SPRING 1982

Ohio Geology Newsletter

Division of Geological Survey

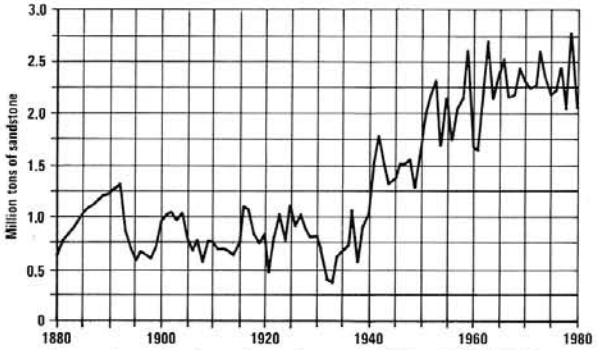
OHIO'S SANDSTONE INDUSTRY

Ohio sandstone has supported a variety of industries since the early 1800's. Sandstone is an abundant resource in the state, mainly quarried in the eastern half of the state from rocks of Mississippian to Permian age. Ohio's high-silica sandstones are especially versatile and have been used in the glass, iron, steel, ceramic, and construction industries. Ohio has led the rest of the U.S. for years in production of dimension sandstone, that is, stone cut to a specific size rather than being crushed when quarried. The earliest uses of Ohio sandstone were as building materials and date back to before the advent of European settlement in the region.

In 1838 John Locke, a geologist with the first Geological Survey of Ohio, surveyed an old Indian fortification on Fort Hill, located in Highland County. He found that the walls were built from the thin-bedded Mississippian-age sandstone (Berea) that caps the hills in that area. Locke dated the structure by counting tree rings in trees that had grown on the walls of the fort. The trees were over 600 years old. Artifacts discovered near the fort are Hopewell, dating from the period 200 A.D. to 700 A.D., possible evidence for an even earlier building date.

By the time John Locke filed his report in 1838, sandstone had been in commercial production at several locations around the state for about 25 years. In Scioto County on the Ohio River, the Buena Vista sandstone had been produced since 1814, providing construction materials for locks, dams, and buildings in Cincinnati. Farther east the Hanging Rock Iron District saw the growing use of sandstone in the construction of iron furnaces. Grindstones and decorative and building stone were being quarried in Washington County as early as 1819. In northern Ohio, John Baldwin was just establishing a grindstone industry in what would become one of the most productive localities of dimension sandstone in the world—Berea, Ohio.

Unfinished grindstones of Upper Marietta sandstone (Dunkard Group) at the Marietta Stone Co. quarries, Washington County, circa *1920.*



Annual production of sandstone in Ohio: 1880-1980

By the late 1800's Ohio's annual output of sandstone had topped 1 million tons. Many county courthouses, large churches, and other public buildings throughout Ohio and much of the eastern U.S. and Canada were built from Ohio sandstone. But sandstone began to face stiff competition from brick, cement, and Indiana limestone. As quarries closed, accessibility of the railroads played an important role in determining which localities remained in production.

Despite the setbacks of competition, the production of Ohio sandstone continued to grow slowly as new uses were found for the resource. Annual production of sandstone began to top 2 million tons in the 1950's and has exceeded that figure annually for nearly the last 20 years. The estimated total production of sandstone in Ohio from 1800 to 1980 was 145,493,773 tons. That is enough sandstone to build 21 pyramids the size of the Great Pyramid at Giza—the largest monument ever built by man.

The geologically oldest sandstone in commercial production today is the Berea "grit," of early Mississippian age, quarried in northern Ohio in Erie, Huron, and Lorain Counties. The deepest and largest quarries in Ohio are located at South Amherst, in Lorain County. The Buckeye Quarry is 240 feet deep and produces dimension stone from the massive sandstones that make up the lower portion of the Berea. The No. 6 Quarry, called the "Gray Canyon," has been producing sandstone continuously for over 100 years and is thought to be the largest sandstone quarry in the world. The massive bedding and excellent bearing strength make the Berea a valuable building stone. Berea sandstone has been shipped to many parts of the U.S. and Canada for use in public buildings and bridges.

Originally it was the upper layer of thin-bedded sandstone that attracted the eye of pioneer John Baldwin, who developed a commercial process to turn out grindstones. The angularity of the grains made the Berea an excellent source of grindstones, and at one time the Berea produced four-fifths of the

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ODNR
Ohio Department of Natural Resources
James A. Rhodes, Governor • Robert W. Teater, Director • Horace R. Collins, Chief

Chief's corner by Horace R. Collins

All Ohioans are undoubtedly aware of the serious financial condition of the State. Legislators and public administrators alike are looking for solutions to our present problems. Cutbacks in funding are having a serious effect on the operation of the Division of Geological Survey and, given the condition of the State's monetary position at the present time, we would feel negligent toward those we serve if we did not mention our current situation. The Division of Geological Survey along with its sister Divisions and Offices in the Department of Natural Resources has sustained several substantial reductions in general revenues over the past year and further cuts are anticipated. The seriousness of these cuts is even more significant when it is realized that the operating budget for the current fiscal year is substantially below operating levels of the previous fiscal year. Obviously no public agency can continue to absorb heavy cuts in operating funds without seriously affecting services.

The fact is, services to the public from the Division of Geological Survey have been affected. Some of these effects are immediately obvious to those who frequently use the services of the Division while others will not be noticed until later. The most immediate effects have been a reduction in staff, an almost total curtailment of equipment purchases, a reduction in data-gathering activities, and a virtual cessation of printing.

The Subsurface Geology Section, which is extensively patronized, is, for example, operating with 20 percent fewer staff at a time when the work load has increased 60 percent. One might ask, how can that much more work get done with fewer people? The answer is simple—it isn't. This particular phase of our operation is months behind on its work load. If a citizen requests a map from the Subsurface Section it will be anywhere from 5 to 8 months out-of-date.

The work of the Lake Erie Section, which assists private home owners and local municipalities in resolving shore erosion problems, will be sharply curtailed. Other similar shortcomings are beginning to happen in almost all areas of the Division's operations. The printing of technical reports and maps has come almost to a complete stop. These reports and maps constitute the data base that industry, government, and private citizens often use to make policy decisions and as such are the lifeblood of a Geological Survey.

Laboratory and field equipment does wear out with use and needs replacement. New equipment is needed from time to time to upgrade facilities and to provide the increasingly sophisticated data commonly requested by industry, planners, design engineers, exploration geologists, lawyers, legislators, and local policy makers. The loss of research tools and research ability quickly reaches a point of severely diminishing returns. Because of a decline in funding, the equipment and space needs of the Division's coal-washing laboratory could not be met. With a slumping coal industry in Ohio and rising concerns with sulfur in coal the Geological Survey is getting more, not less, frequent requests for information on coal washability. It's obviously a bad time to reduce these vital services.

The Survey is being forced to use for general operations those funds originally set aside for other program uses such as deep drilling to evaluate resources in previously unexplored sections of the State. With each cut in general revenue the closing down of drilling operations comes one step closer. There is even serious doubt as to how forcefully we can move into the new mapping program provided for by HB 385.

In short, every cut has materially reduced the Survey's ability to serve the public. Everything that can be temporarily deferred has been long deferred. Every saving that can be made has been made. Every additional reduction in funds will be purchased at a further reduction in staff. There isn't anything left to cut but the basic program. Over the long term, continual underfunding will weaken the Geological Survey's ability to provide essential technical and resource information to all segments of our society who need geological and mineral resource data.

OHIO GEOLOGY

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grindstones used in the world. Grindstones were shipped as far away as Russia, South America, and Japan.

During the 1800's Buena Vista, on the Ohio River in Scioto County, was one of the earliest and most important quarrying centers. The Buena Vista sandstone is a medium-bedded, fine-grained, and remarkably uniform stone, part of the Cuyahoga Formation of Mississippian age. Known as the City Ledge because of its early popularity with architects in Cincinnati, Buena Vista sandstone was quarried extensively for building stone and canal works. Like the Berea it was shipped all over the U.S. as building stone.

Around the turn of the century production of the Buena Vista sandstone shifted to McDermott, a station on the Norfolk and Western Railroad in Scioto County. Although the competition of brick, cement, and other stone caused a decline in demand for a time, in recent years companies marketing the Buena Vista sandstone have developed a new product—laboratory table tops made from Buena Vista slabs impregnated with special resins. This treatment forms a chemically resistant and durable surface for laboratory work.

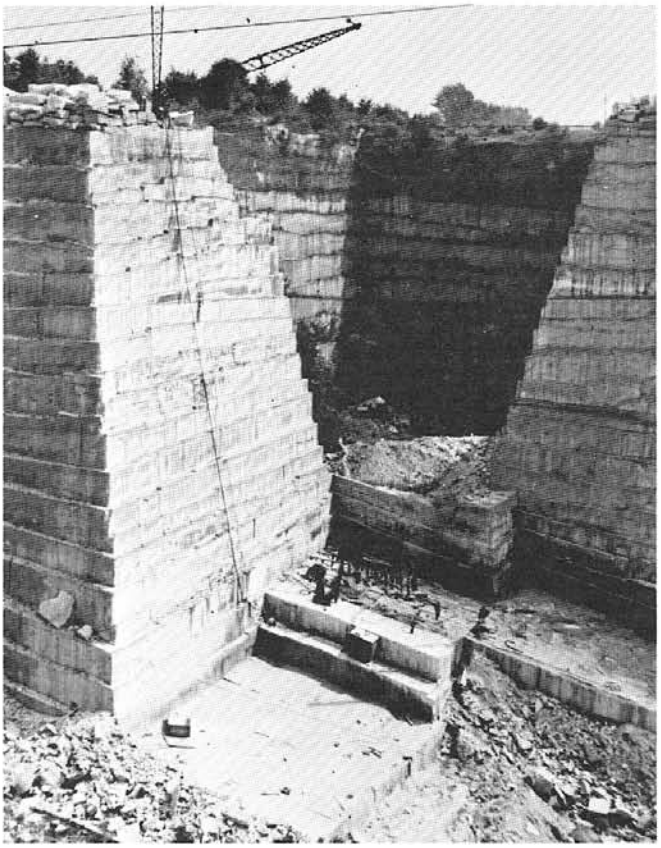
Sharon sandstone (Lower Pennsylvanian) in North Quarry of Industrial Silica Corp., Portage County.

Although the Sharon sandstone has been quarried as dimension stone, today it is primarily used for crushed and broken stone products. The Sharon sandstone is quarried in two widely separated areas of Ohio: in Geauga, Portage, and Summit Counties in northeastern Ohio and in Jackson, Pike,

and Ross Counties in southern Ohio. Geologic evidence indicates two geographically distinct but compositionally similar source areas for the Sharon, the oldest Pennsylvanian-age deposit in Ohio. The Sharon sandstone is composed almost entirely of quartz sand and pebbles. Its chemical purity and extremely high silica content give the Sharon excellent refractory qualities needed for many purposes in the iron, steel, and ceramic industries. When first exposed, the Sharon sandstone is easily crushed and quarried, but exposure and subsequent case hardening make it a workable dimension stone.

The Massillon sandstone is another excellent refractory sandstone owing to its high silica content. In Coshocton, Holmes, and Knox Counties its strong cementation also makes the Massillon sandstone an excellent source for building stone. The color of the Massillon differs from site to site; it is produced in shades of brown, red, pink, burgundy, buff gray, and amber for construction uses. The Massillon is also quarried for refractory brick and other industrial purposes. In Perry County, the Massillon sandstone is quarried for glass sand and foundry sand. The Massillon sandstone, like the Sharon sandstone, is also of Pennsylvanian age, belonging to the Pottsville Group.

Several other sandstones of Pennsylvanian and Permian age are quarried in eastern and southeastern Ohio both as dimension stone and as crushed and broken stone. The tonnage of crushed and broken stone products far exceeds the production of dimension sandstone; nevertheless Ohio holds a leading position in the production of dimension sandstone.



Buckeye Quarry of Cleveland Quarries Co. in the Berea sandstone at South Amherst, Lorain County.

The two leading U.S. producers of dimension sandstone are both located in Ohio. Briar Hill Stone Company of Glenmont, Ohio, quarries Massillon sandstone in Coshocton and Knox Counties for refractory and construction materials, and is listed as the no. 1 producer of dimension sandstone in the 1978-1979 U.S. Bureau of Mines Minerals Yearbook. Next in production tonnage is the Cleveland Quarries Company (a division of Standard Slag Company of Youngstown, Ohio), which quarries Berea sandstone in Erie and Lorain Counties for grindstones, rubble, curbing, flagging, ashlar, and construction stone. The Cleveland Quarry Company operates the Buckeye Quarry and the No. 6 Quarry at South Amherst. With the help of these and other dimension sandstone producers in the state, Ohio has led the U.S. in production of dimension sandstone for many years.

A tour across Ohio would reveal many uses of Ohio sandstone. Most of the county courthouses and many fine public buildings and churches were constructed and trimmed with Ohio sandstone. Ohio canals were fitted with locks and dams made of local sandstone. The National Road and the railroads ran on beds of crushed sandstone and crossed bridges and culverts of Ohio sandstone. Today, iron and steel industries use Ohio sandstone as a source of molding sand, refractory brick, and raw material for ferrosilicon. Although future trends are difficult to predict, Ohio has the raw materials to support a sturdy and versatile sandstone industry supplying a wide variety of needs for the people of Ohio and beyond.

—Karen Van Buskirk
Technical Publications Section

GEOLOGIC MAPS – BEDROCK

Geologic maps and their accompanying explanatory reports are the principal means by which a geologist portrays and conveys information concerning the geology of a particular area. Such maps are not only useful to other geologists but also are of importance to mineral industries seeking new mineral deposits, to planning and engineering agencies concerned with the properties and characteristics of the local geology, and to citizens who are curious about the rocks or potential mineral deposits beneath their property.

Of the many kinds of geologic maps, some of which will be described in future issues of *Ohio Geology,* perhaps the most fundamental is the bedrock geology map. These maps depict the geologist's interpretation of the surface distribution and configuration of various rock units over a particular area as if all unconsolidated materials had been removed. Such maps may be prepared at various scales depending upon the detail in which geologic information is to be depicted. In Ohio, mapping is done principally at a scale of 1:24,000 (7½-minute quadrangle, 1 inch equals 2,000 feet) and either published at this scale or reduced to a scale of 1:62,500 (1 inch equals 1 mile) and composited with other reduced 7½-minute quadrangles to form a county map.

To prepare a bedrock geology map the geologist must first gather all existing information about the geology of the area to be mapped. This information consists of descriptions and thicknesses of outcropping rocks (measured stratigraphic sections) prepared during previous geologic investigations in the area (such sections are filed by county and township in the permanent files of the Survey), location and evaluation of drillers' records from water wells (which may number several thousand within a county), and evaluation of geophysical and drillers' records from oil and gas wells.

After these preliminary reconnaissance data are plotted and evaluated the geologist must begin the lengthy and

rigorous process of field work. The geologist attempts to visit every significant outcrop of rock in the area and at each of these locations the thickness of the rocks is precisely measured and a detailed description of each bed of rock is prepared. Such features as rock type, grain size, color, bedding structures, fossils, and minerals are noted along with the precise map location and elevation of the measured section. In many cases samples of various rock units are collected for laboratory analysis.

Once the geologist has completed field work in an area, which may require several field seasons depending upon the size of an area, its geologic complexity, and the abundance of exposed rock, analysis of all of the assembled data begins. The geologist must decide what rock units are to be portrayed on the map. Commonly, a geologic formation is the primary map unit depicted, but, depending on many factors, either larger or smaller subdivisions may be shown on the map. Persistent and important beds of rock may be portrayed as a line on the map.

In unglaciated portions of the state the bedrock units are drawn directly upon a topographic map; however, in glaciated areas, where the bedrock may be covered by unconsolidated glacial material, the contour lines of a topographic map do not portray the configuration of the bedrock surface. In these cases a topographic map of the bedrock surface, known as a top-of-rock map, must be constructed before the bedrock geology can be portrayed. Top-of-rock maps are constructed by contouring elevations of the bedrock surface obtained from water-well data and other sources.

Because the rocks are not everywhere exposed in an area—indeed, exposures may be very limited—the geologist must evaluate all of the information that has been gathered and project the geology from well-known areas into areas where little or no information exists. This requires an intimate knowledge and understanding of the geologic structures and mode of deposition of the rocks. The geologist depicts degree of uncertainty by various types of lines delineating beds of rock or contacts between formations. Solid lines indicate a high degree of certainty, whereas dashed lines indicate less certainty and inferred contacts.

A bedrock geology map commonly shows the locations of pits, quarries, and mines from which various mineral resources are or have been extracted in the past. In addition, structure contours are drawn on a prominent or important rock unit such as a coal or a limestone. These contours show the elevation and structural configuration of the bed of rock, that is, they depict the direction and rate of dip of the rock unit and any flexures, bends, or breaks that indicate structures known to geologists as anticlines, synclines, or faults.

In addition to the bedrock geology map the geologist may prepare additional maps that portray specific aspects of the bedrock geology. These maps may show the distribution, quality, and thickness of a mineral deposit such as coal, clay, limestone, or sandstone and such information as the depth of the deposit and any structural peculiarities associated with it. Maps showing the thickness and structure of potential oil- and gas-bearing units may also be desirable. Geologic hazards such as areas prone to landslides may also be the subject of separate maps. In addition to these various maps the geologist commonly constructs cross sections of an area that show the thickness and characteristics of the underlying bedrock.

From the above discussion, it is apparent that the process of mapping bedrock geology is detailed and time consuming. The rewards are, however, worth the effort because the detailed bedrock map and its derivative maps serve as a permanent and accessible record of the geology of a particular area. Mineral industries, both immediately and in the future, can utilize the geologic information to make informed decisions as to future exploration and expansion. Engineers and building contractors can use bedrock information in order to avoid potentially hazardous landslide-prone areas and determine areas in which excavations can be made with the least effort and greatest safety. Local and regional planning agencies can utilize the bedrock information in regulating development within an area and determine the best sites for waste disposal and other activities. In short, intelligent decisions can be made by a wide variety of citizens based upon reliable and detailed information in an area for which a bedrock geology map has been prepared.

ROCK AND MINERAL CLUBS IN OHIO

Ohio's rich and varied geology provides the hunting grounds for a large number of avid rock hounds. Many of them gather for monthly meetings to share their interests, skills, and specimens with other rock hounds. All of them share the desire to discover the hidden beauties in Ohio's rocks and minerals, and so they know their state in a special way.

Rock and mineral clubs in Ohio. Numbers refer to table below.

MIDWEST FEDERATION MINERALOGICAL AND GEOLOGICAL SOCIETIES–1982-83 OHIO CLUBS

1. Akron Mineral Society (Cuyahoga Falls)
2. Ashtabula County Gem and Mineral Club (Austinburg)
3. Brukner Center Gem & Mineral Club (Troy)
4. Brunswick High School Geology Society (Brunswick)
5. Chippewa Gem & Mineral Society (Medina)
6. Cincinnati Mineral Society (Cincinnati)
7. Cleveland Geological Society (Cleveland)
8. Columbus Rock and Mineral Society, Inc. (Columbus)
9. Dayton Gem & Mineral Society Inc. (Dayton)
10. East Ohio Lapidary Club, Inc. (Leavittsburg)
11. Euclid Lapidary & Mineral Society (Euclid)
12. Fairview Park Lapidary Society, Inc. (Fairview Park)
13. Firelands Geological Club (Norwalk)
14. Fort Hamilton Gem and Mineral Society (Hamilton)
15. Hancock Geological Society (Forest)
16. Heights Gem & Mineral Society (Pepper Pike)
17. Lake Erie Gem & Geological Society (Elyria)
18. Lake Shore Mineral and Lapidary Society, Inc. (Mentor)
19. Licking County Rock & Mineral Society (Newark)
20. Manchester Earth Science Jr. Club (Akron)
21. Medina County Gem & Mineral Society (Seville)
22. Miami Valley Mineral and Gem Club (Fairborn)
23. Micro Mineral Society of the Cleveland Museum of Natural History (Cleveland)
24. Mineralogical Society of Cleveland (Cleveland Heights)
25. Parma Lapidary Club (Parma)
26. Port Clinton Earth Science Club (Port Clinton)
27. Richland Lithic and Lapidary Society (Mansfield)
28. Rockport Lapidary Club (North Olmsted)
29. Rockwell International Gem & Mineral Club (Columbus)
30. Roehm Geology Club (Berea)
31. The Rolling Stones (Worthington)
32. Stark County Gem and Mineral Club (Canton)
33. Stonelick Valley Gem & Mineral Society (Mt. Repose)
34. Summit Lapidary Club, Inc. (Cuyahoga Falls)
35. Toledo Gem & Rockhound Club (Toledo)
36. Tuscarawas Valley Gem & Mineral Society (New Philadelphia)
37. Wayne County Gem & Mineral Club (Wooster)
38. West Central Ohio Rock Club, Inc. (Lima)

The Midwest Federation of Mineralogical and Geological Societies (MWF) includes 38 Ohio clubs. These Ohio clubs report a total membership of over 2,500 people, including more than 300 junior members. Many of these clubs are affiliated with museums, schools, nature centers, rock shops, and industries around Ohio. The clubs range in size from a handful of interested individuals to a Toledo club reporting 269 members. Other clubs around the state are not a part of

the MWF and their numbers would swell the totals even more. Some club members are professionals, including geologists, ceramic engineers, jewellers, and science teachers, but most are amateurs, some of whom cultivate their interest in rocks and minerals to a high level for the sheer fun of it. Some clubs focus their activities on a particular field such as mineralogy, paleontology, or lapidary work, but most seem to combine aspects of all three in their club pursuits.

During the year, a club may travel to collect gem-quality flint at Flint Ridge and fossils at Hueston Woods, to study the mineral collections at a nearby museum and the faceting of gems at a jeweller's shop. Clubs invite experts in the various fields to lecture and demonstrate their particular areas of interest at the monthly meetings. Some clubs own equipment to prepare specimens for display and jewelry.

Rock and mineral clubs around the state also sponsor shows that provide an opportunity for the general public to sample the skills and rewards of collecting. The shows are often an annual affair, such as the ones in Cincinnati and Columbus that are held each year in April. Commercial dealers display specimens and equipment for sale, and clubs arrange for special displays, lectures, and demonstrations. Commonly, the admission fee goes to fund scholarships in the earth sciences.

All of this study and practice has its rewards: the beautiful collections of fossils, rocks, and minerals as well as the lovely jewelry crafted by one's own hand. But perhaps the best of all is the sheer enjoyment of recognizing a real find in the field. Rock hounds know Ohio streams for what they are: the instruments that sort, tumble, reveal, and deposit treasures from the earth. And collectors can find precious specimens where others may fail to see any value: in the spoil piles of coal mines, in the debris left from quarrying, in road cuts, and in gravel pits around the state. Their hobby truly is a kind of exploration and exciting discoveries are a real part of it.

Perhaps because of this special perspective rock hounds can better understand the issues concerning Ohio's mineral resources. Rock and mineral collectors frequently view the activities involved in mineral production, they seek a knowledge of the local geology, they often have a curiosity about mineral deposits of all kinds, and therefore develop insight into the problems and potentials of mineral resource development.

Thus the value of this hobby is far greater than the worth of a collection and tools. Rock and mineral club members know their state in a special way. They have an appreciation for the treasures hidden beneath the surface of the earth and revealed by quarry, road cut, and stream. Fossil, rock, and mineral collecting provides them with a hobby that combines some of the best aspects of outdoor living, exploration and discovery, handiwork and artistic expression, and continuing education in the sciences. The rock hound's curiosity, experience, and unique perspective on Ohio's mineral resources make this individual a better informed citizen on many of the significant resource issues in the state. All in all, rock hounding seems a pretty good way to spend one's precious free time!

BOOK ON GREEN RIVER FISH AVAILABLE

The Wyoming Geological Survey has issued a bulletin that is of interest to fossil collectors throughout the world, including many in Ohio. This volume, Wyoming Geological Survey Bulletin 63, *Paleontology of the Green River Formation with a review of the fish fauna* by Lance Grande, is packed with superb photographs and line drawings of not only the well-known fish fauna from this Eocene lake deposit but also many other types of fossils.

Green River fish are available for sale or trade at nearly every rock and mineral show, rock shop, and even in many gift shops throughout the country. Any collector of these specimens, either casual or serious, will find this volume to be a great aid in identification of specimens and in gaining an understanding and appreciation of the unique deposit. Bulletin 63 may be ordered for $8.00 from the Wyoming Geological Survey, Box 3008, University Station, Laramie, Wyoming 82071.

1982 GEM AND MINERAL EVENTS IN OHIO

Apr 24-25 SHOW	COLUMBUS, Veterans Memorial, 300 W. Broad St. Sponsored by Columbus Rock and Mineral Society, Inc., Licking County Rock & Mineral Society, Rockwell International Gem & Mineral Club, and the Rolling Stones.
May 15-16 SHOW	BEREA, Cuyahoga County Fairgrounds. Sponsored by Parma Lapidary Club, Fairview Park Lapidary Society, Inc., and Rockport Lapidary Club.
May 30 MINI SHOW	DAYTON, Riverbend Art Center, 142 Riverbend Dr. Sponsored by Dayton Gem & Mineral Society, Inc.
June 5-6 SWAP	WAUSEON, Fulton County Fairgrounds, Ohio Rte. 108. Sponsored by State Line Gem and Mineral Society of Tecumseh, Michigan.
June 12-13 SHOW	LIMA, Allen County Fairgrounds, Ohio Rte. 309 at I-75. Sponsored by West Central Ohio Rock Club, Inc.
June 19-20 SHOW	MEDINA, Medina County Joint Vocational School, 1101 W. Liberty St. Sponsored by Medina County Gem & Mineral Society and Chippewa Gem & Mineral Society.
June 19-20 SHOW	JEFFERSON, 4-H Building, Ashtabula County Fairgrounds. Sponsored by Ashtabula County Gem and Mineral Club.
July 11 SWAP	ELYRIA, Fox Farm, 10735 La Grange Rd. Sponsored by Lake Erie Gem & Geological Society.
Aug 14-22 SHOW	MANSFIELD, Kingwood Center, 900 Park Avenue West. Sponsored by Richland Lithic and Lapidary Society.
Sept 10-12 SHOW	TOLEDO, Masonic Complex, 4645 Heatherdowns Blvd. Sponsored by Toledo Gem & Rockhound Club.
Sept 11-12 SHOW	FINDLAY, Merchants Building, Hancock County Fairgrounds. Sponsored by Hancock Geological Society.
Sept 18-19 SHOW	CLEVELAND HEIGHTS, Heights Recreation Pavilion, 1 Monticello Blvd. Sponsored by Lake Shore Mineral and Lapidary Society, Inc., Heights Gem & Mineral Society, and Mineralogical Society of Cleveland.
Sept 18-19 SHOW	NEWARK, YWCA Building, 6th & W. Church St. Sponsored by Licking County Rock & Mineral Society.
Oct 2-3 SHOW	FAIRBORN, Lion's Den, Kona Hills. Sponsored by Miami Valley Mineral and Gem Club.
Oct 2-3 SHOW	CANTON, Stark County Fairgrounds, Wertz & 4th St. NW. Sponsored by Stark County Gem and Mineral Club.
Oct 16-17 SHOW	LEAVITTSBURG, Johnson Community Center, Gilmore Rd. Sponsored by East Ohio Lapidary Club, Inc.

NEW DEPUTY CHIEF APPOINTED

Robert G. Van Horn, former head of the Survey's Regional Geology Section, was recently appointed to the position of Deputy Chief by Horace R. Collins, Division Chief and State Geologist.

Bob, a native Ohioan from the Dayton area, came to the Survey in 1972 after receiving B.S. (1969) and M.S. (1972) degrees in geology from Ohio State University. He had previous summer experience with the Survey and as a field geologist for the oil industry in Montana.

Bob fills the position created by the resignation in July 1981 of Dr. Richard A. Struble, who left the Survey to become Senior Geologist with Tetra Tech, Inc., Columbus. In addition to administrative responsibilities, Bob has worked with mapping sand and gravel, surficial materials, and solid-waste-disposal sites and had responsibility for reviewing environmental impact statements and power-site applications for the Survey. More recently he has been involved in coal-resource evaluations and in preliminary investigations of Ohio's limestones and dolomites as sulfur dioxide sorbents in coal-fired fluidized-bed combustors.

In his new position Bob is looking forward to becoming better acquainted with industry and government representatives throughout the state as well as continuing to participate in the Survey's endeavors to provide Ohioans with geologic information, a commodity that is becoming increasingly important in today's society.

FLINT RIDGE

In the prehistoric network of commerce and industry in North America, Ohio's Flint Ridge played a pivotal role. Flint from Flint Ridge was traded all across North America because of its quality and beautiful color. The Flint Ridge area is covered with hundreds of shallow pits, where the Indians dug the raw materials for knives, scrapers, and arrowheads. Flint Ridge was a hub in a network of trails that radiated in all directions. As the flint travelled out from Ohio in trade, iron from Lake Superior, mica from the Appalachians, shells and sharks' teeth from the Gulf of Mexico, and obsidian from the Rockies flowed in to Ohio.

The value of Flint Ridge flint was not forgotten as the Indian culture gave way to European culture. Buhrstones for Ohio grist mills were produced at Flint Ridge and used to grind the corn of the early settlers. Farmers began to turn up thousands of flint implements and partially shaped or broken tools in their fields all around Flint Ridge, and in many other parts of Ohio.

In 1965 flint became the state's official gemstone, because the flint deposit at Flint Ridge is outstanding in the United States. Today's rock hounds and others still make regular pilgrimages to Flint Ridge to collect pieces of the brilliantly colored flint. Delicate masses of quartz crystals, useless to the Indians because they couldn't be shaped into tools, are now valued by collectors and carried home for display.

Museum at Flint Ridge.

Flint Ridge State Memorial preserves part of the area quarried by the Indians for so many years. Trails lead the visitor among the many flint pits; a museum built over an old quarry pit depicts the manner in which flint was quarried and shaped into implements. Although there are flint outcrops at the surface, the Indians dug deep for "fresh" flint, which is more easily shaped into tools.

Visitors may not collect flint in the state memorial, but outcrops along the road yield pieces of flint and quartz crystal. Fine quality pieces can also be collected on nearby farms, but permission must be obtained to collect on private land and generally a small fee is charged for the privilege. Collectors look for the brightly colored pieces which may be found in red, green, blue, yellow, pink, white, black, gray, or a mixture of colors. Even the quartz crystals may be found in a variety of colors.

Flint is a silica mineral with two qualities that make it an excellent raw material for tools: it is very hard and durable, but it is brittle enough to be shaped readily. Ordinary flint is gray to black, and is commonly found in association with marine limestones. Flint is generally amorphous (having no crystal structure) or cryptocrystalline (having a crystal structure invisible to the naked eye). Flint Ridge flint varies from the norm in its wide array of colors and the inclusions of quartz crystal masses.

As the visitor approaches Flint Ridge, the road climbs up onto a ridge capped by Pennsylvanian-age rocks of the Allegheny Group, more than 275 million years old. The flint is part of the Vanport limestone, and the flint deposit is massive and extensive, running roughly 8 miles long from east to west. Flint Ridge stretches from Hopewell Township in Muskingum County through Hopewell Township in Licking County to the eastern edge of Franklin Township in Licking County.

The Flint Ridge State Memorial and nearby collecting localities can be reached by going north 4 miles from the intersection of I-70 and Licking County Road 668 at

Brownsville, Ohio. The museum is run by the Ohio Historical Society and will open this year on Memorial Day weekend and close on Labor Day weekend. The hours of operation will be: Wednesday through Saturday, 9:30 a.m. to 5 p.m., and Sunday, noon to 5 p.m., May 29 through September 5. The museum will be closed July 4. Admission is $1.00 for adults and 75 cents for children; members of the Ohio Historical Society can visit the museum for free.

OHIO SAND SHIPPED TO SAUDI ARABIA

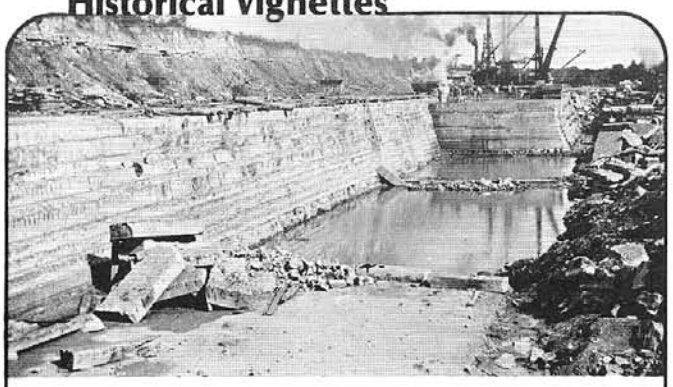
An Associated Press story concerning the shipment of 9 tons of sand from an Ohio sandstone producer to a sheik in Saudi Arabia was carried recently by newspapers nationwide and in several other countries. The sand, which is to be used in a swimming pool filter in Jidda, Saudi Arabia, was supplied by Walter C. Best, Inc., Chardon, Ohio. Added to the $50/ton cost of the sand was approximately $4,000 in freight charges, according to Wayne C. Johnson, Vice President, Marketing, for Best. Johnson added that the shipment represents only a small fraction of the more than 600,000 tons of sand produced annually at the Best plant.

The obvious irony alluded to in the newspaper articles—shipping sand from Ohio to a sand-rich region such as Saudi Arabia—gives some clue to the lack of public awareness about the variable quality and origin of sandstone and other mineral deposits and the fact that sand is simply a term denoting size. The Walter C. Best, Inc., operation in Geauga County quarries the Sharon sandstone, an extremely pure (98%± silica), poorly cemented, quartz sandstone that is easily disaggregated and screened into various size fractions ranging from fine sand to pebbles several inches in diameter. Such pure silica sands are not widely distributed throughout the world. Although the sheik may have been able to obtain sand adequate for his needs closer to home than Ohio, this incident does serve to point out the value and quality of the Sharon sandstone.

The Sharon was deposited in northeastern Ohio and northwestern Pennsylvania during early Pennsylvanian time by streams flowing southward from headwaters somewhere north of the present Erie basin. These streams carried a load of principally quartz sand and pebbles that were derived from the erosion of a sedimentary deposit—the Sharon is therefore a multicycle deposit, that is, it is the result of several cycles of erosion and deposition. Sharon sandstone is also exposed in southern Ohio (Jackson County and vicinity), but present evidence suggests that this deposit represents a separate stream system that had a source area in northern West Virginia. A third body of Sharon sandstone is present in the subsurface in eastern Ohio.

The Sharon sandstone has been quarried in Ohio in both the northeastern and southern areas of outcrop for a considerable period of time, and extensive reserves insure that adequate supplies of this important mineral resource will be available for many years to come. Sharon sand and pebble is used for ferrosilicon, foundry sand, glass sand, refractory sand, polishing and grinding sand, and a host of other uses that require very pure silica sand. Fairly minor but perhaps more noticeable uses of Sharon sand and pebble are as an architectural aggregate and as the sand in golf course sand traps.

Historical vignettes



McDermott Stone Company quarry in Buena Vista sandstone (Lower Mississippian), Scioto County, circa *1920. Photo by J. A. Bownocker.*

SURVEY STAFF NOTES

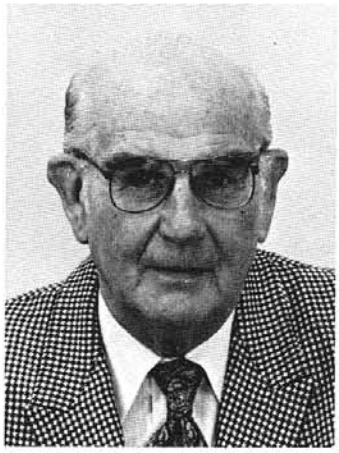
Barbara Adams

Richard Carlton

Barbara Adams is administrative secretary in the Administrative Section of the Survey. She acts as liaison between the Chief, Deputy Chief, other divisions and departments, the public, and other Survey staff. Barbara began state service in 1961 with the Ohio Department of Taxation. In 1964 she came to the Subsurface Geology Section of the Survey. While Barbara was part of that section she researched and compiled the *Subsurface information catalog—1968-1974* (Information Circular 46). In 1974 she was promoted to Office Manager of the Administrative Section and continues to keep the Survey running smoothly. Barbara handles the division payroll and has served temporarily as EEO representative and personnel officer. In her spare time, Barbara likes to sew and work in her garden. She lives with her husband Carl in Columbus.

Richard Carlton is a petrographer in the Regional Geology Section. Dick received his B.S. in geology at Washington State University, and then his M.S. and Ph.D. in geology at Oregon State University. Upon leaving school, Dick packed up his family and moved to Ohio to join the Division of Geological Survey in 1970. During the last 12 years, Dick has been involved in petrographic assessment of Ohio clays, shales, and coals. Currently Dick is studying the characteristics of pyritic sulfur in Ohio coals with the Survey's new computerized microscope and image-analysis system. The objective of this study is to develop a petrographic technique for predicting the washability of individual coals from small core samples. After hours, Dick enjoys golf, tennis, and gardening. He lives in Upper Arlington with his wife, Patty, and children, Jennifer and Peter.

FORMER STATE GEOLOGIST HONORED



Ralph J. Bernhagen, former State Geologist and Chief of the Division of Geological Survey (1957-1968), was honored February 27, 1982, by the League of Ohio Sportsmen and the Ohio Wildlife Federation at their 74th annual convention as an outstanding individual in the field of conservation.

Bernhagen, whose specialty is ground-water geology, has served the state of Ohio for more than 40 years, beginning his career with the Water Supply Board in 1941. In 1949 he became Chief Geologist with the Division of Water in the newly formed Ohio Department of Natural Resources. Bernhagen came to the Survey in 1953 as Assistant Chief and became State Geologist and Division Chief in 1957, a position he held until 1968. Currently Bernhagen is special assistant for Lake Erie to the Chief of the Division of Water.

OHIO GEOLOGY SLIDE CONTEST

Do you have a favorite 35mm color slide of an outcrop, mineral industry, landform, sedimentary structure, or rock, mineral, or fossil specimen? It may be a winner in the Ohio Geology Slide Contest being sponsored by the Survey.

Winning photos will be displayed at the 1982 Ohio State Fair and the awards ceremony will be held at the Fair on Conservation Day, Saturday, August 14, 1982.

The principal requirements of the contest are that the photograph be a 35mm color slide and that it portray some aspect of Ohio geology. For a list of rules and an official entry form, write: Ohio Geology Slide Contest, Division of Geological Survey, Ohio Department of Natural Resources, Fountain Square, Bldg. B, Columbus, Ohio 43224. Entries must be submitted by May 31, 1982.

CORE RIG UPDATE

The coring project designed to investigate high-calcium limestone resources in western Ohio (*Ohio Geology*, Winter 1982) has recently been completed and now begins the lengthy process of chemical evaluation of the cores.

The Survey rig has now moved to southern Ohio, where approximately eight cores are to be drilled in a search for additional occurrences of the Clarion (No. 4A) coal and possible southeastward extension of the Sharon (No. 1) field of Jackson County. Project geologists Douglas Crowell and Clark Scheerens will evaluate the cores taken in Athens, Gallia, Jackson, Meigs, and Vinton Counties.

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

GEOLOGY SERVES OHIO