months nibbling aquatic vegetation in the numerous kettle lakes that dotted the recently deglaciated landscape.

No individuals of *Cervalces scotti* are known to have survived the Pleistocene, which ended about 10,000 years ago. No radiocarbon date is yet available for the Hartville specimen, but the Darke County specimen is associated with a radiocarbon date of about 10,200 years ago. This time seems to mark, at least in Ohio, the approximate time of extinction of not only *Cervalces scotti* but also mastodon, mammoth, ground sloth, giant beaver, and a host of other large mammals, collectively known as the megafauna.

The reason for this apparently coincident demise is uncertain and has been the subject of volumes of speculative theories. Radical environmental changes or overhunting by Paleo-Indians have been popular themes. In the case of the stag-moose, it has been suggested that competition from immigrant modern moose may have been a critical factor in the demise of the former. Nevertheless, discoveries of such skeletal remains are a source of local excitement and, in no small way, are of considerable scientific importance as clues to the puzzle of the rise and fall of the Pleistocene megafauna.

—Michael C. Hansen

EMPLOYEE OF THE YEAR AWARD

Lawrence H. Wickstrom, right, receives "Employee of the Year" plaque from Division Chief Horace R. Collins.

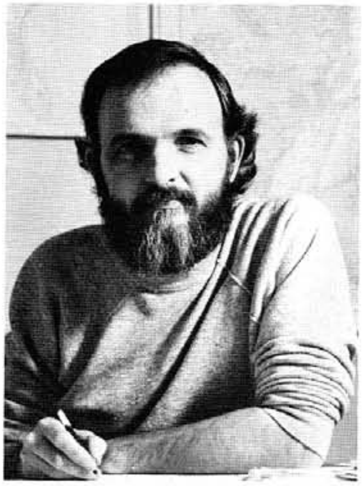
Lawrence H. Wickstrom, a geologist in the Subsurface Geology Section, was the recipient of the Survey's 1987 "Employee of the Year" award in ceremonies held at the Division's annual Christmas luncheon. This award, created in 1983, recognizes superior efforts and contributions by an employee. It has particular significance because honorees are selected from nominations submitted by fellow employees.

Larry is orginally from Canton and came to the Survey in 1983 after receiving B.S. and M.S. degrees in geology from Kent State University. His primary focus at the Survey has been on Cambrian-Ordovician subsurface stratigraphy, with particular emphasis on the Trenton Limestone of northwestern Ohio. In addition, Larry has recently been working on Devonian shales as part of a Gas Research Institute grant to the Survey. His computer skills have enabled Larry to develop a system for computerization of data on Devonian shale gas wells.

Larry is admired by his fellow employees for his enthusiasm, dedication, and friendliness. He is always eager to help others and willing to spend the time and effort to complete a project or task in the best way possible.

Larry is currently president of the Ohio Geological Society and is past president of the Ohio chapter of the Computer Oriented Geological Society. He and his wife reside in Columbus.

JAMES A. BROWN RETIRES



James A. Brown, cartographer supervisor in the Technical Publications Section, retired on December 31, 1987, after a successful 22-year career at the Division of Geological Survey. Jim's artistry as a draftsman and skills in preparing color geologic maps are second to none and will be greatly missed at the Survey, along with his always good humor and positive attitude. Indicative of both his technical expertise and affability, Jim received the Division's first "Employee of the Year" award in 1983.

Jim lives in Delaware County with his wife and three children and plans to pursue other employment in the areas of graphics or cartography. In addition, he intends to devote more time to his hobbies of fishing, landscape painting, and collecting antique pocket knives. We wish Jim the best of success with these ventures. His skills and personality will be missed at the Survey.

CAESAR CREEK FIELD TRIP A SUCCESS

The Division of Geological Survey's fossil-collecting field trip at Caesar Creek State Park on November 7, 1987, was a resounding success despite rain and blustery weather. A total of 227 registrants from Ohio and as far away as Missouri and Rhode Island braved the elements to search for Ordovician fossils on the extensive outcrop along the emergency spillway below the dam at the park, located in Warren County. The U.S. Army Corps of Engineers, the agency responsible for the dam and spillway, was extremely cooperative with the Survey in the organization of this event.

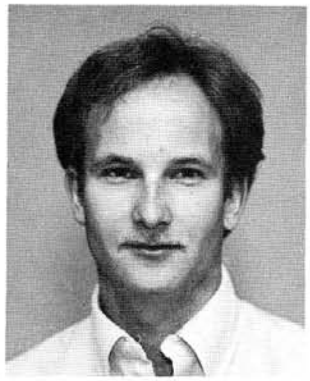
Owing to the limited parking, the field trip was publicized only to subscribers to the *Ohio Geology* newsletter. The field trip was the concluding event in the Survey's celebration of its Sesquicentennial Year. The enthusiastic response from participants suggests that future outings at this or other sites would be well received.

Although every collector did not find a highly prized fossil such as a trilobite, all found fossils in abundance. Survey personnel assisted collectors in locating and identifying specimens. Single copies of the guidebook prepared for this trip, Open-File Report 87-1, *Guide to the fossils and geology of Caesar Creek State Park,* are available from the Survey at no charge.

—Douglas L. Shrake
Regional Geology Section

SURVEY STAFF NOTES

Toni McCall



Mac Swinford

Toni McCall is a word-processing specialist in the Regional Geology Section and handles all secretarial tasks, including typing of numerous manuscripts prepared by section geologists, correspondence, stratigraphic and core records, and numerous other duties. Toni came to the Survey in 1985 with extensive training and employment in data and word processing.

Toni is originally from Cleveland and now lives in Columbus. She particularly enjoys working with people at the Survey and pursuing her hobbies of designing crocheted and sewn clothes, bowling, and fishing.

Mac Swinford is a geologist in the Regional Geology Section and is coordinator of the mapping of Lower Paleozoic rocks for the Survey's statewide county geologic mapping program. Mac is a graduate of Kiski School and has a B.A. degree in geology from Ohio Wesleyan University and an M.S. degree in geology from Eastern Kentucky University. He also worked in Wyoming as a mudlogger before coming to the Survey in 1983. He particularly likes doing traditional geologic field mapping of Ohio's Lower Paleozoic stratigraphy.

Mac, who is originally from Columbus but grew up in Pittsburgh, lives in the Columbus suburb of Grandview Heights with his wife and daughter. He enjoys woodworking and his home computer as hobbies.

CUYAHOGA COUNTY GLACIAL REPORT

The Division of Geological Survey recently issued Report of Investigations No. 134, *Glacial and surficial geology of Cuyahoga County, Ohio,* by John P. Ford. This publication consists of a full-color map at a scale of 1:62,500 and a 29-page report that describes the physiography, glacial deposits, surficial bedrock units, and mineral resources of the county.

The map depicts the distribution of glacial and bedrock units on a topographic base compiled from U.S. Geological Survey topographic quadrangle maps. The text includes a table listing textures and composition of till samples and 17 measured stratigraphic sections.

This report on highly urbanized Cuyahoga County will be of great value to planners, engineers, mineral producers, the construction industry, and to individuals interested in the geologic history and development of the landscape of Cuyahoga County. Report of Investigations No. 134 is available from the Division of Geological Survey for $15.44, which includes tax and mailing.

UPCOMING MEETINGS

Ohio will host three geologic meetings of note in upcoming months. Each meeting will feature a variety of oral presentations and poster sessions on geologic topics. One or more geologic field trips will also be offered. For additional information, please contact the appropriate person listed below.

April 20-23, 1988, Akron. North-Central Section, Geological Society of America, Annual Meeting. Contact: Lindgren L. Chyi, Department of Geology, University of Akron, Akron, OH 44325. Telephone: 216-375-7630.

April 29-May 1, 1988, Newark. The Ohio Academy of Science Annual Meeting. Contact: Lynn Edward Elfner, Ohio Academy of Science, 445 King Ave., Columbus, OH 43201. Telephone: 614-424-6045.

August 21-24, 1988, Columbus. Fifth Annual Midyear Meeting of the Society of Economic Paleontologists and Mineralogists (SEPM). Contact: Walter C. Sweet, Department of Geology and Mineralogy, Ohio State University, Columbus, OH 43210. Telephone: 614-292-2326.

QUARTERLY MINERAL SALES, JULY—AUGUST—SEPTEMBER 1987

compiled by Sherry Weisgarber Lopez

Commodity	Tonnage sold this quarter[1]	Number of mines reporting sales[1]	Value of tonnage sold[1] (dollars)
Coal	8,033,214	206	248,356,273
Limestone/dolomite[2]	13,730,280	100[3]	49,948,101
Sand and gravel[2]	12,607,221	194[3]	41,765,556
Salt	713,878	5[4]	6,232,579
Sandstone/conglomerate[2]	511,934	27[3]	7,581,624
Clay[2]	313,511	23[3]	1,140,313
Shale[2]	698,489	16[3]	879,948
Gypsum[2]	62,861	1	597,180
Peat	4,441	2	55,012

[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.

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

OHIO DEPARTMENT OF NATURAL RESOURCES
DIVISION OF GEOLOGICAL SURVEY

Naturally OHIO the heart of it all!

BULK RATE
U.S. POSTAGE PAID
Columbus, OH
Permit No. 537

Total copies printed: 3,000
Unit cost: $.4092
Publication date: 3/88