



# GEOFACTS No. 28

OHIO DEPARTMENT OF NATURAL RESOURCES • DIVISION OF GEOLOGICAL SURVEY

## CELESTINE IN OHIO

The sublime beauty of a mineral often is reflected in its name: celestine (celestite), which comes from the Greek “coelestis” meaning celestial, alludes to the light-blue color of the mineral named by German geologist Abraham Gottlieb Werner. The name is derived from a bedded, fibrous variety discovered in 1799 in Blair County, Pennsylvania. Today celestine is the name officially recognized by the International Mineralogical Association. The spectacular, prismatic crystals discovered on “Strontian Island” (Green Island) in 1820, west of Put-in-Bay in the Ohio portion of Lake Erie, were the most sought after by collectors and museums during the nineteenth century. A quick search of the Smithsonian Natural History Museum mineral database lists 89 celestine specimens from Ohio; 16 of those specify Lake Erie as a location. Classic Ohio celestine localities include the Lime City quarry (Wood County) and the unique, world-class Crystal Cave on South Bass Island.

### GEOLOGIC SETTING

Celestine occurs primarily in Devonian-age and Silurian-age dolomitic limestone associated with the Findlay Arch of northwestern Ohio. It also rarely can be found in the vicinity of the Serpent Mound meteorite impact structure located in south-central Ohio. Faulting and fracturing along the Findlay Arch facilitated movement of hot, saline fluids containing an enriched content of strontium and other elements that precipitated to form various minerals. The mineralization is most likely related to multiple fluid migration events that also included secondary dolomitization of the host rock. Celestine has been found in the Devonian-age Detroit River Group, Dundee Limestone, Ten Mile Creek Dolomite, and Silica Formation on the west flank of the Findlay Arch and the Columbus and Delaware Limestones on the crest and east flank of the Findlay Arch. Celestine also has been found in the Silurian-age Salina Group (including Bass Islands Dolomite), Tymochtee Dolomite, Greenfield Dolomite, and Lockport Dolomite on the crest or eastern flank of the Arch. Celestine crystals normally line small vugs or occur along fractures; quarry operations sometimes expose large, mineralized cavities several feet across.

### MINERALOGY

Celestine is a strontium sulfate ( $\text{SrSO}_4$ ), related to barite ( $\text{BaSO}_4$ ), and usually forms crystals or aggregates in cavities and fractures of dolostone in northwestern Ohio. Celestine is transparent to translucent and generally white to light blue but may be colorless or pale yellow. Crystals often occur in tabular, bladed, columnar, or blocky habits. Celestine is relatively soft (can be scratched easily with a knife), heavy, and appears vitreous to pearly. Several Ohio localities produce multiple mineral specimens that may include celestine and purple, yellow, or brown fluorite ( $\text{CaF}_2$ ); stontianite ( $\text{SrCO}_3$ ); barite; sphalerite ( $\text{ZnS}$ ); calcite ( $\text{CaCO}_3$ ); and rarely galena ( $\text{PbS}$ ).

Celestine is the primary ore for strontium and has not been mined in the United States since 1959; worldwide supply comes primarily from Mexico. The major uses of strontium are flares and fireworks (crimson color); ferric ceramic magnets; and glass for cathode ray tubes used in color televisions, although this use

is rapidly being replaced by liquid crystal display (LCD) and other technologies. Minor uses of strontium include refining of zinc, toothpaste for sensitive teeth, and as an additive to drilling fluids for oil-and-gas wells in the United States. Strontium atoms are used for the world’s most accurate clocks.

### *Crystallography and physical properties of celestine*

Crystal Symmetry	Orthorhombic dipyramidal
Moh’s Hardness	3–3.5
Specific gravity ( $\text{g/cm}^3$ )	4.0
Fracture	Irregular
Cleavage	Perfect on {001}; good on {210}; poor on {010}
Streak	White
Solubility	Very slightly soluble in water

### WHERE TO SEE CELESTINE

Crystal Cave on South Bass Island is a globally unique underground display of stunning celestine crystals up to 18 inches (45 cm) in length. It is often described as the “world’s largest geode,” although it lacks many of the geologic features associated with a geode. Celestine was first discovered on South Bass



*Celestine crystal group, 7.5 cm in height, from a quarry near Portage, Wood County, Ohio. John Medici specimen, Terry Huizing photo.*

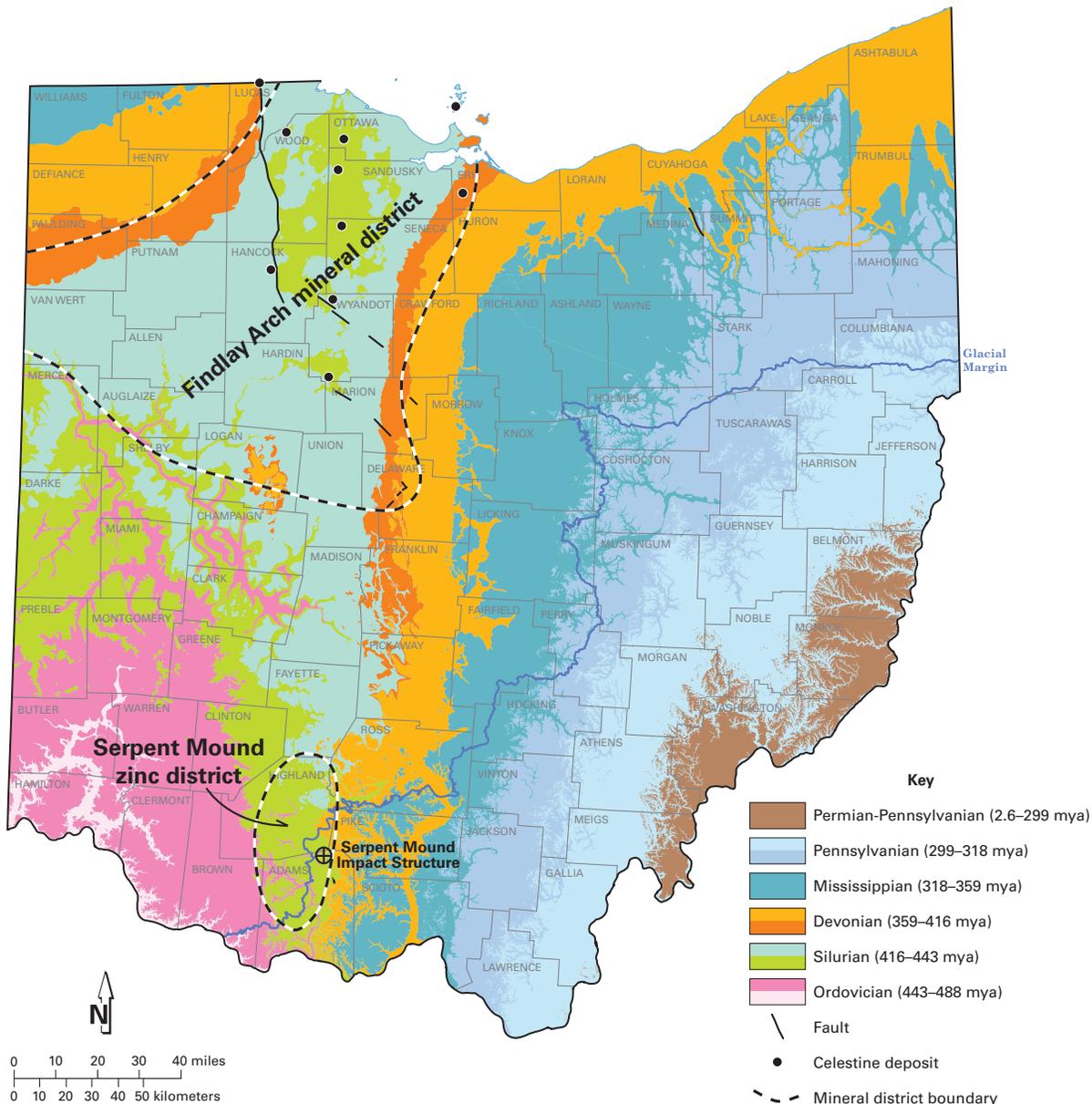
Island in 1859. In 1880, Herman Herbster was improving his vineyard property by drilling a water well. The drill bit became stuck at approximately 30 feet and while recovering the drilling tools, large amounts of celestine were discovered. The following decades of failed mining ventures and other financial difficulties led to a Sheriff's sale of the property that contained Crystal Cave in 1894 and eventually led to ownership by the Heineman family. Gustav Heineman estimated that 150 tons of celestine crystals were excavated from the floor of the cave so it would be accessible to tourists. The approximately 35-ft-long, multiple-chamber Crystal Cave officially opened to the public in 1898. Today, this magnificent natural wonder is still open for tours to visitors of the 50-acre Heineman Winery, operated by the fourth generation of the family.

An official state mineral has been adopted by 23 U.S. states. Ohio is not among those that recognize a state mineral, although flint, a variety of quartz, is the state gemstone. The state mineral of Illinois is fluorite because of its beautiful specimens and mining history. Galena is the state mineral of both Missouri and

Wisconsin for similar reasons. One could argue that celestine from Ohio has similar attributes (wonderful specimens and historic mining history), with the added global significance of the enigmatic celestine deposit at Crystal Cave.

### FURTHER READING

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Bedrock Geologic Map of Ohio showing the Findlay Arch mineral district, the Serpent Mound zinc district, and selected locations of celestine deposits; mya = million years ago.

• This GeoFacts compiled by Mark E. Wolfe • May 2014 •

The Division of Geological Survey GeoFacts Series is available online at [www.OhioGeology.com](http://www.OhioGeology.com).