STATEHOUSE FOSSILS

A guide to fossils of the Ohio Capitol

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with illustrations by
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Front Cover: West side of Ohio Statehouse and artist's reconstruction of the cephalopod *Goldringia cyclops*.

Back Cover: Looking up at the ceiling of the Ohio Statehouse rotunda.

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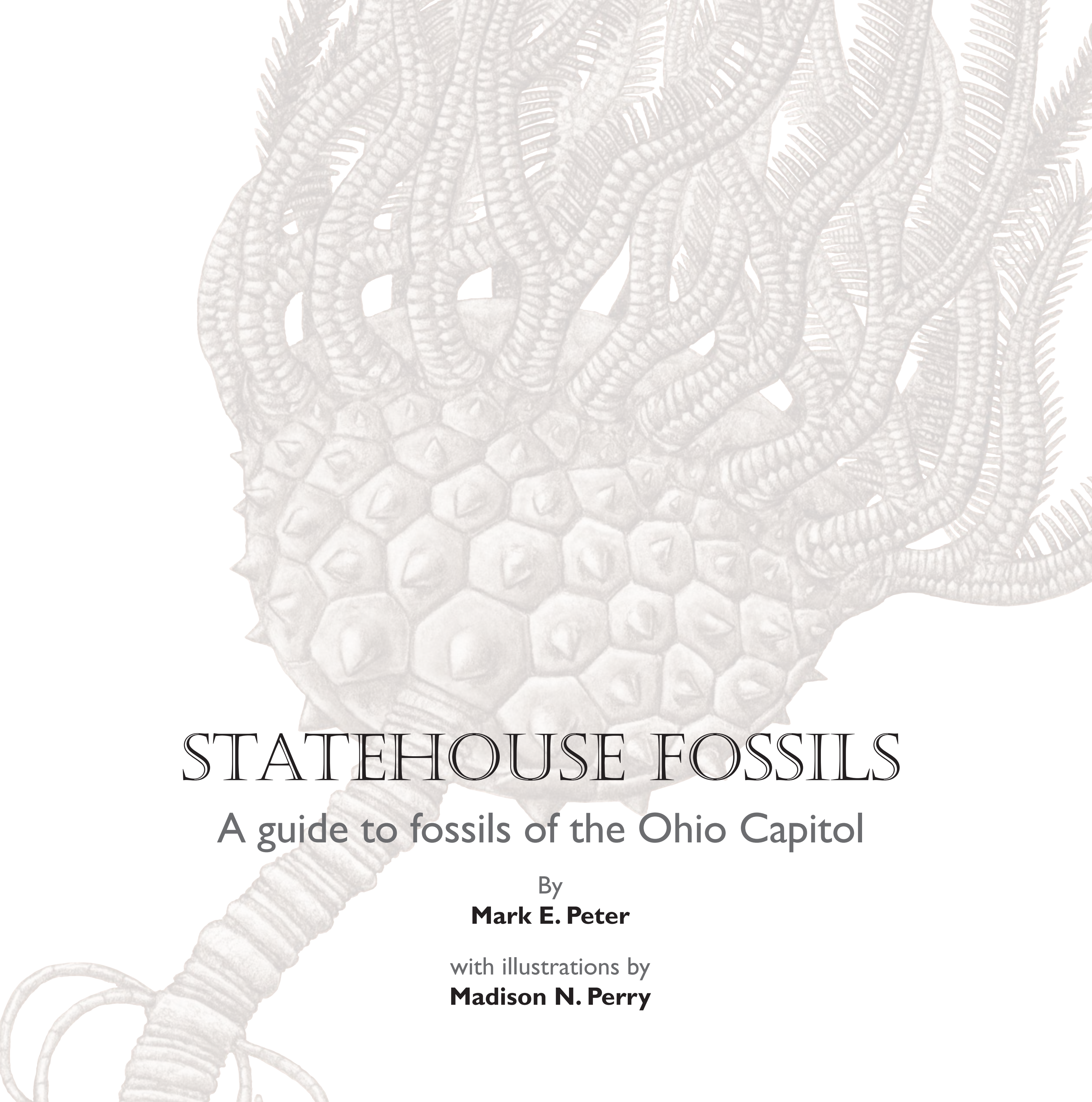

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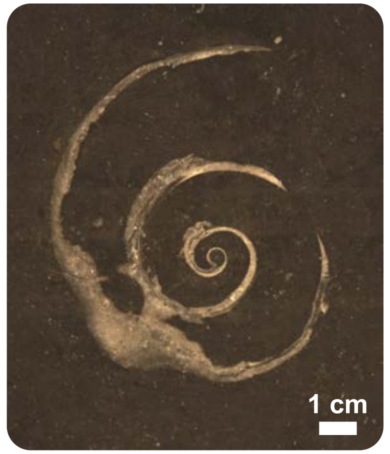
How to Use This Booklet

Using the guidebook

The guidebook portion (p. 6–27) of this booklet contains information about the Crown Point Limestone and the Columbus Limestone and some of the fossils each contains. For each of these building stones, fossil organisms are grouped according to their biological classifications. Locations of many of the depicted fossils are provided with a reference to maps in the tour portion (p. 28–37) of the booklet (see boldface in caption at right).



Marine gastropod (sea snail) *Maclurites magnus,* iconic fossil of the Crown Point Limestone. **Ground floor map, p. 29 (G2)**

Taking a self-guided tour

To take a self-guided fossil tour while visiting the Ohio Capitol, use the maps in the back of the booklet to locate the fossils. A recommended approach is to complete the indoor portion of the tour (p. 28–33) first, followed by the outdoor portion (p. 34–37). To learn more about the fossils at each stop, refer to pages in the guidebook listed below the thumbnail images that accompany each map. Some of the fossils will be more challenging to find than others—but that is part of the fun.

Photographing your finds

Removal of fossils from the Ohio Capitol is prohibited; however, one can make a photographic fossil collection. Record-keeping tools and photographic scales are provided on the inside back cover.

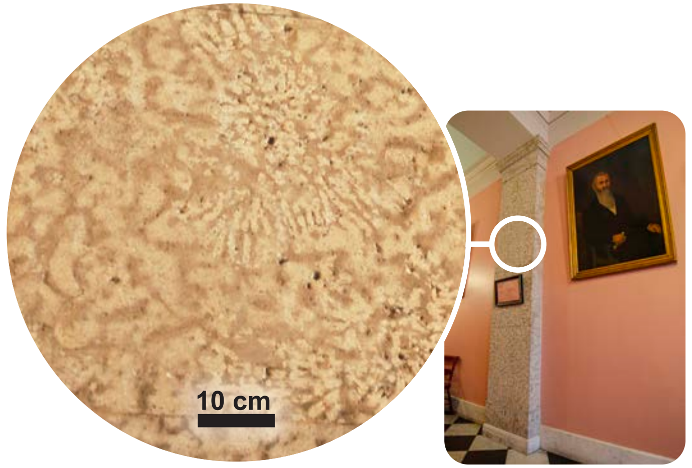
Accessibility

Indoor fossil stops and outdoor stops E1, E2, and E3 of the self-guided tour are accessible to individuals using wheelchairs.

Contents

INTRODUCTION

The halls of the Ohio Statehouse are lined with portraits of governors and artifacts of Ohio history, but the *walls* of the Statehouse tell an older story from Ohio's prehistoric past. These walls were hewn from Columbus Limestone, a rock formation underlying the Capitol and the source for the Statehouse exterior walls, towering columns, iconic rotunda, and broad entrance stairs. This local building stone has weathered the elements admirably since completion of the current Statehouse in 1861.



Fossils of colonial rugose corals, possibly *Eridophyllum* species (sp.), among fossil burrows in a column of Columbus Limestone. **First floor map, p. 31 (F4)**

The Columbus Limestone is ancient, having formed about 390–405 million years ago, during the Devonian Period, and it is full of fossils. Few buildings in the world exhibit the variety or abundance of fossils of the Ohio Statehouse.

This booklet provides a self-guided tour of the common fossils in the Statehouse, Senate Building, and grounds of the Capitol. It is based on a guided tour offered by The Ohio State University's Orton Geological Museum and the Ohio Department of Natural Resources, Division of Geological Survey. Locations of some of the best fossils are noted on the self-guided tour pages (p. 28–37). The booklet assists with basic identification; however, additional references, such as those provided in the Further Reading section (p. 38), will be needed to identify fossils to the level of genus or species.

Fossil brachiopod in the Carthage "Marble" (limestone) tile representing Harrison County in the large county map of Ohio, located in the floor of the Map Room.
Ground floor map, p. 29 (G1)

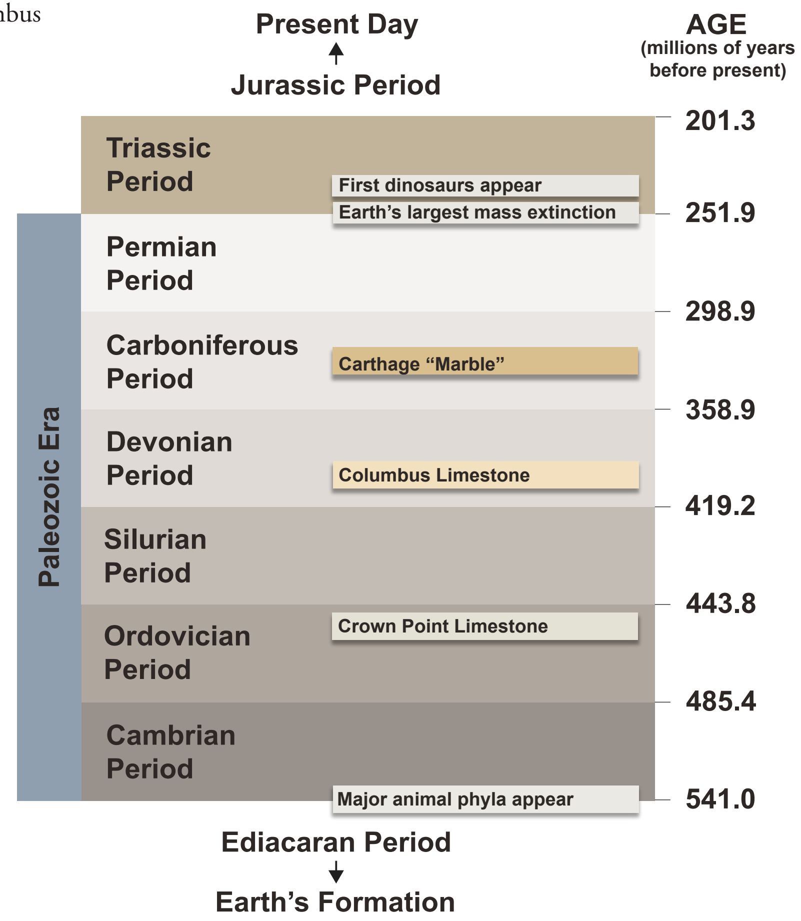
The fossiliferous building stones

Columbus Limestone was used exclusively for the exterior walls of the Capitol buildings, but various stones were used for the interior. Many are igneous rocks, such as granites, or metamorphic rocks, such as marbles. Igneous rocks do not typically contain fossils, and fossils may be destroyed by heat or pressure when rocks are metamorphosed. Sedimentary rocks, especially limestones, are more likely to preserve fossils.

Limestones are primarily calcium carbonate ($CaCO_3$), and for the Columbus Limestone, much of that consists of tiny particles of fragmented calcareous algae, plus fossil shells or skeletons secreted by animals. The two fossiliferous (fossil-bearing) rocks used extensively at the Capitol are the Columbus Limestone and the Crown Point Limestone, a gray to black limestone used as a floor tile.

Geologic time scale for the Paleozoic Era, with approximate times of deposition of the Columbus Limestone and the (nonlocal) Crown Point Limestone and Carthage "Marble." Bedrock exposed at the surface in Ohio was deposited during the Paleozoic Era, between the Late Ordovician and the early part of the Permian Period. The Triassic Period of the Mesozoic Era is also included for context. Fossils of dinosaurs first appear in rocks deposited during the Triassic Period. Rocks of this period either were not deposited in Ohio or have completely eroded away.

A third fossiliferous limestone, Carthage "Marble," was used on the Ohio county map in the Map Room to represent several counties (tour stop G1, ground floor map, p. 29). Quarried near Carthage, Missouri, this light-gray to buff-colored stone, although called a marble by the mining industry, is actually a limestone. Deposited during the Carboniferous Period approximately 335 million years ago, it contains fossils of marine invertebrates (animals without a backbone), such as brachiopods, bryozoans, and crinoids.



Internal mold of a high-spired marine gastropod (sea snail), possibly *Loxonema* sp., in Columbus Limestone. Note voids where the original shell has dissolved. **Exterior map (East & South), p. 35 (E3)**

Fossil preservation

Fossils are the bodily remains or other evidence of once-living organisms preserved in the rock record. In the Columbus Limestone and Crown Point Limestone, many of the fossils are the hard, mineralized shells or skeletons of marine animals. In other cases, where the original shell has dissolved, sediments filling the inside of the shell left an impression of the shell's inside, called an *internal mold.* Hard parts of organisms, such as shells, bones, or teeth, are more likely to become fossils than soft organs and tissues, which are subject to rapid decomposition.

Original shells and their molds are *body fossils*—a record of an organism's body or some part of it. Other fossils, called *trace fossils,* are records of behavior, preserved as burrows, borings, and trackways. Feeding burrows are prominent in the walls of the Statehouse. Produced by an unknown type of animal, these trace fossils were made in carbonate mud before it cemented to form limestone. Soon after the burrows were excavated, they were filled with a sediment that currently erodes more readily than the surrounding rock.

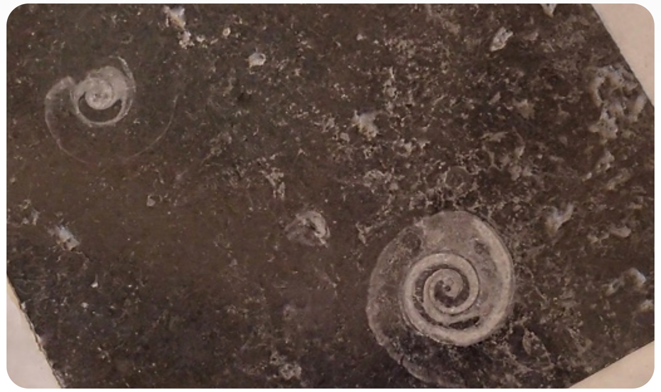
Larger fossils at the Capitol are exposed as two-dimensional cross sections, formed when the rock was cut in the quarry. Depending on the orientation of the fossil within the rock and the angle of the cut, fossil cross sections are lengthwise, crosswise, or somewhere in-between.

Feeding burrows produced by an unknown type of animal, preserved in an exterior wall of the Statehouse. In places (such as at top right of this photo), Statehouse caretakers have filled exposed burrows with grout to reinforce the facing.

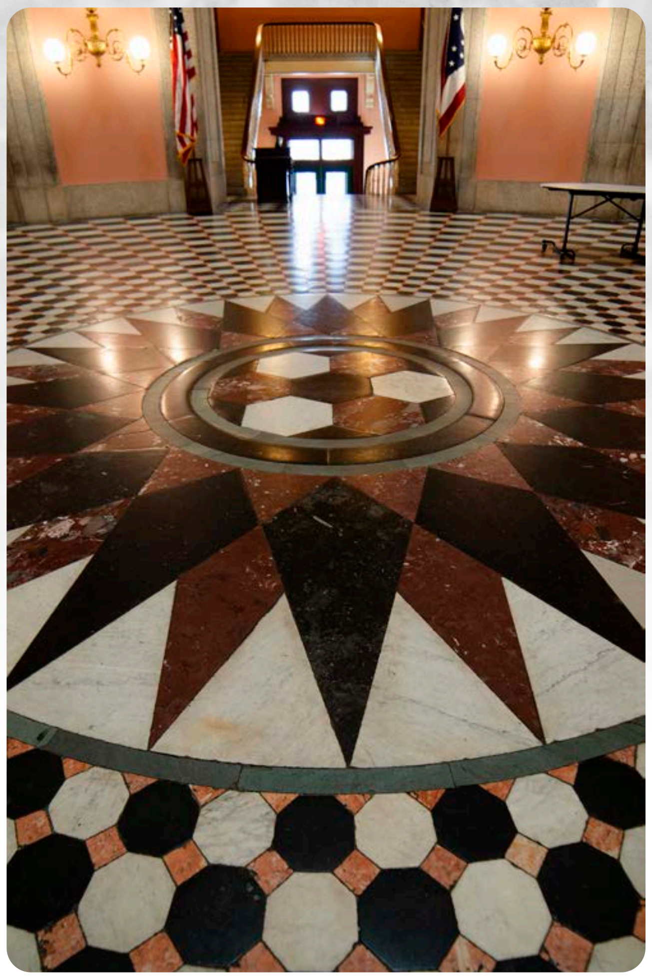
CROWN POINT LIMESTONE

This Late Ordovician (about 459 million years old) black to gray limestone from Vermont is used in the Capitol as floor tile. White crystals of the mineral calcite in the Crown Point fossils contrast with the dark limestone matrix. The Crown Point Limestone was deposited in a warm, shallow, sunlit sea along the eastern margin of North America. During the Ordovician Period, present-day Vermont was south of Earth's equator, in tropical to subtropical latitudes.

Named for exposures at Crown Point, New York, the limestone was sourced from quarries on Isle La Motte, Vermont, in Lake Champlain. Quarry operations on the island began in the late eighteenth century and continued into the twentieth century. Marketed as a marble, rock from these quarries has not been metamorphosed by heat or pressure and is actually a limestone. The darker variety was variously called Champlain Black or Radio Black, after its use in Radio City Music Hall in New York City. Crown Point Limestone was also used in the U.S. Capitol Building, the National Art Gallery in Washington, D.C., and in the state capitols of Vermont and Maine.



Fossils in the floor: the black tiles in the floors of the Statehouse were quarried from Crown Point Limestone. Spiral shapes of the marine gastropod (sea snail) *Maclurites magnus* are among the conspicuous fossils.

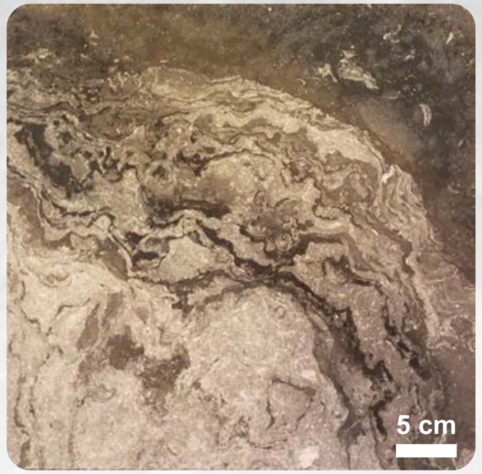


Crown Point Limestone from Vermont was used for the black floor tiles in the Statehouse rotunda. Other rotunda floor tiles are composed of a red breccia from an unknown source and marbles from various localities: Italy (white), Portugal (pink), Tennessee (red), and Vermont (green).

Crown Point Limestone Fossils

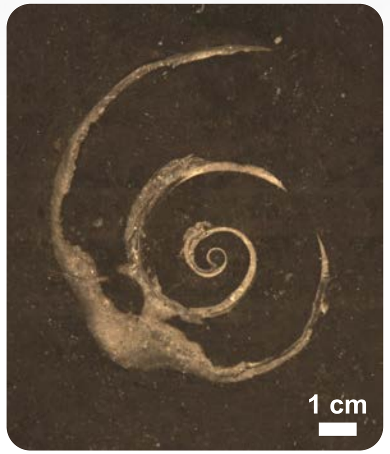
Fossils of the Crown Point Limestone can be viewed outdoors in the historic quarries on Isle La Motte within the Chazy Fossil Reef National Natural Landmark. There, visitors can see fossil mounds comprised of a framework of once-living organisms and accumulations of lime muds. The mounds contain calcareous (composed of $CaCO_3$) skeletons of stromatoporoid sponges, algae, bryozoans, and corals. Like modern coral-sponge reefs, these mounds provided stable attachment sites and sheltered spaces for a diverse assemblage of animals.

Major groups of invertebrates occurring in the Crown Point Limestone are also represented in the Columbus Limestone. Only the most prominent fossils of the Crown Point Limestone are treated separately in this booklet.



"Reef" mound in a Crown Point Limestone floor tile. **Second floor map, p. 33 (S2)**

Marine gastropod (sea snail) *Hormotoma* sp. in Crown Point Limestone, with the mineral calcite (white) filling the initial whorls of the shell. This large, high-spired gastropod was likely a mobile herbivore. **First floor map, p. 31 (F5)**



Marine gastropod (sea snail) *Maclurites magnus,* iconic fossil of the Crown Point Limestone. **Ground floor map, p. 29 (G2)**

Marine gastropods (sea snails)

Maclurites magnus is a conspicuous fossil within the Crown Point Limestone, and its spiral shapes are numerous in the black floor tiles of the Statehouse. Shells of this large gastropod grew to 20 centimeters (8 inches) in diameter. The name *Maclurites* honors geologist and philanthropist William Maclure, author of the first (1809) geological map of the United States.

Complete *Maclurites* fossils reveal the unusual shape of the shell, which has a flat base and a concave upper surface that is frequently overgrown by calcareous sponges. Adult *Maclurites* were likely stationary, with their flat sides resting on the seafloor.

Like a few modern sea snails, *Maclurites* was probably a suspension feeder. It had an *operculum,* a sort of trap door covering the aperture (main opening) of the shell. When open, seawater entered the shell. Like modern suspension-feeding gastropods, *Maclurites* may have possessed a mucous-covered gill appendage for collecting plankton and suspended food particles from the seawater.

Marine gastropod *Maclurites magnus*. Artist's reconstruction of the living snail as viewed from the flat side of the shell, which would have rested on the ancient seafloor.

Marine gastropod (sea snail) *Maclurites magnus* in Crown Point Limestone. Cross section along flat side of shell, showing growth lines.

Marine gastropod (sea snail) *Maclurites magnus* in Crown Point Limestone. "Side view" (section through axis of coiling). The early, inner whorls of the shell of *Maclurites* expanded rapidly; the later, outer whorls were much larger. **First floor map, p. 31 (F1)**

Cephalopods

The genus *Stereospyroceras,* now extinct, belongs to the Cephalopoda—a class of marine mollusks that includes modern squids and octopuses. It had an *orthoconic* (straight and conical) external shell with prominent annulations. This cephalopod likely measured less than 30 centimeters (12 inches); however, other orthocones were giants of the Ordovician seas, reaching lengths of 7 meters (23 feet). *Stereospyroceras* probably traveled with the shell in a horizontal position and expelled water through a soft tube-shaped funnel, called a *hyponome,* to propel itself rapidly when necessary. Like other cephalopods, *Stereospyroceras* was likely an active predator.

Cephalopod *Stereospyroceras* sp. in Crown Point Limestone. Note annulations (rings), curved septa (in cephalopods, the partitions between chambers), and a portion of the siphuncle (tube connecting the chambers). **First floor map, p. 31 (F3)**

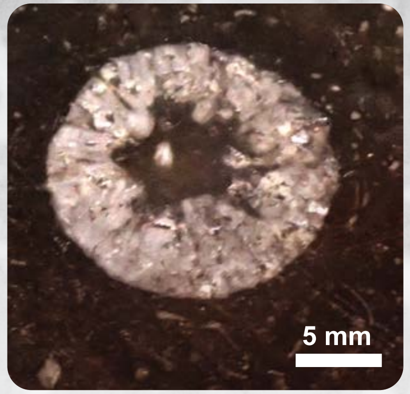
Cephalopod, possibly *Stereospyroceras* sp. Note the gentle taper of the shell. As the cephalopod grew, it widened and elongated its shell. The animal lived in the outermost shell chamber, the "living chamber" (not preserved here), and sealed off additional chambers as it grew.

Crinoids ("sea lilies")

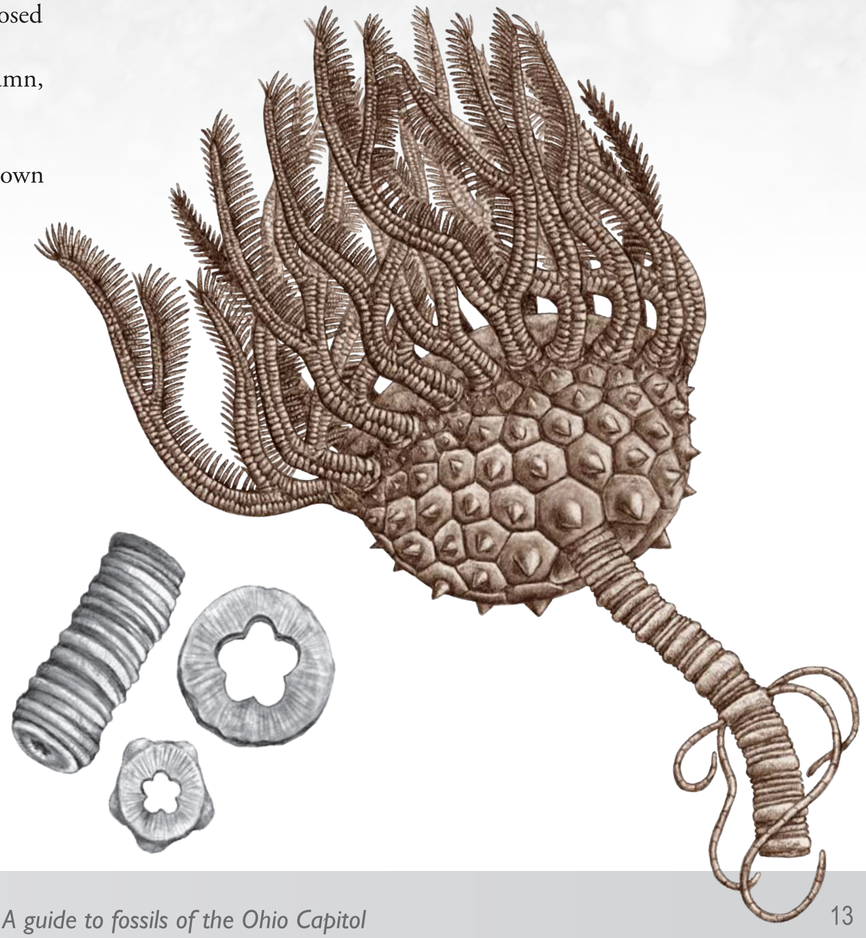
The term *crinoid* (CRY-noid) is derived from ancient Greek *krinon,* meaning "lily," because some crinoids resemble the flower. Stalked crinoids are called "sea lilies," but they are actually echinoderm ("spiny-skinned") animals, related to sea stars, brittle stars, sea cucumbers, and sea urchins. Crinoids originated during the Ordovician Period and are still present in modern marine environments.

Most sea stars and sea urchins are mobile and actively search for food, but stalked crinoids attach to a firm object or the seafloor. They rely upon currents to bring small organic particles and plankton. Whereas sea stars have mouths on their undersides, crinoid mouths are directed upward. Feather-like arms contain "food" grooves lined with sticky tube feet. The tube feet catch organic particles suspended in the water and pass them along the grooves in the arms to the central mouth.

Crinoids have skeletons with numerous plates composed of the mineral calcite ($CaCO_3$). The most commonly recognized crinoid fossils are individual pieces of the column, or stalk, called *columnals.* These resemble small washers. Crinoid skeletons fall apart soon after the animal dies. Complete crinoid fossils (having an entire column and crown with intact arms) are uncommon but are occasionally preserved when the animals were rapidly buried by storm sediments.



Large crinoid columnal in Crown Point Limestone. Note the star-shaped center. **First floor map, p. 31 (F2)**



Crinoids. Far right: Artist's reconstruction of a nearly complete crinoid showing upper part of column (stalk) and crown with intact arms. (This species, *Megistocrinus spinosulus,* occurs in the Columbus Limestone.) Near right: Drawings of crinoid column section and individual columnals with pentameral (five-fold) symmetry that is common in echinoderms, OSU 23339.

Columbus Limestone

The primary building stone for the Capitol, the Columbus Limestone is also a world-class fossil deposit. The Columbus Limestone was deposited mostly in a warm, clear, shallow and sunny inland sea during the Early to Middle Devonian, about 390–405 million years ago. At that time, the area that is now Ohio was in a tropical to subtropical latitude, south of Earth's equator. In environments such as this, calcareous algae, corals, sponges, and other organisms produce calcium carbonate ($CaCO_3$) skeletons and shells that accumulate to form thick limestone deposits. The greatest thickness of the Columbus Limestone is in central Ohio, where it is about 32 meters (105 feet) thick. Modern-day analogues to the Columbus Limestone include carbonate accumulations like the Bahama Banks. At times, islands similar to those of the Bahamas may have emerged from the Devonian inland sea.

In addition to limestone, some beds of the Columbus Limestone contain abundant nodules of chert. Colorful varieties of chert are better known as *flint,* which is Ohio's State Gemstone. Chert is a sedimentary rock composed of microscopic crystals of quartz (silica, SiO_2). In some parts of the Columbus Limestone, many fossils are *silicified*—their original calcium carbonate shells are chemically replaced with silica. These silicified fossils are especially resistant to weathering and erosion.

The name "Columbus limestone" was first used by William W. Mather in a report published in 1859. Mather, who had previously supervised the first geological survey of Ohio, used the name to refer to a succession of rocks encountered in an artesian well drilled at the site of the current Ohio capitol. Ohio's second State Geologist, John S. Newberry, refined the definition of the Columbus Limestone in 1873 by distinguishing the upper part of the succession as the unit now referred to as the Delaware Limestone.

Several limestone deposits in North America are of a similar age to the Columbus Limestone and contain many of the same fossils. These include: the Jeffersonville Limestone of Indiana and Kentucky, spectacularly exposed at the Falls of the Ohio State Park near Louisville; the Bois Blanc Limestone of Ontario, New York, and Michigan; and the Onondaga Limestone of New York, Pennsylvania, and Ontario.

Columbus Limestone is quarried for dimension stone and crushed for construction aggregate, which is commonly used in road resurfacing and to make concrete. Because of its high calcium carbonate content, it is a source of lime products and used to manufacture Portland cement. The famous Ohio Stadium in Columbus is constructed from poured concrete made from Columbus Limestone.

Other than the Capitol, public places in central Ohio to view (but not collect) the Columbus Limestone include Hayden Falls Park and Quarry Trails Metro Park, which occupies a former portion of the Marble Cliff Quarry. Buildings in downtown Dublin and historic German Village also incorporate Columbus Limestone. Other locations in Ohio where Columbus Limestone can be viewed include Marblehead Lighthouse State Park and the glacial grooves on Kelleys Island. Several of the large privately-owned caverns in Ohio formed in the Columbus Limestone.

A "bone bed" exposed at a construction site in central Ohio. Bone beds in the Columbus Limestone contain concentrated, fragmentary remains of fish. Some of the fossil teeth in this photo belonged to the extinct lobe-finned fish *Onychodus sigmoides*.

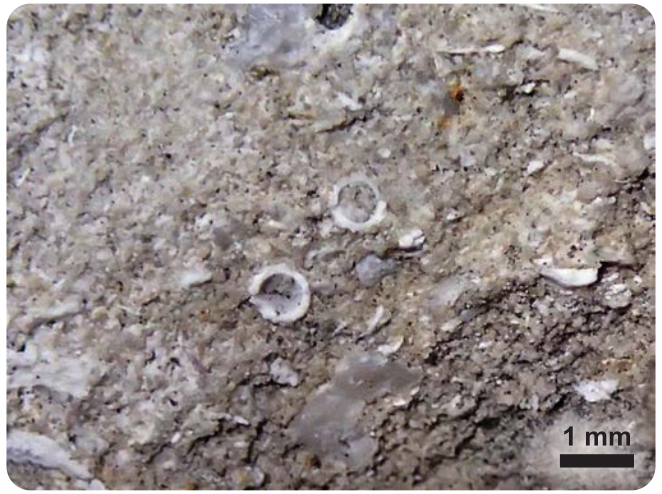
Columbus Limestone Fossils

Fossils in the Columbus Limestone include the remains of marine invertebrate animals, such as corals, echinoderms, brachiopods, bryozoans, stromatoporoids (calcareous sponges), mollusks, and arthropods. Vertebrates, in the form of fish fossils, are fairly common but mostly as skeletal fragments, scales, and teeth. These are especially abundant and concentrated within a few layers that paleontologists call "bone beds."

Psilophytes, a group of early vascular plants, and charophytes, a type of green alga, have also been identified from fossils. Psilophytes were among the Devonian land plants, and modern charophytes live in fresh or brackish water, which is typically found on or near land. The presence of psilophytes and charophytes in the Columbus Limestone is evidence of nearby land, probably occurring as sporadic islands during this period.

Besides the common large fossils discussed below, several types of tiny fossils are present in the Columbus Limestone. These microfossils (fossils best studied under a microscope) are described by Eriksson (2002), listed in the Further Reading section (p. 38).

Crinoid columnal (individual stem piece) in Columbus Limestone. Note the void in the center, which is shaped like a five-rayed star with rounded points. Although complete echinoderms (including crinoids) have not yet been discovered at the Capitol, a magnifying glass will show that echinoderm skeleton pieces are a major component of the limestone.



Fossils of charophyte oogonia (female reproductive structures of a green alga) in Columbus Limestone. These tiny (about 1 millimeter or less), white, calcareous spheres are abundant in places at the Capitol, but a magnifying glass is required to identify them. Note the external ridges, which resemble short spines in cross section. An oogonium fossil in cross section superficially resembles a small crinoid columnal, but crinoid columnals are cylindrical rather than spherical, and have proportionately smaller voids at their centers.

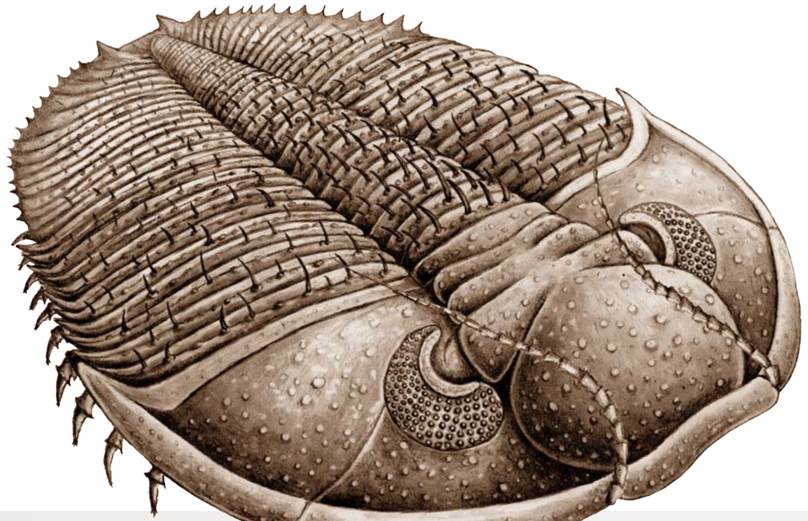
Trilobites

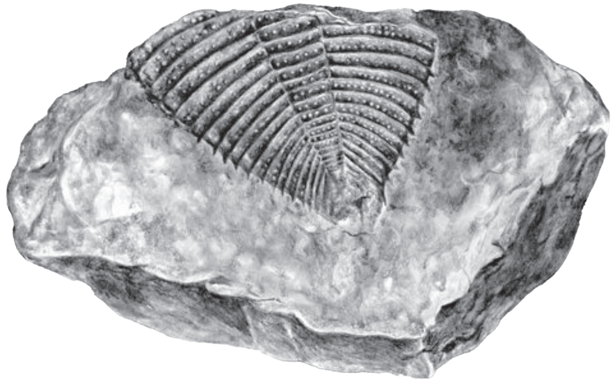
Trilobites (pronounced TRY-lo-bites) were arthropods that resembled modern horseshoe crabs. The name *trilobite* (Latin, "three-lobed animal") refers to the three lengthwise divisions of the exoskeleton. Trilobites were a diverse and widespread group for most of the Paleozoic Era, from their appearance in the Cambrian Period to their extinction in the latest Permian Period. Trilobites adopted a wide range of life strategies. Many crawled on the sea bottom or swam just above it; others were pelagic, living in the water column well above the seafloor. Some, such as *Coronura,* likely fed upon worms or other live prey inhabiting the seafloor sediment.

Because trilobites molted their calcareous exoskeletons as they grew, one trilobite could leave many fossils—mostly partial exoskeletons. Complete trilobite fossils are somewhat rarer, in part because trilobites were prey for other marine carnivores. Most trilobites could enroll into a ball, similar to modern-day pill bugs, in response to predators or adverse environmental conditions.

The smallest mature trilobites were mere millimeters, but some approached one meter (3.3 feet) in length. Among the largest was *Isotelus maximus,* from Ordovician rocks of southwestern Ohio. *Isotelus* is Ohio's official State Invertebrate Fossil. In the Columbus Limestone, tail shields of the trilobite *Coronura aspectans* are somewhat common. *Coronura* attained lengths of 20 centimeters (8 inches) or more.

Trilobite (of the order Phacopida) showing multiple thoracic (middle-body) segments and the three lobes for which trilobites were named. Head and tail shields are not visible. **Second floor map, p. 33 (S1)**





Trilobite *Coronura aspectans.* Left: Artist's reconstruction of the living trilobite. Above: Drawing of fossil tail shield specimen, OSU 9552.

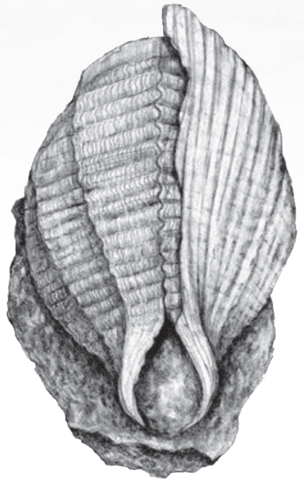
Rostroconchs

Rostroconchs ("snout shells") were a class of mollusks. As such, they belonged to the invertebrate phylum that includes gastropods, cephalopods, and bivalves, among others. Long extinct, rostroconchs ranged from the Cambrian Period through the late Permian Period. In Ohio, they are known from Ordovician, Devonian, and Carboniferous rocks. More rostroconchs have been collected from the Columbus Limestone than any other rock unit on Earth.

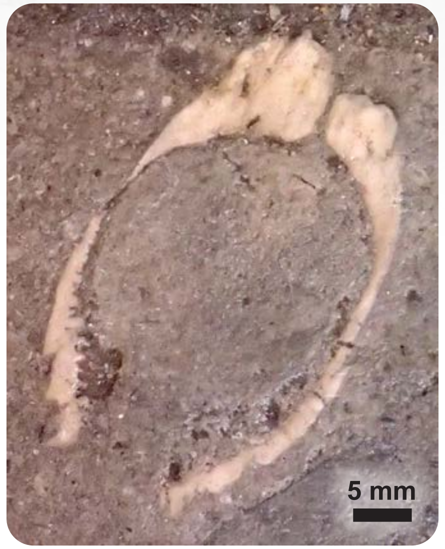
Unlike bivalves (p. 19), which have two distinct valves that articulate on a hinge with teeth and sockets, rostroconch shells lacked true hinges. The rostroconch left and right valves were fused and could not repeatedly open and close like those of bivalves.

The group name refers to the rostrum, or snout, protruding from the posterior (rear) end of the shell. The rostrum may have functioned as a respiratory siphon, like a snorkel, enabling rostroconchs like *Hoareicardia* to live partially buried in seafloor sediment. Some paleontologists have interpreted rostroconchs as mobile deposit feeders that swept up organic matter using a fleshy foot extending through the anterior (front) opening; others have proposed they were stationary suspension feeders.

The genus name *Hoareicardia* honors Professor Richard D. Hoare, a Bowling Green State University paleontologist who studied Ohio rostroconchs. *Hoareicardia cunea* was formerly within the genus *Hippocardia,* named for its resemblance to the shape of a horse's heart.



Rostroconch *Hoareicardia cunea.* Left: Drawing of fossil shell (composite of three specimens), OSU 36130. Right: Artist's reconstruction of the living rostroconch partially buried in seafloor sediment (from opposite side of the shell).

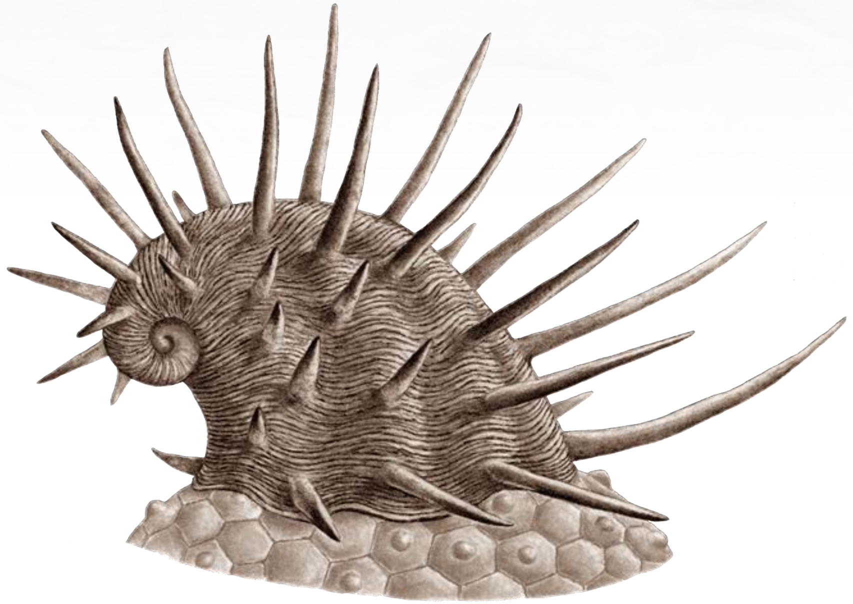


Rostroconch *Hoareicardia cunea.* This cross section exposes a portion of the hood (upper right) that encircled the rostrum, or snout. The large gap at lower left is the anterior (front) opening of the shell. **First floor map, p. 31 (F7)**

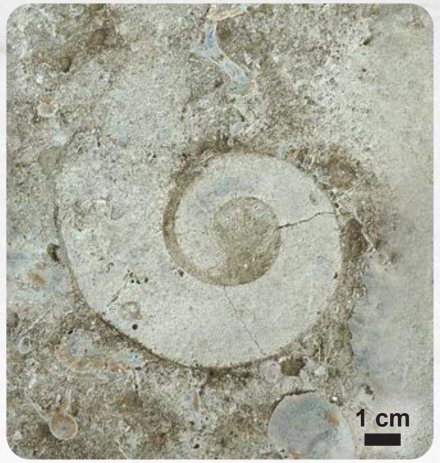
Marine gastropods (sea snails)

Spiniplatyceras was a spiny marine snail with a low spire and rapidly expanding shell. It was a parasite of crinoids (p. 13) and would attach to the top of the crinoid and feed upon its waste. Some relatives of *Spiniplatyceras* gastropods may have also drilled through the skeletons of crinoids and blastoids (another type of stalked echinoderm) to steal food from their hosts. The large spines would have protected *Spiniplatyceras* from predators while it was exposed atop the echinoderms and perhaps afforded some protection for the crinoid or blastoid as well.

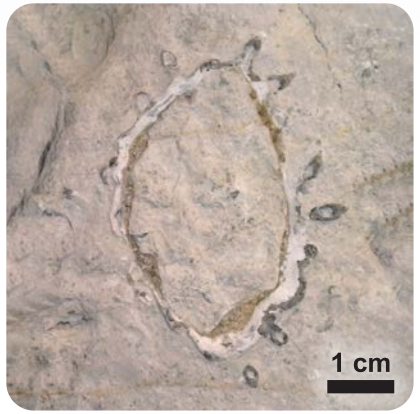
Another gastropod, *Pleuronotus,* had a shell that coiled primarily in one plane. The term *gastropod* derives from Greek words for "stomach" and "foot." Indeed, many gastropods creep on a large, ventrally-located, foot-like appendage. However, like *Maclurites* from the Crown Point Limestone, *Pleuronotus* was probably a stationary suspension feeder. It would have settled in one place, much like an oyster, and relied upon currents to supply its food.



Artist's reconstruction of a living *Spiniplatyceras* sp. marine gastropod that is firmly attached to the upper surface of a crinoid.



Marine gastropod (sea snail) *Pleuronotus decewi,* internal mold. Note lack of septa (internal partitions), which distinguishes gastropods like *Pleuronotus* from coiled cephalopods like *Goldringia.* **Exterior map (West & North), p. 37 (E13)**



Spiny marine gastropod *Spiniplatyceras* sp. Cross section through outer whorl near shell aperture (main opening), showing hollow spine bases. **First floor map, p. 31(F6)**

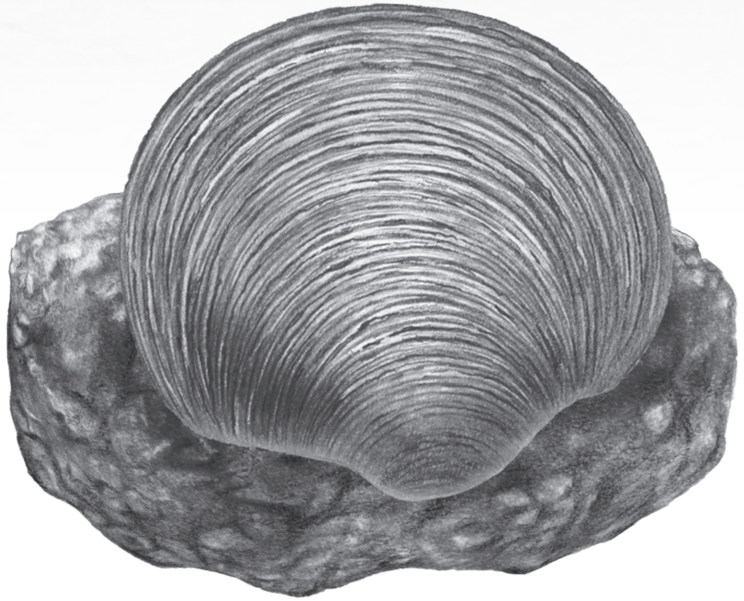
Bivalves

Bivalves include modern clams, mussels, scallops, oysters, and other groups. They have a long fossil record, from the early Cambrian Period to the present. Most obtain food by filtering freshwater or seawater using specialized comb-like gills that function both as respiratory and feeding organs.

Fossil bivalves can be distinguished from the unrelated brachiopods (p. 22) by their shell symmetry. The two valves (shell halves) of a bivalve mirror one another, whereas the two valves of a brachiopod do not. Likewise, the left and right halves of a single brachiopod valve are symmetric, whereas individual valves of bivalves are asymmetric.

Another difference between bivalves and brachiopods is their preservation in the Columbus Limestone. Fossil bivalves (and other mollusks) are often preserved only as internal and external molds, whereas the original shells of brachiopods are preserved in the limestone. This preservation difference is related to the mineral composition of the original shells. Most brachiopods constructed their shells with the mineral calcite, which was chemically stable in the Devonian seas. Bivalves and other mollusks were more likely to use another crystal form of calcium carbonate ($CaCO_3$) that was less stable and less likely to be preserved.

Bivalve, possibly *Modiomorpha concentrica.* The original shell has dissolved, leaving a void in the limestone. **Exterior map (West & North), p. 37 (E8)**



Bivalve *Paracyclas elliptica.* Drawing of fossil specimen, OSU 8037.

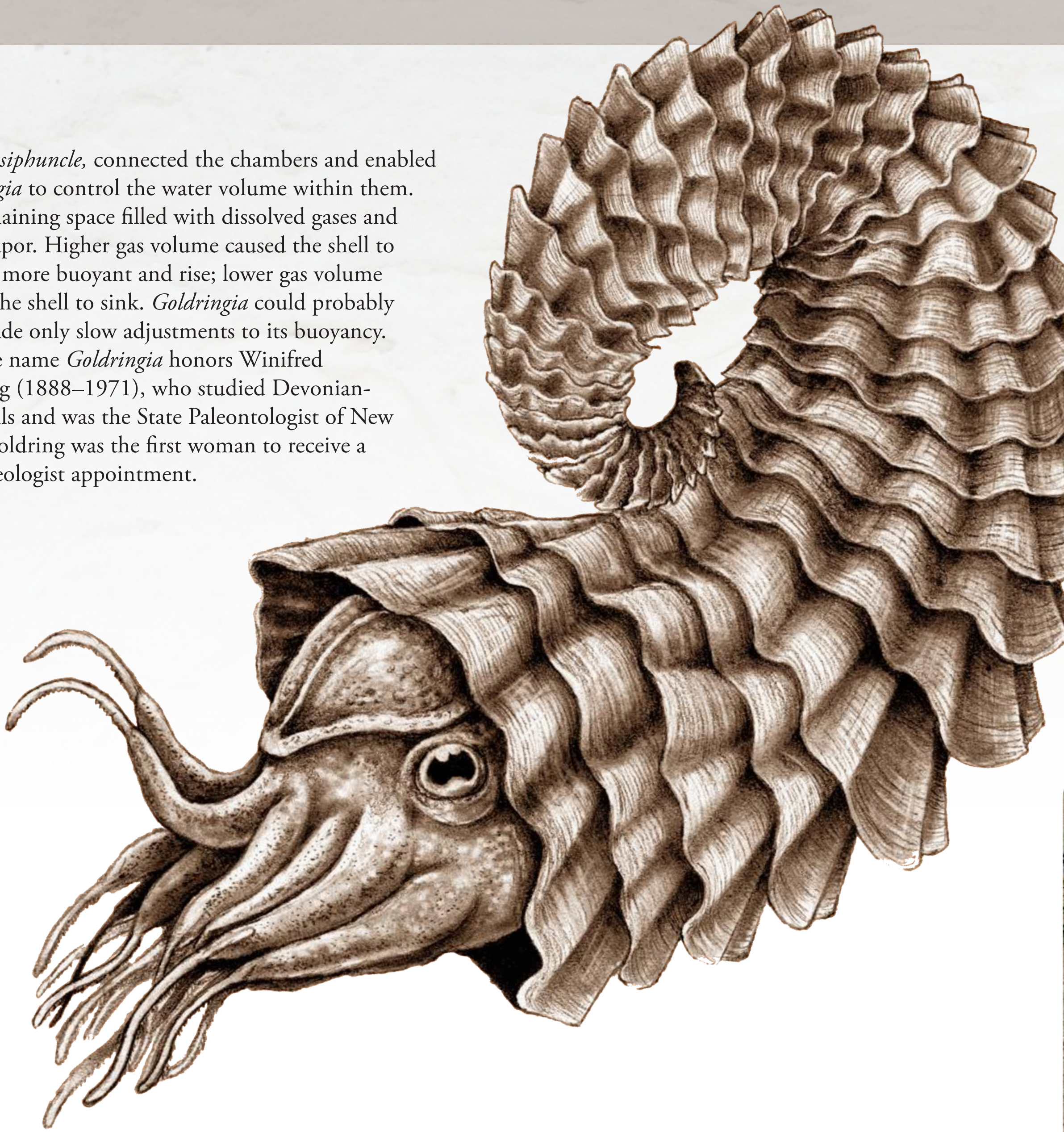
Cephalopods

Cephalopods (Greek, "head" and "foot") are a class of marine mollusks that includes modern squids, octopuses, cuttlefishes, and nautiluses, as well as extinct forms such as ammonites. Like the living *Nautilus,* many Devonian-age cephalopods had conical external shells. Fossil cephalopod shells in the Statehouse vary from straight (orthoconic) shells to shells that are gently curved or coiled.

The cephalopod *Goldringia cyclops* is arguably the most charismatic fossil in the Statehouse. Like *Nautilus,* its living relative, *Goldringia* had a coiled shell. Modern cephalopods are predators, and evidence suggests that ancient cephalopods were as well. *Goldringia* likely pursued a variety of preys, including trilobites (p. 16) and smaller cephalopods.

In addition to providing a defense from other predators, the many-chambered shell helped *Goldringia* maintain neutral buoyancy in the water column. As it grew, *Goldringia* expanded its shell and sealed off successive chambers. The bulk of the cephalopod, including the head with large eyes, beak, and tentacles, resided in the outermost chamber, the "living chamber." A calcareous tube lined with living tissue, called a *siphuncle,* connected the chambers and enabled *Goldringia* to control the water volume within them. The remaining space filled with dissolved gases and water vapor. Higher gas volume caused the shell to become more buoyant and rise; lower gas volume caused the shell to sink. *Goldringia* could probably have made only slow adjustments to its buoyancy.

The name *Goldringia* honors Winifred Goldring (1888–1971), who studied Devonian-age fossils and was the State Paleontologist of New York. Goldring was the first woman to receive a State Geologist appointment.



Cephalopod *Goldringia cyclops*. Above: Artist's reconstruction of the living animal. Left: Drawing of fossil specimen, OSU 8999. The delicate frills typically break off when specimens are extracted from the limestone.

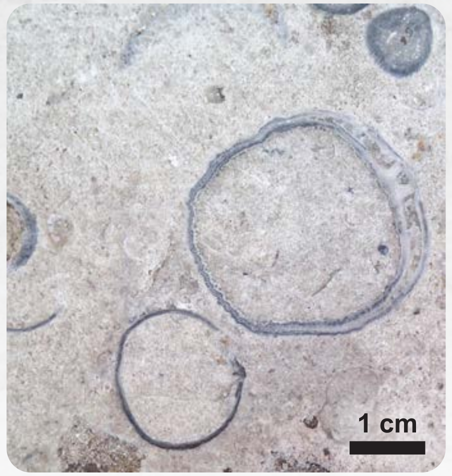
Cephalopod *Goldringia cyclops* in Columbus Limestone. Note frills, which resemble spines in cross section. The living chamber (outermost, undivided portion), septa (chamber partitions), and a portion of the siphuncle (just inside outer shell wall at top left) are visible. **Exterior map (East & South), p. 35 (E1)**

Orthoconic (noncoiled) cephalopod. The original shell has dissolved, but limy muds filled voids in the shell chambers. Part of the siphuncle (narrow tube that connected the chambers) is exposed at lower right. **Exterior map (East & South), p. 35 (E4)**

Brachiopods

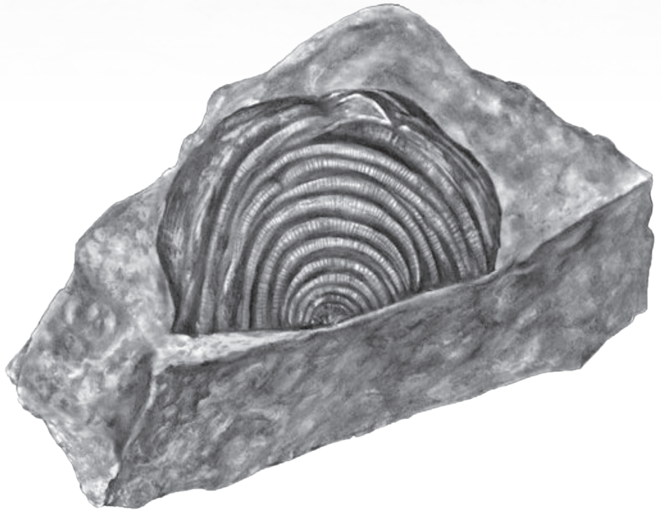
Brachiopod shells are common, easily recognized fossils within the Columbus Limestone. Many brachiopod varieties have been described. Like bivalves (p. 19), brachiopods have a hard shell consisting of two valves. However, brachiopods and bivalves are only superficially similar. Although still represented in modern seas, brachiopods were more abundant and conspicuous during the Devonian Period when the Columbus Limestone was deposited.

Brachiopods have a feeding structure called a *lophophore,* an organ with tentacles and finer, hair-like cilia used for respiration and to capture plankton and small food particles from seawater. The name *brachiopod* is from Latin *brachium,* "arm," and ancient Greek *pod,* "foot." The name was inspired by the two "arm" branches of the U-shaped lophophore and its support structures, which are occasionally preserved in fossils.



Brachiopods in cross section. Several varieties are visible. Note that these fossils are not molds—the original shells have been preserved. **Exterior map (West & North), p. 37 (E6)**

Brachiopod *Leptaena rhomboidalis,* interior of ventral valve. *Leptaena* sp. brachiopods are distinct, having a nearly rectangular outline and deep wrinkles on the exterior of the shell. Here, the wrinkles are visible from the inside of the valve. **Exterior map (West & North), p. 37 (E11)**



Brachiopod *Leptaena rhomboidalis,* exterior of ventral valve. Drawing of fossil specimen, OSU 25192.

Bryozoans

Bryozoans (ancient Greek, "moss animals") are so named because some living bryozoan colonies resemble mosses. Not to be confused with plants, bryozoans are invertebrate animals with a long fossil record, from the Early Ordovician to the present. Modern species inhabit freshwater, brackish, and marine environments. Bryozoans are colonial animals, with tiny individuals called *zooids.* Collectively, zooids build a colony skeleton called a *zoarium.* Specialized feeding zooids each have a tentacled feeding organ, called a *lophophore,* that is used for respiration and to collect plankton and organic food particles.

Shapes of bryozoan colonies include twig-shaped branching forms, fans, mounds, encrusting sheets, and others. As with corals, bryozoan colony shape is influenced by the environment. Identification of bryozoans to genus or species usually requires examination of polished thin sections. Bryozoans can be readily distinguished from corals because the individual tubes housing the zooids are usually less than one millimeter across, whereas an individual corallite in a coral colony is many times larger.

Bryozoan colony (white, branching skeleton) with internal mold of a high-spired marine gastropod (sea snail), possibly *Loxonema* sp. **Exterior map (West & North), p. 37 (E12)**

Fragment of a fenestrate (windowed) bryozoan. Fenestrate bryozoan skeletons had fronds with a delicate, mesh-like structure. Open "windows," or spaces, in the mesh allowed seawater to flow through the skeleton. Currents of seawater were generated in part by zooids, the tiny individual animals that collectively made up the bryozoan colony. Specialized feeding zooids, equipped with small tentacles, captured food particles from the seawater. Zooids lived in tiny holes in the skeleton that were much smaller than the "window" holes visible in this photograph.

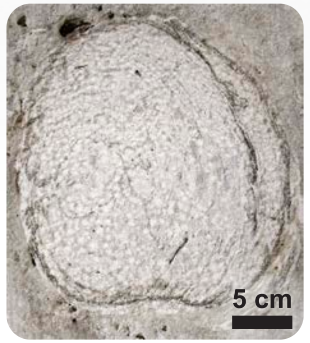
Stromatoporoids (calcareous sponges)

Stromatoporoids (from ancient Greek *stroma,* "bed," and *poros,* "passage") were bottom-dwelling, sessile (nonmobile) marine invertebrate animals that built skeletons with thin laminae (layers) of calcium carbonate. Entire skeletons ranged in size from a few millimeters to more than one meter (3.3 feet) in diameter. Mound-shaped and encrusting forms were common.

Paleontologists have debated how to classify stromatoporoids, but they are widely considered to have been calcareous sponges. They should not be confused with stromatolites, which are layered mats of sediments that were trapped, bound, and cemented by filamentous algae or cyanobacteria. Most sponges are filter-feeding animals with specialized cells that actively move water through passages in the animal. The sponges filter this water to obtain nutrients. This manner of feeding is inferred for stromatoporoids.

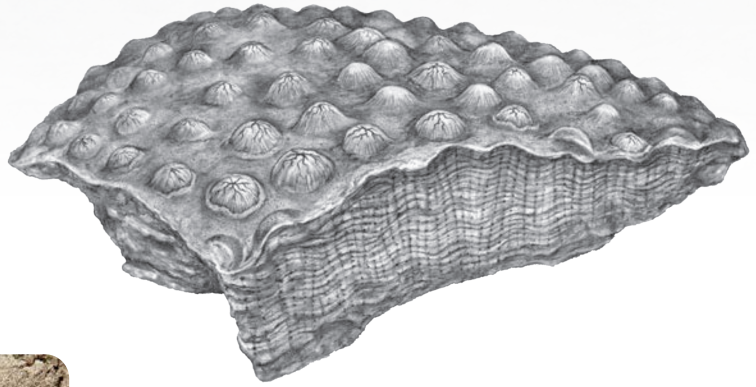
The outer surfaces of stromatoporoids are covered with small mounds called *mamelons,* which may have assisted with channeling exhalant water away from the animal. *Astrorhyzae* (from ancient Greek, "star roots") are grooves radiating from the center of the mamelons. These grooves connect to canals that penetrate deeper into the layers of the stromatoporoid. The most easily observed features in cross sections are the horizontal laminae (layers) and vertical pillars that bound the passages within the stromatoporoid.

Stromatoporoids thrived in warm, clear, mostly shallow marine waters. During the Devonian Period, when the Columbus Limestone was deposited, stromatoporoids contributed to the building of reefs. They colonized available hard surfaces, including shells and skeletons of other animals.



Cross section of mound-shaped stromatoporoid (calcareous sponge) showing concentric laminae (layers), which inspired the moniker, "cabbage heads." **Exterior map (East & South), p. 35 (E5)**

Stromatoporoid (calcareous sponge) overgrowing a rugose "horn" coral. Stromatoporoids colonized many hard surfaces exposed on the seafloor. These included dead (or in some cases, living) shells and skeletons of other animals.



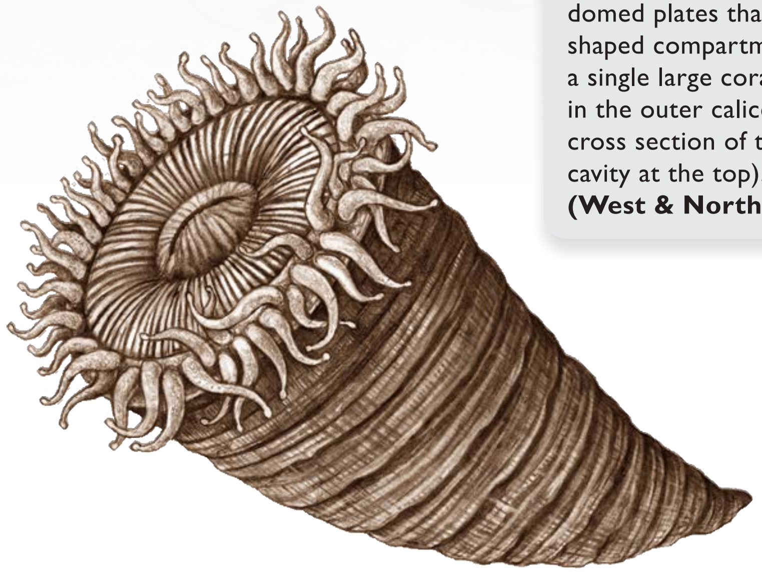
Stromatoporoid *Parallelopora snoufferensis.* Note the horizontal laminae and vertical pillars (side view) and mamelons (bumps) with astrorhizae (top view). Drawing of broken fossil specimen, OSU 17146.

Solitary rugose corals ("horn" corals)

Rugose corals were either solitary, having a single large coral polyp, or colonial, with multiple polyps sharing a common skeletal framework. Solitary rugose corals are colloquially called "horn" corals because their calcareous skeletons were shaped like a cow's horn. Now extinct, they lived from the Middle Ordovician to late in the Permian Period.

Horn corals ranged in size from a few millimeters to nearly one meter (3.3 feet) long. With a length up to 75 centimeters (30 inches), *Siphonophrentis gigantea* from the Columbus Limestone is the largest horn coral known from Ohio.

Rugose corals (Latin *rugosus,* "wrinkled") derive their name from the appearance of their external skeletal walls. The wrinkles represent growth intervals, and paleontologists have determined that they record daily, lunar monthly, and annual growth. By counting growth lines on corals, Professor John W. Wells of Cornell University inferred that during the Devonian Period, there were approximately 400 Earth days per year, and consequently, each day was a few hours shorter. His observations from fossils corroborated theoretical calculations by physicists of the rate at which the axial rotation of Earth has slowed over time owing to tidal friction from the Moon.



Rugose "horn" coral, consisting of a single polyp with a mouth surrounded by a ring of stinging tentacles. Artist's reconstruction of living coral, based on *Cyathophyllum halli,* OSU 10307.

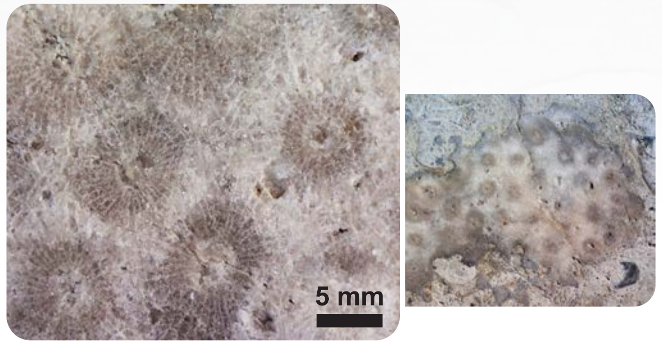
Solitary rugose "horn" coral *Cystiphylloides americanum.* Note the many dissepiments—small, domed plates that form bubble-shaped compartments. During life, a single large coral polyp resided in the outer calice, or cup (in this cross section of the skeleton, the cavity at the top). **Exterior map (West & North), p. 37 (E9)**

Colonial rugose corals

Colonial corals share a common skeletal framework. They are essentially a series of joined calcareous tubes called *corallites,* each with a single living coral polyp residing at the top or outermost portion. Rugose corals, both colonial and solitary, had prominent *septa,* which in corals are the longitudinal partitions of the corallites that extend from the inner walls of the tubes to the tube centers.

Hexagonaria and *Prismatophyllum* were colonial rugose corals with a similar appearance. Their corallites were shaped like hexagonal prisms (hence the genus names). Some *Hexagonaria* corals are better known as Petoskey Stones, after the city in northern Michigan. Local collectors polish wave-tumbled coral pieces found on the shores of Lake Michigan and sell them as souvenirs.

Colonial rugose "finger" coral *Eridophyllum* sp. Left: Cross sections of two colonies. Right: Close-up of corallites. Note the prominent radiating septa. **Exterior map (West & North), p. 37 (E7)**



Colonial rugose coral *Hexagonaria* sp. Right: Cross section of colony. Left: Close-up showing individual corallites with radiating septa. **Exterior map (West & North), p. 37 (E10)**

Rugose coral *Prismatophyllum rugosum.* Drawing of fossil specimen, OSU 17744.

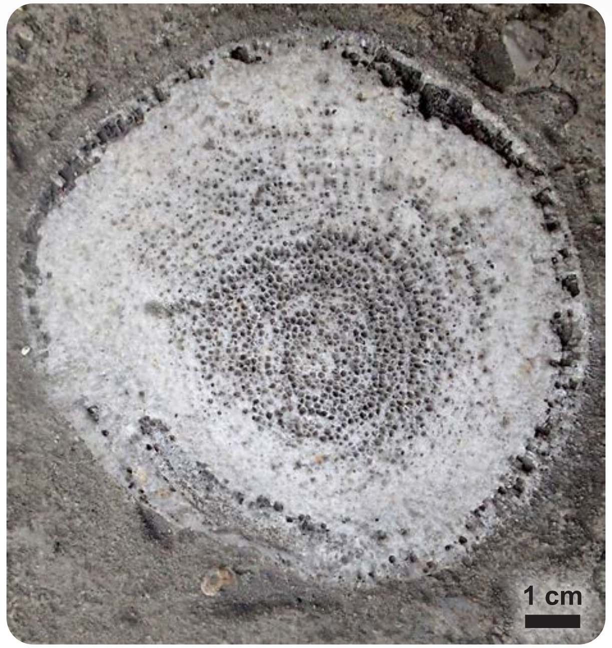
Tabulate corals

Tabulate corals, an extinct group, ranged from the Cambrian Period through the end of the Permian Period. These colonial corals lacked or had reduced septa, but the corallites had many floor-like transverse (crosswise) partitions, called *tabulae.* The colony expanded as polyps elongated their corallite tubes and laid down additional tabulae as new "floors." The living polyp occupied only the top (outer) floor of the tube, its "penthouse."

The tabulate coral *Favosites* is commonly called the "honeycomb coral," for its resemblance to the wax structures built by honeybees. In 1816, French naturalist Jean-Baptiste Lamarck, known for his early theory of biological evolution, gave *Favosites* its name (Latin *favus,* "honeycomb").

Polyps probably caught plankton using tentacles with stinging cells. *Favosites* lived in shallow water and may have obtained much of its energy from photosynthetic algae harbored within the coral's living tissue, like modern reef-building corals.

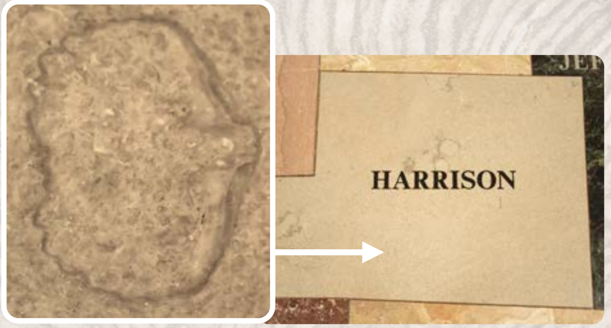
Tabulate coral *Favosites* sp. Note tabulae (floor-like partitions) within the corallites. Drawing of fossil specimen, OSU 29098.



Tabulate coral *Favosites* sp. Cross section of a colony, exposing a honeycomb pattern in the center, where the corallites are oriented vertically. **Exterior map (East & South), p. 35 (E2)**

Ground Floor Fossils

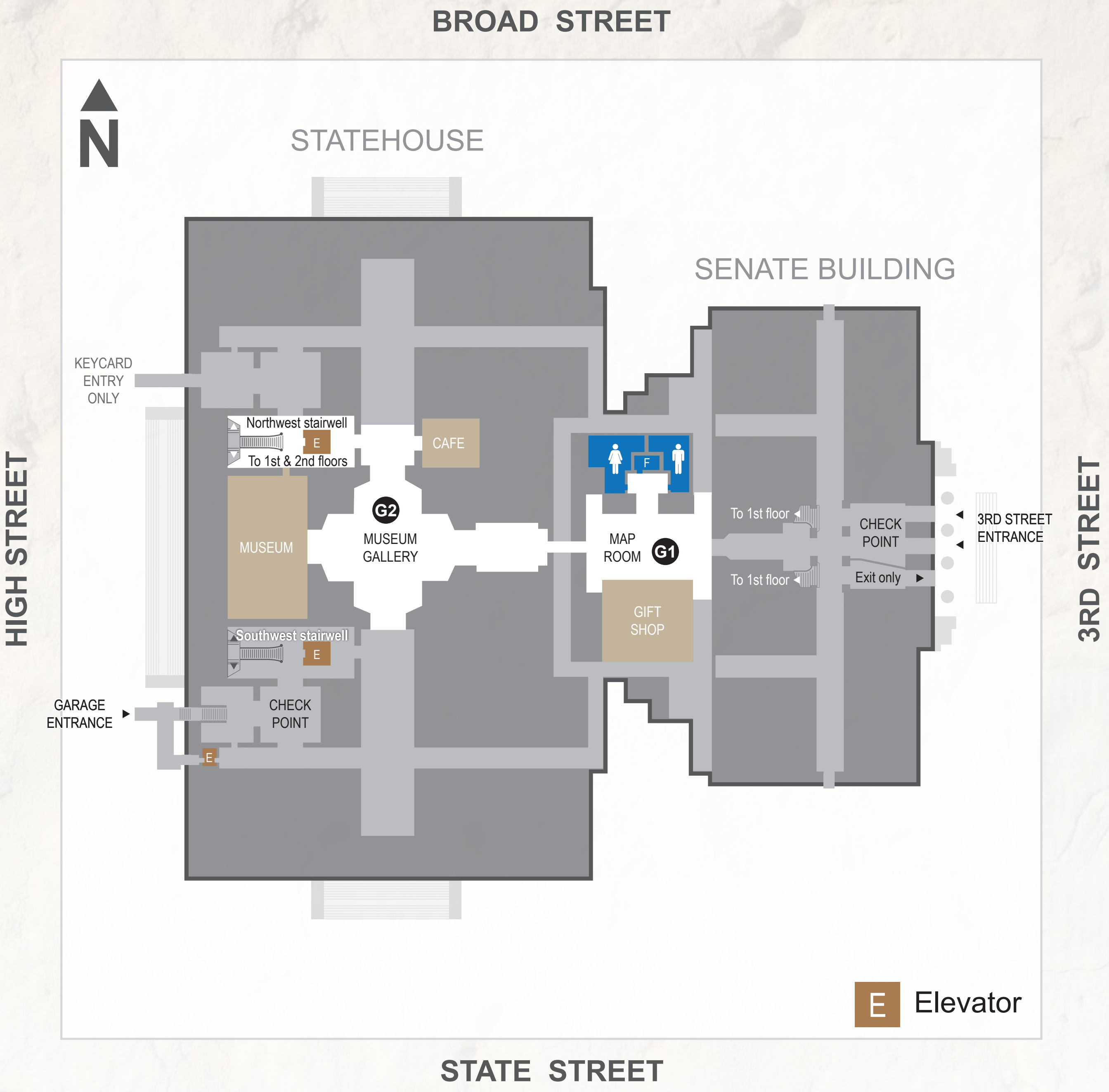
G1



Brachiopod in Carthage "Marble" (limestone), 2 × 1.5 cm
Map room, on large county map of Ohio in floor tile representing Harrison County (eastern Ohio). (p. 6, 22)

G2

Marine gastropod (sea snail) *Maclurites magnus*, 10 × 8 cm
North end of museum gallery, in perimeter border of Crown Point Limestone (black) floor tiles. (p. 10)

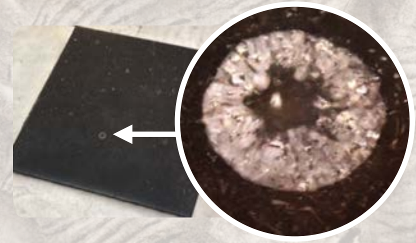


First Floor Fossils

F1

Marine gastropod (sea snail) *Maclurites magnus*, "side view," 5.5 × 2.5 cm
At top of stairs from first floor, in north entrance to rotunda. (p. 11)

F2



Crinoid columnal, 1.5 × 1.5 cm
At top of stairs from first floor, in north entrance to rotunda. (p. 13)

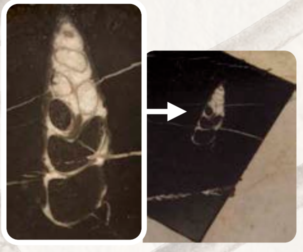
F3

Cephalopod *Stereospyroceras* sp., 10 × 1.5 cm
In kite-shaped Crown Point Limestone floor tile, east side of circle at center of rotunda. (p. 12)

F4

Colonial rugose "finger" corals, ~40 cm wide, and fossil burrows
In Columbus Limestone column, in hallway outside Ulysses S. Grant Hearing Room. (p. 6, 26)

F5



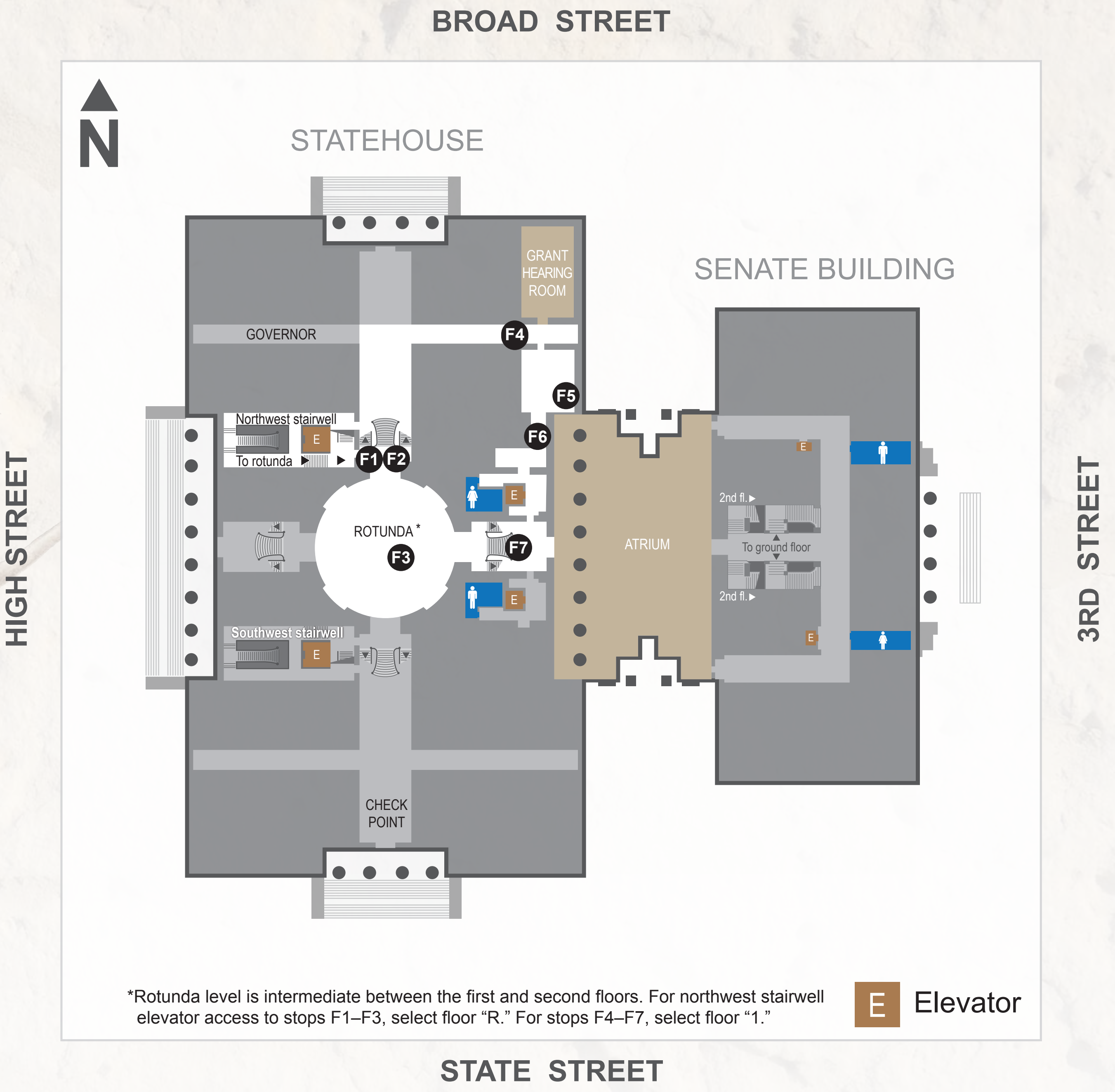
Marine gastropod (sea snail) *Hormotoma* sp., 13 × 4 cm
Crown Point Limestone floor tile in southeast corner of northeast passageway. (p. 10)

F6

Marine gastropod (sea snail) *Spiniplatyceras* sp., 5 × 3.5 cm
South end of rock wall in short hallway immediately south of northeast passageway, near eye level of a standing adult. (p. 18)

F7

Rostroconch *Hoareicardia cunea*, 4.5 × 2.5 cm
Stairs between rotunda and atrium, second step from bottom. (p. 17)



*Rotunda level is intermediate between the first and second floors. For northwest stairwell elevator access to stops F1–F3, select floor "R." For stops F4–F7, select floor "1."

Second Floor Fossils

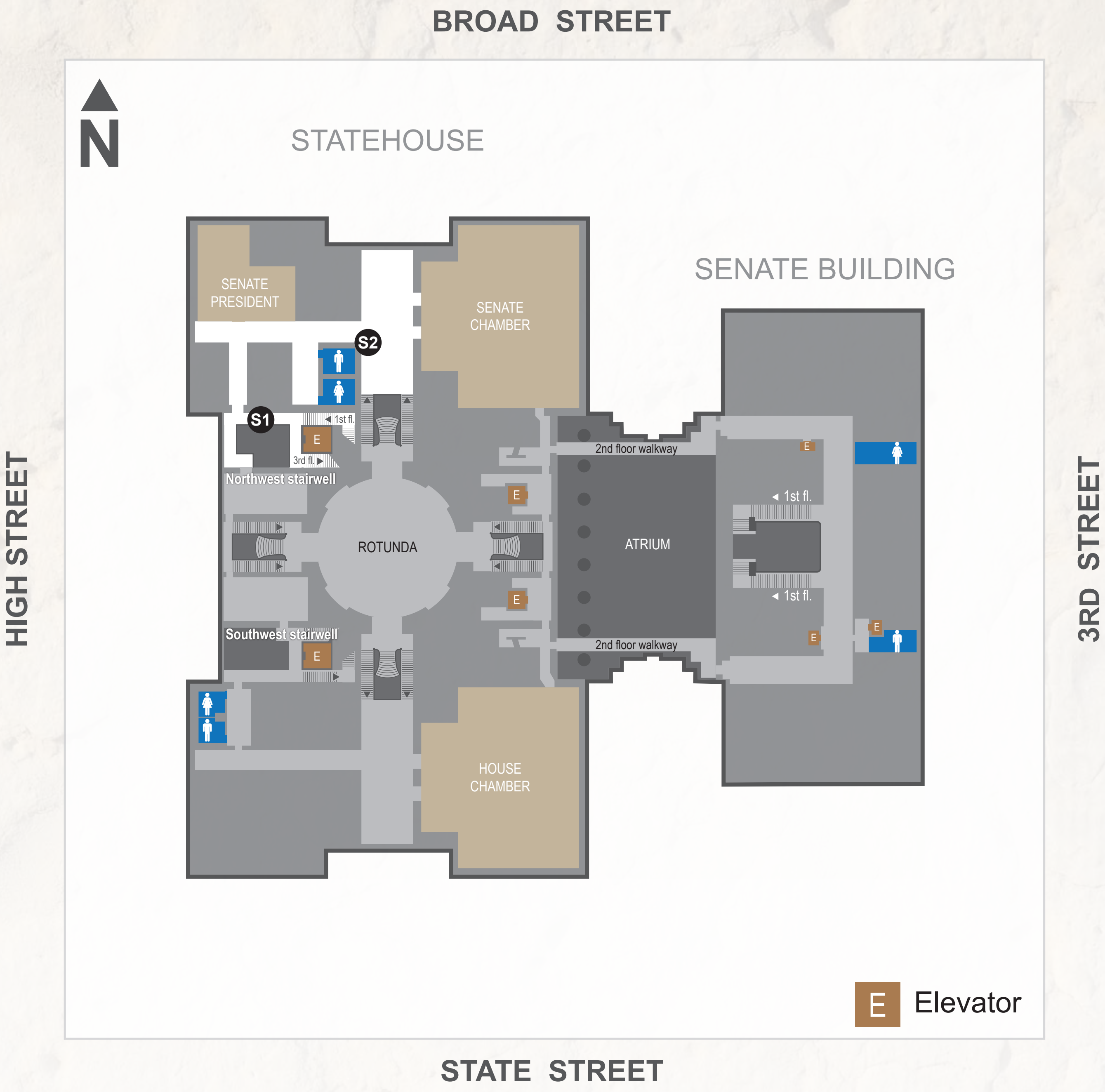
S1

Trilobite, 4 × 3 cm
Northwest stairwell (North Light Court), top surface of windowsill, near entrance to hallway leading to Senate President's office and Senate Chamber. (p. 16)

NOTE: Contrast of trilobite in image is enhanced. To locate fossil, carefully examine the spot indicated with the arrow, about 3 cm left (west) of a jagged crack in the stone and 5 cm from the outer edge of the windowsill.

S2

"Reef" mound cross section, 54 × 40 cm
One of several; Crown Point Limestone floor tile, near west wall of north side main hall, at entrance to hallway leading to Senate President's office. (p. 10)



E1

Cephalopod *Goldringia cyclops*, 22 × 19 cm
North end of Third Street steps, sixth step from bottom. (p. 21)

E2

Tabulate coral *Favosites* sp., 11.5 × 11 cm (larger of two colonies)
In pavement in front of the middle set of doors. (p. 27)

E3

Marine gastropod (sea snail), possibly *Loxonema* sp., 8 × 2.5 cm
South end of Third Street steps, fifth step from bottom. (p. 8)

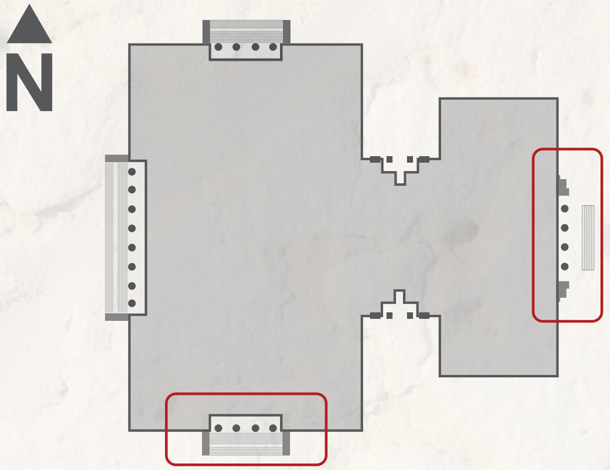
E4

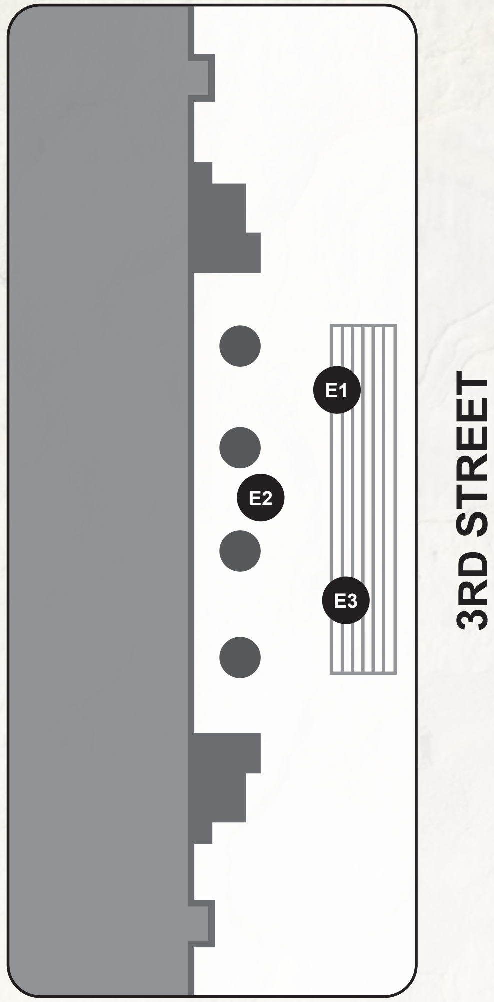
Orthoconic (noncoiled) cephalopod, 24 × 3 cm
West end of State Street steps, second step above intermediate landing. (p. 21)

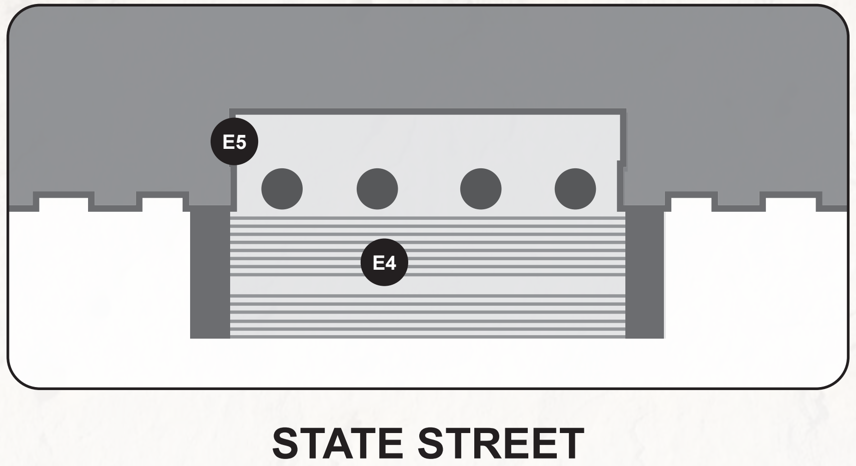
E5

Stromatoporoid (calcareous sponge), 27 × 25 cm
On western wall of covered area behind columns, just above the eye level of a standing adult of average height. (p. 24)

Exterior Fossils (East & South)







Fossil Tour

E6

Brachiopods in cross section, larger specimen 3.5 × 3 cm
South end of High Street steps, second step above intermediate landing. (p. 22)

E7

Colonial rugose "finger" coral *Eridophyllum* sp. (two colonies and close-up), larger colony 20 × 20 cm
Between railings in center of High Street steps, second and third steps above plaza. (p. 26)

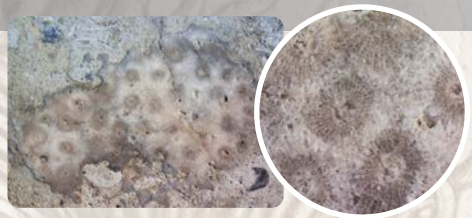
E8

Bivalve, possibly *Modiomorpha concentrica,* 5 × 2.5 cm
North end of High Street steps, second step above intermediate landing. (p. 19)

E9

Rugose "horn" coral *Cystiphylloides americanum,* 13 × 5 cm
North end of High Street steps, on intermediate landing. (p. 25)

E10



Colonial rugose coral *Hexagonaria* sp., 10 × 6 cm (colony and close-up)
North end of High Street steps, second step above intermediate landing. (p. 26)

E11

Brachiopod *Leptaena rhomboidalis,* 4 × 2.5 cm
North end of High Street steps, on intermediate landing. (p. 22)

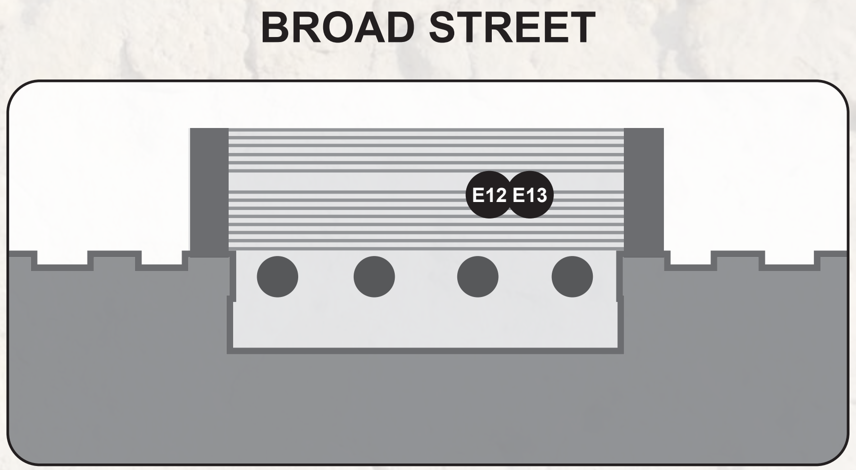
E12

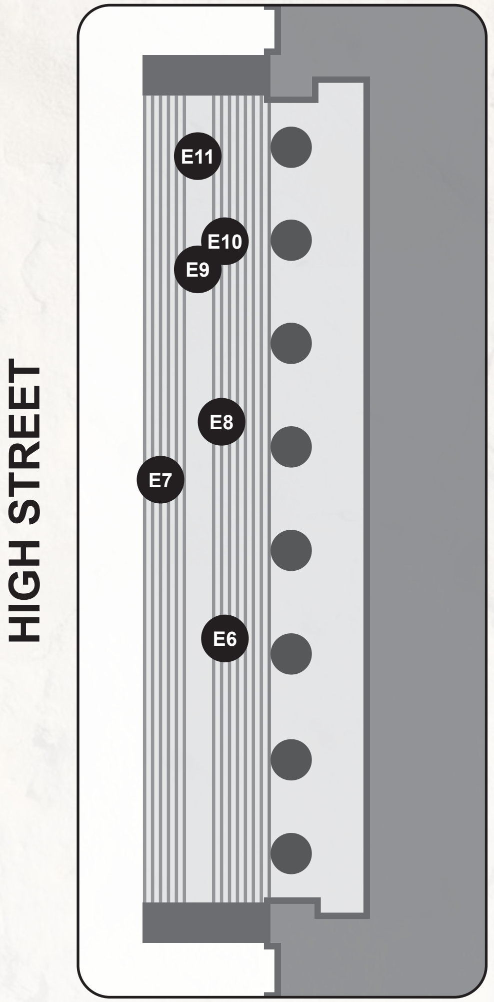
Bryozoan colony, 17 × 15 cm, and marine gastropod (sea snail), possibly *Loxonema* sp.
East end of Broad Street steps, first step above intermediate landing. (p. 23)

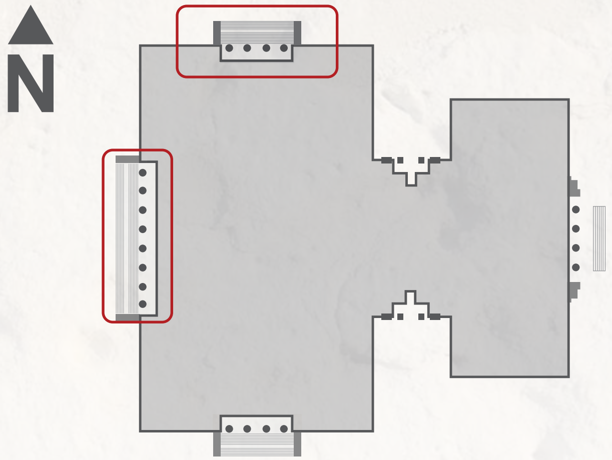
E13

Marine gastropod (sea snail) *Pleuronotus decewi,* 9 × 7 cm
East end of Broad Street steps, first step above intermediate landing. (p. 18)

Exterior Fossils (West & North)







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Websites

Cincinnati Dry Dredgers: **drydredgers.org**

Columbus Rock and Mineral Society: **columbusrockandmineralsociety.org**

Falls of the Ohio State Park (Clarksville, Indiana): **fallsoftheohio.org**

North Coast Fossil Club: **ncfclub.org**

Ohio Statehouse: **ohiostatehouse.org**

Orton Geological Museum: **ortongeologicalmuseum.osu.edu**

Documenting Your Finds

Paleontologists (scientists who study fossils) keep records of their finds. The tools on this page can help you document fossils that you find at the Ohio Capitol. Use the blank labels to record information and if you take a photo, be sure to include one of the provided photographic scales.

Useful Items

Camera, pen or pencil, notebook or sketchbook, compass, magnifying glass, LED light, GPS app (many of these are available on a smartphone)

Sample sketch and label:

Common Name : Sea snail Specimen No. : G2

Scientific Name : Maclurites magnus

Location : Ohio Statehouse interior, ground floor, north end of Museum Gallery, in black floor tile

Formation : Crown Point Limestone Age : Ordovician Period

Description : Spiral shell, lined with white calcite, with thickening on part of final whorl; cross section perpendicular to axis of coiling Size : 9 cm., largest dimension

Found by : Jane Smith Date : October 16, 2019

In company of : Statehouse fossil tour participants

Notes or sketch:

Common Name : ______ Specimen No. : ______

Scientific Name : ______

Location : ______

Formation : ______ Age : ______

Description : ______

Size : ______

Found by : ______ Date : ______

In company of : ______

Notes or sketch:

Common Name : ______ Specimen No. : ______

Scientific Name : ______

Location : ______

Formation : ______ Age : ______

Description : ______

Size : ______

Found by : ______ Date : ______

In company of : ______

cm

in

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Dale Gnidovec, Curator of the Orton Geological Museum, who has led the Statehouse Fossils Tour for many years, supplied invaluable experience and loaned specimens for illustrations; Professor Loren Babcock of The Ohio State University reviewed and improved the manuscript; Jacob Markiewicz assisted with locating the fossils; and Michael Rupert of the Capitol Square Review and Advisory Board provided helpful information and access to Capitol buildings and grounds.

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