

GUIDEBOOK NO. 5

# GUIDE TO THE BUILDING STONES OF DOWNTOWN CLEVELAND: A WALKING TOUR

by Joseph T. Hannibal  and Mark T. Schmidt





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# GUIDE TO THE BUILDING STONES OF DOWNTOWN CLEVELAND: *A WALKING TOUR*

by

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Front cover: Photo of the Terminal Tower complex as viewed from the northeast, with the Cuyahoga River in the background. Photo by Jennie Jones, courtesy Tower City Archives.  
Back cover: Map of downtown Cleveland showing stops.

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## INTRODUCTION

Urban areas are good places for geologic investigations. They can provide a high diversity of materials for examination in a convenient and familiar setting. They can also serve as focal points for discussing topics such as the geologic history and setting of the area, the origin and physical characteristics of the rocks used for building stones, and factors that influence the selection of particular types of stone. The effects of the environment on building materials, and the geologic history of the regions that have yielded the materials, are other fruitful topics.

This guide is intended to assist geologists, teachers, students, and the general public in conducting their own geologic investigations in downtown Cleveland. We have provided references to our sources to encourage further study of the topics discussed. Terms that may not be familiar to all readers are defined in the glossary that begins on page 28. Such words are printed in boldface the first time they are mentioned in the text. The photos that accompany the descriptions of each stop were taken between 1985 and 1989 unless otherwise noted.

## BUILDING STONES

Many kinds of rocks, both locally quarried and imported from various parts of the world, are used as **building stones** in downtown Cleveland (fig. 1). Examples of **igneous**, **metamorphic**, and **sedimentary** rocks can be seen within a short distance from the Terminal Tower.

This guide discusses rocks used for exteriors and interiors of buildings and for ornamental works of art. These stones have been selected by the artists, architects, and builders on the basis of appearance (color, texture, and patterns), physical properties (durability and workability), availability, and cost.

Both formal **rock-unit names** and names used in the building-stone trade are given, where possible. A formal rock-unit name, such as a **formation name**, is assigned to a given rock at the time of its first geologic description. A formation name consists of two parts, the name of a locality and the word formation or the name of a type of rock (*e.g.*, **sandstone**, **shale**, etc.). Two or more formations may be combined in a **group**. Formation names are used in this guide if they have been firmly identified. Group names are used in some cases.

The **trade name** of a rock may be the same as the formal rock-unit name or it may be different. A particular rock may have more than one trade name. Throughout this guide, trade names are printed in italics in order to distinguish them from formal rock-unit names.

Different uses of the terms **granite** and **marble** by builders and geologists can be confusing. Granite in builders' terminology is a hard crystalline rock. In geological terms, granite is an igneous rock that crystallized beneath the surface of the Earth and is composed of **potassium feldspar**,

**plagioclase feldspar**, **quartz**, and small amounts of dark, iron- and magnesium-rich minerals. Marble in builders' terminology is simply a fairly soft, typically carbonate, rock that may be crystalline, and which can be polished. In geological terms, marble is a **limestone** or **dolomite** that has been metamorphosed (recrystallized). **Metamorphism** occurs below the surface of the Earth owing to heat and pressure.

Weathering of building stone has come under increasing attention in recent years (see, for instance, Winkler, 1987, and Doe, 1989), as have techniques for cleaning stone (see Mack, 1975, and Grimmer, 1979). Thus we have included information on weathering and cleaning of buildings in several instances.

All stops in this guide are keyed to the map of downtown Cleveland (fig. 2 and back cover). Stops are numbered so that a walking tour can begin and end on Public Square. A geologic time scale (table 1), a summary of uses, sources, and ages of building stones used in downtown Cleveland (table 2), and a list of trade names and formal rock-unit names for stone used in downtown Cleveland (table 3) follow the text.

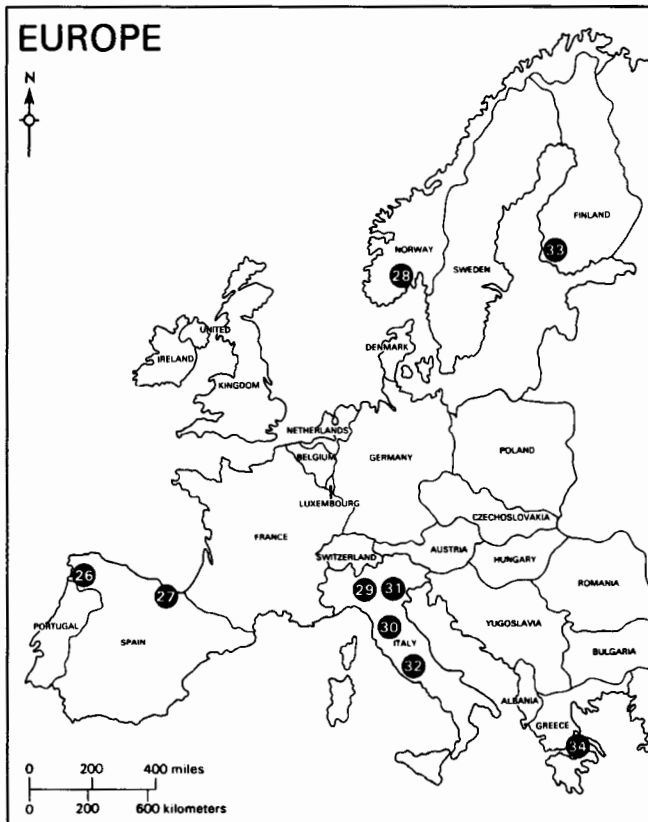
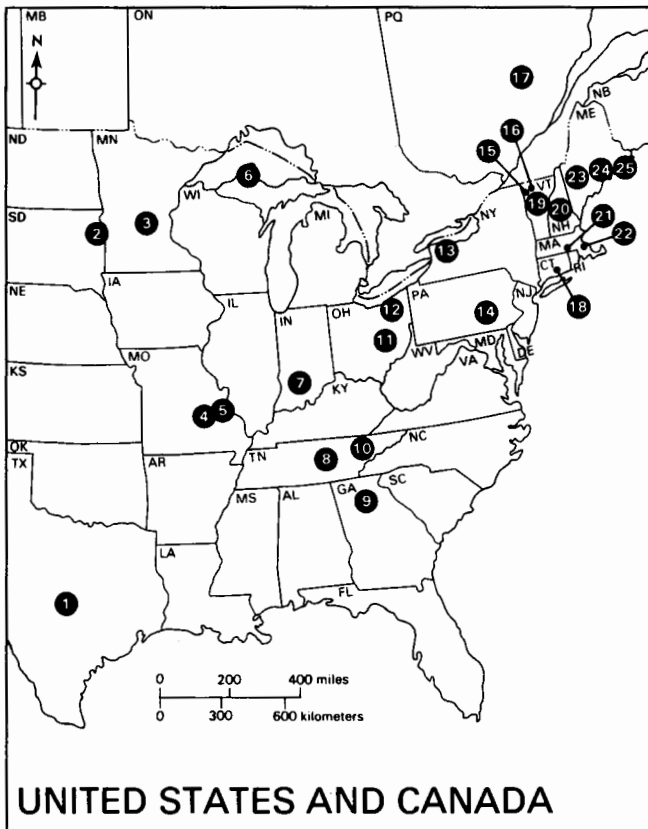
## GEOLOGIC SETTING

Downtown Cleveland is built over a large prehistoric valley which was carved more than 2 million years ago, during the **Tertiary** Period, and was later widened and deepened by glacial erosion. The valley was subsequently filled, primarily with material deposited by glaciers or related to the lakes that were predecessors to Lake Erie. The valley is now referred to as a buried valley (fig. 3). **Bedrock**, the **Devonian**-age Chagrin Member of the Ohio Shale, is more than 200 feet beneath the surface at Public Square.

**Unconsolidated sediments**—clay, silty clay, silty sand, etc.—representing **till**, **glaciofluvial**, **lacustrine**, **deltaic**, and beach deposits fill the valley. All of these materials were deposited within the last 2 million years. The presence of layers of fine, water-saturated sand in upper layers of this sequence has led to the Cleveland folktale of "quicksand" underlying several major downtown buildings. These saturated sands are not classic quicksands, however (Cuyahoga County Engineer Commission, 1906). Teeth and bones of mastodons have been found in shallow excavations made in these deposits in the downtown area (see Whittlesey, 1867).

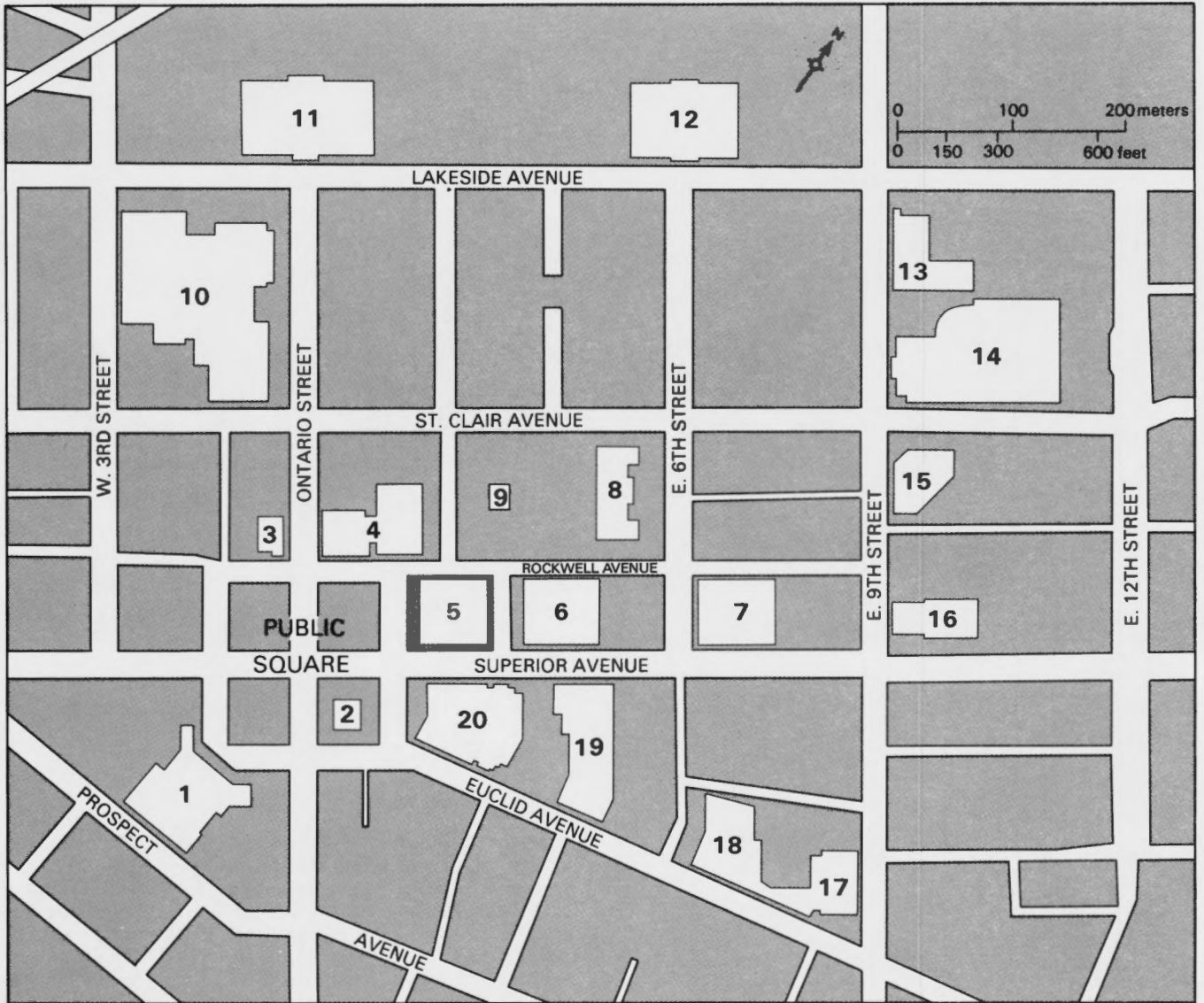
The depth to bedrock does not pose a problem for buildings of moderate size. Such buildings may be built on platforms or on **spread footings**. But very tall buildings, such as the Terminal Tower and the BP America Building, must compensate with **caissons** that reach bedrock.

Although borings have been taken in preparation for the building of many structures in the Cleveland area, there are only a few published descriptions of the sediments found during these investigations (see, for instance, Bagley, 1953).



- 1) Town Mountain Granite, Burnet Co., Texas
- 2) Milbank Granite, Milbank, South Dakota
- 3) *Charcoal Black granite*, St. Cloud, Minnesota
- 4) Graniteville Granite, Graniteville, Missouri
- 5) Grand Tower Formation, Ozora, Missouri
- 6) Jacobsville Sandstone, Jacobsville, Michigan
- 7) Salem Limestone, Bloomington-Bedford, Indiana
- 8) Crossville Sandstone, Crossville, Cumberland Co., Tennessee
- 9) Murphy Marble, Tate area, Georgia
- 10) Holston Formation, Knoxville area, Tennessee
- 11) Massillon sandstone, Coshocton Co., Ohio
- 12) Berea Sandstone, northeastern Ohio
- 13) Grimsby Sandstone, northwestern New York
- 14) Hammer Creek Formation, Dauphin Co., Pennsylvania
- 15) Crown Point Limestone, Isle La Motte, Vermont
- 16) "marble," Swanton, Vermont
- 17) *Canadian Black granite*, Lac St.-Jean, Quebec
- 18) *Stony Creek Red granite*, Branford Twp., New Haven Co., Connecticut
- 19) Woodbury Granite, Woodbury, Vermont
- 20) Mascoma Group, Grafton Co., New Hampshire
- 21) Milford Granite, Milford Twp., Worcester Co., Massachusetts
- 22) Quincy Granite, Quincy, Massachusetts
- 23) *North Jay Gray granite*, North Jay, Maine
- 24) *Mount Waldo granite*, Frankfort, Maine
- 25) *Moose-a-bec granite*, Hardwood Island, Maine
- 26) *Spanish Pink granite*, Porriño area, Spain
- 27) *Negro Marquiña marble*, Marquiña, Spain
- 28) *Emerald Pearl granite*, Larvik, Norway
- 29) *Botticino marble*, northern Italy
- 30) *Convent Siena marble*, Siena, Italy
- 31) *Rose Tavernelle marble*, Vicenza, Italy
- 32) *Este Light marble*, Tivoli, Italy
- 33) *Taivassalo granite*, Taivassalo, Finland
- 34) *Pentelikon marble*, Mt. Pentelycus, Greece

FIGURE 1.—Sources of some of the building stones used in downtown Cleveland.



- |   |                                     |
|---|-------------------------------------|
| 1) Terminal Tower (Tower City)                    | 11) Cuyahoga County Courthouse      |
| 2) Soldiers' and Sailors' Monument                | 12) City Hall                       |
| 3) Old Stone Church                               | 13) Ohio Bell Headquarters Building |
| 4) Society for Savings Building and Society Tower | 14) Galleria                        |
| 5) Old Federal Building                           | 15) One Cleveland Center            |
| 6) Cleveland Public Library                       | 16) St. John's Cathedral            |
| 7) Federal Reserve Bank Building                  | 17) National City Center Building   |
| 8) Board of Education Building                    | 18) National City Bank Building     |
| 9) War Memorial Fountain                          | 19) Old Arcade                      |
| 10) Justice Center                                | 20) BP America Building             |

FIGURE 2.—Map of downtown Cleveland showing locations of buildings for Stops 1-20. This map is also shown on the back cover of this guidebook.

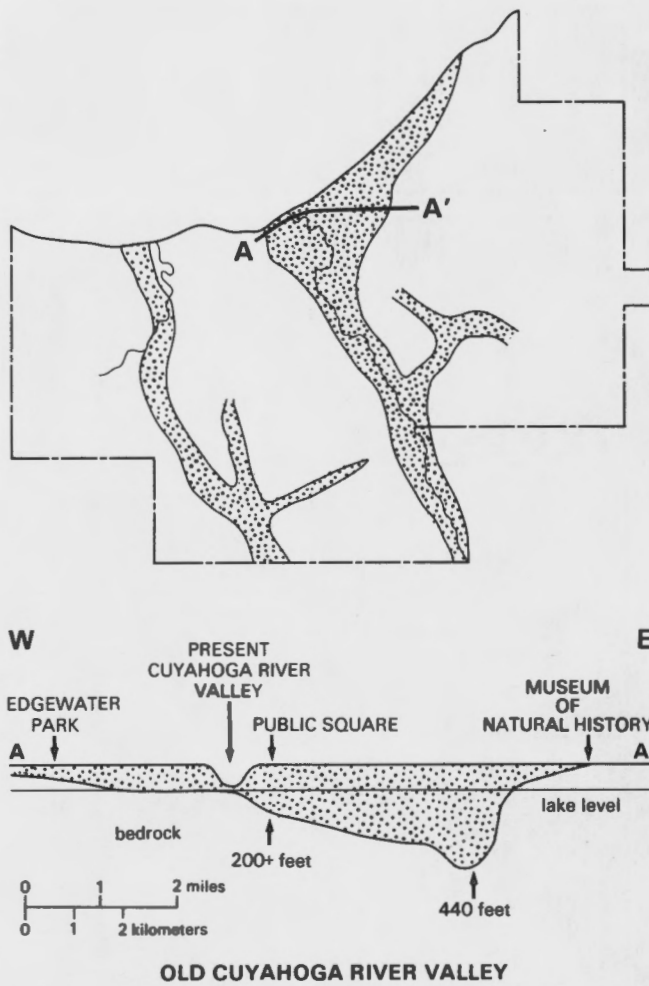


FIGURE 3.—Location of buried valleys in Cuyahoga County (modified from A. B. Williams, 1949, fig. 2) and cross section (A-A') of the buried valley underlying downtown Cleveland (modified from A. B. Williams, 1940, fig. 28). A-A' runs approximately along Detroit and Euclid Avenues between Edgewater Park and the University Circle area (which includes The Cleveland Museum of Natural History).

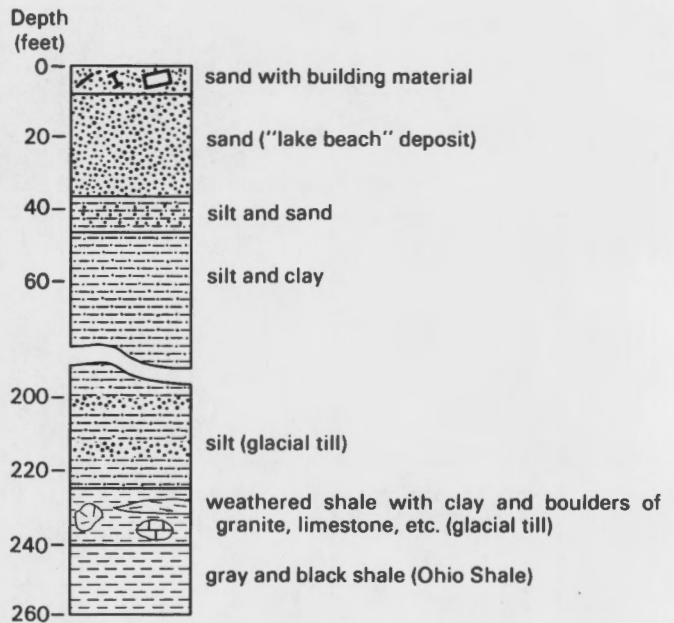


FIGURE 4.—Preliminary borehole #1 drilled on the site of the BP America Building. Data for illustration provided by BP America.

Several boreholes were drilled in 1981 in preparation for the construction of the BP America Building on the east side of Public Square. A columnar section based upon data from one of these boreholes is shown in figure 4.

## ARCHITECTURE

Many readers may be interested in obtaining additional information about the buildings and other structures described in this geologically oriented guidebook. A number of books are devoted to the architecture of Cleveland structures; these include books by Johannesen (1979), Herrick (1986), and Gaede and Kalin (1991). Gaede and Kalin's *Guide to Cleveland architecture* includes maps of walking tours in several areas of the city, including the downtown area.

### Stop 1. TERMINAL TOWER (TOWER CITY)



FIGURE 5.—The Terminal Tower. The BP America Building is on the right. Photo taken in 1989 from the west side of the Cuyahoga River.

The Terminal Tower (fig. 5) is Cleveland's best known landmark. This 52-story tower on the south side of Public Square is 708 feet high, measured from the concourse level. At the time it was built, in 1927-28 (fig. 6), it was the second tallest building in the United States.

Most of the exterior of the Terminal Tower is clad with Salem Limestone, quarried in southern Indiana. This rock, marketed as *Indiana limestone*, is one of the most widely used building stones in the eastern United States. The specific commercial variety of *Indiana limestone* used for the Terminal Tower is known as *Gray Indiana limestone*.

Salem Limestone is made up chiefly of the **calcium carbonate** skeletons of marine animals. Fragments of larger marine organisms can be seen with the unaided eye. With a magnifying lens, many smaller skeletal elements can be seen (fig. 7). **Fossils** in the Salem Limestone include **bryozoans**, **sea lilies**, **brachiopods**, and **foraminiferans**. These animals lived in warm, shallow seas that once covered southern Indiana and adjacent areas about 325 million years ago, during the **Mississippian Period**. The size and uniformity of grains indicate they were sorted by wave action and, thus, that this rock was deposited in water shallow enough for the sediment to be affected by waves. Additional information on the nomenclature, environment of deposition, composition, and use of Salem Limestone is given in Patton

and Carr (1982).

A small amount of granite is used along the base of the exterior of the Terminal Tower. The lobby contains flooring of *Tennessee marble* and walls of *Botticino marble*. These two materials are discussed under Cleveland Public Library (Stop 6). One of the two information desks in the lobby has a *Rosoro marble* top and base and *Botticino marble* side panels. The *Rosoro marble* contains **cephalopods**, sea lilies, and other fossils. It is **Mesozoic**, probably **Jurassic**, in age. The other desk has a green *Verde Antique* top and *Botticino* sides.



FIGURE 6.—The Terminal Tower during construction in 1927. Note the steel framework exposed on the upper portion of the building and the layered, unconsolidated sediments to the bottom left of the photo, at the base of the building. Photo courtesy of Tower City Archives.

Some 118,000 tons of granite, limestone, and terra cotta (a fired clay) were used in the original construction of the building (Toman and Cook, 1980). *Verde Antique* and a variety of other stones are used in the Tower City complex, located in and adjacent to the Terminal Tower; the complex had its grand opening in 1990. Several types of stone can be found in individual shops in Tower City, including *Verona marble*, an orange-colored limestone from Italy, and *Blue Pearl granite*, a blue-gray igneous rock composed primarily of feldspars, many of which exhibit a blue sheen. *Balmoral Red granite*, a deep-red granite quarried in Thivassalo, Finland, is used in the entranceway of the Regional Transit System station at Tower City.

The Terminal Tower is supported by steel-reinforced concrete supports that reach bedrock, the Chagrin Member of the Ohio Shale, about 250 feet below ground level. Cores taken just previous to the original construction show that the bedrock is composed of interbedded greenish-gray shale, gray shale, very dark gray shale, and reddish iron-stained **siltstone**.

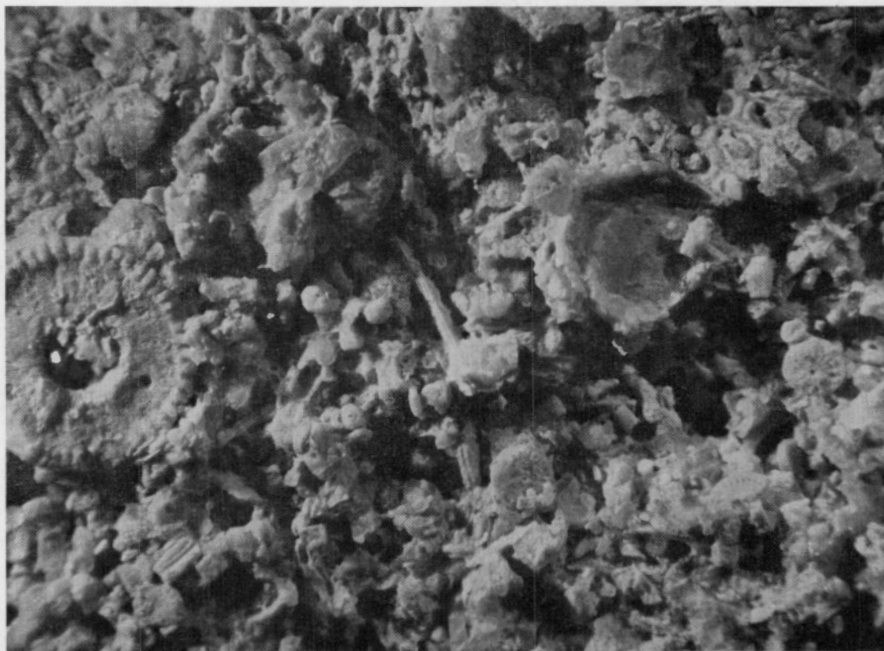


FIGURE 7.—Close-up of Salem Limestone. The wheel-shaped object to the left is a segment of the stem of a sea lily and is about 3 mm across.

## Stop 2. SOLDIERS' AND SAILORS' MONUMENT

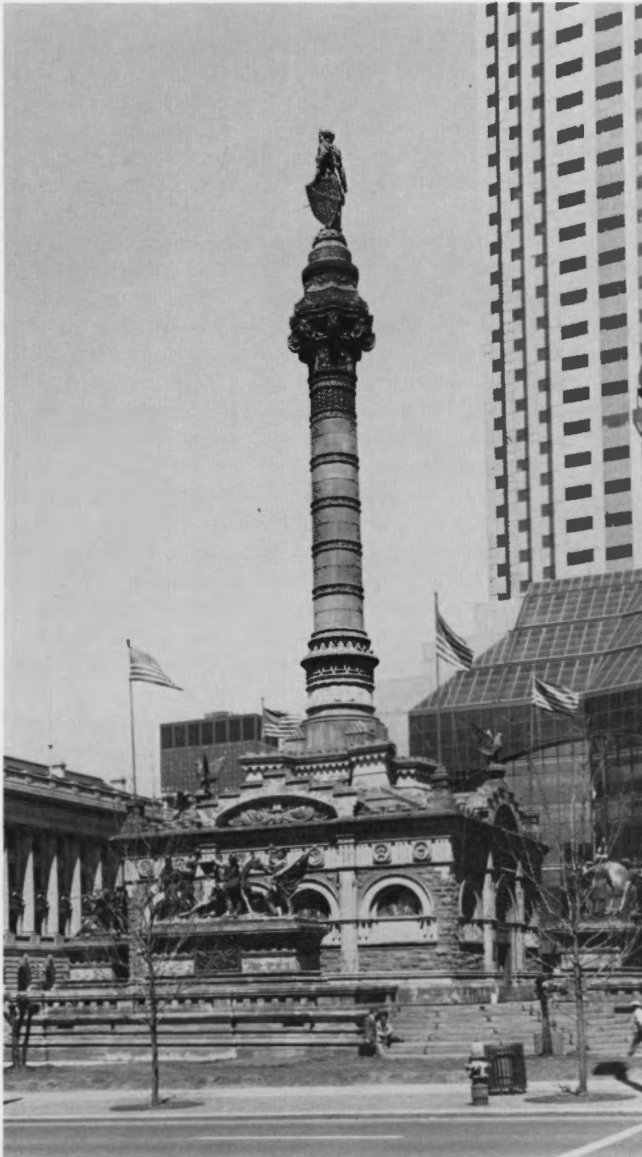


FIGURE 8.—Soldiers' and Sailors' Monument. The BP America Building is to the right. Photo circa 1988.

The Soldiers' and Sailors' Monument (fig. 8), on the southeast quadrant of Public Square, was dedicated in 1894. Much of this monument, including the large ramps and pedestals, a portion of the column, and the trim on the

building, is composed of light-colored Berea Sandstone, a rock once quarried extensively in northeastern Ohio. The rock used for this monument was quarried in the Amherst, Ohio, area, where it is still quarried today. Berea Sandstone quarried in the Amherst area has also been called *Amherst stone* (see, for instance, Gleason, 1894, p. 613).

Berea Sandstone is composed mostly of the mineral quartz. The Berea is of Devonian-Mississippian age and has been interpreted as having been deposited as river deposits, beaches, shallow marine sands, and/or sand dunes. (See Lewis, 1988, for one such interpretation.) These interpretations are based partly on the presence of certain types of inclined layering, known as cross-strata, which can be seen in the large blocks used in this monument. Wavy bedding structures can also be seen on the pedestals. The use of Berea Sandstone as a building material is discussed in numerous publications (see, for instance, Bownocker, 1915, and Hannibal, 1985a, 1985b).

The outer steps and the **esplanade** are made of red *Medina stone* (Gleason, 1894, p. 613). This sandstone was also used for paving in Cleveland at the turn of the century (Tillson, 1903). It is the **Silurian** Grimsby Sandstone, also known as the *Medina sandstone* (part of the Medina Group), a rock formerly quarried in Pennsylvania and, quite extensively, in Orleans County and other counties in New York State (Richardson, 1917, p. 246-247). Groups of curved markings seen on the esplanade are remnants of prehistoric wave ripples.

Most of the outer walls of the building and the tall central column at the top of the monument are composed of black Quincy Granite. This is a Mississippian(?) age unit named for Quincy, Massachusetts. The building is made of roughly dressed blocks; the column is polished. Each of the 10 blocks of Quincy Granite composing the column weighs about 14 tons (Gleason, 1894, p. 613). The statuary on the pedestals is bronze.

White marble said to have come from Italy, red and green **slate**, and red and white *Medina stone* are used in the interior of the monument.

The outside of the monument was cleaned in 1966 and 1979 (Barrett, 1981, p. 50).

Low stone walls and outer stairways were installed around the monument in 1989. They are made of *Charcoal Black granite* and *Cavallo Buff sandstone*. *Charcoal Black* is a **granodiorite** quarried in the St. Cloud, Minnesota, area. It is 1.8 billion years old. *Cavallo Buff* is quarried from the **Pennsylvanian**-age Massillon sandstone of the Pottsville Group in Coshocton County, Ohio.

There is a U.S. Geological Survey (USGS) **bench mark** on the northwest side of the monument, marking 668 feet above sea level. This bench mark is plotted on the 1903 Cleveland 15-minute USGS topographic quadrangle map.

### Stop 3. OLD STONE CHURCH

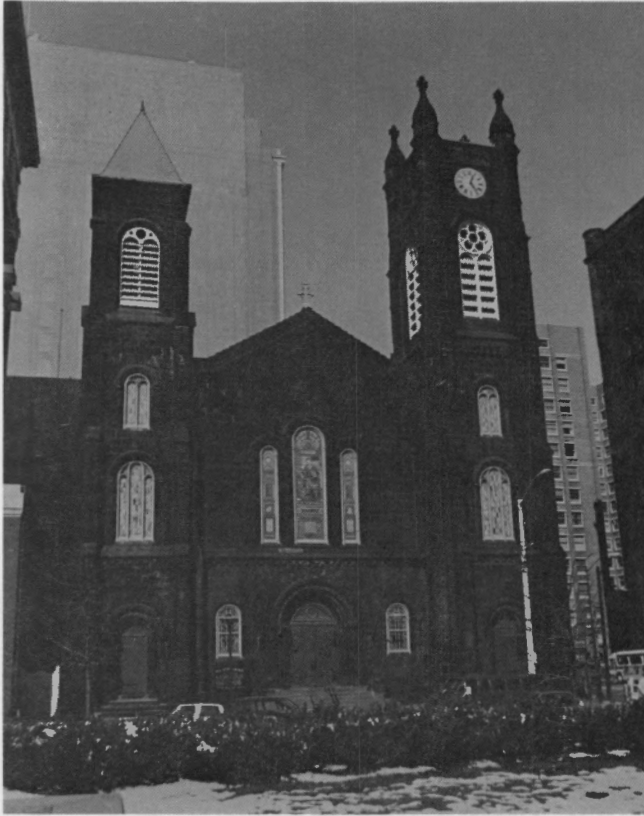


FIGURE 9.—The Old Stone Church. The Berea Sandstone facing of the church has blackened but is very well preserved after more than 130 years of exposure. Photo circa 1985. Reprinted from fall 1986 issue of *Earth science* by permission of American Geological Institute.

The Old Stone (First Presbyterian) Church (fig. 9), bordering the north side of Public Square, was dedicated in 1855. It is the oldest building in the Public Square area, but is actually the second “Old Stone Church” to stand on this spot. The church is faced with Berea Sandstone quarried by the Black River Stone Company in Carlisle Township, Lorain County, south of Elyria, Ohio (W. W. Williams, 1879, p. 248).

The sandstone has acquired a black surficial coating giving the church its antique look. May (1973, p. 13) reported that this rock has never been cleaned. The nature of this coating is subject for debate. One possible cause is surface deposition of airborne pollutants. In support of this theory, many other downtown buildings faced with other types of stone (see, for example, Old Federal Building, Stop 5) have developed a dark coloration. Sandstones, being composed of rounded particles, have a comparatively high surface area and would be expected to trap particles effectively. A second possibility is that the coating, and the brown rim below the surficial coating, are at least partly due to weathering of the rock itself, and therefore are controlled by the rock composition and **permeability** (see Winkler, 1987, p. 88). An example of this type of weathering in the natural environment is known as “desert varnish”—a coating of iron oxide and traces of manganese oxide and silica brought out in solution from within the rock and deposited by evaporation on the rock surface. It is likely that both processes occur simultaneously. The stone facing of this church has been remarkably durable, withstanding major fires in 1857 and 1888 (May, 1973, p. 10-11).

A 1961 addition on the north side of the church complex is faced with Salem Limestone. Portions of the limestone, especially those protected from rainwater, have also acquired a black coating.

#### Stop 4. SOCIETY FOR SAVINGS BUILDING AND SOCIETY TOWER



FIGURE 10.—Society for Savings Building. Red Jacobsville Sandstone, used for most of the building, and granite from Missouri used for the base help to support the building. Photo circa 1985.

Bordering the north side of Public Square, the 10-story Society for Savings (formerly Society National Bank) Building (fig. 10), Cleveland's oldest skyscraper, forms a part of the Society Center Complex. The original building opened in 1890. The base and columns of this building are made of pink Precambrian-age Graniteville Granite. This rock, quarried in the Graniteville area, Iron County, Missouri (Buckley and Buehler, 1904), has also been called *Missouri granite* and is 1.3 billion years old.

The exterior walls are composed of red sandstone. They are 5 feet thick and are partially load bearing. There is also a steel skeleton. The red stone is Jacobsville Sandstone (Dorr and Eschman, 1970, p. 93), a Late Precambrian-age (800-570 million years old) unit quarried by the Portage Entry Red Stone Company in Jacobsville and vicinity, Houghton County, Michigan. This area was a famous quarry region. This rock was quarried in large quantities into the 1920's, but only small amounts have been quarried since (Johnson, 1983, p. 117). It is composed primarily of grains of quartz and feldspar. Its red color is due to the presence of **hematite**. This rock is also known as *Portage Entry Red sandstone*. Hamblin (1958) describes the natural occurrence of the rock in detail.

Gaede (1973) reported that there has been some **spalling** of sandstone from this building. During the recent past, portions of the stone were carefully chiseled off the exterior as part of the building's maintenance program (Charles R. Thomas, personal communication). In the spring of 1990 the



FIGURE 11.—Society Tower, as it was being completed in 1991. The stone facing visible in this photo is *Stony Creek granite*. The Society for Savings Building is to the left of the Society Tower. Because its exterior was recently cleaned, the color of the stone walls of the Society for Savings Building appears to be lighter than in figure 10. Photo by M. Vantz, The Cleveland Electric Illuminating Company, 1991.

entire exterior was cleaned using chemicals.

Small (5 mm-1+ cm) white to gray spots can be seen in places in the stone. These spots are spherical areas where the original red coloration of the rock was leached away, perhaps because of organic inclusions. These spheres are a prominent feature of the Jacobsville Sandstone (Hamblin, 1958, p. 23-25).

Many types of rock were used inside the building. Some entryways have walls of **travertine** (see National City Center Building, Stop 17) and at least one had flooring of gray slate. *Tennessee marble*, a light-pink limestone with dark **stylolites** (see Cleveland Public Library, Stop 6), red “marble” quarried in Swanton, Vermont, and other stone were used in the banking area (Society for Savings, 1891,

p. 40-42, 60-61). The red “marble” is **Cambrian** in age.

The 57-story Society Tower (fig. 11), located immediately east of the Society for Savings Building, was constructed in 1990-91. Most of its facing is *Stony Creek granite*, and most of it is **flamed** (*Stony Creek granite* is discussed under the National City Bank Building, Stop 18). Flamed *Napoleon Red granite* is used for the exterior of most of the bottom portion of the building. Stone used inside this building and the adjacent hotel complex includes *Rosso Verona (Red Verona) marble*, a nodular, orange-colored limestone of Jurassic age quarried in the Venice, Italy, area (Albertini, 1987); purplish *Rosso Levanto marble* quarried in the Mediterranean area; and *Breccia Pernice marble* (discussed under BP America Building, Stop 20).

### Stop 5. OLD FEDERAL BUILDING



FIGURE 12.—Old Federal Building at Superior Avenue and Public Square, faced with very light gray *Mount Waldo granite*. Photo circa 1988.

The Old Federal Building (fig. 12), also known as the Federal Courthouse, is located at Superior Avenue and Public Square. It was the first building to be constructed (1905-11) as part of Cleveland’s Mall Plan, a development plan for public buildings in Cleveland’s Mall area (Rarick, 1986). Other buildings built as part of the Mall Plan are the Cuyahoga County Courthouse (Stop 11), the Cleveland Public Library (Stop 6), the Federal Reserve Bank Building (Stop 7), the Board of Education Building (Stop 8), and Public Auditorium (see Additional sites).

The exterior of the building is faced with a light-gray granite from New England. According to a booklet published at the time of the dedication of this building, the granite was supplied by the John Swenson Granite Company, Concord, New Hampshire. The stone is *Mount Waldo granite* quarried in Frankfort, Maine (Dale, 1923, p. 258-260; Grindle, 1977, p. 154, 157-158). It is part of the New Hampshire **Plutonic Series** and is Devonian in age. Several published and unpublished sources, however, report that this building is faced with other types of granite from New England. The surface of the stone on the first floor is finished differently from that of the rest of the building. Patches of a different, but similarly colored, granite were added at various spots along ground level in 1989.

There was controversy over the use of granite, rather than local sandstone, for this building (Anonymous, 1902; Anonymous, 1903). The U.S. Treasurer favored sandstone, but the Cleveland City Council (1904, p. 461) adopted a resolution supporting granite. The use of granite was also supported by the Committee on Public Buildings and Grounds of the U.S. Congress. A minority of the committee disagreed, favoring the use of local sandstone (U.S. House of Representatives, 1905).

The outside of this building has been cleaned several times. Plans for the initial cleaning were made by 1930, but the cleaning, done with steam and an ammonium bifluoride solution, did not begin until 1939 (Anonymous, 1939). By the early 1960’s the rock was so darkened again that it was described as being “soot-blackened” granite (Segal, 1962, p. 15), and the building was said to have a “grimy, bespattered appearance” that was a “civic disgrace” (Anonymous, 1963). The building was cleaned in 1963 and again in the late 1970’s.

The exterior statues, “Jurisprudence” and “Commerce,” are sculpted in *Tennessee marble* (Dale, 1924, p. 160; see Cleveland Public Library, Stop 6, for a discussion of this stone). The exterior of these statues has weathered some since installation, resulting in roughened surfaces. (See Campen, 1980, for additional information on these and other outdoor sculptures in downtown Cleveland.)

Much of the facing in the interior of the building, including vaulted ceilings, walls, and floors of the first floor, is of *Italian marble*. This rock is a limestone containing **coated grains**, fossils, and stylolites. It is probably *Botticino marble* (see Cleveland Public Library, Stop 6). In the third floor hallways *Cipollino marble*, a white marble with prominent green streaks, is used for several pillars, and white *Pentelikon marble* is used for **wainscoting** (Croly, 1911, p. 212). “Cipollino” means “onion-shaped,” referring to the resemblance of this streaked marble to an onion cut in half (Bowles, 1939, p. 328). Both of these stones are true marbles and both *Pentelikon marble* and classic *Cipollino marble* are quarried in Greece. However, other varieties of *Cipollino marble* are quarried elsewhere. *Tennessee marble* is used for flooring on the second and third floors. Also used in the building’s halls are *Verde Antique* and a dark-red-brown limestone **breccia**.

The two large, ornate courtrooms on the second floor have **pilasters** made of gray, **fossiliferous** limestone and wainscoting made of dark-red limestone. The red limestone contains abundant, white fossils of **ammonites**.

## Stop 6. CLEVELAND PUBLIC LIBRARY



FIGURE 13.—Cleveland Public Library's Main Building. The white Murphy Marble facing has weathered badly in places. This weathering is especially noticeable in ornamental trim at street level. Photo circa 1988.

The Cleveland Public Library Main Building (fig. 13) at 325 Superior Avenue is a treasure trove for those who enjoy fine building stone. This building was constructed in 1923-25 and is supported by spread footings. It is clad with *Cherokee marble* (Daneker, 1927, p. 56), a coarse-grained white marble with light-gray veining. This stone has also been identified as *Mezzotint* or *Mezzotint Cherokee* (Hehr and others, 1975). The term "mezzotint" (a modification of the Italian word "mezzatinta") indicates a marble with wavy markings. The stone was quarried in the Tate area, in north-central Georgia's marble district, and is Cambrian in age. The formal geologic name for this rock is the Murphy Marble. The stone was originally deposited as carbonate sediment along an ancient barrier reef (Power and Forrest, 1973) and was later transformed to marble by heat and pressure. The surface of the stone is finished in the same manner as on the Old Federal Building (Stop 5).

Some of the marble, particularly on the face of sculpted figures and designs and that formerly used for **balusters**, has deteriorated with time, probably owing to acid rain. This building was sandblasted in 1980 and 1986, possibly adding to the problem. The exterior marble balusters were replaced with concrete balusters in 1980. (See Doe, 1989, for a discussion of similar deterioration of buildings in Washington, D.C.)

The steps at the main entrance are made of *North Jay Gray granite*, quarried at North Jay, Franklin County, Maine (unsigned manuscript, Cleveland Public Library).

Inside the building various types of limestone are used. A cream-colored limestone known as *Botticino marble*, quarried in the Brescia area in northern Italy, lines many walls. Stylolites are prominent in this rock (fig. 14A). Some of the stylolites are seen in side view, some in top and bottom view.

The *Botticino marble* also contains fossils. Some of these, including tiny snails, are preserved within coated grains, which in cross section look like sliced-open M&M's (fig. 14A). This rock was deposited during the Jurassic Period on shallow limestone banks similar to the modern Bahama Banks. One of the best places to see fossiliferous *Botticino* is in the second-floor hall leading to the History Department;

additional fossiliferous *Botticino* can be seen in the first- and third-floor hallways.

Windowsills in a number of departments, including the Literature and Popular Departments on the first floor, the History and Social Sciences Departments on the second floor, and the Fine Arts Department and Photograph Collection Room on the third floor, are made of a cream-colored limestone, possibly from the **Cretaceous** of France (S. Horenstein, personal communication). This rock is filled with fossils of large, discoidal foraminiferans (fig. 14C). Some are 2 cm or larger in diameter. The elegant internal spiral structure of these particular foraminiferans is evident in many of the fossils.

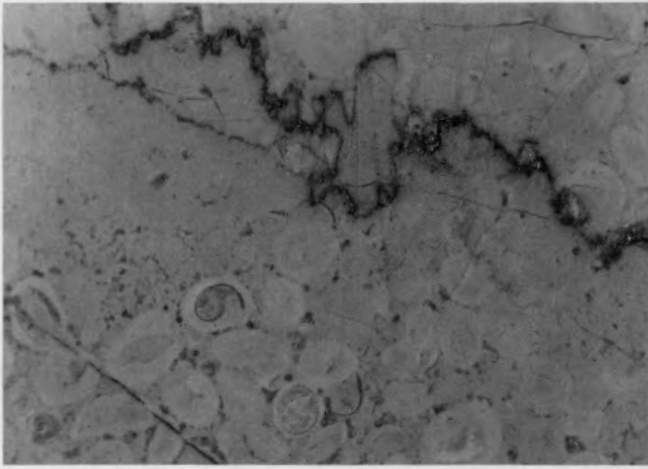
The John G. White Room, on the library's third floor, has windowsills and trim around the doors (fig. 15) made of *St. Genevieve Golden Vein marble*. This is a Middle Devonian limestone from the Grand Tower Formation, quarried in Ozora, Ste. Genevieve County, Missouri (Hinckey, 1946, p. 14-22). It includes a variety of fossils, such as solitary **rugose corals** (fig. 14B), some of which are several centimeters long, **colonial corals**, branching bryozoans (fig. 14D), and **stromatoporoids**. These fossils represent part of a coral-dominated, shallow-marine community.

A light-pink limestone known as *Rose Tavernelle marble*, probably quarried in Vicenza, Italy, can be examined along the hallway outside the White Room. This rock contains small foraminiferans, colonial corals, and fragments of sea lilies.

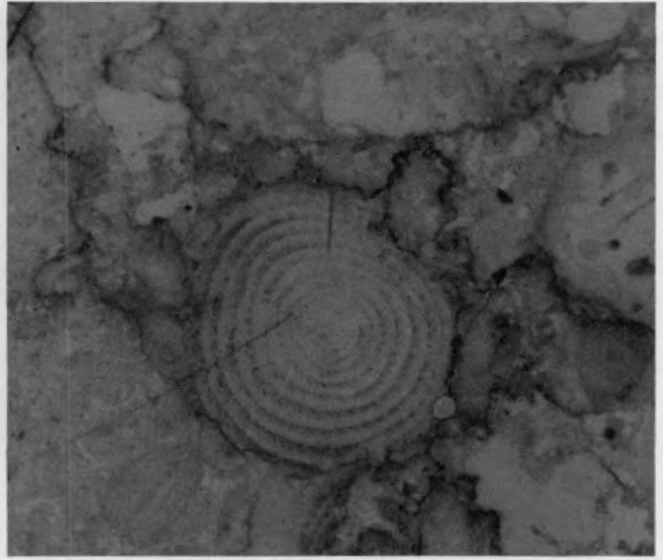
A pink crystalline limestone known as *Tennessee marble* (Bates, 1969, p. 171) or *Holston marble* is used for much of the flooring in the library's corridors. It is also used to line the walls in the basement corridor, and can best be examined there. This stone, quarried in the Knoxville area, in eastern Tennessee, belongs to the Holston Formation and represents part of a bryozoan-dominated **Ordovician**-age reef tract (Walker and Ferrigno, 1973). Prominent stylolites and abundant bryozoans of several types, including branching and hemispherical colonies, some over 2 cm long, can be seen in this stone. Internal features of the bryozoan colonies, including tubular living chambers of individual animals, can be seen with the aid of a hand lens.

Other types of rock are also used inside the building. Travertine (see National City Center Building, Stop 17, for discussion) is used for some flooring in hallways. Brett Hall also has flooring of travertine, chosen because its porosity reduces noise, but most of it was covered with carpeting in 1980. *Gray Monte Aurato marble*, a limestone breccia, and *Red Senora marble*, a limestone containing corals, bryozoans, and other fossils, are used for columns in Brett Hall. *Golden Nebo Travis marble*, a yellow-brown limestone quarried in Utah, is used in the Lending Department on the first floor near Superior Avenue (Hehr and others, 1975, and unsigned manuscript at Cleveland Public Library). Walls in the basement washrooms are faced with white *Alhambra marble*.

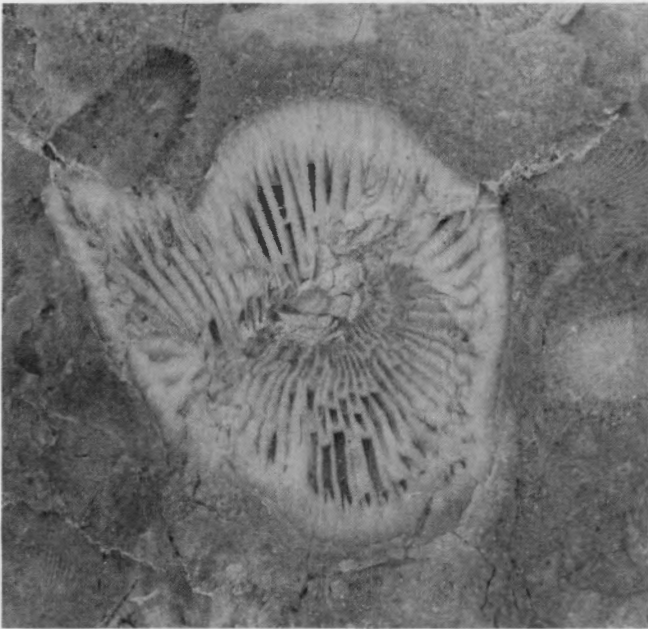
The Business and Science Building (formerly the *Plain Dealer* Building) of the library is located just east of the Main Building and was built in 1909. The lower portion is faced with *Mascoma granite*, a light-gray granite quarried near Enfield, Grafton County, New Hampshire (Dale, 1923, p. 177-178). It is part of the Mascoma Group, which is Devonian in age. *Verde Antique*, *Tennessee marble*, and a white marble with dark veins are used in the lobby. The *Verde Antique* was probably quarried in Vermont.



A



C



B



D

FIGURE 14.—Fossiliferous limestone used inside Cleveland Public Library. **A.** *Botticino marble* wall, with stylolites (dark, jagged lines) and spherical, coated grains, some containing snails, in second-floor hallway leading to History Department. Coated grains, seen in cross section, are about 5 mm in diameter. **B.** Close-up of doorframe in the J. G. White Room showing rugose coral in cross section. **C.** Foraminiferans in windowsill of History Department. The largest specimen shown is about 1 cm across. Reprinted from fall 1986 issue of *Earth science* by permission of American Geological Institute. **D.** Bryozoans and corals in a windowsill of the White Room.



FIGURE 15.—Doorframe of J. G. White Room made of fossiliferous limestone from the Grand Tower Formation. Area of close-up in figure 14B is in center left side of doorframe.

### Stop 7. FEDERAL RESERVE BANK BUILDING



FIGURE 16.—Federal Reserve Bank Building, clad in pink Murphy Marble. Photo circa 1988.

The Federal Reserve Bank Building (fig. 16), at East 6th Street and Superior, was opened in 1923. It is clad with *Etowah marble*, a pink marble with dark streaks quarried in the Tate area, Georgia. The formal geologic name for this rock is Murphy Marble. (See Cleveland Public Library, Stop 6, for discussion of another variety of Murphy Marble.) The statues, “Integrity” and “Security,” on the East 6th Street side of the building, as well as some street curbing near the building, are of the same marble.

The base of the building is made of *Moose-a-bec granite* (Herrick, 1986, p. 81). This reddish-gray granite was quarried on Hardwood Island on Moosabec Reach near Jonesport, on the northeastern coast of Maine (Dale, 1923, p. 270-271). It is Devonian in age.

Originally only the lower parts of the walls above the granite base were to be faced with marble; the upper parts were to be *Indiana limestone*. The Georgia Marble Company of Tate, however, submitted a bid under which the cost of using marble for all of the walls was only slightly more than using a combination of limestone and marble (Anonymous, 1921; Campen, 1965). The exterior of the building was first cleaned in 1930. In fact, the Federal Reserve Bank Building was illustrated in an advertisement (Georgia Marble Company, 1930) touting the ease of cleaning Georgia marble.

Inside, *Convent Siena marble* from the Siena area, Italy, is used in the walls of the banking concourse. This rock is a tan limestone with prominent veins of calcite.

The building is supported by a large number of concrete piles, the longest of which extend 8 feet below the surface level of Lake Erie (Robertson, 1921), that is, an elevation close to 560 feet above sea level.

### Stop 8. BOARD OF EDUCATION BUILDING



FIGURE 17.—Board of Education Building, faced with light-brown Berea Sandstone. Photo circa 1986.

The Cleveland Board of Education Building (fig. 17), on East 6th Street between Rockwell and St. Clair Avenues, is faced with Berea Sandstone quarried in the Amherst area. The stone used for this building was marketed as *Silvertone Gray Amherst sandstone* by the Cleveland Quarries Company.

The use of Berea Sandstone for this building was controversial. It was a departure from the granite and marble used for other buildings in the Mall area. In the summer of 1930, Harry Hopkins, who had formerly been city manager, attacked the proposed use of Berea Sandstone for the building as a potential “blot on the Mall.” The *Plain Dealer* quoted Hopkins as saying, “If sandstone is placed in this group, between a limestone building (Public Hall) and a marble building (Public Library), all the defects of sandstone will be magnified” (Anonymous, 1930). Except for some spalling near ground level, however, this stone has held up very well since its installation in 1930.

Inside the building a white marble with gray streaks lines the walls and is also used for flooring. A limestone containing sea lilies and other fossils frames the basement elevator entrances.

### Stop 9. WAR MEMORIAL FOUNTAIN



FIGURE 18.—War Memorial Fountain. Statuary around the base of the central bronze figure is sculpted from larvikite. Photo circa 1986.

Just west of the Board of Education Building is the War Memorial Fountain (fig. 18), also known as the Peace Memorial Fountain, sculpted by Marshall M. Fredericks and dedicated in 1964. The four carvings located around the large, bronze central statue of the fountain are made of **larvikite**. This dark-brown, **Permian**(?)-age rock is composed predominantly of feldspar and was quarried in the Larvik area of Norway. It is marketed under the name *Emerald Pearl granite*. Further information on larvikite is given in Slagle (1982, p. 29). Although a difficult rock to carve and polish compared to marble or limestone, larvikite was chosen because of its beautiful color, hardness, and interesting crystalline composition, as well as the availability of large blocks.

The bluish rock used for walls around the basin is also composed primarily of feldspar. Light reflects off the smooth planes within the crystals in these rocks.

The War Memorial Fountain was disassembled in 1989 and the surrounding mall area was excavated for a large underground parking garage completed in 1991. The War Memorial was then reassembled and the mall area was called the War Memorial Plaza. Large amounts of *Solar White granite* were used for the street-level openings of the large air shafts supplying the garage's air intake and exhaust, as well as other parts of the Plaza. *Solar White* is a very light gray, Precambrian-age granite quarried in the Carolinas (Hund, 1990, p. G104). The light color is due to the white coloration of the feldspars and the low amount of dark minerals in this stone.

### Stop 10. JUSTICE CENTER



FIGURE 19.—Justice Center. Cracks have developed in the *Spanish Pink granite* used to face the building and for sidewalks around the building. Photo circa 1988.

The Justice Center complex (fig. 19), completed in 1977, is bounded by Ontario, St. Clair, West 3rd, and Lakeside, and was one of the most controversial building projects in Cleveland. The plans for the building and the architectural firm were changed and there were enormous cost increases while the building was being erected. Even the selection of a Canadian firm for much of the stonework was opposed. Originally the building was to be steel and glass. The use of stone was one factor that vastly increased the cost of the building.

The Justice Center is faced with *Spanish Pink granite* quarried in the Pedrolonga Quarry, in the Porriño area of northern Spain, near the Portuguese border (R. C. Adams, personal communication). This rock, also known as *Rosa Porriño granite*, is used as sidewalk material and inside the building as well. It contains a high proportion of quartz and some dark **xenoliths**. This stone was fabricated (cut into thin slabs, etc.) in Massa, Italy (R. C. Adams, personal communication). Much of it is very thin, only 2.5 cm thick. In the 1980's cracks developed in the exterior stone, particularly in the walkways and along the base of the building. Replacement of damaged granite was scheduled for late 1991.

The proposed use of precast granite, rather than actual granite panels, for parts of a nearby jail addition to the Justice Center provoked further controversy in 1991.

### Stop 11. CUYAHOGA COUNTY COURTHOUSE



FIGURE 20.—Cuyahoga County Courthouse, faced with light-gray Milford Granite.

The Cuyahoga County Courthouse (fig. 20), on Lakeside Avenue at Ontario, was built between 1906 and 1912 and

was the second building to be completed as part of Cleveland's Mall Plan. The exterior of the courthouse is Milford Granite (*Milford Pink granite*), a very light gray **biotite granite** of Devonian(?) age quarried in Milford Township, Worcester County, Massachusetts, by the Webb Pink Granite Company (Dale, 1923, p. 352). Parallel streaks of biotite are evident in many of the blocks of granite. *Tennessee marble* and *Georgia marble* are used for flooring, and *Colorado marble* is used for walls and columns (Marzulli, 1982?, p. 41). The *Colorado marble* may have been quarried near Marble, Colorado. Statues located above the front (Lakeside Avenue) entranceway and on the upper part of the back of the building are carved from a light-colored stone, probably *Tennessee marble*.

Several different types of foundations were considered for this building, including both concrete piles and spread footings. The latter were recommended by the Cuyahoga County Engineer Commission (1906).

### Stop 12. CITY HALL



FIGURE 21.—City Hall, faced with light-gray Woodbury Granite. Photo circa 1988.

Cleveland City Hall (fig. 21), on Lakeside at East 6th, was built between 1912 and 1916 and was dedicated in 1916. It is faced with Devonian-age Woodbury Granite (*Woodbury Bashaw granite*), a biotite granite from the Robeson Mountain quarry of the Woodbury Granite Company in Woodbury, Vermont (Dale, 1923, p. 149-150). The exterior surface is finished in the same fashion as the Old Federal Building (Stop 5). City Hall was sandblasted in 1973.

Inside the front entrance area, *Botticino marble* is used (Herrick, 1986, p. 50). This limestone contains coated grains and numerous stylolites (see Cleveland Public Library, Stop 6, for discussion). Walls of the rooms just off this area are faced with white marble containing dark veins. Much of the flooring is *Tennessee marble* (see Cleveland Public Library, Stop 6, for discussion).

### Stop 13. OHIO BELL HEADQUARTERS BUILDING



FIGURE 22.—Ohio Bell Headquarters Building. The pink Town Mountain Granite contains large crystals.

The Ohio Bell Headquarters Building (fig. 22), at East 9th Street and Lakeside, completed in 1983, is faced with a variety of Town Mountain Granite sold as *Texas Pearl granite* (Norman Perttula, personal communication). This rock is also used in the interior of the building. It was quarried in Marble Falls, Burnet County, Texas, and contains large crystals. Town Mountain Granite is Precambrian in age, dated at approximately 1.1 billion years.

The sidewalk at the entranceway and flooring in the lobby is *Canadian Black granite* (Norman Perttula, personal communication), also known as *Péribonka granite*, quarried in the Lac St.-Jean area, Québec (Bussiere Company, Québec, personal communication). This black rock is a Precambrian-age **anorthosite**, composed mostly of black plagioclase feldspar. It is about 1.2 billion years old (Higgins, 1989). Additional information on this stone can be found in Nantel (1983) and Wousson, Martignole, and Nantel (1988).

### Stop 14. GALLERIA



FIGURE 23.—Galleria entrance on East 9th Street. Red *Taivassalo granite* is used around the entranceway and for the lower portion of the walls. Photo circa 1988.

The Galleria (fig. 23), whose main entrance is on East 9th off St. Clair, was completed in 1987. The main entry arch and lower portion of the outer walls are faced with *Taivassalo granite*, a red granite quarried in Taivassalo, Finland, and fabricated in Verona, Italy. This rock is Precambrian in age, approximately 1.6 billion years old (Eskola, 1963, p. 235-238). It contains some xenoliths.

Various types of stone, including granite, marble, limestone, slate, and anorthosite, are used inside the building. The limestone flooring used in some shops is highly fossiliferous. Among the fossils that can be seen are corals and foraminiferans. Stylolites are also visible in some of the stone.

The Galleria is supported by a grid of underground columns.

### Stop 15. ONE CLEVELAND CENTER



FIGURE 24.—One Cleveland Center. Dark-gray Crown Point Limestone is used around the base of the building.

One Cleveland Center (fig. 24), at East 9th and St. Clair, was completed in 1983. The rock used in this building preserves a fine assemblage of Early Ordovician fossils representing a very shallow marine habitat. This rock is Crown Point Limestone from Vermont and is marketed as *Champlain Black marble*, named for its occurrence in the Lake Champlain area and its dark color. The rock was quarried by the Vermont Marble Company, Proctor, Vermont (Dianne Ludman, personal communication), on Isle La Motte, an island in Lake Champlain. The paleontology and other aspects of the Crown Point Limestone are discussed by Fisher (1968) and Ratté and Ogden (1989).

The rock is used both inside and outside the building. Inside, in the lobby, it is polished; outside, along the base of the building and in the low walls around the building, it is **honed**. The polished rock is quite dark; the honed rock is medium gray. Weathering over the few years since it was installed has made the fossils on the exterior stand out. **Nautiloids**, brachiopods, bryozoans, sea lilies, **echinoids**, algae, and even **trilobites**, can be found in this rock. Several fossils of the large snail *Maclurites* are 10 or more cm in diameter (fig. 25A). Preserved portions of nautiloids can be more than 5 cm long (fig. 25B). Interior structures of these cephalopods, including the internal partitions of the shells and the **siphuncle**, can be seen. The dark color of this limestone is due to the presence of organic material and finely disseminated **pyrite**. Inside the building, where the rock has been polished, larger particles of pyrite can be seen to glisten with their characteristic gold color.

Portions of the stone used for the low exterior walls have split off along stylolites since installation.

The depth to bedrock at this location is about 200 feet. Eighteen concrete caissons extend to bedrock to support the building. Exterior trusses distribute the weight of the building for maximum caisson efficiency (Dianne Ludman, personal communication).



A



B

FIGURE 25.—Fossils in polished slabs of the Crown Point Limestone in the lobby of One Cleveland Center. **A.** *Maclurites*, a large snail, about 10 cm in diameter. Reprinted from fall 1986 issue of *Earth science* by permission of American Geological Institute. **B.** Nautiloid cephalopod, 5.4 cm long.

## Stop 16. ST JOHN'S CATHEDRAL

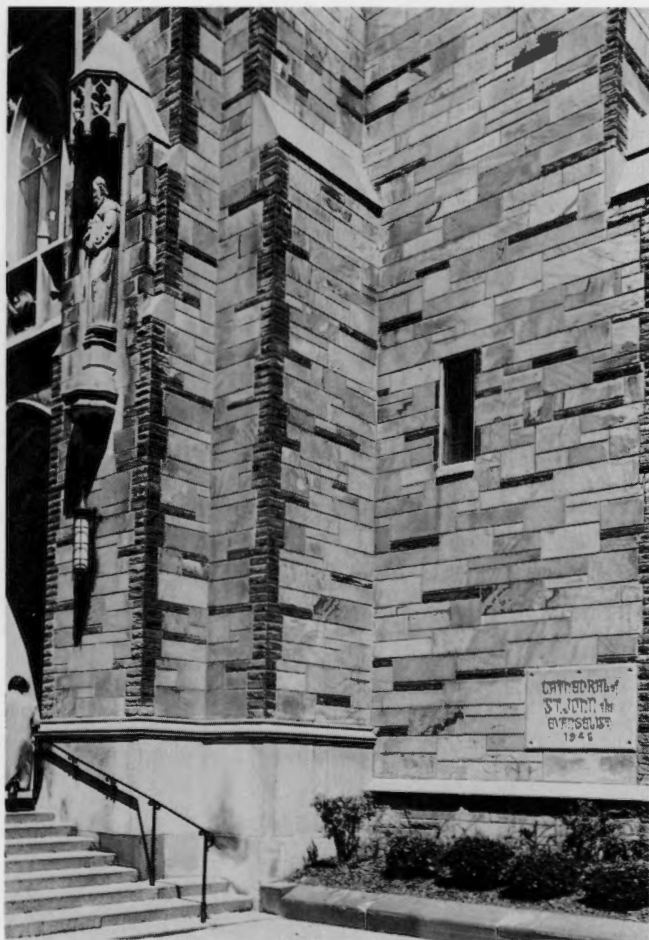


FIGURE 26.—Southwest corner of St. John's Cathedral. Facing is light-brown Crossville Sandstone; trim and statuary are light-gray Salem Limestone. Photo circa 1988.

St. John's Cathedral (fig. 26), at East 9th and Superior, was constructed in 1848-52 and extensively rebuilt in 1946-48. During rebuilding it was clad in Crossville Sandstone, a rock of early Pennsylvanian age (Pottsville Group)



FIGURE 27.—Cornerstone of St. John's Cathedral, fashioned from Salem Limestone. Photo circa 1988.

quarried in Cumberland County, central Tennessee. Builders call this rock *Tennessee Crab Orchard stone*. This rock is found near Crab Orchard and Crossville, Tennessee (Bates, 1969, p. 112). Graceful red, brown, and orange patterns, due to iron oxides and cross-stratification, mark this rock. This sandstone contains considerable **mica**, primarily **muscovite**, which is visible upon close inspection. The mica imparts a "sheen" to the rock.

Salem Limestone is used for sculptures and trim around the building, including the cornerstone (fig. 27). Distinct, straight to curved, tubular burrows or channels made by organisms moving through the sediment can be seen in various places on the front of the cathedral. These **trace fossils**, some known as *Margaritichnus* or "*Eione*," are up to 2 cm wide and 24 cm long. They are superimposed on a matrix of very small fossils (see discussion of those fossils under the Terminal Tower, Stop 1). The burrowed rock has been interpreted as representing **shoal sediments** (Archer and Brown, 1988, 1990).

The front steps of the cathedral are made of granite.

### Stop 17. NATIONAL CITY CENTER BUILDING



FIGURE 28.—National City Center Building. Facing of white travertine shows differential darkening, probably due to pollutants.

The National City Center Building (fig. 28), at East 9th and Euclid Avenue, was completed in 1980. It is faced with a white travertine. Travertine is one of the most commonly used building stones today. Chafetz and Folk (1984, p. 290) have called travertine “probably the most economically valuable building stone in the world.”

The name “travertine” is derived from the Latin phrase for “stone of Tibur,” referring to the city in Italy in which the rock was quarried. This city is now known as Tivoli. The travertine for this building is **Quaternary** in age and was quarried in the Ditta Mariotti Prima Quarry in Tivoli. The variety of travertine used here is marketed under the name *Este Light marble* (William Larson, personal communication).

Travertine was chosen for this building because of its low

cost compared to other good building stone, its light color (matching the tone of some nearby buildings), its uniform nature, and its lasting qualities. Slabs of the travertine, 2 to 3 cm thick, are anchored to the frame of the building with stainless-steel clip angles and pins. There is a 1/4-inch air space between the travertine facing and the enclosing wall of the building, designed to prevent water which collects behind the facing from being pulled into the building due to differential pressure (William Larson, personal communication).

By about 1986, the travertine had darkened differentially owing to weathering. This darkening accentuated the original pattern of **sedimentary structures** in the rock, including several types described by Chafetz and Folk (1984). The exterior of this building was steam cleaned in 1990. Dissolution of the travertine has continued to result in **stalactite-like streaks** on the windows (fig. 29).

Minor amounts of travertine are found in northeastern Ohio. Prosser (1912, p. 314) reported its occurrence along Warner Hollow in Ashtabula County. Travertine boulders can still be found there, in what is now the Camp Whitewood area. To our knowledge, this local material has not been used as building material.

Flagging and low planters around the building are of granite. **Flow bands** and alignment of the grains of biotite can be observed in the granite.

This building is built on a large concrete pad.



FIGURE 29.—Close-up of windows of National City Center Building showing streaks of calcite. The calcite was dissolved from the travertine facing.

### Stop 18. NATIONAL CITY BANK BUILDING



FIGURE 30.—National City Bank Building. The lower portion of the building is faced with *Stony Creek Red granite*.

The National City Bank Building (fig. 30), 629 Euclid Avenue, was formerly called the Guardian Trust and Savings Building. It was built in 1895 and later enlarged. The outside of the lower portion of the building is faced with *Stony Creek Red granite*, a biotite granite quarried in Branford Township, New Haven County, Connecticut (Dale, 1923, p. 379-380). This rock is pre-Triassic in age. The three-story-high basilicalike banking lobby is faced with *Etowah marble* from Georgia (see Federal Reserve Bank Building, Stop 7, for discussion).

### Stop 19. OLD ARCADE



FIGURE 31.—Superior Avenue entrance of the Old Arcade, made of reddish-brown sandstone from the Hammer Creek Formation.

The Old Arcade, located between Euclid and Superior Avenues just across from the Cleveland Public Library, was built in 1888-90. The Arcade was designed to accommodate the slope between Superior and Euclid Avenues. The higher,

Euclid Avenue side of the Arcade is built on old "lake beach" deposits, possibly formed on the shores of Lake Warren, one of the Ice Age predecessors of Lake Erie. Wood fragments excavated from the Euclid Avenue "beach ridge" at Cleveland State University have been radiocarbon dated at 10,600 to 13,200 years before present (Lewis, 1987, p. 72).

The reddish-brown sandstone used on the Superior Avenue side of the Arcade (fig. 31) is *Hummelstown brownstone*, quarried in the Hummelstown area of southern Dauphin County, Pennsylvania. This rock belongs to the Hammer Creek Formation (Geyer, 1977, p. 45), part of the Triassic Newark Group. It was quarried from at least 1800 until well into the 20th century in Pennsylvania and has been used for numerous buildings in that and other states. Stone (1932, p. 126-130) described this rock and its use as a building material and listed a number of buildings, including the Arcade and others in Ohio, for which it was used. In addition, the Arcade is illustrated in Hopkins' (1897, pl. XV) classic work on Pennsylvania brownstones. Brownstone from Wisconsin has also been used in Cleveland (Buckley, 1898, p. 220).

Unfortunately, the Euclid Avenue side of the Old Arcade was extensively remodeled in 1939. Only a small amount of *Hummelstown brownstone* remains on this side of the Arcade. The rock now used as facing for the second floor on the Euclid Avenue side was marketed as *Carnelian*

granite and is from Milbank, South Dakota (Schofield, 1973, p. 23). The formal geologic name for this rock is Milbank Granite (see BP America Building, Stop 20, for discussion).

According to Hand (1891, p. 24), most of the stone used inside the Arcade is *Tennessee marble*. This rock type is best seen near the Euclid Avenue end. On the lower level, there is a fossiliferous, gray limestone, probably *St. Genevieve Golden Vein marble* (see discussion of this stone under Cleveland Public Library, Stop 6). Stairs leading from the

first to the second floor on the Superior Avenue end of the Arcade are travertine. The lower few feet of the walls on the second floor level are lined with white marble. Flooring includes pieces of domestic and imported stone.

Hand (1891, [p. 18]) reported that there was "considerable difficulty" in excavating this site and erecting the foundations for the Arcade, owing to the "sandy nature of the soil and quicksand." Columns of the iron framework of the Arcade are on 3- to 8-foot-square spread footings (Schofield, 1966, p. 284).

### Stop 20. BP AMERICA BUILDING



FIGURE 32.—BP America Building (center) flanked by the Old Federal Building on the left and the Soldiers' and Sailors' Monument in front. Photo, taken in 1987, courtesy of BP America.

The 45-story BP America Building (fig. 32), on the east side of Public Square, was completed in 1985. The outside is faced with two types of stone, Town Mountain Granite and Milbank Granite. The Town Mountain Granite (about 85 percent of the facing) was quarried in Burnet County, Texas. Builders call this rock *Sunset Red granite* or *Texas Pink granite*, after its red coloration. This rock is from the same formation as the *Texas Pearl granite* used for the Ohio Bell Headquarters Building (Stop 13). Upon close inspection, individual minerals that make up the rock can be easily

distinguished. In order of decreasing abundance the minerals are **microcline**, plagioclase, quartz, biotite, and **hornblende**. The granite used for the facing of the building is polished; that used for the sidewalk is flamed, giving it a rougher finish.

The other 15 percent of the exterior is clad with Milbank Granite, quarried in Milbank, South Dakota. Although this rock is composed of the same basic minerals as the Town Mountain Granite, it is slightly darker, has bluish quartz, and displays pronounced streaking. This parallel streaking, or foliation, resulted because the minerals in this rock recrystallized under directed pressure, and grew fastest at right angles to this pressure (along the long dimension). Because the rock has been metamorphosed it may be considered a **gneiss**, but, in fact, it is neither a true igneous rock (granite) nor a metamorphic rock (gneiss) but a transitional type. This rock is marketed under several names, including *Sequoia granite* and *Sequoia Brown granite* (see also listings under Additional sites). As far as we know, it is the oldest of all the stone used in downtown Cleveland, dated at 2.0-2.5 billion years old.

Several types of imported rock are used in the atrium of the BP America Building. Portions of the walls are lined with a mottled gray, cream, and red limestone, *Breccia Pernice marble*. This rock is composed of large, sharp-edged fragments of Jurassic-age limestone quarried in the Mount Pastello region of northern Italy (Albertini, 1987, p. 41). Various types of small fossils, including snails, can be seen in this rock. The gray fountain is made of a dark, fossiliferous limestone, *Negro Marquiña marble* (Giancarlo Calicchia, personal communication), a **Carboniferous**-age stone quarried in Marquiña, Spain (Hund, 1990, p. L-1(M)). The benches are made of a light-colored burrowed limestone, probably from Europe.

The building is supported by 70 caissons that penetrate the bedrock 230 feet below the structure. The possibility of earthquakes was considered when this building was designed (A. Huckelbridge, personal communication).

### ADDITIONAL SITES

There are many additional sites in downtown Cleveland to observe rocks used as building stone. A few are listed below, generally in the order in which they are encountered from west to east in the downtown area.

The red sandstone used for the exterior of the ground floors of the original portion (1891) of the Western Reserve Building, at the corner of West 9th Street and Superior Avenue, is probably *Jacobsville Sandstone*. Portions of this stone have deteriorated over time; small chips of stone can often be found lying on the sidewalk around the building.

*Massillon sandstone (Briar Hill sandstone)* from Coshocton County, Ohio, was used for the facing of the lower floor of the large 1990 addition on the north side of the original building (R. Drew Sondles, personal communication). Reddish blocks of sandstone were specially selected for sawing into facing for this addition. The lobby area of the addition contains a variety of stone, including green slate and white marble from Vermont and pinkish marble from Georgia, as well as stone from Europe and China (R. Drew Sondles, personal communication). The Vermont marble is

Ordovician in age and is quarried in Danby from the Columbian Marble Member of the Shelburne Formation.

The Old Post Office (M-K Ferguson Plaza), erected as the main post office building in 1934, is bounded by Prospect Avenue, West 3rd Street, Huron Road, and West 6th Street. The lower level of the exterior of this building is clad with a pink granite. Most of the remainder of the sides of this building were clad in *Silvertone Gray Amherst sandstone* in the 1930's, but in the late 1970's problems with the adherence of the stone panels unfortunately resulted in the replacement of most of the original sandstone with concrete panels. Some original sandstone panels remain above the first row of windows, however. The interior of the splendid old post office lobby in this building was restored in 1990. The walls are primarily clad with *Ste. Genevieve Golden Vein marble* (Hinchey, 1946) containing a spectacular assemblage of fossil corals. Most flooring is *Tennessee marble*.

Stone paving, once used extensively for streets, can be seen occasionally. The granite used to pave Broome Court, off West 3rd Street near St. Clair Avenue, can still be observed. In other areas red *Medina stone* used for street paving can sometimes be seen, especially when it is uncovered during construction projects. Cleveland was once known for its abundant use of this stone (Dickinson, 1894, p. 136). It was said that there were probably more pavements of *Medina stone* in Cleveland than in any other city in the U.S. (Tillson, 1903, p. 207).

On the southwest quadrant of Public Square, brownish-red *Carnelian Red granite* (Milbank Granite), quarried in South Dakota by the Cold Springs Granite Company, Cold Springs, Minnesota, is used for steps, low walls, and decorative items. The same type of stone is used on the northwest and northeast quadrants.

In the F. W. Woolworth Company, 306 Euclid Avenue, pillars and the sides of the escalator entrance are faced with fossiliferous limestone, possibly *Ste. Genevieve Golden Vein marble*. Public Auditorium, on East 6th Street, between St. Clair and Lakeside Avenues, has a granite base and Salem Limestone facing.

*Rosa Beta granite*, a pink-colored true granite quarried in Sardegna, Italy; *Vermillion granite*, also a pink granite, from Canada; and *Carnelian granite* (Milbank Granite) from South Dakota are used for the Bank One Center Building, completed in 1991 at East 6th Street and Superior Avenue (RTKL Associates, personal communication).

The lower portion of the new Federal Building, at East 9th Street and Lakeside Avenue, built in 1967, is faced with *Swenson Green granite*, supplied by the John Swenson Granite Company, Concord, New Hampshire. The first floor of the TransOhio Savings Bank, at East 9th and Euclid, is faced with *Sequoya granite* (Milbank Granite).

Parts of the exterior and the lobby of the AmeriTrust Tower, East 9th near Euclid Avenue, are faced with *Jet Mist granite*, quarried in Culpeper County, Virginia. The lower portion of the Ohio Savings Plaza, 1801 East 9th Street, is faced with *Andes Black granite*, a stone quarried in South America, probably Brazil.

The exterior of the Huntington Building, 917 Euclid Avenue, built in 1921, is faced with Salem Limestone. Inside is a huge L-shaped banking lobby, with columns and walls faced with an Italian limestone resembling *Botticino marble*. The larger columns are said to be made of white *Tavernelle marble* (Anonymous, 1924). Various small fossils and coated grains can be seen in the walls. There are also larger fossils, probably of **rudist clams**. Flooring in the lobby is *Tennessee marble*. One of the large murals in the lobby, "Industry and

commerce," shows people building a stone bridge.

Erie Street Cemetery, established in 1826, stretches from East 9th to East 14th Streets between Erie Court and Sumner Avenue. Many varieties of stone are used for headstones, monuments, mausoleums, and walls of this cemetery. They include Vermont marble, a fine-grained white marble; Columbus Limestone, a Middle Devonian-age limestone containing numerous fossils, including corals, bryozoans, and brachiopods; a variety of granites; and Berea Sandstone. Some of the marble monuments have bowed over time. The cemetery is a good place to measure weathering rates by determining how far large mica grains now protrude from the surface of marble monuments with which they were once flush.

The stone facing on the 15-story Renaissance on Playhouse Square Building, at East 14th Street and Huron Road, completed in 1990, is *Autumn Brown granite*. This Precambrian-age stone, also known as *Newton Brown granite* (the name was changed to avoid confusion with another building stone), was quarried at St. Alexis-des-Monts, Québec (Kate Falardeau, personal communication). The two contrasting colors of the stone seen on different parts of the building are due to different types of finishing. The dark-brown slabs of this stone, used for most of the exterior, are polished; the much lighter slabs of the same stone, used for small portions of the exterior, are flamed. Prominent crystals of brown feldspar, several cm long, give this stone its brown color. This stone also contains large amounts of easily visible quartz and hornblende (see Nantel, 1983, for additional information). *Autumn Brown granite*, along with *Peribonka granite* (see discussion under Ohio Bell Headquarters Building, Stop 13), are used inside the building (Richard L. Kramer, personal communication).

Most of the exterior of the Hanna Building, at East 14th and Euclid, built in 1924, is faced with Salem Limestone. The lobby is faced with *Botticino marble*. The exterior of Trinity Cathedral, at East 22nd Street and Euclid Avenue, and much of the Cleveland State University complex are also faced with Salem Limestone.

Finally, no work on the building stones of downtown Cleveland would be complete without a reference to two massive bridges built using stone. These bridges are located just west of the downtown area.

The east end of the Lorain-Carnegie, or Hope Memorial, Bridge is located only a few blocks southwest of the Erie Street Cemetery. This bridge, one of the major links between the east and west sides of town, was constructed in 1932 with a large amount of Berea Sandstone (Hannibal, 1985b), of a commercial variety known as *Buckeye Gray sandstone*, from the Amherst-area quarries. Much of the sandstone has been removed during later renovation. The large, sculpted, sandstone pylons which remain are hollow, allowing for interesting "atmospheric" effects that cause the sandstone to darken and lighten as moisture penetrates the stone and then evaporates (Charles R. Thomas, personal communication). These pylons were cleaned in the 1980's (see Wayne, 1983, and Chambers and Chambers, 1983) using crushed walnut shells. The name "Hope Memorial" is said to be in honor of Harry Hope, one of the stonemasons who worked on the sandstone pylons.

More than 2 million cubic feet of Berea Sandstone, quarried in Berea, Ohio, were used to construct the old Superior Viaduct in 1875-1878 (Hannibal, 1985b) (fig. 33). The remaining portion of the viaduct is located on the west side of the Cuyahoga River, with its western terminus near the intersection of West 25th Street and Detroit Avenue.

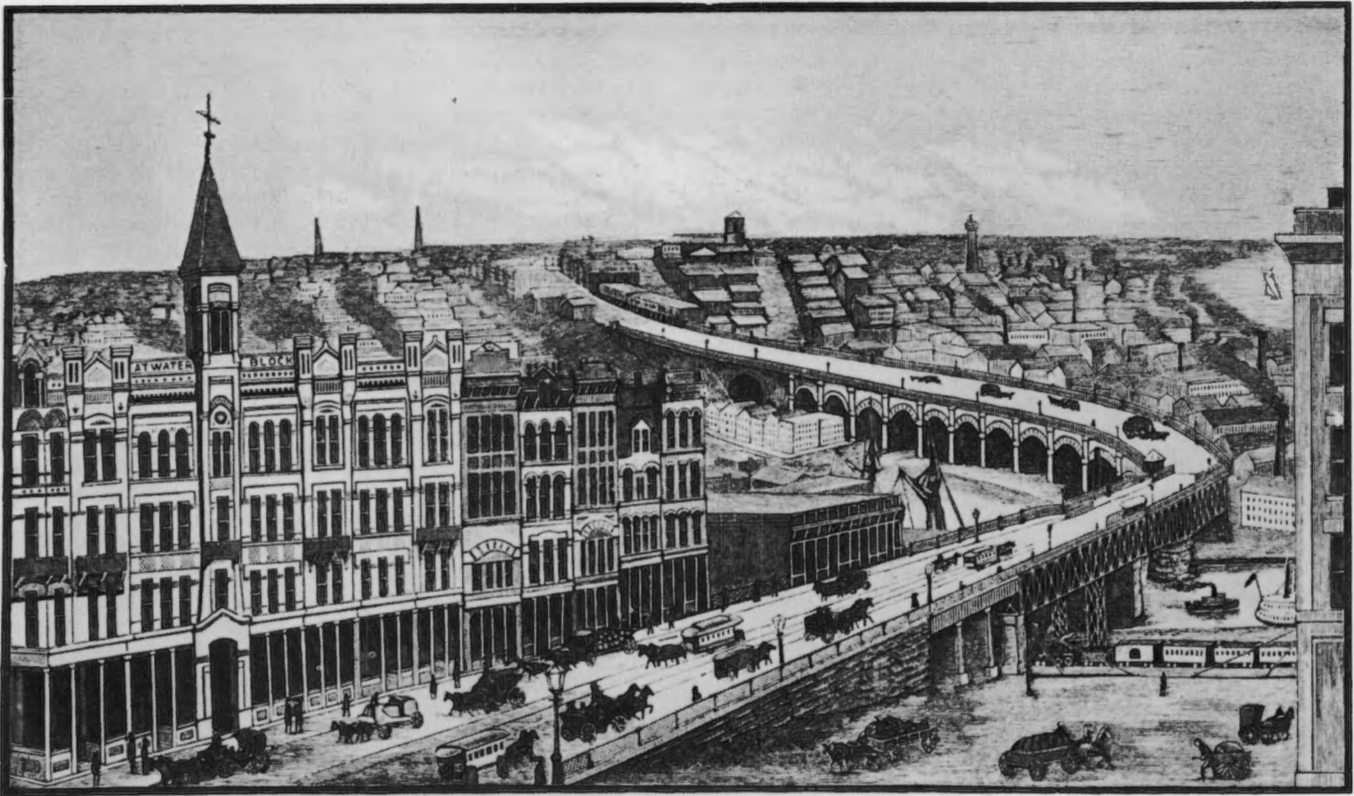


FIGURE 33.—Nineteenth-century view, looking westward, of the old Superior Viaduct, built in 1875-78. Portions of the bridge remain today (from Cleveland Stone Company, circa 1890, p. 30).

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## GLOSSARY

- ammonite** An extinct type of shelled **cephalopod**. It has a multichambered shell through which passes a tube called a **siphuncle**. The chambers of ammonites are separated by complex partitions.
- anorthosite** A **plutonic** rock composed almost entirely of **plagioclase feldspar**.
- balusters** Posts that support the upper rail of a railing.
- beach ridge** A low ridge of sandy material formed from associated beach and dune deposits. Advancing shorelines may leave behind a series of discontinuous beach ridges inland from, and roughly parallel to, the present shoreline.
- bedrock** The solid rock that underlies a particular region.
- bench mark** A durable marker, commonly embedded in stone or concrete, that indicates the elevation of a particular spot. Bench marks are used as standards for making other measurements of elevation.
- biotite** A common black, dark-brown, or dark-green **mica** containing iron and magnesium.
- biotite granite** A **granite** containing **biotite**.
- brachiopod** A marine invertebrate with two shells that superficially resembles a clam. The shells are each bilaterally symmetrical, not symmetrical to one another as are those of a clam.
- breccia** A coarse-grained rock composed of angular rock fragments with finer grained particles in between.
- brownstone** A brown or reddish-brown **sandstone** used for buildings.
- bryozoan** A small, aquatic, **colonial** invertebrate. Bryozoans are known informally as moss animals. The individual tubes within a bryozoan colony are typically less than 1/2 mm wide.
- building stone** A natural or manmade stone used for building.
- caissons** Underground vertical supports used in the foundation of a building or other large structure.
- calcite** A generally light-colored mineral composed of **calcium carbonate**. Calcite is fairly soft and effervesces (bubbles) in weak acids. It is the principal mineral in **limestone** and many **marbles**.
- calcium carbonate** The chemical compound CaCO<sub>3</sub>. A common natural form is the mineral **calcite**.
- Cambrian** The earliest geologic period of the **Paleozoic Era**. It began about 570 million years ago and lasted until about 505 million years ago.
- Carboniferous** A late **Paleozoic** period of geologic time. It encompasses the **Mississippian** and **Pennsylvanian** Periods. It began about 360 million years ago and lasted until about 286 million years ago.
- Cenozoic Era** The large division of geologic time following the **Mesozoic Era**, spanning from about 66 million years ago to the present.
- cephalopod** A group of marine invertebrates that includes octopuses, squids, and their relatives, modern and extinct, including shell-bearing forms.
- coated grains** Particles, such as small **fossils**, enclosed in concentric layers of **calcium carbonate**. These grains were formed as the particles were rolled around by waves in very shallow water.
- colonial** Said of animals that live together as an interconnected unit.
- coral** A marine invertebrate with a soft body and a hard external structure composed of **calcium carbonate**. Corals live attached to the seafloor in shallow, tropical seas. Some corals live as

- separate individuals, others are **colonial** and form extensive reefs.
- Cretaceous** The most recent geologic period of the **Mesozoic Era**. It began about 144 million years ago and lasted until about 66 million years ago.
- deltaic** Related to a delta, which is a deposit of **sediment** that forms where a river flows into a lake or ocean.
- Devonian** A mid-**Paleozoic** period of geologic time. It began about 408 million years ago and lasted until about 360 million years ago.
- dolomite** A light-colored mineral composed of calcium and magnesium carbonate, (CaMg)CO<sub>3</sub>. It is fairly soft and dissolves in weak acids, but effervesces less than **calcite**. It is a common mineral in some **limestones** and many **marbles**. The term also is used to refer to a rock dominated by the mineral dolomite.
- echinoid** A more or less spherical-shaped marine invertebrate related to starfish. Sea urchins are a common type of echinoid.
- esplanade** The platform at the top of a flight of stairs.
- feldspar** A group of common rock-forming **silicate minerals** which may be categorized into two major divisions: **plagioclase feldspars** and **potassium feldspars**.
- flamed** A roughened surface on a **building stone** produced by a flame.
- flow bands** Layers in **igneous** rock, indicated by differences in color, composition, or texture, formed by movement in an **igneous magma** when it was partially crystallized. Flow bands are commonly wavy and discontinuous.
- foraminiferan** A type of single-celled organism with a hard exterior covering consisting of one to many chambers.
- formation** A particular body of rock or sequence of rock strata. It is identified by its composition and its position relative to other rock strata. Formal formation names consist of two parts: the name of a locality, and the word formation or the name of a type of rock (e.g., **sandstone**, **shale**). The first letter of each word in a formal formation name is capitalized.
- fossil** Any preserved remains or traces of prehistoric organisms.
- fossiliferous** Containing **fossils**.
- gabbro** A dark-colored **plutonic** rock composed primarily of iron- and magnesium-rich minerals and calcium-rich **plagioclase feldspars**.
- glaciofluvial** Relating to streams carrying meltwater away from a glacier.
- gneiss** A banded or layered **metamorphic** rock. The principal minerals in gneiss are usually **feldspar**, **quartz**, and **mica**.
- granite** A light-colored **plutonic** rock that consists primarily of **potassium feldspars** and **plagioclase feldspars** and contains **quartz**. Granite may also contain small amounts of **micas** and other minerals. Builders and architects use this term in a broader sense to indicate very hard crystalline rock used for building purposes.
- granodiorite** A **plutonic** rock intermediate in color and composition between **granite** and **gabbro**.
- group** A term for two or more associated **formations**.
- hematite** A reddish-brown mineral composed of iron oxide.
- honed** A type of smooth rock finish with a dull sheen.
- hornblende** A dark-green to black **silicate mineral** containing iron and magnesium, generally distinguished from **biotite** by the elongate shape of its crystals.
- igneous** A rock that crystallized from molten material either below the Earth's surface (**plutonic**) or at the Earth's surface (volcanic).
- Jurassic** The period of geologic time during the middle of the **Mesozoic Era**. It began about 208 million years ago and lasted until about 144 million years ago.
- lacustrine** Related to lakes.
- larvikite** A **plutonic** rock composed predominantly of **potassium** and **plagioclase feldspars**, named for Larvik, Norway.
- limestone** A **sedimentary** rock composed predominantly of **calcite**.
- magma** Molten rock beneath the surface of the Earth.
- marble** A rock resulting from the **metamorphism** of **limestone** or **dolomite**. Builders and architects use this term in a broader sense to indicate stone, typically composed of **calcite** or **dolomite**, that is capable of being polished.
- Mesozoic Era** The large division of geologic time between the **Paleozoic** and **Cenozoic Eras**, spanning from about 245 to 66 million years ago.
- metamorphic** A rock derived from pre-existing rock as the result of **metamorphism**.
- metamorphism** Recrystallization of pre-existing rock due to heat and/or pressure within the Earth.
- mica** A type of common rock-forming mineral with a flat shape, easily split into thin layers or sheets. Among the most common micas are **muscovite** and **biotite**.
- microcline** A type of **potassium feldspar** common in granites.
- Mississippian** A late **Paleozoic** period of geologic time. It began about 360 million years ago and lasted until about 320 million years ago.
- muscovite** A common **mica**, clear to golden in color.
- nautiloid** A type of **cephalopod** with a multichambered shell through which passes a tube called a **siphuncle**. The chambers of nautiloids are separated by simple partitions.
- Ordovician** An early **Paleozoic** period of geologic time, spanning from 505 to 438 million years ago.
- Paleozoic Era** The large division of geologic time between the **Precambrian** and **Mesozoic Eras**. It began about 570 million years ago and lasted until about 245 million years ago.
- pelmatozoan** A marine invertebrate with a central stalk-like supporting column and a flowerlike body. They are known informally as **sea lilies** and are relatives of starfish and sea urchins (**echinoids**).
- Pennsylvanian** A late **Paleozoic** period of geologic time. It began about 320 million years ago and lasted until about 286 million years ago.
- permeability** A measure of how rapidly fluids can pass through a rock. In a qualitative sense, rocks that allow fluids to pass through rapidly are said to have high permeability.
- Permian** A late **Paleozoic** period of geologic time. It began about 286 million years ago and lasted until about 245 million years ago.
- pilaster** A vertical element projecting from a wall, resembling a column, but rectangular in shape.
- plagioclase feldspar** A common rock-forming **silicate mineral** ranging in color from white to gray.
- plutonic** An **igneous** rock, or relating to igneous rock, that crystallized below the surface of the Earth.
- potassium feldspar** A common rock-forming **silicate mineral** ranging in color from white to pink or red.
- Precambrian Era** All geologic time from the formation of the Earth, about 4.6 billion years ago, to the beginning of the **Paleozoic Era**, about 570 million years ago.
- pyrite** A gold-colored mineral composed of iron sulfide. It is informally known as "fool's gold."
- quartz** A common glassy, generally clear to gray-colored, rock-forming mineral composed of silica, silicon dioxide (SiO<sub>2</sub>).
- Quaternary** The most recent period of the **Cenozoic Era**. It began about 1.6 million years ago.
- rock-unit name** The name given to a rock unit, such as a **formation**, at the time of its first formal geologic description.
- rudist clam** A type of clam with two different-sized shells that lived during the **Mesozoic Era**.
- rugose coral** A type of **Paleozoic coral** that is generally cone shaped and thus superficially resembles a horn.
- sandstone** A **sedimentary** rock composed of sand-sized grains (between 1/16 and 2 mm in diameter), generally composed of silica, held together by mineral cement.
- sea lilies** An informal term for certain types of **pelmatozoans**.
- sediment** Solid materials, such as sand and silt particles, that have been transported and deposited by natural processes, typically in layers.
- sedimentary** Relating to or containing **sediment**.
- sedimentary structures** Structures, such as ripple marks and cross bedding, formed in **sediment** such as sand. These structures are commonly preserved in **sedimentary** rocks.
- serpentine** A typically green mineral, rich in iron and magnesium, found in some **metamorphic** rocks, such as **Verde Antique**.
- shale** A **sedimentary** rock composed of clay minerals or clay-sized particles (less than 1/256 mm in diameter), distinguished from the slightly coarser **siltstone** by its smooth feel.
- shoal** A shallow-water environment.
- silicate mineral** A mineral whose crystal structure contains silicon and oxygen.
- siltstone** A **sedimentary** rock composed of silt-sized grains (between 1/256 and 1/16 mm in diameter), distinguished from the finer grained **shale** by its gritty feel.

**Silurian** An early **Paleozoic** period of geologic time. It began about 438 million years ago and lasted until about 408 million years ago.

**siphuncle** A tube running the length of a **cephalopod**.

**slate** A rock derived from the **metamorphism** of **shale**. Slate breaks easily into thin layers.

**spalling** The breaking off of chips and small pieces of rock, commonly along a curved surface.

**spread footings** Especially wide areas of a building foundation at the bottom of underground columns or supports.

**stalactite** A conical deposit of **calcite** that hangs from the ceiling of a cave.

**stromatoporoid** An extinct, spongelike organism.

**stylolites** Natural, irregular seams in **limestone** that formed where the rock was sutured back together after portions of the limestone dissolved away. Limestone is easily dissolved by weak acids. The dark color of stylolites is due to a concentration of insoluble materials that remained behind.

**Tertiary** A period of geologic time covering most of the **Cenozoic Era**, spanning from 66 to about 1.6 million years ago.

**till** Generally unstratified material deposited by a glacier.

**trace fossil** A trackway, burrow, or other indirect evidence of a prehistoric animal.

**trade name** A manufacturer's name for a product, such as a building stone. The names *Amherst stone*, *Indiana limestone*, and *Sunset Red granite* are examples of trade names. Such names are italicized in this report.

**travertine** Freshwater **limestone** deposited by springs, commonly with the help of bacterial activity.

**Triassic** The earliest geologic time period of the **Mesozoic Era**. It began about 245 million years ago and lasted until about 208 million years ago.

**trilobite** An extinct invertebrate distantly related to crabs.

**unconsolidated** Composed of grains that are not firmly cemented together, such as sand or gravel.

**Verde Antique** The trade name for a dark-green **serpentine**-rich rock commonly used as a **building stone**.

**wainscoting** The lining of an inside wall, commonly the lower 3 feet or so.

**xenolith** A fragment of rock that was engulfed by intruding **magma**. Xenoliths may melt and become assimilated in the magma, or resist melting and become part of the rock that forms when the magma cools and crystallizes.

TABLE 1.—Simplified geologic time scale showing the geologic periods during which building stones used in downtown Cleveland were deposited or formed<sup>1</sup>

Era	Period	Millions of years ago	Building stone
CENOZOIC	Quaternary	1.6	<i>Este Light marble</i>
	Tertiary		<i>Rosso Levanto marble</i>
MESOZOIC	Cretaceous	66.4	?cream-colored limestone at Cleveland Public Library
	Jurassic	144	<i>Botticino marble</i> , <i>Breccia Pernice marble</i> , <i>Rosoro marble</i>
	Triassic	208	Hammer Creek Formation
	Permian	245	? <i>Emerald Pearl granite</i>
	Pennsylvanian	286	Crossville Sandstone, Massillon sandstone
PALEOZOIC	Mississippian	320	Salem Limestone, ?Quincy Granite
		360	Berea Sandstone
	Devonian		Grand Tower Formation, ?Milford Granite, Woodbury Granite, Mascoma Group, <i>Mount Waldo granite</i> , <i>Moose-a-bec granite</i>
		408	
	Silurian	438	Grimsby Sandstone
	Ordovician	505	Crown Point Limestone, Holston Formation
	Cambrian	570	Murphy Marble
PRECAMBRIAN			Town Mountain Granite Graniteville Granite <i>Canadian Black granite</i> <i>Taivassalo granite</i> <i>Charcoal Black granite</i> Milbank Granite

<sup>1</sup>Dates for the time scale are from Palmer (1983). A question mark preceding building stone name indicates uncertain age.

TABLE 2.—Summary of uses, sources, and ages of major types of building stones used for Stops 1-20 in downtown Cleveland

Building stone	Use	Source	Age
<b>STOP 1.—TERMINAL TOWER (TOWER CITY)</b>			
Salem Limestone ( <i>Gray Indiana limestone</i> )	exterior	Bloomington-Bedford, Indiana	Mississippian
Holston Formation ( <i>Tennessee marble</i> )	flooring	Knoxville area, Tennessee northern Italy	Ordovician Jurassic Jurassic
Botticino marble	interior walls		
Rosoro marble	Visitor Information Center desk		
Verde Antique	Visitor Information Center desk; Tower City complex		
Verona marble	Tower City complex	Verona area, Italy	
Blue Pearl granite	Tower City complex	Taivassalo, Finland	Precambrian
Balmoral Red granite	Tower City complex		
<b>STOP 2.—SOLDIERS' AND SAILORS' MONUMENT</b>			
Berea Sandstone ( <i>Amherst stone</i> )	much of exterior	Amherst, Ohio northwestern New York Quincy, Massachusetts St. Cloud, Minnesota Coshocton Co., Ohio	Devonian-Mississippian Silurian ?Mississippian Precambrian Pennsylvanian
Grimsbey Sandstone ( <i>Medina sandstone</i> )	outer steps & esplanade		
Quincy Granite	column & building exterior		
Charcoal Black granite	low outer walls		
Massillon sandstone ( <i>Cavallo Buff sandstone</i> )	lower outer walls		
<b>STOP 3.—OLD STONE CHURCH</b>			
Berea Sandstone	exterior	Carlisle Twp., Lorain Co., Ohio Bloomington-Bedford, Indiana	Devonian-Mississippian Mississippian
Salem Limestone ( <i>Indiana limestone</i> )	exterior of addition		
<b>STOP 4.—SOCIETY FOR SAVINGS BUILDING AND SOCIETY TOWER</b>			
Graniteville Granite ( <i>Missouri granite</i> )	exterior base & columns	Graniteville, Missouri Jacobsville, Michigan	Precambrian Precambrian
Jacobsville Sandstone ( <i>Portage Entry Red sandstone</i> )	exterior		
"marble"	interior	Swanton, Vermont eastern Tennessee Branford Twp., New Haven Co., Connecticut Vanga, Sweden	Cambrian Ordovician pre-Triassic
Holston Formation ( <i>Tennessee marble</i> )	flooring		
Stony Creek granite	upper portion of exterior of Society Tower		
Napoleon Red granite	lower two floors of exterior of Society Tower		
Rosso Verona marble	interior of Society Tower	Venice area, Italy Mediterranean area Mt. Pastello area, Italy	Jurassic Tertiary Jurassic
Rosso Levanto marble	interior of Society Tower		
Breccia Pernice marble	lobby of Society Tower		
<b>STOP 5.—OLD FEDERAL BUILDING</b>			
Mount Waldo granite	exterior	Frankfort, Maine Italy	Devonian
Italian marble	interior		
Cippollino marble	pillars	Mt. Pentelycus, Greece eastern Tennessee	Ordovician
Pentelikon marble	wainscoting		
Holston Formation ( <i>Tennessee marble</i> )	statues; flooring on 2nd & 3rd floors		
<b>STOP 6.—CLEVELAND PUBLIC LIBRARY</b>			
Murphy Marble ( <i>Cherokee marble</i> )	exterior	Tate area, Georgia North Jay, Maine	Cambrian
North Jay Gray granite	main entrance steps		
Botticino marble	interior facing	northern Italy ?France	Jurassic ?Cretaceous
cream-colored limestone	windowsills-History and Social Sciences Departments & the Photograph Collection Room		
Grand Tower Formation ( <i>Ste. Genevieve Golden Vein marble</i> )	window sills & door trim-White Room	Ozora, Missouri	Devonian
Rose Tavernelle marble	hallway outside the White Room	?Vicenza, Italy	
Holston Formation ( <i>Tennessee marble</i> )	flooring	Knoxville area, Tennessee	Ordovician
travertine	flooring		?Quaternary
Monte Aurato marble	columns-Brett Hall	South America	
Red Sonora marble	columns-Brett Hall		
Golden Nebo Travis marble	Lending Department walls	Utah	
Alhambra marble	basement restrooms		
Mascoma Group ( <i>Mascoma granite</i> )	Business and Science Building exterior	Grafton Co., New Hampshire	Devonian
Verde Antique	Business and Science Building lobby	?Vermont	
<b>STOP 7.—FEDERAL RESERVE BANK</b>			
Murphy Marble ( <i>Etowah marble</i> )	exterior	Tate area, Georgia Hardwood Island, Maine Siena, Italy	Cambrian Devonian
Moose-a-bec granite	base		
Convent Siena marble	walls of banking concourse		

TABLE 2.—Summary of uses, sources, and ages of major types of building stones used for Stops 1-20 in downtown Cleveland—Continued

Building stone	Use	Source	Age
<b>STOP 8.—BOARD OF EDUCATION BUILDING</b>			
Berea Sandstone ( <i>Silvertone Gray Amherst sandstone</i> )	exterior	Amherst, Ohio	Devonian-Mississippian
<b>STOP 9.—WAR MEMORIAL FOUNTAIN</b>			
Emerald Pearl granite	carvings	Larvik, Norway	?Permian
Solar White granite	air shafts	the Carolinas	Precambrian
<b>STOP 10.—JUSTICE CENTER</b>			
Spanish Pink granite ( <i>Rosa Porriño granite</i> )	exterior	Porriño area, Spain	Precambrian
<b>STOP 11.—CUYAHOGA COUNTY COURTHOUSE</b>			
Milford Granite ( <i>Milford Pink granite</i> )	exterior	Milford Twp., Worcester Co., Massachusetts	?Devonian
Colorado marble	hallway walls & columns	Colorado	Ordovician
Holston Formation ( <i>Tennessee marble</i> )	flooring	Knoxville area, Tennessee	
Georgia marble	flooring	Georgia	
<b>STOP 12.—CITY HALL</b>			
Woodbury Granite ( <i>Woodbury Bashaw granite</i> )	exterior	Woodbury, Vermont	Devonian
Botticino marble	inside front entrance	northern Italy	Jurassic
Holston Formation ( <i>Tennessee marble</i> )	flooring	Knoxville area, Tennessee	Ordovician
<b>STOP 13.—OHIO BELL HEADQUARTERS BUILDING</b>			
Town Mountain Granite ( <i>Texas Pearl granite</i> )	exterior	Burnet Co., Texas	Precambrian
Canadian Black granite ( <i>Péribonka granite</i> )	sidewalk & flooring	Lac St.-Jean, Quebec	Precambrian
<b>STOP 14.—GALLERIA</b>			
Taivassalo granite	main entry arch & lower portion of exterior walls	Taivassalo, Finland	Precambrian
<b>STOP 15.—ONE CLEVELAND CENTER</b>			
Crown Point Limestone ( <i>Champlain Black marble</i> )	lobby facing, exterior base & low walls	Isle La Motte, Vermont	Ordovician
<b>STOP 16.—ST. JOHN'S CATHEDRAL</b>			
Crossville Sandstone ( <i>Tennessee Crab Orchard stone</i> )	exterior	Cumberland Co., Tennessee	Pennsylvanian
Salem Limestone ( <i>Indiana limestone</i> )	exterior trim	Bloomington-Bedford, Indiana	Mississippian
<b>STOP 17.—NATIONAL CITY CENTER BUILDING</b>			
<i>Este Light marble</i> (travertine)	exterior	Tivoli, Italy	Quaternary
<b>STOP 18.—NATIONAL CITY BANK BUILDING</b>			
<i>Stony Creek Red granite</i>	exterior facing-lower floors	Branford Twp., New Haven Co., Connecticut	pre-Triassic
Murphy Marble ( <i>Etowah marble</i> )	banking lobby	Tate area, Georgia	Cambrian
<b>STOP 19.—OLD ARCADE</b>			
Hammer Creek Formation ( <i>Hummels-town brownstone</i> )	north entrance exterior	Dauphin Co., Pennsylvania	Triassic
Milbank Granite ( <i>Carnelian granite</i> )	south entrance-2nd floor exterior	Milbank, South Dakota	Precambrian
Holston Formation ( <i>Tennessee marble</i> )	interior	Knoxville area, Tennessee	Ordovician
Grand Tower Formation ( <i>Ste. Genevieve Golden Vein marble</i> )	lower level walls	Ozora, Missouri	Devonian
<b>STOP 20.—BP AMERICA BUILDING</b>			
Town Mountain Granite ( <i>Sunset Red or Texas Pink granite</i> )	exterior (85 percent)	Burnet Co., Texas	Precambrian
Milbank Granite ( <i>Sequoia or Sequoia Brown granite</i> )	exterior (15 percent)	Milbank, South Dakota	Precambrian
Breccia Pernice marble	interior facing	Mt. Pastello area, Italy	Jurassic
Negro Marquíña marble	gray fountain in atrium	Marquíña, Spain	Carboniferous

TABLE 3.—Trade names and rock-unit names of building stones and the buildings in downtown Cleveland for which they are used. Only stones for Steps 1-20 are included

Building stone	Building	Building stone	Building
<i>Alhambra marble</i>	Cleveland Public Library	<i>Milford Pink Granite</i>	Cuyahoga County Courthouse
<i>Amherst stone</i>	Soldiers' and Sailors' Monument	<i>Missouri granite</i>	Society for Savings Building
<i>Balmoral Red granite</i>	Terminal Tower (Tower City)	<i>Monte Aurato marble</i>	Cleveland Public Library
Berea Sandstone	Board of Education Building, Old Stone Church, Soldiers' and Sailors' Monument	<i>Moose-a-pec granite</i>	Federal Reserve Bank Building
	Terminal Tower (Tower City)	<i>Mount Waldo granite</i>	Old Federal Building
<i>Blue Pearl granite</i>	Terminal Tower (Tower City)	Murphy Marble	Cleveland Public Library, Federal Reserve Bank Building, National City Bank Building
<i>Botticino marble</i>	City Hall, Cleveland Public Library, Terminal Tower	<i>Napoleon Red Granite</i>	Society Tower
<i>Breccia Pernice marble</i>	Society Tower, BP America Building	<i>Negro Marquina marble</i>	BP America Building
<i>Canadian Black granite</i>	Ohio Bell Headquarters Building	<i>North Jay Gray granite</i>	Cleveland Public Library
<i>Carnelian granite</i>	Old Arcade	<i>Pentelikon marble</i>	Old Federal Building
<i>Cavallo Buff sandstone</i>	Soldiers' and Sailors' Monument	<i>Péribonka granite</i>	Ohio Bell Headquarters Building
<i>Champlain Black marble</i>	One Cleveland Center	<i>Portage Entry Red sandstone</i>	Society for Savings Building
<i>Charcoal Black granite</i>	Soldiers' and Sailors' Monument	Quincy Granite	Soldiers' and Sailors' Monument
<i>Cherokee marble</i>	Cleveland Public Library	<i>Red Senora marble</i>	Cleveland Public Library
<i>Cippolino marble</i>	Old Federal Building	<i>Rosa Porriño granite</i>	Justice Center
<i>Colorado marble</i>	Cuyahoga County Courthouse	<i>Rose Tavernelle marble</i>	Cleveland Public Library
<i>Convent Siena marble</i>	Federal Reserve Bank Building	<i>Rosoro marble</i>	Terminal Tower
<i>Crossville Sandstone</i>	St. John's Cathedral	<i>Rosso Levanto marble</i>	Society Tower
<i>Crown Point Limestone</i>	One Cleveland Center	<i>Rosso Verona marble</i>	Society Tower
<i>Emerald Pearl granite</i>	War Memorial Fountain	<i>Ste. Genevieve Golden Vein marble</i>	Cleveland Public Library, ?Old Arcade
<i>Este Light marble</i>	National City Center Building		
<i>Etowah marble</i>	Federal Reserve Bank Building, National City Bank Building	Salem Limestone	Old Stone Church, St. John's Cathedral, Terminal Tower
<i>Georgia marble</i>	Cuyahoga County Courthouse	<i>Sequoya Brown granite</i>	BP America Building
<i>Golden Nebo Travis marble</i>	Cleveland Public Library	<i>Sequoya granite</i>	BP America Building
Grand Tower Formation	Cleveland Public Library, ?Old Arcade	<i>Silverstone Gray Amherst sandstone</i>	Board of Education Building
Graniteville Granite	Society for Savings Building	<i>Spanish Pink granite</i>	Justice Center
<i>Gray Indiana limestone</i>	Terminal Tower	<i>Stony Creek Red granite</i>	National City Bank Building, Society Tower
Grimsby Sandstone	Soldiers' and Sailors' Monument	<i>Sunset Red granite</i>	BP America Building
Hammer Creek Formation	Old Arcade	<i>Tauvassalo granite</i>	Galleria
Holston Formation ( <i>Holston marble</i> )	City Hall, Cleveland Public Library, Cuyahoga County Courthouse, Old Arcade, Old Federal Building, Society for Savings Building, Terminal Tower	<i>Tennessee Crab Orchard stone</i>	St. John's Cathedral
<i>Hummelstown brownstone</i>	Old Arcade	<i>Tennessee marble</i>	hoga County Courthouse, Old Arcade, Old Federal Building, Society for Savings Building, Terminal Tower
<i>Indiana limestone</i>	Old Stone Church, St. John's Cathedral, Terminal Tower	Texas Pearl granite	Ohio Bell Headquarters Building
<i>Italian marble</i>	Old Federal Building	<i>Texas Pink granite</i>	BP America Building
Jacobsville Sandstone	Society for Savings Building	Town Mountain Granite	BP America Building, Ohio Bell Headquarters Building
<i>Mascoma granite</i>	Cleveland Public Library	<i>Verde Antique</i>	Cleveland Public Library, Terminal Tower (Tower City)
Mascoma Group	Cleveland Public Library	<i>Verona marble</i>	Terminal Tower (Tower City)
Massillon sandstone	Soldiers' and Sailors' Monument	<i>Woodbury Bashaw granite</i>	City Hall
<i>Medina sandstone</i>	Soldiers' and Sailors' Monument	Woodbury Granite	City Hall
<i>Medina stone</i>	Soldiers' and Sailors' Monument		
Milbank Granite	BP America Building, Old Arcade		
Milford Granite	Cuyahoga County Courthouse		

## ADDITIONAL NOTES, AUGUST 1994

**Stop 1. TERMINAL TOWER (TOWER CITY).** The *Rosoro marble* desk has been removed.

**Stop 4. SOCIETY TOWER.** There are large ammonites in the *Rosso Verona marble* used around the elevators on the first floor. Some of these fossils are 8 cm or more in diameter. They may be difficult to see, as they blend in with the nodules in this orange limestone.

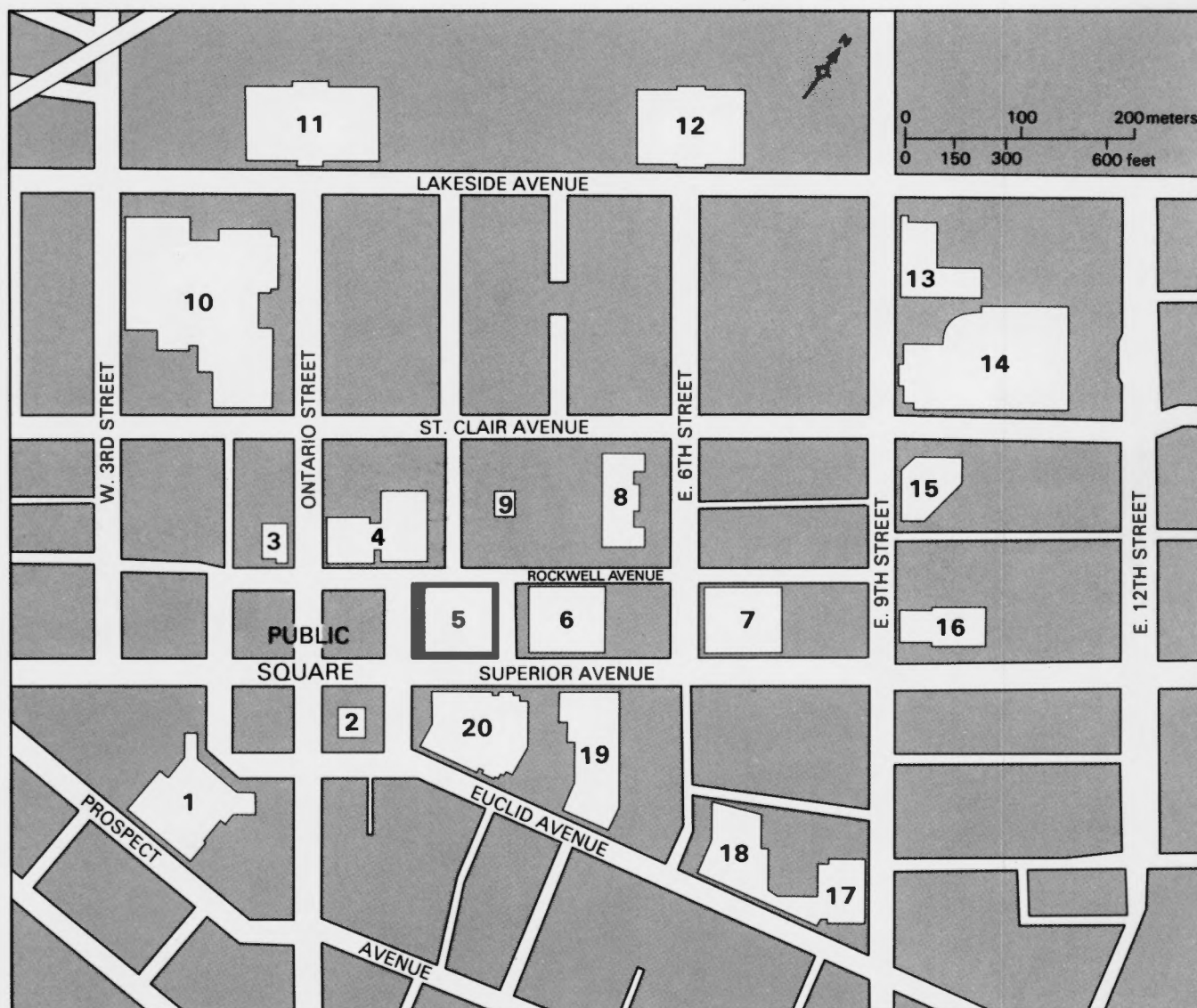
**Stops 4 and 18. SOCIETY TOWER AND NATIONAL CITY BANK BUILDING.** *Stony Creek granite (Stony Creek Red granite)* is technically a migmatite, a banded rock containing both igneous and metamorphic minerals. Because most of the stone is flamed rather than polished, its color is muted under ordinary conditions. The banding shows up best when the stone is wet, following a good rain.

**Stop 6. CLEVELAND PUBLIC LIBRARY.** The large foraminiferans (see fig. 14C) in the stone used for the windowsills of the Literature, History, and several other departments may be nummulitids (Helen Tappan-Loeblich, University of California, Los Angeles, personal communication, 1993); thus the stone they are preserved in may be Cenozoic in age. The Business and Science Building was demolished in the summer of 1994 to make way for a new library building. That building is scheduled to be clad in Murphy Marble.

**Stop 10. JUSTICE CENTER.** Many slabs of the *Spanish Pink granite* in this building were replaced in 1993-94 with new slabs of the same stone type. A new jail addition was completed in 1994 at the corner of West 3rd Street and St. Clair Avenue. *Spanish Pink granite* was used only for the base of the jail addition; concrete was used for the remainder of the exterior. Concrete contains a variety of geological ingredients. Light-colored flakes of mica in this concrete sparkle in the sunlight.

**Stop 13. OHIO BELL HEADQUARTERS BUILDING.** Ohio Bell changed its name to Ameritech in 1994.

**ADDITIONAL SITES.** Gateway, a large sports complex just south of Carnegie Avenue between East 9th and Ontario Streets, was completed in 1994. Several types of stone are used on the base of the exterior of the new ballpark at Gateway: gray *Indiana limestone* (Salem Limestone), grayish-orange *Mankato stone* quarried in southern Minnesota, and deep-green *Atlantic Green granite* quarried at Rivière-à-Pierre, Québec (Paul Shand, Classic Marble Co., personal communication, 1994). Mottling in the *Mankato stone*, which is quarried from the Oneota Dolomite of Early Ordovician age, is due in part to fossil animal burrows.



- 1) Terminal Tower (Tower City)
- 2) Soldiers' and Sailors' Monument
- 3) Old Stone Church
- 4) Society for Savings Building and Society Tower
- 5) Old Federal Building
- 6) Cleveland Public Library
- 7) Federal Reserve Bank Building
- 8) Board of Education Building
- 9) War Memorial Fountain
- 10) Justice Center

- 11) Cuyahoga County Courthouse
- 12) City Hall
- 13) Ohio Bell Headquarters Building
- 14) Galleria
- 15) One Cleveland Center
- 16) St. John's Cathedral
- 17) National City Center Building
- 18) National City Bank Building
- 19) Old Arcade
- 20) BP America Building

MAP OF DOWNTOWN CLEVELAND SHOWING LOCATIONS OF BUILDINGS FOR STOPS 1-20