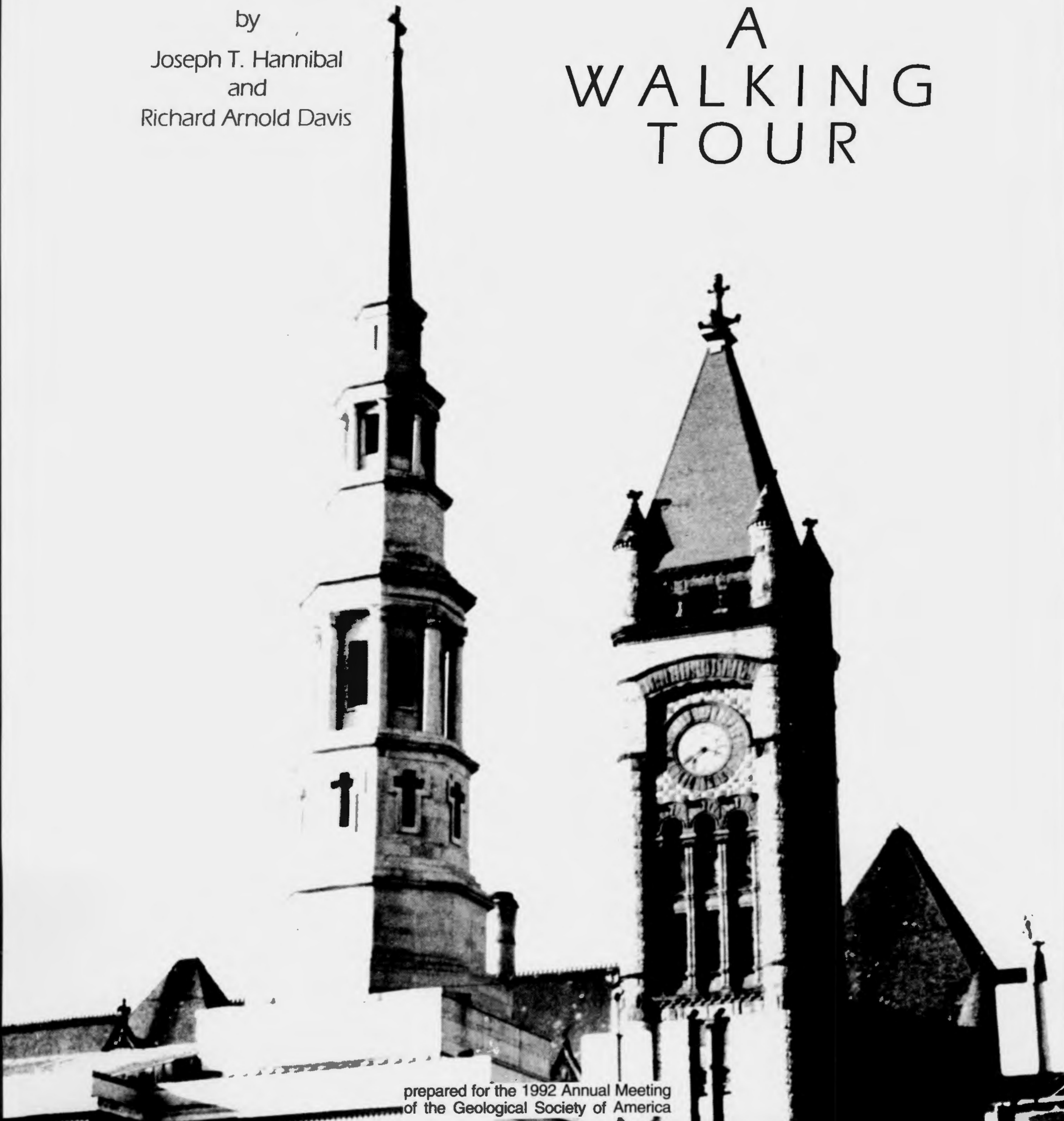
GUIDEBOOK NO. 7

GUIDE TO THE BUILDING STONES OF DOWNTOWN CINCINNATI:

A WALKING TOUR

by
Joseph T. Hannibal
and
Richard Arnold Davis



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GUIDE TO THE BUILDING STONES OF DOWNTOWN CINCINNATI: A WALKING TOUR

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INTRODUCTION

Urban areas are excellent locales for geologic investigations. In cities such as Cincinnati one can examine a great variety of geologic materials used for buildings, bridges, and monuments. These easily accessible materials can serve as focal points for discussions of the geologic history of a region, the origins and characteristics of various types of stone from exotic locales, and the reasons for the selection of various **building stones** for particular structures. The effects of weathering on various types of stone also can be explored.

This guide is intended to assist those who would like to investigate the many types of stone used for buildings and other structures in downtown Cincinnati. References are provided for those who would like additional information on the buildings and stone types noted in this guidebook. We also have included, at the end of this publication, a glossary that lists terms that may not be familiar to some readers. Such terms are printed in **boldface** when they are used for the first time in this guidebook.

BUILDING STONES

Many types of stone from quarries in North America and other regions of the world have been used for buildings and other structures in downtown Cincinnati (fig. 1). The specific stones were selected by architects and others because of a number of factors, including durability, color, availability, and cost.

Because geologists generally refer to particular types of stone in a different manner than do those who quarry and process stone, we have attempted, when first referring to a particular type of stone, to give both the formal **rock-unit name** used by geologists and the **trade name** used in the building-stone industry.

A formal rock-unit name has two parts. The first is the name of a place, generally a town or city, where that rock layer or body occurs and has been studied. The second is the name of the dominant rock type of that rock layer, for instance **limestone** or **shale,** or the word **formation.** For example, in Cincinnati, a particular rock unit that is exposed in the hillsides is called the Miamitown Shale; it consists mainly of shale and was named for Miamitown, a village west of Cincinnati. The Kope Formation, which is exposed near the base of the hills of Cincinnati, consists of both limestone and shale; it was named for Kope Hollow, near Levanna, Ohio, in Brown County.

Two or more formations may, in some cases, be combined in a **group.** Furthermore, formations may be subdivided into smaller units, termed **members.**

Trade names of stone may be the same as, or similar to, formal rock-unit names. However, in most cases, trade names bear no relationship to the rock-unit name. There also may be more than one trade name for a particular stone. In this guidebook trade names are printed in *italics* in order to distinguish them from rock-unit names.

It is important to note that the terms **granite** and **marble** are used differently by geologists than by those in the building-stone trade. Granite, in the commercial sense, is used to designate any hard, crystalline rock. In the geological sense it signifies a **coarsely crystalline igneous** rock composed of crystals of **potassium feldspar, plagioclase feldspar, quartz,** and in many cases small amounts of dark, iron- and potassium-rich minerals such as **biotite** and **hornblende.** Thus, the geologic use of the term granite is more restrictive than the commercial use of the term.

Marble, in the commercial sense, generally designates a softer rock, characteristically composed of the mineral **calcite,** that can be polished. Commercial marbles may be, but are not always, crystalline. The geologic use of the term is restricted to **carbonate** rocks resulting from **metamorphism** of limestone or **dolomite.**

In recent years there has been great interest in weathering of building stone as well as in restoration techniques (for example, see Winkler, 1987, and Baird, 1977). We have noted some instances of weathering and preservation of stone in this guidebook.

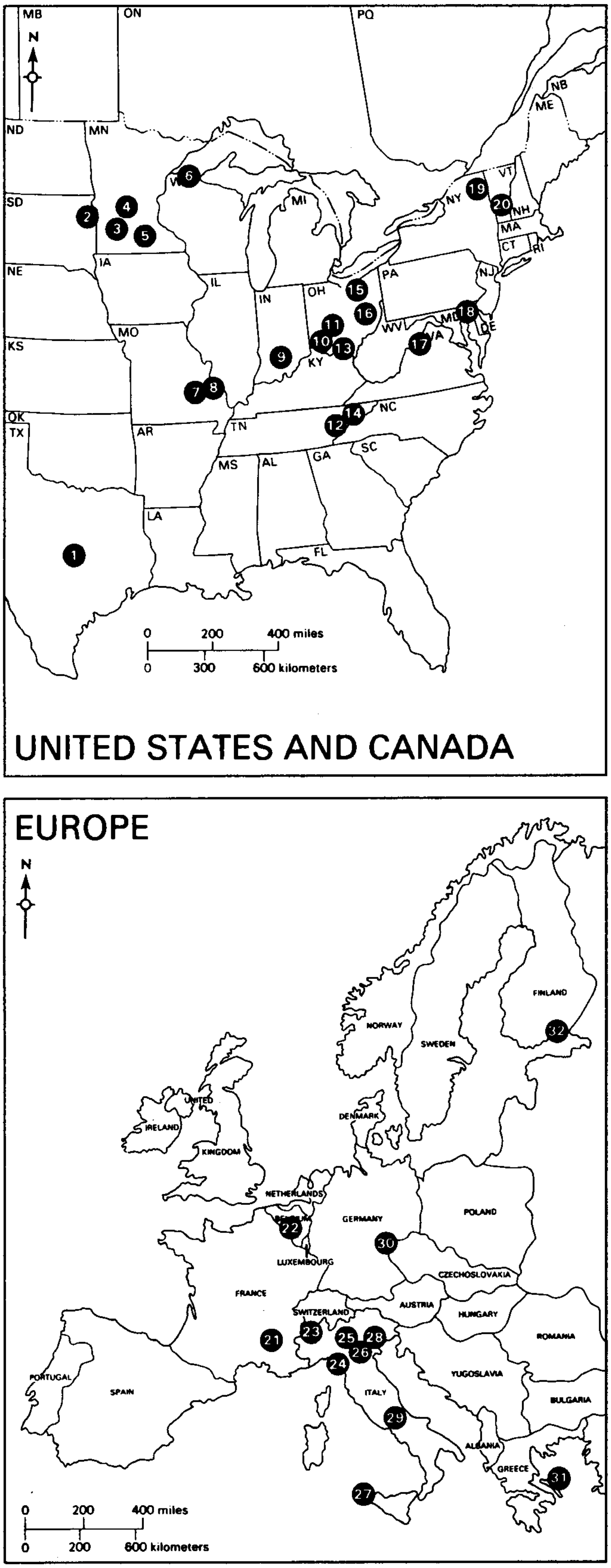
With the exception of Union Terminal, now the home of the Museum Center at Cincinnati Union Terminal, the formal field-trip stops in this guide are keyed to a map of downtown Cincinnati (fig. 2). The stops are numbered so that one may begin and end a walking tour near Fountain Square, a well-known gathering place in the heart of downtown Cincinnati. Because of the distance covered, however, many users may want to divide this trip into separate segments.

A geologic time scale (table 1), a summary of uses of stone (table 2), and a list of trade names and formal rock-unit names for stone used in downtown Cincinnati (table 3) follow the text of this guide.

GEOLOGIC SETTING

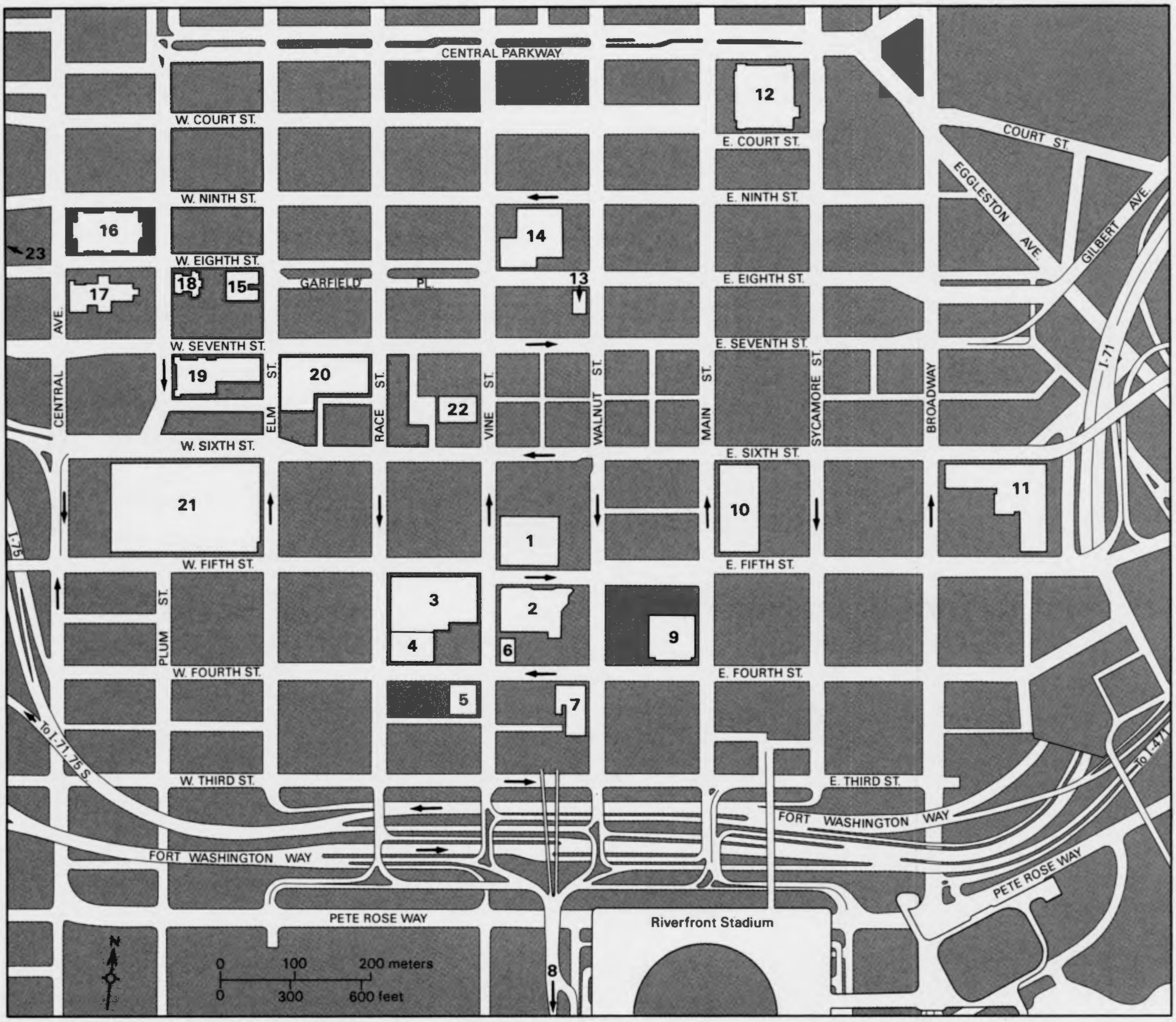
Cincinnati, the "Queen City" (once known by the less elegant appellation, "Porkopolis"), is located along the northern bank of the Ohio River, nestled among hills composed of rock of **Ordovician** age. Cincinnati is often said to be a city of hills—just ask anyone who's tried to bicycle in the city or who's endeavored to drive a car on a snowy winter's morning. However, Cincinnati is, in fact, a city of valleys—valleys carved into the gently rolling surface that characterized the area some 2 million years ago, before the arrival of the glaciers. Only remnants of that rolling surface remain. The topography of Cincinnati is thus primarily the product of glaciers and the waters related to those glaciers during the **Pleistocene Epoch,** or Ice Age.

Physiographically, Cincinnati is located just north of the



1) Town Mountain Granite (*Sunset Red granite*), Burnet Co., Texas
2) Milbank Granite, Milbank, South Dakota
3) Morton Gneiss (*Rainbow Granite*), Morton, Minnesota
4) *Opalescent granite*, Cold Spring, Minnesota, and *Rockville granite*, Rockville, Minnesota
5) Oneota Dolostone (*Mankato-Kasota stone*), southeastern Minnesota
6) Bayfield Group (*Lake Superior brownstone*), Houghton, Wisconsin
7) Graniteville Granite (*Missouri Red granite*), Iron County, southeastern Missouri
8) Grand Tower Formation (*Ste. Genevieve Golden Vein marble*), Ozora, Missouri
9) Salem Limestone (*Indiana limestone*), Bloomington-Bedford, Indiana
10) Fairmount Member of the Fairview Formation (*Cincinnati limestone*), Cincinnati area, Ohio
11) Dayton Formation (*Dayton limestone*), Dayton area, Ohio
12) Holston Formation (*Tennessee marble*), eastern Tennessee
13) Buena Vista Member of the Cuyahoga Formation, Buena Vista area, Ohio
14) *Imperial black marble*, Rutledge, Tennessee
15) Berea Sandstone, Amherst area, Ohio
16) Massillon sandstone (*Briar Hill sandstone*), Coshocton County, Ohio
17) *Virginia Black marble*, Harrisonburg, Virginia
18) *Cardiff Green marble*, Cambria, Harford County, Maryland
19) Marcy Anorthosite (*Cold Spring Green granite*), Jay, New York
20) Shelburne Formation (*Pearl Danby, Imperial Danby, Montclair Danby marble, Vermont marble*), Danby, Vermont
21) *Roman Breche marble*, Rousillon, France
22) *Bleu Belge marble*, Bioul, Belgium
23) *Verde Issorie marble* and Italian *Verde Antique*, Valle d'Aosta, Italy
24) *Red Levanto marble* and *Portoro marble*, La Spezia area, Liguria, Italy
25) *Botticino marble*, northern Italy
26) *Rosato marble* and *Red* and *Yellow Verona marbles*, west of Verona, Italy
27) *Dolcetto Perlato marble*, Mount Erice, Custonaci-Trapani, Sicily
28) *Cunard Pink marble* and *Tavernelle Perlato marble*, Tavernelle/Chiampo area, Vicenza, northern Italy
29) *Roman travertine*, Tivoli, Italy
30) *Bavarian porphyry*, Weissenstadt, Bavaria, Germany
31) *Skyros marble*, Island of Skyros, in the Aegean Sea
32) *Carmen Red granite*, Virojoki, near Kotka, Finland

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



1) Fountain Square
2) Westin Hotel
3) Carew Tower
4) Tower Place
5) Central Trust Bank Tower
6) Ingalls Building
7) Dixie Terminal Building
8) Roebling Suspension Bridge (off map)
9) Federal Reserve Bank
10) Federal Building
11) Procter and Gamble Company Headquarters
12) Hamilton County Courthouse
13) St. Louis Church
14) Public Library of Cincinnati and Hamilton County
15) Covenant-First Presbyterian Church
16) City Hall
17) St. Peter in Chains Cathedral
18) Plum Street Temple
19) Cincinnati and Suburban Bell Telephone Building
20) John Shillito Company Building
21) Convention Center
22) Cincinnati Enquirer Building
23) Union Terminal (Museum Center) (off map)

FIGURE 2.—Map of downtown Cincinnati indicating locations of Stops 1-23, with the exceptions of Stop 8 and Stop 23, which are outside the area of this map. This map is also shown on the back cover of this guidebook.

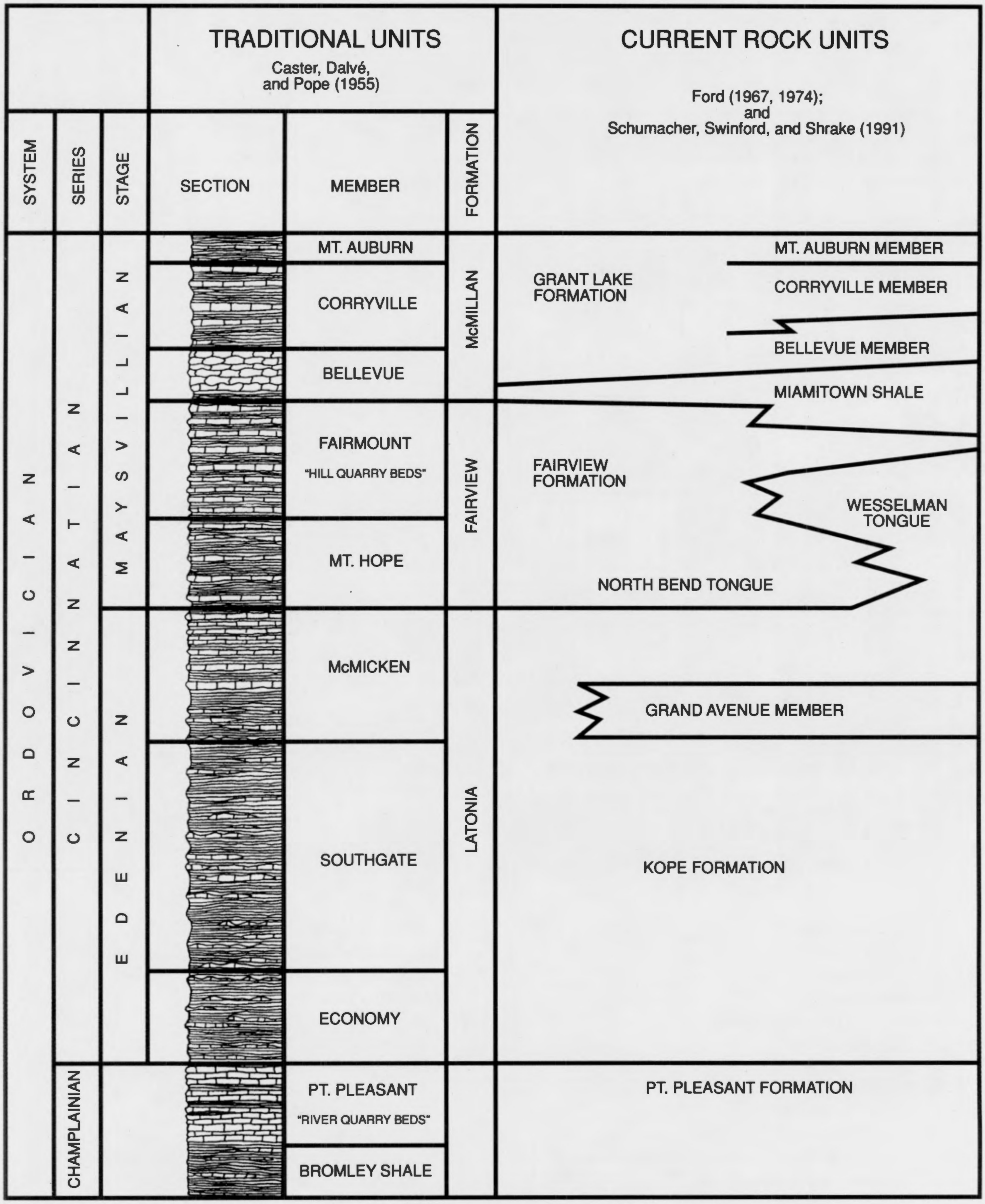


FIGURE 3.—Geologic column of rocks in the Cincinnati area.

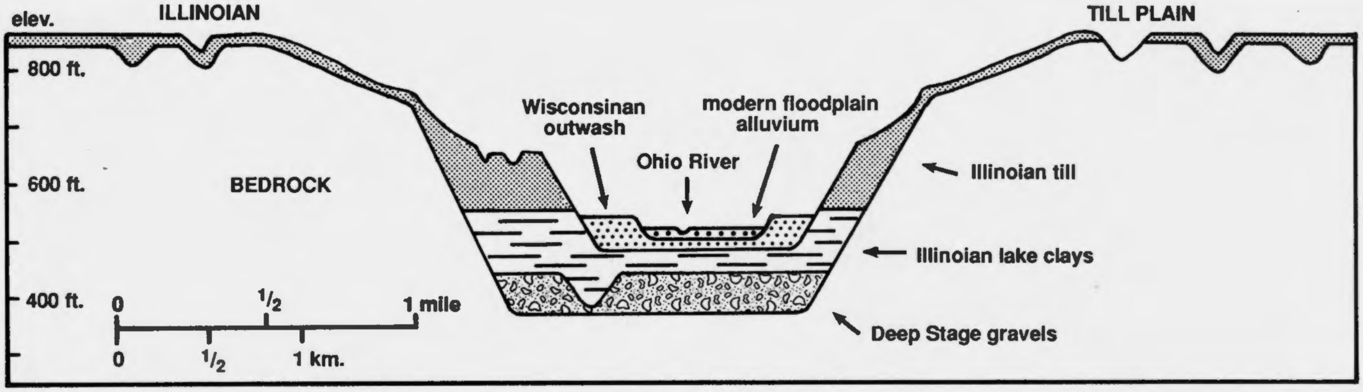


FIGURE 4.—Cross section across the Ohio River valley showing rocks and unconsolidated sediment present (modified from Durrell, 1977, fig. 11).

margin of the **Till** Plains Section of the Central Lowland Province and the Bluegrass Section of the Interior Low Plateaus Province (Fenneman, 1938; Forsyth, 1979). Although the city lies at the southern end of the Till Plains, it is difficult to tell just how many glaciers reached Cincinnati. The most recent glacier, traditionally called the Wisconsinan, did not reach the city.

The glacier stopped several miles north of the city about 19,500 years ago; thus the **terminal moraine** of this glacier is located several miles north of the city limits (Durrell, 1977; Davis, 1981). However, **outwash** related to that glacier clogged all the valleys. In fact, Cincinnati owes its very existence to the Wisconsinan terrace upon which the bulk of downtown sits.

What is now Cincinnati was founded in 1788 as the village of Losantiville. It actually was the second settlement in the area; some six weeks earlier, and somewhat to the east, the village of Columbia had been founded. A third settlement, North Bend, was established slightly to the west in early 1789. The Native Americans of the area were justifiably upset by the three log-cabin villages of interlopers. To protect the new settlers, the U.S. Army was ordered to build a fort in the area. They chose Losantiville as the site for the fort because the Wisconsinan terrace on which the village was located was above floodstage. (The drop in elevation between today's Fourth Street and Third Street marks the edge of this terrace.) The sites of the other two villages were so low as to be flooded every year or two.

There is ample evidence that the glacier traditionally called the Illinoian reached and passed over what is now Cincinnati. Beneath the Wisconsinan outwash, except in deeper valleys, is Illinoian till, and, beneath that, Illinoian lake clays deposited in lakes that resulted from damming of northward-flowing streams by the advancing ice sheet. The uplands commonly have a blanket of Illinoian till, too. The Pleistocene sands and gravels of the Cincinnati area have yielded numerous **fossil** shells of clams and snails as well as remains of insects and plants. Bones of vertebrates, including mastodon and mammoth, also have been recovered from Pleistocene sediments in Cincinnati and the surrounding area.

Beneath the clays, sands, and gravels of the Pleistocene lies **bedrock** of Ordovician age. It is ironic that the geologic period we call the Ordovician was not named after Cincinnati, for the rocks in the Cincinnati region had been studied for more than four decades before the Ordovician was named by the British geologist Charles Lapworth. The fossils of the Cincinnati area are world-famous because of their abundance and excellent preservation.

The local bedrock was deposited in a warm, shallow sea during the latter part of the Ordovician Period, about 450 million years ago. This part of the Ordovician, at least in North America, is called the Cincinnatian Series. From oldest to youngest, the rocks of the typical Cincinnatian are divided into the Edenian, the Maysvillian, and the Richmondian Stages. In the city itself, only the limestones and shales (actually claystones or mudstones) of the Edenian and Maysvillian are exposed (fig. 3).

Cincinnati sits on the crest of a broad, slightly northward-plunging **anticline** called the Cincinnati Arch. Away from the city the rocks dip gently to the west, north, and east and are overlain by Richmondian and younger rocks in those directions. To the south, older rocks, still Ordovician in age, are exposed.

Ordovician rocks, primarily limestones and shales, are exposed on the hillsides around the city. The rocks of the slopes of the hills belong, in ascending order, to the Kope Formation, the Fairview Formation, the Miamitown Shale, and the Bellevue Member (fig. 3). Rock of the Corryville Member is at the top of this sequence in a few places.

For a score of decades the bedrock in Cincinnati has been a source of building stone. The favorite limestone was obtained from the so-called "Hill Quarry beds," which are formally part of the Fairmount Member of the Fairview Formation (fig. 3; Davis, 1985). Many of the flat areas in the Fairview section of the city once were quarry floors. The playing field in Cincinnati's Fairview Park is an example.

Those who construct large buildings in Cincinnati must take into consideration the nature of the subsurface, for instance the depth to bedrock and the type of **unconsolidated** material (fig. 4). Some unconsolidated materials, such as some sand and gravel, have a high bearing capacity (Condit, 1968, p. 16); however, others cannot support large buildings.

USE OF BUILDING STONE IN CINCINNATI

The first building stones used in Cincinnati were locally quarried or were stones that could be transported easily to Cincinnati by river and canal. Limestone from the hills around the city was among the earliest stone to be used. This stone, known as blue limestone (Cist, 1851, p. 19; Orton, 1873) or *Cincinnati limestone,* was quarried from hillside outcrops of the Fairmount Member of the Fairview Formation (see Bownocker, 1915, p. 20-23; and Fenneman, 1916, p. 177-178). The development of numerous quarries in this stone provided great opportunities for collecting fossils—it was quarrying activity that led in great part to

FIGURE 5.—Examples of some stone types that were widely used in the Cincinnati area in the mid-1800's can be seen in the older portion of Butterfield Senior Center, once the Cuvier Press Club. This building was constructed in 1862. The blocks of stone in the foreground are *Dayton limestone.* Note the wavy nature of the bedding of the blocks used for steps. Also note the elongate burrows seen in top or bottom view on the stone to the right. The pillar is fine-grained *Buena Vista sandstone.*

Cincinnati's fame as a fossil locality (Edward Orton *in* Ford and Ford, 1881, p. 17). Many of these fossils have been illustrated by Davis (1985).

Buena Vista **sandstone,** quarried from sandy layers of the Cuyahoga Formation in the Portsmouth region, in Adams and Scioto Counties, near the Ohio River, was one of the earlier types of stone sent to Cincinnati by river. This stone was almost certainly the stone that Cist (1851, p. 19) referred to as "fine-grained sandstone used for building in Cincinnati." This stone was also referred to simply as **freestone.**

Large amounts of *Dayton limestone* (fig. 5) also were brought to Cincinnati at an early date (Howe, 1847, p. 369). It was shipped from Montgomery County by canal boat after the completion of the segment of the Miami and Erie Canal between Cincinnati and Dayton in 1829. Later, Berea Sandstone quarried in northern Ohio was sent by rail. In the mid-1800's, David Hummel, a prominent stone supplier, offered *Cincinnati limestone, Dayton limestone, Buena Vista sandstone,* and Berea Sandstone to his customers in Cincinnati and vicinity. Hummel's business prospered and is represented today by Cincinnati's Hummel Industries (Baird, 1977).

Over time, other types of stone, quarried in nearby states, other areas of North America, and other regions of the world, were shipped to Cincinnati for use as part of the exteriors and interiors of buildings. These imported varieties include **sedimentary,** igneous, and **metamorphic** rocks. Thus, examples of all three major rock types, quarried from a wide variety of localities, can be seen in downtown Cincinnati.

ARCHITECTURE AND HISTORY

This guide emphasizes geological aspects of building stone. Those readers wishing additional information, particularly architectural and historical information on the buildings covered by this guide, can turn to several books. These include: the excellent Work Projects Administration guide (Writers' Program of the Work Projects Administration in the State of Ohio, 1943); Giglierano, Overmeyer, and Propas' large compendium, *The Bicentennial guide to Greater Cincinnati* (1988); and Dorsey and Roth's *Architecture and construction in Cincinnati* (1987).

Stop 1. FOUNTAIN SQUARE

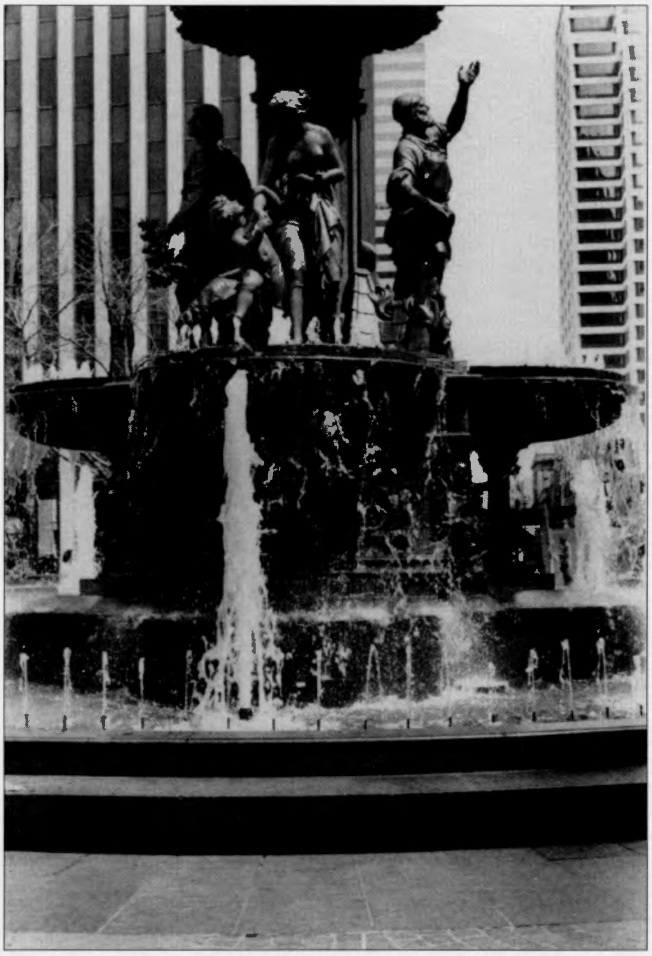


FIGURE 6.—The Tyler Davidson Fountain at Fountain Square. Photo taken in 1992.

Fountain Square is located on the northeast corner of the intersection of Fifth and Vine Streets. The Square, an open area that includes the Tyler Davidson Fountain (figs. 6, 8), is Cincinnati's most famous landmark. It was originally the site of a market. This square is said to be one of the most successful urban spaces in Ohio (Campen, 1980, p. 13).

The Tyler Davidson Fountain, the centerpiece of the square, was dedicated in October of 1871. The fountain came from Germany. Its metallic portion was cast at the Royal Bronze Foundry in Munich; the bronze came from Danish cannon. The fountain originally stood in the middle of Fifth Street but was moved about 30 feet and rotated in 1969 (Giglierano, Overmeyer, and Propas, 1988).

The rim of the basin and the base of the fountain are fashioned from *Bavarian* ***porphyry,*** a dark-brownish-blue igneous rock that has large crystals, called **phenocrysts,** in a finer **groundmass** (phenocrysts are common in igneous rock used as building stone). This stone was quarried and polished in the Fichtelgebirge at Weissenstadt, northern Bavaria, Germany (Poole, 1872, p. 6; Kenny, 1875, p. 111). Porphyry from the Fichtelgebirge and other areas of Germany commonly was used for decorative stone for monuments in the late nineteenth century (Karrer, 1892, p. 13). The stone that has been exposed to water is finely pitted. Such weathering is common in igneous rock exposed to spray in fountains.

The original setting of the fountain was quite different. The fountain once stood on an **esplanade** of freestone that had a rim of *Dayton limestone* (see Stop 17, St. Peter in Chains Cathedral, for more information on this stone). There were also several ornamental posts made of Quincy Granite arranged around this esplanade (Poole, 1872, p. 4). None of the *Dayton limestone* or Quincy Granite remains, probably at least in part because of the lack of availability of these two stone types in later years when the fountain area was being renovated.

Several types of stone are now used in the fountain area; the most conspicuous of these are *Opalescent granite* and *Rockville granite,* two types of stone quarried by the Cold Spring Granite Company in Minnesota. Many of the present benches around the fountain are made with polished slabs of *Opalescent granite* (Jan Ellering, personal communication, 1992). Most of the paving stones, installed in the plaza area around the fountain in the late 1960's, are also fashioned from *Opalescent granite* (Roger Stubbs, personal communication, 1978). *Opalescent granite* is a dark-colored igneous rock quarried at Cold Spring, Minnesota, and is **Precambrian** in age (Kain, 1978). It contains large crystals of grayish-green and orangish-brown **feldspar** and smaller crystals of clear quartz, **pyroxene,** biotite, and hornblende. The blocks used for paving have a roughened finish known as a thermal finish. Such a finish provides firmer footing in bad weather—and in areas hit with spray from the fountain on windy days. Large paving stones directly surrounding the fountain are probably *Cold Spring Black granite* (Jodie Moore, personal communication, 1992), a Precambrian stone quarried in Alma, Quebec.

Rockville granite is used for stairs, railings, and trim around Fountain Square. This stone is a Precambrian **quartz monzonite** quarried in Rockville, Minnesota (Kain, 1978, p. 8). Much of this stone, including that used for steps, is unpolished; that used for the large, rounded railings is polished. The crystal content of this rock can best be seen when it is polished. It contains large (generally 1-3 cm in diameter), irregularly rounded, light-colored (very light gray to grayish-pink) crystals of plagioclase feldspar and smaller crystals of clear to gray quartz and dark iron- and magnesium-rich minerals. The stage at Fountain Square is made with *Carnelian granite,* a variety of Milbank Granite (see Stop 20, The John Shillito Company Building, for more information on this stone).

Stop 2. WESTIN HOTEL

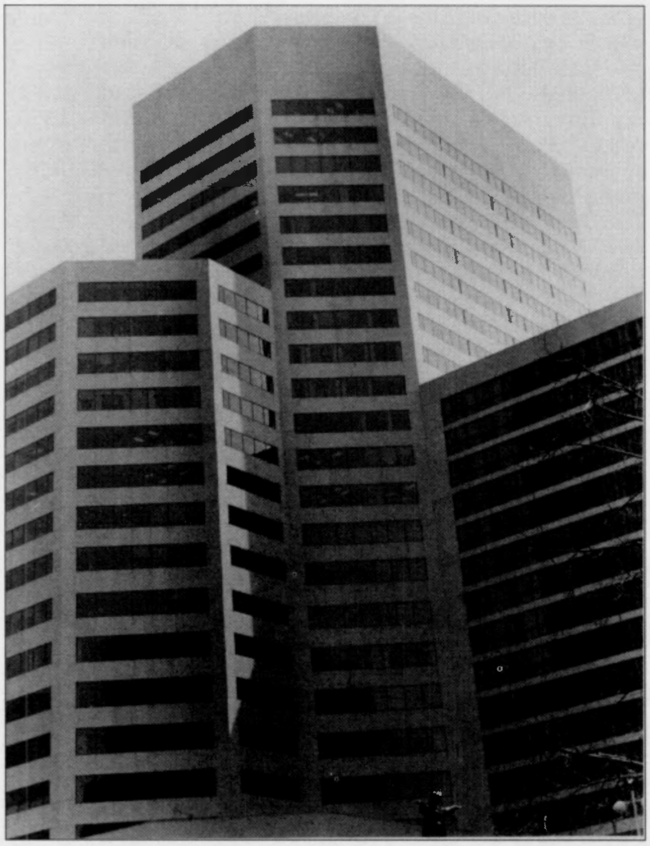


FIGURE 7.—Westin Hotel. Note top of Tyler Davidson Fountain in bottom center. Photo taken in 1992.

Town Mountain Granite is used for the exterior facing and for parts of the interior of the 17-story Westin Hotel (fig. 7), located at the southeast corner of Fifth and Vine Streets. This building was completed in 1981. Town Mountain Granite is a light-red granite of Precambrian age; it is approximately 1.1 billion years old. This granite is composed primarily of crystals of pink **microcline,** white plagioclase feldspar, clear quartz, and the dark minerals biotite and hornblende. Some of the pink microcline crystals are several centimeters long. The commercial name of this stone, *Sunset Red granite,* is derived from its color. It was quarried in the Marble Falls area, Burnet County, Texas. This stone has been used for a number of well-known buildings, including the Texas Capitol in Austin (Barnes, Dawson, and Parkinson, 1942, p. 56) and the BP Building in Cleveland, Ohio (Hannibal and Schmidt, 1992, p. 24). More information on the mineralogy and other aspects of this stone can be found in Barnes, Dawson, and Parkinson (1942, p. 54-56). The Town Mountain Granite used on the exterior of the Westin Hotel is unpolished. It has a wire-sawn finish, that is, it is used just as it came out of the mill after being cut into slabs with a wire saw (Jodie Moore, personal communication, 1992). Most of the granite used in the interior of the building also is unpolished, but some is polished to create a contrasting effect.

Stop 3. CAREW TOWER

FIGURE 8.—Carew Tower, *ca.* 1940's. Part of the Tyler Davidson Fountain is in the foreground, and the facade of the old Albee Theater (see Stop 21) can be seen in the bottom left corner. Photo by Paul Briol, courtesy of The Cincinnati Historical Society.

Carew Tower (fig. 8), at 574 feet, is the tallest building in Cincinnati. It is located on the south side of Fifth Street between Vine Street and Race Street and includes the Omni Netherland Plaza Hotel. This Art Deco building was intended for mixed use—to house a hotel, offices, shops, a garage, and so on. It was one of the first buildings to be designed with mixed use in mind and, when the first tenant arrived in 1930, was the largest building of its kind in the United States (Giglierano, Overmyer, and Propas, 1988, p. 42).

The lower few floors of the building are faced primarily with black "granites" and Salem Limestone. (Salem Limestone is described in detail under Stop 13, St. Louis Church.)

The "black granites" are interspersed among the windows and doors on the ground floor. One with large crystals may be *Rosetta Black granite,* which is quarried at Mellen, Wisconsin. Set immediately adjacent is a black stone with smaller crystals; this stone may be *Andes Black granite,* which is quarried in South America. *Péribonka granite,* quarried in the Lac St.-Jean area of Quebec, also is used. None of these rocks is a true granite in the geologic sense; they are varieties of the dark-colored, coarsely crystalline igneous rock called **gabbro.** Visible in both of these stones are crystals of various minerals, including pyroxene, plagioclase feldspar, and **magnetite.**

The interior of the Carew Tower complex contains a number of building and ornamental stones. The entranceway of the Netherland Plaza Hotel, on Fifth Street, is faced with *Villa de Este* ***travertine,*** quarried about 10 miles east of Rome (Reuben Bullard, personal communication, *ca.* 1985). This travertine is **Quaternary** in age. (Travertine is discussed in more detail under Stop 5, Central Trust Bank Tower.)

Steps and flooring in the lobby area of the hotel are made of pink *Tennessee marble.* This stone, actually a limestone, is quarried in the Knoxville area in eastern Tennessee. It is obtained from rocks of the Ordovician-age Holston Formation. *Tennessee marble* originated as **sediment** from a **bryozoan**-dominated reef tract (see Walker and Ferrigno, 1973). The stone contains numerous fossil bryozoans, but these and other fossils generally are difficult to see (especially when it is used for steps or flooring!). The degree of pink coloration in *Tennessee marble* is due to the amount of **hematite** present (Dale, 1924, p. 152). **Stylolites,** which are sharply delineated, dark, jagged lines, are common features of this stone. More information on *Tennessee marble* can be found in Gordon, Dale, and Bowles (1924). Trim of the flooring is ***Verde Antique.***

Roman Breche marble is used in the foyer of the Netherland Plaza (Brunsman, *ca.* 1984). This **breccia** contains gray, white, and very distinctive olive-green fragments. It is quarried in Rousillon, southern France, in the Pyrenees. Hannibal probably passed through this region of France on his way to Italy, as the Carthage Marble Corporation, of Carthage, Missouri, has pointed out (Carthage Marble Corporation, 1966, no. 3).

The Hall of Mirrors (third-floor ballroom) makes extensive use of *Flêur de Peche marble* ("peach flower"), said to come from France (Brunsman, *ca.* 1984). It is used for **wainscoting,** stairways, and other features. This breccia, with its purple, white, and gray fragments and matrix of white and green minerals, may, however, be the stone known as *Fior di Persica marble* ("flower of Persia"), quarried at Seravezza, Tuscany (McClymont, 1990). Whatever its place of origin, this stone has a complex geologic history (compare the fragments and the matrix of this stone to the less complex *Roman Breche marble*). The fragments in *Flêur de Peche* have been metamorphosed to some degree and the stone contains interesting spherical purple and white radial structures, 2 to 7 cm in diameter, which must have grown in place.

Some fabricated stone is used inside the building complex. Walls have been **marbleized** to resemble travertine, and pillars made to resemble *Verde Antique.*

The supplier for the marble used in the Netherland Plaza was one of the founders of the Marble Institute of America. Thus this hotel became the site, in 1944, of the organizational meeting of the Marble Institute of America (Robert Hund, personal communication, 1991).

Stop 4. TOWER PLACE

FIGURE 9.—Tower Place. Photo taken in 1992.

Two interesting stones are used for portions of Tower Place (fig. 9), located on the northeast corner of Fourth Street and Race Street. Red *Briar Hill sandstone* is used around the entranceways, and beige Oneota **Dolostone** is used for other facing. *Briar Hill sandstone* is quarried from the Massillon sandstone, part of the Pottsville Group, at several locations in Knox, Holmes, and Coshocton Counties, Ohio, by the Briar Hill Stone Company, whose headquarters are located in Glenmont, Holmes County. The rock unit is named for the city of Massillon in Stark County, Ohio. The Massillon in the Knox/Holmes/Coschocton County region has been quarried since at least 1857 (Briar Hill Stone Company staff, 1991). More information on the history of these quarries can be found in Bownocker (1915, p. 118-129), two articles in *Stone Magazine* (Anonymous, 1959, 1971), and in an article by the Briar Hill Stone Company staff (1991).

Various Briar Hill Stone Company quarries in this tri-county area supply stone that ranges in color from light beige to brown to various shades of red. This sandstone is generally coarser in grain size than other Ohio sandstones used as building stone. The particular sandstone used for Tower Place was quarried in Coshocton County (Jerry Parsons, personal communication, 1992).

The Massillon sandstone is **Pennsylvanian** in age. Characteristic Pennsylvanian fossils, including parts of the plant *Stigmaria* (probably the species *Stigmaria ficoides*), have been found in this rock unit. The Massillon was deposited as sediment in very shallow water. Mud cracks can be seen in the quarries toward the top of the sandstone sequence. These mud cracks indicate exposure to the air. The latest geological analysis of the Massillon is contained in the unpublished thesis of Schmidley (1987), who ascribed a **fluvial** environment of deposition to the unit.

Oneota Dolostone used for facing is sold commercially as *Mankato-Kasota stone* or *Minnesota stone.* This Lower Ordovician rock is quarried in southeastern Minnesota. The Oneota Dolostone is part of a sequence of Ordovician **dolomitic** carbonates that are exposed in Wisconsin and adjacent states. The process of **dolomitization** probably resulted in the loss of much of the original character of the sediment composing this stone. However, burrows can be seen in some slabs of this stone used for building purposes. The burrows are circular in cross section and elongate in top and bottom view. The shape of the burrows depends on whether the stone was cut horizontal or perpendicular to natural bedding. When seen in cross section the burrows here are 1-3 cm wide. Over time, because of slight differences in the fillings and the rock matrix, the burrows in this stone are accentuated due to weathering. Additional information on this stone can be found in Kain (1978) and Thiel and Dutton (1935, p. 112-129).

Stop 5. CENTRAL TRUST BANK TOWER

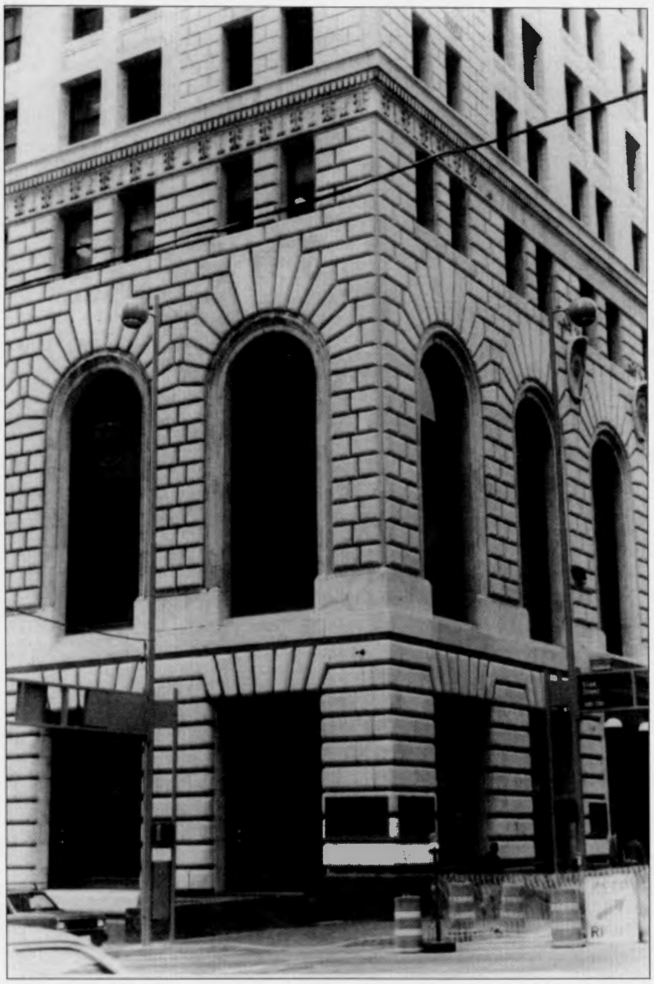


FIGURE 10.—The northeast corner of Central Trust Bank Tower. Photo taken in 1992.

Formerly called the Union Central Life Insurance Building, the 38-story Central Trust Bank Tower (fig. 10), on the southwest corner of Fourth Street and Vine, was completed in 1913. When dedicated, it was the fifth largest building in the world and the tallest outside of New York City (Giglierano, Overmyer, and Propas, 1988).

The facing on the lower part of the building is a finely crystalline white marble from Vermont. The upper floors are faced with white **terra-cotta.** A gray igneous rock, probably a **granodiorite,** is the facing on the base of the building. The stone used at the steps leading down under the east side of the building (on Vine Street) is Morton **Gneiss** (see Stop 19, Cincinnati and Suburban Bell Telephone Building, for a description of this stone); there also is red granite at the entrance.

A wonderful variety of stones is used in the interior of the building. At the two main entrances is *Roman travertine* quarried in Tivoli, Italy (Romer Shawhan, 1959). This stone is Quaternary in age.

Travertine is a popular ornamental stone that really can dress up the interior of a building; unfortunately, the rock is too soft and susceptible to erosion to allow some uses to be successful. For example, footfalls can erode travertine floors, and the use of the stone on building exteriors in certain climates and conditions of air pollution can leave the stone dull and chalky. However, on the positive side, these same qualities can give a building an antique look, and it is said that the porosity of travertine cuts down on noise.

Additional geological information on travertine can be found in Chafetz and Folk (1984), and more examples of the use of travertine are given in Slagle (1982) and Hannibal and Schmidt (1992).

The many varieties of marble used inside this building are listed in the 1941 "remodeling issue" of The Central Trust Key Note (Anonymous, 1941). The bank has been remodeled extensively since the 1940's. We describe below only those stone types still visible in the public area of the bank.

The large, fluted pillars in the main banking lobby and most of the tellers' counter are faced with *Rosato marble,* quarried just west of Verona, Italy, in the foothills of the Alps (Carthage Marble Corporation, 1963, no. 12). This stone consists of moderate-orange-pink to very pale orange nodules separated by irregular, pinkish **veins.** With diligent searching, fossil **cephalopods,** including **belemnites** and **ammonites,** can be found in this stone at the bank. *Rosato marble* is from the same sequence of **Jurassic** (middle **Mesozoic**) rocks that yields the better known *Verona marbles,* also used at this location. The large pillars have inset panels of *Cardiff Green marble. Cardiff Green* is a type of dusky-yellowish-green *Verde Antique* with pale-green veins. It is technically a **serpentinite** and was quarried at Cambria, near Cardiff, in Harford County, Maryland (McClymont, 1990). This stone is probably very early **Paleozoic,** possibly Late **Cambrian,** in age (James Reger, personal communication, 1992). The sides of the banking counters are *Imperial Pink travertine* from Austria, and the tops are pale-red, **foraminiferan**-rich *Cunard Pink marble* from near Chiampo, Italy (McClymont, 1990). Wainscoting along the north wall is *Montana Rose Tan travertine.* This stone is yellowish brown and has rose-colored veining.

The west wall of the banking lobby has an impressive stone mural, approximately 9 feet high by 12 feet wide, made with many varieties of stone (Anonymous, 1941, p. 1). Stone used for this mural was selected with great care, using natural stone coloration and structures to aid in representing features. *Cardiff Green marble* is used in the lower left of the mural. *Verde Antique* from Italy is in the lower center. *Verde Issorie marble* (see Stop 17, St. Peter in Chains Cathedral, for more information on this stone) is used above these. Variegated rose-colored *Colorosa travertine,* quarried in the Rocky Mountains just 4 miles west of Canon City, Colorado (Sharps, 1963, p. 9), is used for tree trunks. Most of the pieces of this travertine are set vertically; thus the natural banding of the stone mimics the appearance of tree bark. *Colorosa travertine* is Quaternary in age (Randy Streufert, personal communication, 1992). *Cunard Pink marble* is above the *Verde Issorie. Skyros marble,* composed mostly of white clasts with gold veining, is used for the buildings in the background. This stone was quarried on the Greek island of Skyros, in the Aegean Sea. *Yellow Verona marble* is used for the large tower and *Red Verona marble* is used for the door of the tower. These Jurassic-age marbles are quarried in the Verona area of Italy (see Stop 23, Union Terminal, for more information on *Verona marble*). *Flêur de Peche marble* (see Stop 3, Carew Tower, for more information on *Flêur de Peche*) and *Breche Violet marble,* quarried in Seravezza, Italy, are used for the snow-capped mountains. These stones are variegated purple, gray, and white. *Eastman Cipollino marble,* a white marble with green veining quarried in West Rutland, Vermont (McClymont, 1990), represents the sky. It is Ordovician in age. The word "cipollino" is Italian for scallion. Because of its color and banding, classic *Cipollino marble* may look like a green onion cut in half. *Verde Antique,* from Italy, and *Cardiff Green marble* are used for leaves. Dark *Alps Green marble,* a serpentinite quarried in the Alps area, probably near the French/Italian border, is used for a 3-inch-wide border, and the entire mural is framed by *Imperial Pink travertine.* Pieces of *Rosato marble* and *Cardiff Green marble,* fashioned much like the pillars in the banking lobby, flank the mural.

Stop 6. INGALLS BUILDING

FIGURE 11.—Ingalls Building. Photo taken in 1992.

The Ingalls Building (fig. 11), located at the northeast corner of Fourth and Vine Streets, was completed in 1903. It is important in the history of architecture as the first reinforced-concrete skyscraper (Writers' Program of the Work Projects Administration, 1943, p. 174; Condit, 1968; Ebert and others, 1979).

Vermont marble, a fine-grained white marble with grayish-green streaks, is used for the exterior of the first three stories. This is a true geological marble, probably quarried in Vermont from the Ordovician-age Shelburne Formation (see Ratté and Ogden, 1989). The marble shows signs of weathering—it is pitted in places. The Fourth Street entranceway has travertine walls and a ceiling of cream-colored marble with golden to black veining.

The use of concrete for such a large building was strikingly revolutionary for the time. Some expected that the building would collapse upon completion (Giglierano, Overmyer, and Propas 1988, p. 39). Early on, it was noted that concrete buildings did not require stone or other types of facing (see Condit, 1968, p. 23). Concrete facing, however, is not as aesthetically pleasing as stone (see Stop 21, Convention Center, for more on this topic).

The Ingalls Building is supported by columns and footings that rest on sand and gravel (Condit, 1968, p. 16).

Stop 7. DIXIE TERMINAL BUILDING

FIGURE 12.—Arch of the entranceway on the Fourth Street side of the Dixie Terminal Building. Photo taken in 1992.

The Dixie Terminal Building (fig. 12), built in 1921, is located at Fourth Street and Walnut Street. The building was intended as a street-car terminal for commuters from northern Kentucky, a function it still serves well, although street cars have been replaced by buses. This building is made of reinforced concrete, but is faced in part with Salem Limestone, known commercially as *Bedford stone* (Kellogg, 1921), or more generically as *Indiana limestone.* (Salem Limestone is described in detail under Stop 13, St. Louis Church.) Several types of granitic rocks, including *Deer Island granite,* a pinkish stone quarried on Crotch Island, Maine, are used for parts of the exterior (David Swenson, personal communication, 1992). *Deer Island granite* is Devonian in age.

There is an archway of ornate, colorful Rookwood tiles inside the building. Cincinnati's Rookwood Pottery Company, founded in 1880, was one of the best known art potteries in the United States (Giglierano, Overmeyer, and Propas, 1988). The clays of the Ohio River valley were among those commonly used by the Rookwood Pottery early on in its history (E. J. Kircher, personal communication, 1992). These materials included red clay from Buena Vista, Ohio, and yellow clay from Hanging Rock, Ohio (Kircher, 1962).

Parts of the interior, including **pilasters** and railings, are faced with *Botticino marble,* a cream-colored limestone of Jurassic age quarried in the Brescia region of northern Italy. The stone contains **coated grains,** some of which contain fossils. There are also panels of a beige/brown marble breccia and a true white marble with golden-gray streaks. *Tennessee marble* is used for floors and stairs (see Stop 3, Carew Tower, for more information on this stone).

[Note: For those who don't relish a trip to the riverfront, Stop 8, the Roebling Suspension Bridge, can be viewed from a large picture window inside the Dixie Terminal.]

Stop 8. ROEBLING SUSPENSION BRIDGE

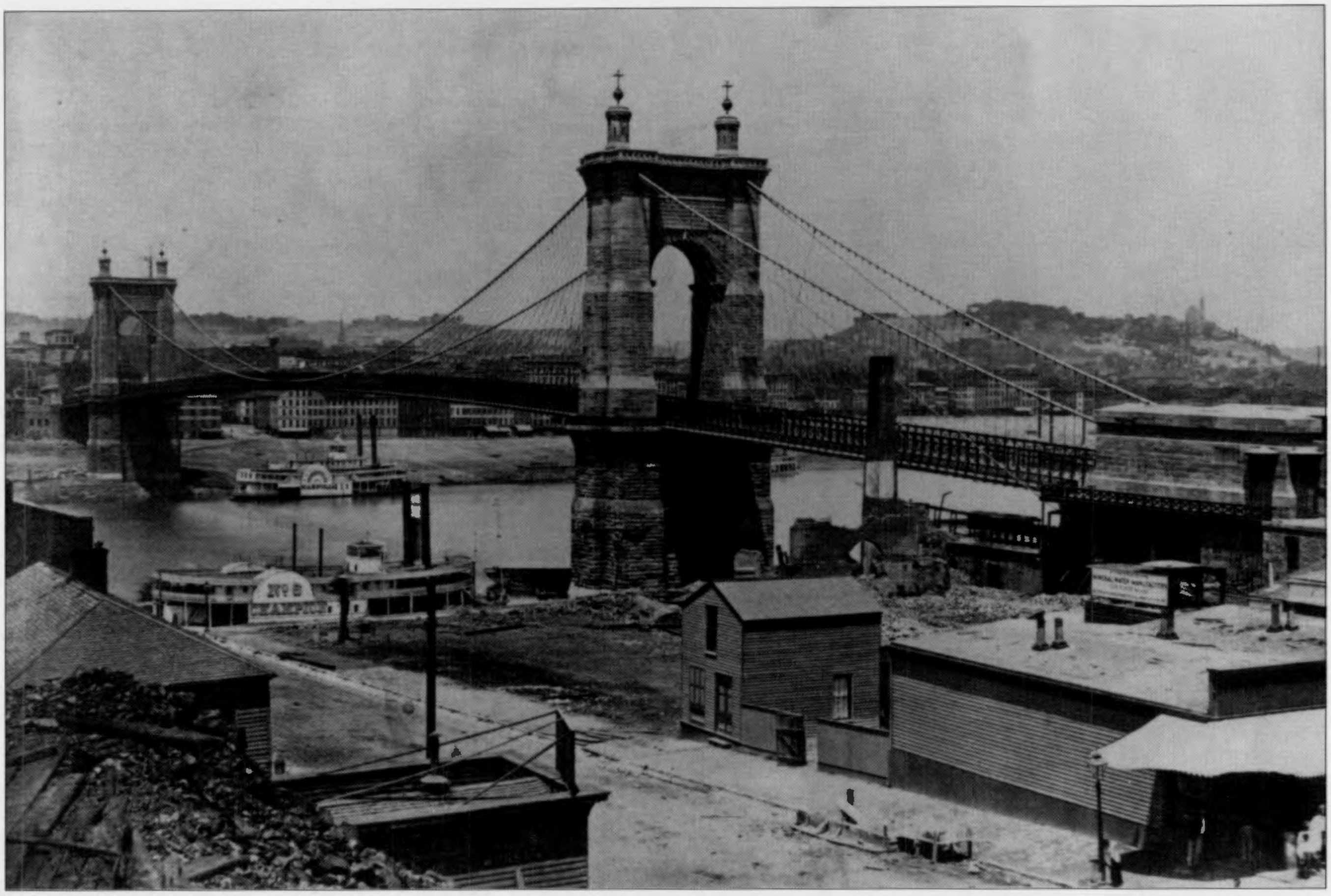


FIGURE 13.—Roebling Suspension Bridge, 1868. Photograph, courtesy of The Cincinnati Historical Society, taken from the Covington, Kentucky, side of the river, looking toward Cincinnati.

Cincinnati's Suspension Bridge (fig. 13), once known as the Ohio Bridge, was renamed in 1983 in honor of its designer and main engineer, John A. Roebling (1806-1869) (Giglierano, Overmyer, and Propas, 1988, p. 26). The bridge is located south of the Dixie Terminal Building (Stop 7), and its northern terminus is just west of Riverfront Stadium. Construction of this bridge was begun in 1856, but, because of the Civil War, which caused a scarcity of stone workers, and other delays, it was not completed until 1867.

Roebling took special care in selecting and documenting the stone used for this great structure. Most details below are taken from his 1867 report on the bridge. (Roebling, by the way, became famous by building another bridge, New York City's Brooklyn Bridge; details of his work on bridges in Cincinnati and elsewhere are given in Steinman, 1945).

The first 25 feet of masonry of the elephantine anchor piers of the bridge are faced with limestone. Roebling felt that limestone would stand up to the river's currents better than sandstone. He wanted to use **shell marble** from quarries below Madison, Indiana, but a suitable quantity of this stone was not available, so he had to use stone from Ohio and other Indiana quarries instead (Roebling, 1867, p. 34).

The interior of the piers is made of Salem Limestone, marketed as *Indiana limestone* (see Stop 13, St. Louis Church, for more information on that stone), from the North Vernon quarries in southeastern Indiana. Except for some limestone trim, the visible portion of the exterior of the piers is *Buena Vista sandstone* (Roebling, 1867; Stevens, 1939, p. 137), also called *Buena Vista stone.* The limestone trim can be easily distinguished from the sandstone, as the limestone is very light in color. The sandstone is light grayish orange to yellowish gray when unweathered, but some of the stone is covered with a dark to very dark coating. This *Buena Vista sandstone,* also known as *Buena Vista freestone* (Bownocker, 1915, p. 123), was quarried from the *Buena Vista freestone* ledge (rock belonging to the Buena Vista Member) in the John Loughrey lands in Green Township, Adams County, Ohio (now within Shawnee State Forest), and was transported by barge along the Ohio River to Cincinnati (Stivers, 1900; Kelley, 1982). The quarries were located in the hills above the village of Buena Vista, Ohio, on the Ohio River about 76 miles (122 kilometers) east of Cincinnati. Because of the ease of transportation by river barge, the stone was widely used in Cincinnati, so much so that one freestone ledge was also called the "City Ledge." The fact that the stone carved well also helped make it popular.

The earliest recorded use of stone from Buena Vista in Cincinnati was in 1814 (Bownocker, 1915, p. 122-123). Later in the 1800's a number of quarries were developed in layers of the Buena Vista Member at Buena Vista as well as at additional towns in the Portmouth region (Anonymous, 1884). Most of the quarries that supplied stone to Cincinnati were closed prior to World War I (see Bownocker, 1915), but this stone continues to be quarried today by the Waller Brothers at McDermott, Scioto County, Ohio (see Calvert, Bernhagen, and Bowman, 1968). In addition to bridges and buildings, the stone was used for pavements, curbs, front steps, windowsills, and so on (Roebling, 1867; Bownocker, 1915, p. 126; Stivers, 1900, p. 426-427). In Cincinnati, not only was the stone from the Buena Vista Member used in the piers of the Suspension Bridge, but also in those of the L & N Bridge and in the locks of the Miami and Erie Canal.

Buena Vista stone is quarried from the Buena Vista Sandstone Member of the Cuyahoga Formation. It occurs above the Sunbury Shale and below the Black Hand Sandstone Member of the Cuyahoga. In older literature *Buena Vista stone* is referred to as being part of the Waverly Group, a rock unit consisting, depending on who was using the term, of rocks between the Ohio Shale and the Carboniferous Conglomerate (now known as the Sharon conglomerate). *Buena Vista stone* from Pike County was sold as *Waverly brown stone* (Orton, 1874, p. 627).

The Buena Vista Member, named for the classic outcrop and quarry region of Buena Vista, Ohio, consists of a sequence of sandstone beds with interbedded shale. It is Early **Mississippian** in age, somewhat younger than Berea Sandstone (see Stop 16, City Hall, for more information on that stone), a sandstone with a similar appearance also used in the Cincinnati area. A sample of *Buena Vista stone* from layers quarried at Buena Vista is composed primarily of very fine (0.06-0.09 mm in diameter) quartz grains. This very fine grain size can be used to help differentiate *Buena Vista stone* from other Ohio sandstones used in Cincinnati as building stones. These other stones, the Berea Sandstone and the Massillon sandstone, characteristically have a larger grain size. Abundant marine **trace fossils,** including numerous *Zoophycos,* found in the Buena Vista Member (see Hyde, 1953, for instance, in which *Zoophycos* is referred to as *Spirophyton*) indicate that these rocks represent a sequence of marine shelf sands and muds. Additional information on this unit, along with a number of measured sections of rock that include the Buena Vista, is given in Hyde (1953).

Bownocker (1915, p. 122-129) described the geology and the history of quarrying of this stone. Transport to Cincinnati was easy, thanks to river barges (Bownocker, 1915, p. 122-123). *Buena Vista stone* quarried in the classic quarry regions commonly contained **pyrite,** petroleum, or both. Large amounts of pyrite can be undesirable, as pyrite can oxidize and cause deterioration or staining of stone. Petroleum-rich stone, however, was thought to be better for some uses. Thus, stone needs careful selection, depending on its intended use. At peak demand, much low-quality stone was shipped—to the detriment of the stone's reputation. On the other hand, because of its water resistance due to impregnation with petroleum and its apparently greater strength, Roebling used the "petroleum" variety of *Buena Vista stone* for the lower masonry layers of the piers (Roebling, 1867, p. 36).

The stone blocks used for the portion of the piers below the deck are **rock faced.** Most of the blocks above the deck were finished so as to have flat, tooled surfaces with **pitched** edges.

The masonry bridge abutments (end supports) of the bridge are composed primarily of *Buena Vista* stone. The abutment on the Cincinnati side includes, below deck level, some blocks of *Cincinnati limestone* from the Fairmount Member of the Fairview Formation.

Blocks of *Buena Vista* below the deck level in the abutments are among the most interesting seen in the bridge. Here tubular trace fossils (discussed and illustrated under Stop 17, St. Peter in Chains Cathedral), **cross-stratification,** undulatory bedding, and iron staining can be seen. Also, there is some honeycomb weathering, a type of weathering characterized by closely spaced hollows, caused in part because of the enlargement of burrow openings.

Stop 9. FEDERAL RESERVE BANK

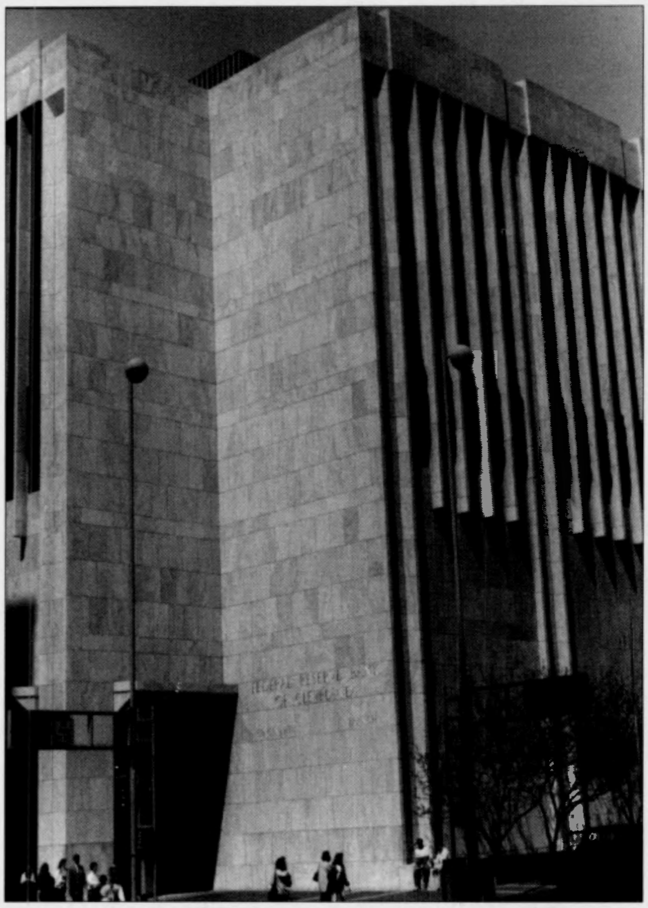


FIGURE 14.—Federal Reserve Bank. Photo taken in 1992.

The current building of the Cincinnati Branch of the Federal Reserve Bank of Cleveland (fig. 14), located at Fourth and Main, was opened in 1972. Its exterior is a type of white marble from Vermont known as *Pearl Danby*. This particular marble is fine grained and contains gray veins. It was quarried from Layer G of the Imperial Quarry of the Vermont Marble Company, OMYA (Duncan Ogden, personal communication, 1992). This quarry is located within Dorset Mountain in Danby. This layer is within the Columbian Marble Member of the Shelburne Formation, of Early Ordovician age (see Ratté and Ogden, 1989).

The sidewalk at the south entranceway is an exposed aggregate concrete, that is, a concrete in which the pebbles used as aggregate stand out from the surface in relief. The concrete includes pebbles of jasper, chert, quartz, granite, and other rocks and minerals.

Roman travertine from Italy is used in the lobby and in other places inside the building. Travertine commonly contains natural fissures. Many of the larger fissures in the travertine used for flooring here are filled; the fissures in the travertine used for wall facing are left unfilled. The pedestal of the sculpture of the eagle in the lobby also is fashioned from *Roman travertine*. More information on travertine is given under Stop 5, Central Trust Bank Tower. (Travertine also is used extensively inside the adjacent Mercantile complex; see additional sites for more information on that building.) White marble also is used in the lobby.

Much *Opalescent granite* is used in and around the Federal Reserve Bank Plaza on the north side of the bank building (Jan Ellering, personal communication, 1992). (See Stop 1, Fountain Square, for more information on this stone.) Most of this stone is polished.

Stop 10. FEDERAL BUILDING

FIGURE 15.—Federal Building. Photo taken in 1992.

Construction of the Federal Building (fig. 15), located on the east side of Main Street between Fifth and Sixth Streets, began in 1962. The building was completed two years later.

The ground floor is faced with polished *Cold Spring Green granite,* also known as *Mountain Green granite* (Cold Spring Granite Company, 1987). This grayish-olive igneous rock is quarried in the Jay (Essex County), New York, area (Hund, 1990, p. G-42). Technically, this stone is a meta-anorthosite, that is, a metamorphosed **anorthosite,** part of the rock unit known as the Marcy Anorthosite; it is Precambrian in age, having been metamorphosed about 1.1 billion years ago (Bill Kelly, personal communication, 1992). The chief mineral in this rock is plagioclase feldspar, including large phenocrysts of bluish-black plagioclase, some of which are iridescent. Close inspection of this stone also reveals dark minerals, including the black minerals pyroxene and hornblende and plentiful small, red garnets. Most of the remainder of the building is faced with Salem Limestone (see Stop 13, St. Louis Church, for more information on that stone).

The two large pillars at the Main Street entrance and the four large pillars in the lobby are faced with a white granitic stone. This stone may be *Bethel White granite* from Vermont (Jodie Moore, personal communication, 1992). It is also somewhat similar to *Sierra White granite,* a fine-grained, white granitic rock of **Cretaceous** age quarried in Raymond, California (Hund, 1990, p. G-98). *Iridian granite,* quarried at Isle, Minnesota, is used for flooring of the entranceway around the pillars (Jodie Moore, personal communication, 1992).

Several types of stone are used inside this building. The lobby has **terrazzo** flooring, light-gray granite columns, and walls of a fine-grained white marble with light-olive-gray streaks. This marble is probably an Ordovician-age stone from Vermont. A dark-charcoal-gray marble is used in the second- through tenth-floor elevator lobbies. This stone is highly **fossiliferous,** containing large globular colonies of bryozoans as well as abundant **sea lily** parts. Stylolites and calcite veins are also abundant in this stone.

Stop 11. PROCTER AND GAMBLE COMPANY HEADQUARTERS

FIGURE 16.—The Procter and Gamble Company Headquarters. Photo taken in 1992.

The international headquarters complex of the Procter and Gamble Company (fig. 16), located northeast of the intersection of Fifth Street and Broadway, was completed in 1985. A variety of stone types was used in its construction (Hund, 1988). Large amounts of *Gray Indiana limestone* (Salem Limestone), also called *Standard Gray Indiana limestone,* quarried from the Indiana Limestone Company's PM & B quarry near Oolitic, Indiana, were used for the exterior of this complex. *Standard Gray* is a fine to moderately large grained, gray variety of *Indiana limestone* (Indiana Limestone Institute of America, 1989, p. 10). The previous headquarters building, located west of the new headquarters and completed in 1967, also was faced with *Gray Indiana limestone.* (See Stop 13, St. Louis Church, for more information on *Indiana limestone.*) The lower few floors of the building are faced primarily with a black "granite" and *Indiana limestone.*

Montclair Danby marble, quarried in Danby, Vermont, was used for portions of the exterior. This white marble with gray to greenish-gray streaks was quarried from Layer D of the quarries of the Vermont Marble Company OMYA inside Dorset Mountain. This layer is within the Columbian Marble Member of the Upper Ordovician Shelburne Formation (see Ratté and Ogden, 1989). A gray granite also is used for part of the exterior of this complex.

Several types of stone are used in the entrance pavilion of this complex. *Imperial Danby marble* (Hund, 1988), a white marble with gold to gray streaks quarried from Layer C of the Vermont Marble Company OMYA quarry at Danby (see Ratté and Ogden, 1989), is used for the fountain. Unpolished pink *Tennessee marble* is used as cladding for the first 10 feet of the square pillars. (See Stop 3, Carew Tower, for more information on *Tennessee marble.*) Some walls are lined with a dark-gray granitic stone. Flooring of the pavilion includes travertine. The larger open spaces in the travertine have been filled with cement.

Wesley Chapel, which was dedicated in 1831, once stood where part of the 1985 Procter and Gamble complex now stands. In the 1840's, the Englishman Charles Lyell, one of the founders of the science of geology, spoke in Wesley Chapel when he visited Cincinnati. Wesley Chapel was once the largest church west of the Alleghenies (Starr, 1970) and the oldest religious building in Cincinnati. It was demolished—alas!—to make room for the Procter and Gamble project.

Stop 12. HAMILTON COUNTY COURTHOUSE

FIGURE 17.—West entranceway of the Hamilton County Courthouse. Photo taken in 1992.

The cornerstone of the present Hamilton County Courthouse (fig. 17), located on the east side of Main Street between Ninth Street and Central Parkway, was laid in 1915. The building was completed in 1919.

The exterior steps, foundation, and adjacent ornamental walls are of an unpolished pink granite from New Hampshire (Marzulli, 1982?, p. 155). Published specifications (Rankin, Kellogg & Crane, 1914?, p. 48) for the portion of the courthouse above the granite base called for either marble, light-colored granite, *Ohio sandstone* (Berea Sandstone) or other sandstone, *Indiana Oolitic limestone* (Salem Limestone), or *Kentucky limestone.* Proposals were solicited for several kinds of stone. Salem Limestone eventually was chosen (see Stop 13, St. Louis Church, for information about Salem Limestone).

There is a U.S. Coast and Geodetic Survey (now National Geodetic Survey) **bench mark** embedded in a granite block in the base of the southwest corner of the building. The S 117 engraved on the bench mark indicates its location. This is a vertical bench mark marking an elevation of 550.619 feet (167.829 meters) above sea level.

Marble used in the interior is said to have come from 25 different quarries in the United States and one in France (Morris and Krieger, 1919, p. 13). Flooring in the interior includes two shades of pink *Tennessee marble* (see Stop 3, Carew Tower, for more information on this stone) as well as a fossilifereous, beige limestone and *Verde Antique.* The walls and ceiling of the main hall (just inside the west entrance of the building) are lined with pink *Tennessee marble. Tennessee marble* used inside buildings generally is polished; however, that used for the walls and ceilings here is **honed.** According to Morris and Krieger (1919), wainscoting is *Hauteville marble,* a pale-yellow, brecciated limestone quarried at the Chateau Hauteville Quarries, near

Hauteville, Ain, France (McClymont, 1990). *Hauteville marble* is Cretaceous in age. Round columns in the halls are composed of a dark, coarsely crystalline igneous rock. Walls and pilasters are a beige limestone with plentiful foraminiferans as well as **brachiopods.** In the early 1990's, a Mesozoic limestone rich in thick-shelled rudist clams was added for fire walls and to replace deteriorated interior stone.

The stonework on the outside and inside of this building was cleaned in 1986 (Dorsey and Roth, 1987, p. 158).

Stop 13. ST. LOUIS CHURCH

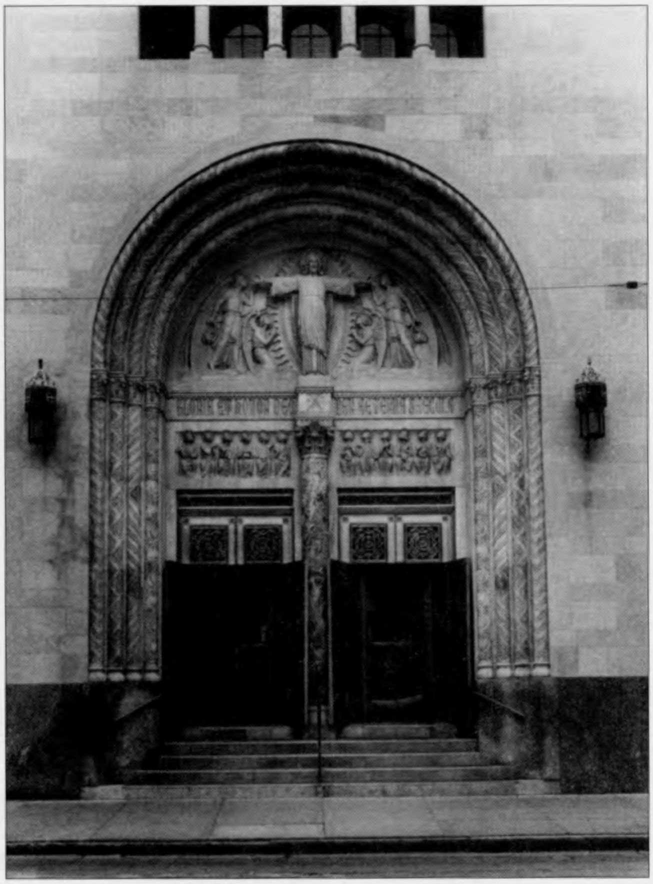


FIGURE 18.—Entrance of St. Louis Church. Photo taken in 1992.

Many types of stone are used for St. Louis Roman Catholic Church (fig. 18), located at Eighth and Walnut Streets. This church was built in 1928. Most of the exterior is clad with Salem Limestone, now known commercially as *Indiana limestone.* In the past this stone also has been called *Bedford stone* or *Indiana Oolitic limestone.* Salem Limestone is of Mississippian age and is quarried in south-central Indiana. It long has been one of the most popular building stones in North America because of its ready availability, its ability to be easily cut in any dimension (it is a freestone), its ability to be easily carved (it is not as hard as many other dimension stones), and its durability.

This limestone consists primarily of small whole marine fossils and broken pieces of larger marine fossils. Disc-shaped sea lily stem pieces (fig. 19) and parts of bryozoans can be seen easily in the stone used for this church. The Salem Limestone was deposited in fairly shallow sea water. This stone is quite porous—many small holes are visible under magnification. Despite, or perhaps because of, this quality, it is quite durable. More information on Salem Limestone as a building stone can be found in the *Indiana limestone handbook* (Indiana Limestone Institute of America, 1989). Information on the depositional environment and other aspects of the stone can be found in Patton and Carr (1982) and Thompson (1990).

A pink granite is used around most of the base of the exterior. This stone not only adds color to the building, but also protects the base of the building. Even with modern coatings, Salem Limestone does not hold up well when it is subjected to large amounts of salt, as would the base of a building in an area where salt is used for ice control.

The large, dark-red exterior pillars by the entrances are fashioned from *Red Levanto marble,* a red, purple, green, and white brecciated stone composed primarily of **serpentine** and calcite. It is quarried in eastern Liguria, Italy, and is of **Tertiary** age (Slagle, 1982). *Red Levanto* is not a good choice of stone for exterior use; the columns have roughened due to weathering since installation.

Some walls in the vestibule of the church are lined with *Ste. Genevieve Golden Vein marble.* This limestone is quarried from the Middle **Devonian** Grand Tower Formation in Ozora, Missouri (Hinchey, 1946, p. 14-22). Fossil **corals,** both solitary and **colonial,** can be seen in this stone. The first-floor chapel contains a number of stone types. These include a medium-grained sandstone used for interior walls, six large columns made of a mottled purple and white stone, and small columns of *Red Levanto marble* and *Verde Antique.* (Compare the rich color and smooth surface of these interior *Red Levanto* columns with the muted colors and rough surface of those on the exterior.) Flooring of the aisles is *Tennessee marble* (see Stop 3, Carew Tower, for more information on this stone). The communion rail is *Verde Antique,* and the tall panels around the altar are *Sienna marble* or a similar stone.

FIGURE 19.—Close-up of a slab of Salem Limestone (from Hannibal and Schmidt, 1992). The wheel-shaped fossil to the left is a segment of the column ("stem") of a sea lily. It is about 3 mm in diameter. Similar fossils can be seen in the stone used for St. Louis Church and several other localities discussed in this guidebook.

Stop 14. PUBLIC LIBRARY OF CINCINNATI AND HAMILTON COUNTY

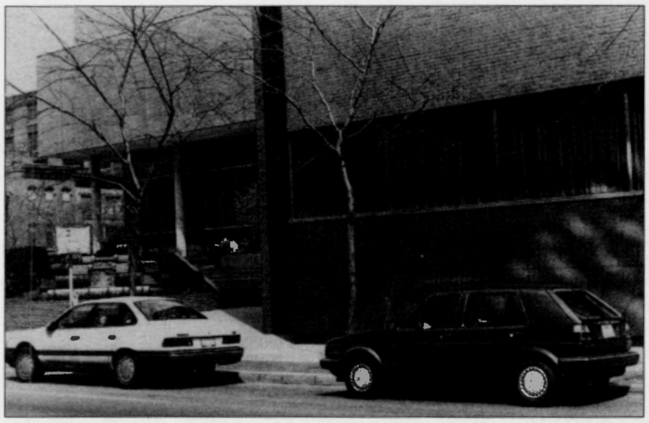


FIGURE 20.—Public Library of Cincinnati and Hamilton County. Photo taken in 1992.

The main building of the Public Library of Cincinnati and Hamilton County (fig. 20) takes up the block bounded by Eighth, Vine, Ninth, and Walnut Streets. The building was built in the early 1950's. Additions were made to the building in later years.

The red stone used for the exterior of the southwest corner of the library is *Imperial Red granite* or a similar stone. *Imperial Red granite* is quarried in Sweden and is Precambrian in age. The reference to "Imperial" in the commercial name of this stone has an interesting origin. Supposedly, Napoleon wanted the red granite of pharaonic Egypt to be used for his tomb, but at the time that the stone was needed the ancient Egyptian quarries had yet to be relocated, thus this Swedish stone was substituted as the closest facsimile. Note the porphyritic nature of this stone and the zoned crystals, some with lighter red material on the outside and a darker material inside, and some vice versa.

In 1979, the Cold Spring Granite Company supplied *Wausau Red granite* for additions to the library (Jan Ellering and Clifford C. Gump, personal communications, 1992). *Wausau Red granite,* also known as *Bright Red granite,* quarried in Wausau, Wisconsin, is used for benches and other items around the Vine Street entrance of the library. A black "granite" from Quebec, perhaps *Péribonka granite,* is used for facing of two large pillars located outside the northwest and southeast corners of the library. These two stones are Precambrian in age.

Several large boulders, some upwards of 10 tons in weight, were placed in the reading garden of the library in 1981. These are glacial **erratics** from a Hilltop Basic Resources gravel pit in the Dayton area (John A. Bentley, personal communication, 1992). Most are igneous and metamorphic rocks.

Stop 15. COVENANT-FIRST PRESBYTERIAN CHURCH

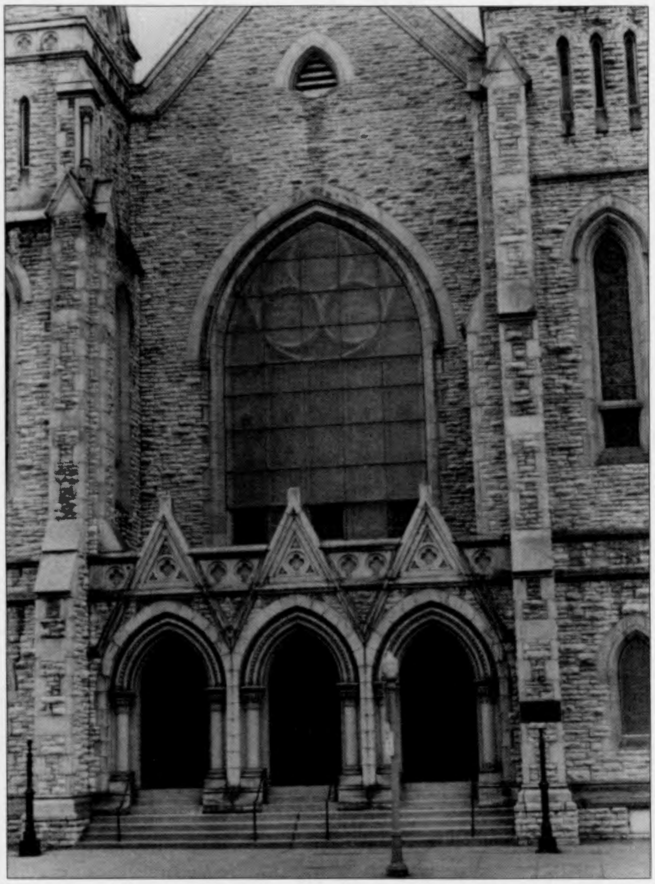


FIGURE 21.—Covenant-First Presbyterian Church. Photo taken in 1992.

The Covenant-First Presbyterian Church (fig. 21), located at the southwest corner of Eighth and Elm Streets, was dedicated as the Second Presbyterian Church in 1875. The main mass of this gothic-style church was constructed of rock from the Fairmount Member of the Fairview Formation. This stone, known as *Hill Quarry limestone* or *Cincinnati limestone,* is said to have been quarried on nearby Mt. Harrison (Dorsey and Roth, 1987, p. 75). (See p. 5 for more information on this stone.) The limestone blocks are rock faced and set as **random ashlar.**

The limestone is very fossiliferous; snails, sea lily fragments, brachiopods, and bryozoans are evident (see Davis, 1985, for more information on fossils from this unit). The limestone was deposited in the shallow, warm sea that occupied what is now the Cincinnati area during the latter part of the Ordovician Period. According to Bownocker (1915, p. 21-22), "Cincinnati has always been the one great market for the rock [*Cincinnati limestone*] where it has been used for buildings, foundations, retaining walls and curbings." This stone was the most commonly used local stone in the Cincinnati area; it still can be seen in the foundations of older buildings and in retaining walls and other structures.

The *Hill Quarry limestone* is accented with trim of *Buena Vista stone* (see Stop 8, Roebling Suspension Bridge, for more information on this stone). This sandstone has been nicely carved. In addition, windowsills in the older part of the building are of *Dayton limestone* (see Stop 17, St. Peter in Chains Cathedral, for more information on this stone).

To the south of the main portion of the building is a later addition. The fine-grained, buff-colored sandstone used for the original building was not used as trim for the addition. In its stead is Salem Limestone (*Indiana limestone*), carved in an identical manner. (See Stop 13, St. Louis Church, for more information on Salem Limestone.)

Carnelian granite, a dark-red stone, is used for fountains, walls, and other features of Piatt Park, which is directly east of Covenant-First Presbyterian Church (Jodie Moore, personal communication, 1992). *Carnelian granite* is quarried in Milbank, South Dakota.

Stop 16. CITY HALL

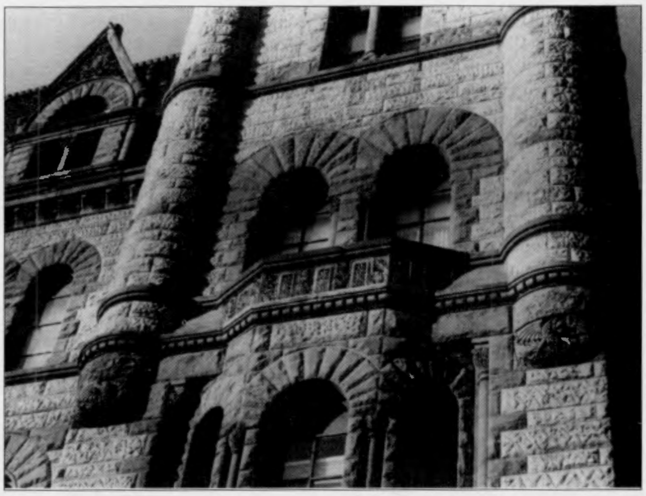


FIGURE 22.—City Hall, detail of south side of building. The darker stone is a red sandstone from the Bayfield Group (*Lake Superior brownstone*); the lighter stone is Berea Sandstone (*Buff Amherst stone*). Photo taken in 1992.

Cincinnati's present City Hall (fig. 22 and front cover) is located in the block circumscribed by Eighth, Plum, and Ninth Streets and Central Avenue. It was built between 1888 and 1893. There were additions in the 1950's and significant repairs during the 1970's. The building was designed by noted Cincinnati architect Samuel Hannaford in Richardson Romanesque style. According to a book (Cincinnati City Council, 1893) published at the time of the dedication of the then-new City Hall, the quarries of the world were searched to find the best materials. The result has been called the crowning achievement of David Hummel's stone company (Baird, 1977, p. 27).

The base of the exterior of City Hall is made of blocks of Graniteville Granite, known commercially as *Missouri Red granite* (Buckley and Buehler, 1904, p. 74). The Graniteville Granite is a Precambrian rock unit quarried in the Iron Mountain area in Iron County, southeastern Missouri. The stone also has been called *Iron Mountain granite* (Baird, 1977, p. 28). This stone is a medium to coarsely crystalline rock that contains easily seen glassy quartz and a low amount of dark minerals (Hebrank, 1989, p. 17). The predominant mineral in this rock is pink feldspar. More information on this stone can be found in Buckley and Buehler (1904, especially p. 62-75) and in Hebrank (1989).

The remainder of the exterior of the building consists of two sandstones, *Lake Superior* **brownstone** and *Buff Amherst stone.* Brownstone was particularly popular among practitioners of the Richardson Romanesque style, which is known for use of massive, rock-faced stone blocks, stone archways, and squat stone columns (see, for example, Slagle, 1982, p. 10). The style was named for the architect H. H. Richardson (1838-86). Brownstone commonly was used in conjunction with other stone, including light-colored sandstones and granite, in order to create polychrome buildings. The *Lake Superior brownstone* used here was quarried at the Prentice Brownstone Company quarries at Houghton, Wisconsin (Buckley, 1898, p. 190-193, 217) and thus was also known as *Prentice brownstone.* City Hall was among the most notable Cincinnati buildings that used this stone (Anonymous, 1901, p. 532). *Lake Superior brownstone* is actually red sandstone from the Precambrian-age Bayfield Group (Dickas, 1986). This sandstone is composed primarily of subangular grains of clear quartz. In places the stone is conglomeratic—it contains small quartz pebbles. The red color of the stone is due to the iron cement that binds the grains together. Technically the stone is a **ferruginous, quartzose** sandstone.

Cross-stratification is evident in many blocks and there are some gray areas, which may be rounded, in the stone. Such gray-spotted areas are a common feature of many red sandstones.

The light-colored stone in City Hall is *Buff Amherst stone* (Cleveland Stone Company, 1900), a commercial term for stone obtained from the Berea Sandstone in the vicinity of Amherst, Ohio. The Berea Sandstone was named for exposures in Berea, just southwest of Cleveland, Ohio. This stone was extensively quarried in Berea for grindstones and building stones from the early 1800's until the mid-1940's. This rock unit is widespread in northeastern and central Ohio. In the older geological literature it is known as the Berea grit and was referred to as part of the Waverly Group. It is Devonian-Mississippian in age and is somewhat older than the Cuyahoga Formation, which includes *Buena Vista stone* (see Stop 8, Roebling Suspension Bridge, for more information on *Buena Vista stone*).

Berea Sandstone is composed of clear quartz crystals cemented by **silica.** It also contains minor amounts of iron. Various interpretations have been made of its depositional environment (see, for instance, Lewis, 1988); certain portions of the Berea have been interpreted as river deposits, beaches, nearshore dunes, marine sands, and **deltaic** deposits. (See Wells, Coogan, and Majoras, 1991, for a recent study of the Berea in the Amherst region.)

The Berea Sandstone used for this building is coarse, gritty, and blue gray; it weathers to a buff color. It contains some iron nodules.

Berea Sandstone is one of the most popular light-colored sandstones in the eastern United States and Canada. It has been used for a large number of buildings in Ohio (other examples are given in Hannibal and Schmidt, 1992).

Most of the blocks of stone used for the exterior of this structure have a rock-faced exterior finish. The stone blocks were finished at the work site (Baird, 1977, p. 29).

Slate roofing tiles are used for portions of the roof visible from windows facing the interior courtyard of City Hall.

This building had acquired a very dark coating within decades of construction. It was first cleaned in 1929 (compare the views of City Hall in figs. 23 and 24). The red sandstone used for the exterior has not held up as well as the Berea Sandstone. Portions of the red stone have had to be chipped off as part of the building's maintenance program, most recently in the autumn of 1991.

Entranceways off Central Avenue and Plum Street have floor mosaics composed primarily of white marble, but also include *Red Verona marble* (this stone is described under Stop 23, Union Terminal) and other types of stone. The interior has a fine-grained white marble with gray streaks from Vermont, columns of polished gray granite, and pink and red *Tennessee marble* (see Stop 3, Carew Tower, for more information on this stone).

Stop 17. ST. PETER IN CHAINS CATHEDRAL

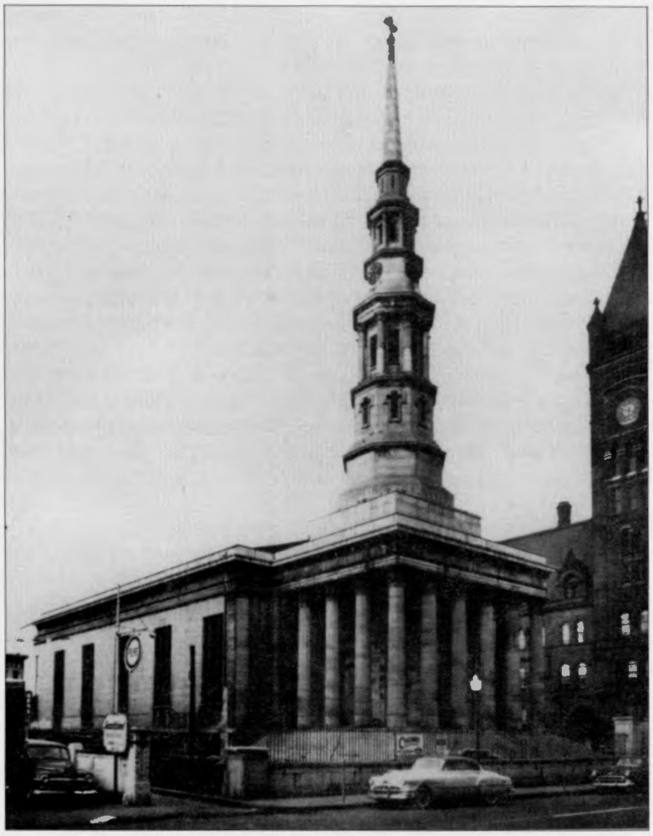


FIGURE 23.—St. Peter in Chains Cathedral, *ca.* 1950. City Hall is in the background to the right. Photograph courtesy of Hummel Industries, Inc.

St. Peter in Chains Cathedral (figs. 23-26) is located in the block bounded by Seventh, Plum, and Eighth Streets and Central Avenue. Its unusual name derives from the Murillo painting of the same name that, in 1824, was presented to Bishop Fenwick of Cincinnati. The cathedral long has been called a "white angel" in reference to its white stone (Nolker and Luebering, 1988; Baird, 1977). It is the oldest permanent cathedral west of the Alleghenies and the second oldest in the country.

The original portion of the cathedral was designed in Neoclassical or Greek Revival style. Construction began in 1841, and the building was consecrated in 1845. The tower is 221 feet tall, and the original walls were 4 feet thick.

This great stone structure was not universally appreciated during construction. One observer was quoted in the *Telegraph,* a Catholic newspaper, as asking why Catholics couldn't put up a cheap building, adding, "Where's the use of those massive walls and deep foundations?" (Nolker and Luebering, 1988, p. 6).

The main stone used in the building is *Dayton limestone,* also known as *Dayton stone.* According to early references (Cuppy, 1882, p. 90; Anonymous, *ca.* 1900), this stone was quarried in the Booher quarries on Old Troy Pike (Ohio Route 202) in Wayne Township, Montgomery County. This site is north of Dayton. According to other sources (*e.g.,* Baird, 1977, p. 8), however, the stone came from the Centerville area, south of Dayton. The earlier references are probably correct, but regardless of which locality it came from, the stone was from the rock unit now called the Dayton Formation. It is **Silurian** in age.

Much *Dayton limestone* was shipped to Cincinnati via the Miami and Erie Canal. Most of the locks along this canal were constructed of this stone (Howe, 1847, p. 369). *Dayton limestone* was subsequently used in many Cincinnati buildings, but the cathedral was the first building in the city to be built of this stone (Cist, 1846, p. 177). Work on the cathedral was delayed in part because of the unreliability of shipping stone via canal from the Dayton area (Nolker and Luebering, 1988, p. 6).

The no longer extant Hamilton County Courthouse, built in 1853 and destroyed in the riot of 1884, and the old Cincinnati College building (Cist, 1846, p. 109) also were built using this stone. *Dayton limestone* was also commonly used for curbs, ornamental walls, front steps of houses, and other works.

The Montgomery County quarries were abandoned by about 1903 (Bownocker, 1915, p. 29). About 1950, the Archdiocese of Cincinnati decided that the cathedral needed to be renovated and expanded. Unfortunately, the quarries from which the original stone was obtained were no longer

FIGURE 24.—St. Peter in Chains Cathedral. City Hall is in the background to the right. Compare the difference in coloration of the stone for both the cathedral and for City Hall in this photo, taken in 1992, with that in figure 23.

operational. What's worse, no one at that time seemed to recall exactly which quarry was the source of the stone used. According to Richard H. Durrell (personal communication, *ca.* 1970), John L. Rich, a professor of geology at the University of Cincinnati, was asked to locate the original quarry in order to match the original stone. He examined the rock in the various old quarries near Dayton and located a source of a suitable match in a quarry near Centerville, south of Dayton, in southeastern Montgomery County. However, Baird (1977, p. 72) reported that a draftsman for Hummel Industries (the successor of the David Hummel Building Company) remembered fishing in an old quarry near Centerville and obtained samples of stone that matched that of the cathedral. Regardless of who rediscovered this particular quarry, it was re-opened (Anonymous, *ca.* 1960-70; Baird, 1977, p. 72; Nolker and Luebering, 1988, p. 13), and enough stone was removed to renovate and expand the cathedral.

In addition to the expansion of the building by the addition of two transepts and other parts from 1953 to 1957, the original floor and west wall of the cathedral, composed of **field stone,** were replaced. The field stone was probably the blue limestone of the Ohio River noted by Cist (1846, p. 179).

Dayton limestone is much lighter colored than most of the building stones used in Cincinnati and has characteristic wavy bedding. Fossils, including **stromatoporoids** and corals, found in outcrops of this stone indicate a relatively shallow marine environment of deposition for the Dayton Formation (Sandy, 1992).

The *Dayton limestone* used for the cathedral contains numerous fossils. The most conspicuous are the corals, some of which are fist sized or larger. They stand out because they are lighter in color than the surrounding rock matrix. Several types of colonial corals can be seen in the church. These include halysitid corals, which are known as chain corals because of their distinctive chainlike appearance when seen in cross section. (Of course, chain corals are singularly appropriate constituents of stone used for a cathedral named St. Peter in Chains.) Cross-sectional views of **horn corals** can also be seen, and, using a hand lens, one may find numerous sea lily parts.

Even more conspicuous than the corals, however, are fossil burrows (fig. 25), which are more or less circular when seen in cross section and elongate in top or bottom views. The larger burrows are 2 cm or more in diameter. Wavy and horizontal bedding is common in the less weathered portions of the stone and even more prominent in more weathered areas. Some burrows have been patched with cement. For more information on *Dayton limestone* see Sandy (1992).

Over time the limestone walls of the cathedral have weathered. By the 1920's, differential weathering had caused some parts of the cathedral to darken, while other parts remained lighter. However, as a whole, this structure remained lighter than City Hall, built across from it in 1888-93. This color difference was due to the constant erosion of the outer surface of the limestone by acidic rain water—limestone is very soluble even in weak acid, but sandstone is generally not so.

The columns at the front of the cathedral are buff-colored, fine-grained *Buena Vista stone* (quarried from the Buena Vista Member; see Stop 8, Roebling Suspension Bridge, for more information about this stone). Small tubular trace fossils can be seen in parts of the pillars (fig. 26). Most of these trace fossils are horizontal to subhorizontal. Some are flattened ovals in cross section, indicating compression before the sandy sediment that was to become this sandstone was cemented into rock. Others of these trace fossils are circular, indicating a lack of compression. In many cases the filling has weathered away. Similar tubular forms are part of or are otherwise associated with the trace fossil *Zoophycos* in rocks of the Buena Vista Member in the Crabtree quarry of the Waller Brothers Stone Co. in the McDermott, Ohio, area.

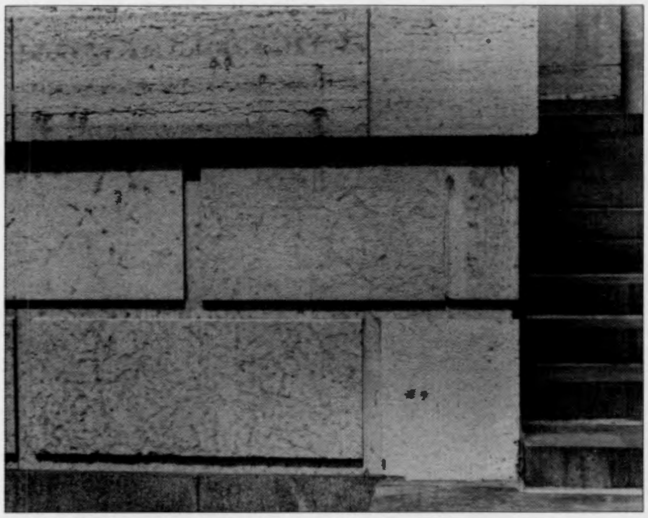


FIGURE 25.—Detail of the south side, near the east entrance, of St. Peter in Chains Cathedral. The top three courses of block are *Dayton limestone*. The top row shows wavy bedding; the bottom two rows show top or bottom views of burrows. Photo taken in 1992.

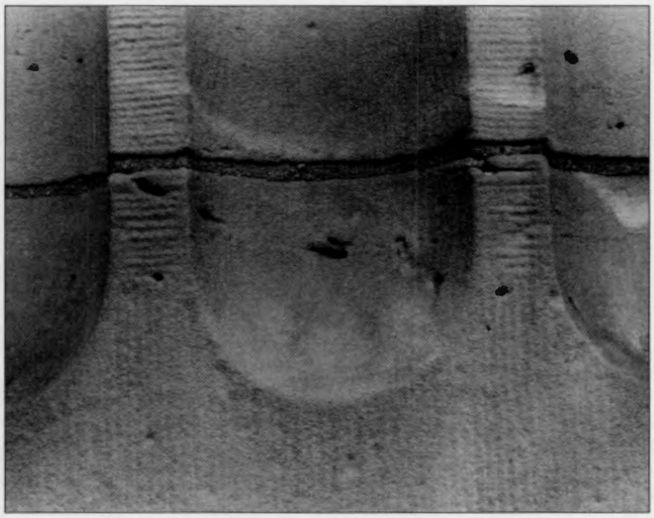


FIGURE 26.—Detail of one of the pillars on the exterior of St. Peter in Chains Cathedral. The pillars are made of *Buena Vista stone;* the dark, circular to elongate features are tubular trace fossils (most are 0.25-0.75 cm in diameter). Photo taken in 1992.

The ornamental window **tracery** (added in the 1950's), street-level walls between the cathedral and the surrounding sidewalks, and some other portions of the exterior of the cathedral complex are made of *Bedford stone* (Salem Limestone; see Stop 13, St. Louis Church, for more information on this stone). Fossils, including small **body fossils** and larger, tubular trace fossils, can be easily seen in this stone at the cathedral. The green color of some of the limestone is due to stain from the bronze railings and light posts set into the top of the wall.

Most of the stone seen inside the cathedral was added during the 1950's renovation. At that time 600 tons of marble were installed over a period of 18 months (Nolker and Luebering, 1988, p. 17).

Imperial Black marble lines the walls of the atrium (the area enclosed by the Plum Street stairway), the narthex (located just inside the atrium), and the nave (the main portion of the cathedral). It also is used for pillars in the Blessed Sacrament Chapel and the baptistry (Nolker and Lubering, 1988, p. 17). *Imperial Black marble* is a mottled gray to brownish-black limestone with some white veining. It is a Middle Cambrian-age stone quarried from the Maryville Limestone at Thorn Hill, north of Rutledge, in Grainger County, Tennessee (Edward T. Luther, personal communication, 1992; Hund, 1990, p. M-3). This stone is the only "marble" quarried in Tennessee that is not from the Ordovician Holston Formation (Maher and Walters, 1960, p. 5). The *Imperial Black marble* in the narthex is distinctly burrowed; that used in the Blessed Sacrament Chapel has numerous coated grains (most 0.5 to 1 cm in diameter) and small fossils.

The large interior pillars are painted stone. Cist (1846, p. 177) refers to them as being made of freestone. *Buena Vista stone* was commonly referred to as a freestone, so these columns may have been made of that stone. However, the blocks used for the interior pillars appear to be thicker than those used for the exterior. Whatever the nature of the pillars, it is likely that they were painted to give them the appearance of marble.

Tavernelle Perlato marble, also known as *Cream Tavernelle marble,* a cream-colored, foraminiferan-rich, brecciated limestone from Italy, is used for the base of pillars and for the pulpit. This Tertiary-age stone is quarried in the Tavernelle/Chiampo area of Vicenza, northern Italy.

The cream-colored stone used for flooring is *Dolcetto Perlato marble* (Nolker and Luebering, 1988, p. 17). This limestone has distinctive, elongate, brown fossil fragments several centimeters in length. Also known as *Perlato Sicilia* and *Creme Perla,* it is quarried from Cretaceous rocks on Mount Erice, Custonaci-Trapani, in western Sicily (Hund, 1990, p. M-23). Trapani, once known as Drepanon, was an important Carthaginian naval base (Carthage Marble Corporation, 1964, no. 10).

Verde Issorie marble is used for inlays in the flooring and for the sanctuary steps (Nolker and Luebering, 1988). This stone also is known as *Issorie Green. Verde Issorie* is a serpentinite of Jurassic age (Broadhurst, Porter, and Selden, 1989, card 15; Hund, 1990, p. M-50) and is quarried at Chambave, in Valle d'Aosta, in the Italian Alps. Most green-colored Italian "marbles" are quarrried in the Valle d'Aosta (Calenzani, 1990, p. 29-32).

The current main altar has supports made of *Bleu Belge marble* (Anonymous, *ca.* 1960-70; Nolker and Luebering, 1988, p. 30). This black stone with white calcite veining is quarried underground at Bioul, Entre-Sambre-et-Meuse, Belgium (Carthage Marble Company, 1969, no. 3). It contains fossils and is Devonian or Mississippian in age. The present altar top (mensa) is made of wood, painted to resemble *Bleu Belge.* Wood was used for the mensa because of problems with two previous stone mensas (one fell off a truck!). One of the mensas was *Negro Marquiña marble* (Neal Mills, personal communication, 1992). *Negro Marquiña* is a black limestone quarried in Marquiña, Spain, and looks very much like *Bleu Belge.*

The previous (1840's) high altar was made of white *Carrara marble* (Cist, 1846, p. 177; Nolker and Luebering, 1988, p. 7), a type of white marble quarried in the Carrara, Italy, area for centuries and made famous because of its use by Michelangelo. *Carrara marble* is derived from carbonate sediments deposited during the Jurassic Period. The carbonate rock metamorphosed into a true marble about 27 million years ago, during the Tertiary Period (Roy Kligfield, personal communication, 1992). This altar is now in the Archbishop's chapel, which is located off the sacristy.

Stop 18. PLUM STREET TEMPLE

The Plum Street Temple (fig. 27), located at Plum and Eighth Streets, was built in 1865-1866 by the first Reform Jewish congregation west of the Alleghenies. The rabbi of the congregation at the time was Isaac Mayer Wise; hence, the temple sometimes is referred to as the Isaac Wise Temple. The building was designed with an interesting mixture of Byzantine, Gothic, and Islamic elements.

The temple is primarily red brick, but its base (lower portion of fig. 28) consists of limestone from the Hill Quarry beds, known as *Hill Quarry limestone* or *Cincinnati limestone* (see discussion of this stone under Stop 15, Covenant-First Presbyterian Church). Because of the nature of the rock, especially the abundant fossils, the rock does not carve or polish well; hence, it almost always is given a rock-faced finish. However, in the Plum Street Temple the stone is smooth cut (although not polished).

The building is trimmed with fine-grained, buff-colored *Buena Vista stone* (upper portion of fig. 28). (See Stop 8, Roebling Suspension Bridge, for more information about this stone.) Tubular burrows, characteristically 0.25 to 0.5 cm in diameter, can be seen in the sandstone. These burrows are like those seen in the pillars of St. Peter in Chains Cathedral (Stop 17, fig. 26).

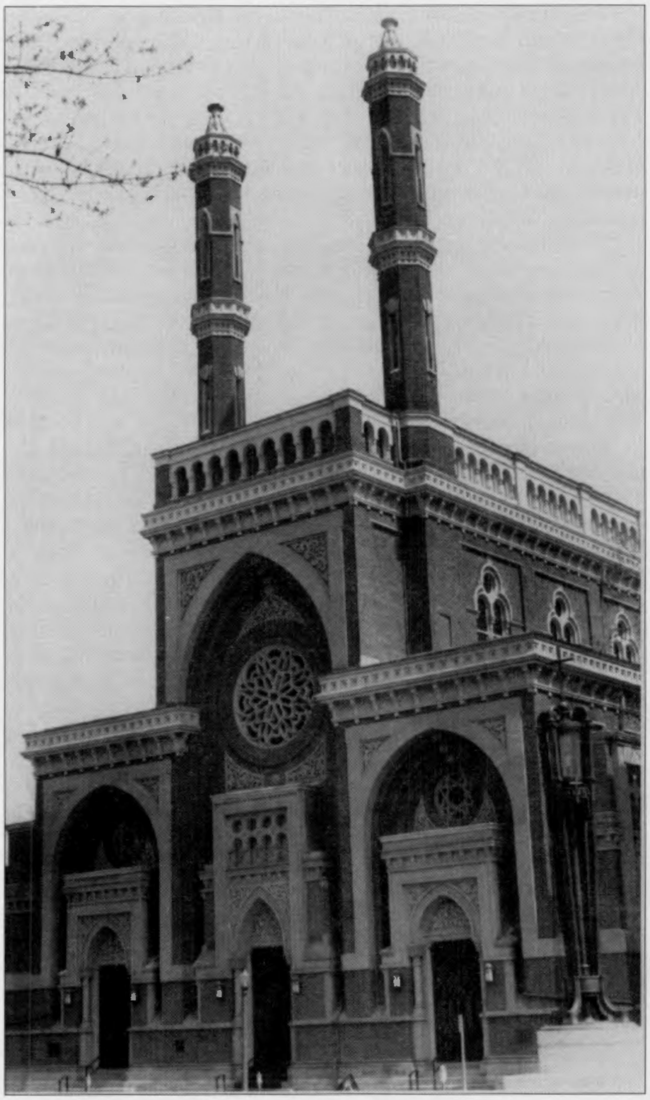


FIGURE 27.—Plum Street Temple. Photo taken in 1992.

FIGURE 28.—Stone at the base of the Plum Street Temple. The lighter colored stone laid in courses is from the Fairview Formation (*Cincinnati limestone*); the darker stone above is fine-grained sandstone (*Buena Vista stone*). Photo taken in 1992.

Stop 19. CINCINNATI AND SUBURBAN BELL TELEPHONE BUILDING

FIGURE 29.—Cincinnati and Suburban Bell Telephone Building. Note carvings (of Salem Limestone) of telephones under the windows. Photo taken in 1992.

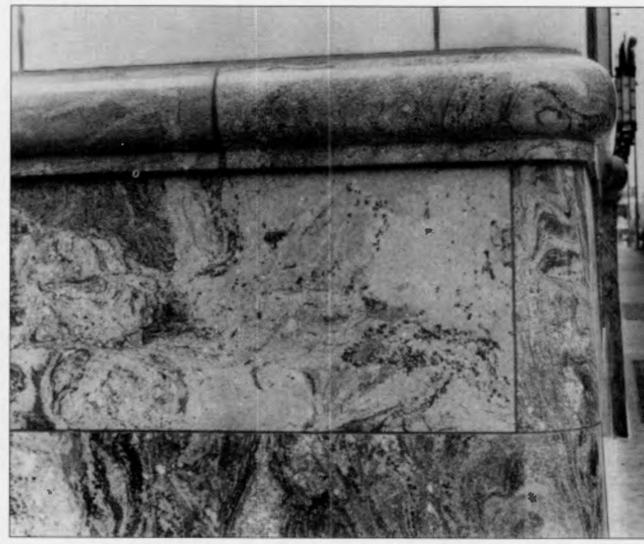


FIGURE 30.—Morton Gneiss at the base of the Cincinnati and Suburban Bell Telephone Building. Photo taken in 1992.

Completed in 1931, the main office of the Cincinnati and Suburban Bell Telephone Company (fig. 29) is an Art Deco style building located at the southwest corner of Seventh Street and Elm Street. The building is faced with Salem Limestone (*Indiana limestone*). (See Stop 13, St. Louis Church, for more information on this stone.) There are some fine limestone carvings on the building; the frieze above the second story features items associated with the company's business, including telephones (fig. 29), pliers, earphones, and telephone poles.

The base of the building is faced with Morton Gneiss (fig. 30), which also is known as Morton **Granite Gneiss.** Technically this rock contains both igneous and metamorphic minerals and thus is a granite-gneiss **migmatite,** a rock of intermediate composition between gneiss and granite. Its geologic history is complex, but essentially it is a granite that has been **metamorphosed.** It was quarried in Morton in southwestern Minnesota (Thiel and Dutton, 1935, p. 94). This pink-and-black banded stone also is known by various commercial names, especially *Rainbow granite.* The dominant mineral is pink feldspar. Most of the black material, found primarily in contorted bands, is biotite. Many interesting granitic textures and metamorphic structures can be seen in slabs of this stone use for building. These features include round, bloblike masses, **dikes,** and gneissic textures (see J. A. Grant, 1973, for a technical description of features of this stone). This Precambrian-age stone is at least 3.3 billion years old (Goldich, 1973; Goldich and Wooden *in* Morey and Hanson, 1980).

Morton Gneiss also was used for the bases of many other buildings, including Cincinnati's Union Terminal (Stop 23) and telephone buildings in St. Paul (Kain, 1978, p. 14), and Minneapolis, Minnesota (Thiel and Dutton, 1935, frontispiece). In addition, it is commonly used for cemetery monuments (see Sandy, 1992). More information on this stone can be found in Thiel and Dutton (1935), J. A. Grant (1972, 1973), Slagle (1982), and in several articles in Morey and Hanson (1980).

Stop 20. THE JOHN SHILLITO COMPANY BUILDING

FIGURE 31.—John Shillito Company Building. Photo taken in 1992.

The John Shillito Company Building (fig. 31), now the home of the Lazarus Department Store, is located on the south side of Seventh Street between Elm and Race Streets.

In 1878 John Shillito built a building at the southwest corner of Seventh and Race Streets for his thriving dry goods business. The building was an early example of the commercial architecture popularized by H. H. Richardson and the "Chicago School" (Ebert and others, 1979). In 1928, Shillito's sons were bought out by the Lazarus Company (Giglierano, Overmyer, and Propas, 1988). In the 1930's a new building was constructed to the west of the old and the two were bound together with an Art Deco facade. The character of the 1878 building is still visible on the north side of Shillito-Rikes Place. The main facing of the building is a commercial variety of Salem Limestone sold as *Select Buff Indiana limestone*. *Select Buff* is a finer grained, buff-colored variety of *Indiana limestone* (Indiana Limestone Institute, 1928) (see Stop 13, St. Louis Church, for more information on Salem Limestone). The limestone was cut into thin slabs, so as not to add too much weight (Anonymous, 1937).

The facing on the ground floor is a variety of Milbank Granite known as *Dakota Mahogany granite*. This medium to coarsely crystalline, brownish-red stone is quarried at Milbank, South Dakota. One distinctive feature of this stone is the blue color of its quartz. Some streaking is visible in this stone, indicating that there may have been some metamorphism. This stone is technically a migmatite. Milbank Granite is a Precambrian-age rock unit, approximately 2.0-2.5 billion years old.

Some of the inside lobby walls are *Tennessee marble* (see Stop 3, Carew Tower, for more information on this stone).

Stop 21. CONVENTION CENTER

FIGURE 32.—Convention Center. Photo taken in 1992.

The first section of the Cincinnati Convention Center (fig. 32) was completed in 1967. It was remodeled and enlarged in the 1980's. The complex is located between Fifth and Sixth Streets, west of Elm Street. The precast concrete of the original 1967 section was so unpopular that it sparked protest (Giglierano, Overmeyer, and Propas, 1988, p. 75). When the building was remodeled in the 1980's stone cladding was added.

Impala Black granite is used around the base of the building (Mark McKillip, personal communication, 1992). This stone is a grayish-black gabbro quarried in Rustenburg, South Africa (Slagle, 1982, p. 47). The polish has been removed from portions of this stone for effect; the unpolished bands are lighter in color.

Much of the exterior is clad with Precambrian-age *Carmen Red granite,* a type of rapakivi granite quarried at Virojoki, near Kotka, in southeastern Finland. This stone also is used for doorways, low wainscoting, and other parts of the interior of the Convention Center. The term "rapakivi" is derived from the Finnish term for "crumbly stone" and refers to the weathered nature of these rocks when first observed in outcrop. Such weathered stone is not suitable for use as building stone. However, unweathered rapakivi granite long has been quarried, in part because of the attractive color of this stone and in part because of the pattern of jointing of natural outcrops in Finland that allows for easier quarrying (Eskola, 1963, p. 237).

The term "rapakivi" now is used to refer to the rock texture, seen in this stone, in which large, ovoid crystals of one type of feldspar are surrounded by another type of feldspar (see Vorma, 1989, for more details).

Rapakivi granites are basically **magmatic** in origin, but there is no general agreement on the details of their origin. The rapakivi rocks of Finland are widespread and quite famous. They are some of the largest masses of rapakivi known. These deposits are later Precambrian in age, between 1.5 and 1.7 billion years old (Vorma, 1989).

Carmen Red granite is composed primarily of ovoid, reddish-brown crystals of **orthoclase** several centimeters in diameter. Many of these crystals are surrounded by a rim of greenish-gray plagioclase. More information on Finnish rapakivi can be found in Eskola (1963, p. 235-238) and in references listed in Vorma (1989).

Most of the *Carmen Red* is polished. As with the *Impala Black,* however, portions of the polish have been removed to create accent bands of lighter color. Both the *Carmen Red* and the *Impala Black* used for this building were fabricated in Italy (Mark McKillip, personal communication, 1992).

The facade of the old (1927) Albee Theater, once located on Fifth Street opposite Fountain Square (see fig. 8), was placed on the south side of the Convention Center (fig. 33) during renovation and expansion in 1986. This facade has pillars of white marble with gray veining, probably quarried in Vermont. Pieces of *Montclair Danby marble* were used to replace a small portion of the facade when it was installed at this location (Mark McKillip, personal communication, 1992). (See Stop 11, Procter and Gamble Company Headquarters, for more information on *Montclair Danby.*)

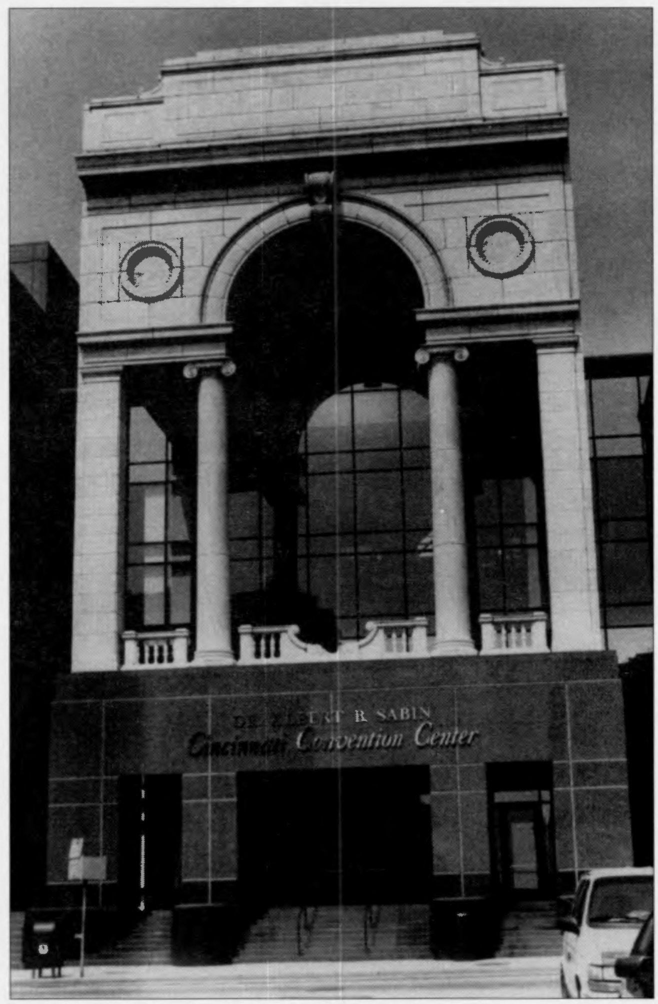


FIGURE 33.—South side of the Convention Center that includes the marble facade from the old Albee Theater (see also fig. 8). Photo taken in 1992.

Stop 22. CINCINNATI ENQUIRER BUILDING

FIGURE 34.—Cincinnati Enquirer Building, Vine Street entranceway. Photo taken in 1992.

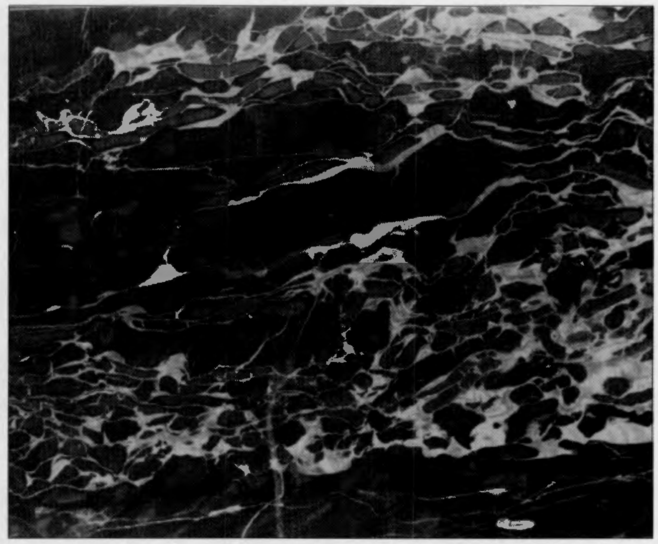


FIGURE 35.—Close-up of the *Black and Gold marble* used around the entranceway of the Cincinnati Enquirer Building. The wavy, more or less horizontal veining is golden brown in color. Photo taken in 1992.

The Cincinnati Enquirer Building (fig. 34), located at 617 Vine Street, between Sixth and Seventh Streets, was completed in 1928 and restored in the 1980's. Most of this building is faced with Salem Limestone (*Indiana limestone*) (see Stop 13, St. Louis Church, for more information on Salem Limestone). There are some very handsome limestone carvings above the ground floor and high on the building

The facing of the first-floor entranceway includes large amounts of *Black and Gold (Portoro) marble* (fig. 35). The same stone is used for pilasters and large hemispherical inserts above the elevators in the lobby. This black limestone has white, yellow, and gold veins. Classic *Black and Gold marble* has been quarried in the Portovenere area, near La Spezia, Liguria, Italy (McClymont, 1990, p. 7). The black color of this limestone is due to the presence of organic material, mostly **fecal pellets.** Gray nodular areas represent accumulations of sediment in areas with higher concentrations of bacteria (Anonymous, 1988). Wavy golden-brown veining in the rock is dolomitic. The white veins which, for the most part, cross-cut the golden veins and other features, are calcite.

The name "Portoro" is a corruption of the name of the Italian town Portovenere, where classic *Black and Gold* has long been quarried. However, black stones similar to classic *Black and Gold marble* have been quarried elsewhere, including France (Renwick, 1909, p. 211; M. H. Grant, 1955, p. 76). Most *Black and Gold marble* imported into the United States is probably the classic variety quarried in the La Spezia area.

This rock is late **Triassic** in age and was probably deposited as a carbonate mud in a somewhat restricted, reducing, lagoonal environment (Anonymous, 1988, p. 8; Miller and Folk, 1991). During the mid-Tertiary this rock was greatly affected by the mountain-building episode known as the Apennine orogeny. At this time the cracks formed that subsequently were filled with calcite. Further details on the geological history of this stone can be found in Folk and Tiezzi (1985), Folk (1988), and Miller and Folk (1991).

The *Black and Gold* used on the outside of the building, as well as that used in the lobby, has been covered, probably during recent renovation, with a transparent coating, probably done because of deterioration of the stone on the exterior of the building. *Black and Gold marble,* however, is not recommended for exterior use (Corbella, Calenzani, and Morandini Frisa, 1990, p. 78).

The floor outside the entrance is pink *Tennessee marble* (see Stop 3, Carew Tower, for more information on this stone). Inside the lobby the flooring is mostly travertine and *Verde Antique,* and the walls are faced with a foraminiferan-rich, cream-colored limestone.

[Note: Stop 23, Cincinnati's Union Terminal, is not within easy walking distance of the other stops in this guide. It is located about 2 miles (3.2 kilometers) from the Enquirer Building.]

Stop 23. UNION TERMINAL (MUSEUM CENTER)

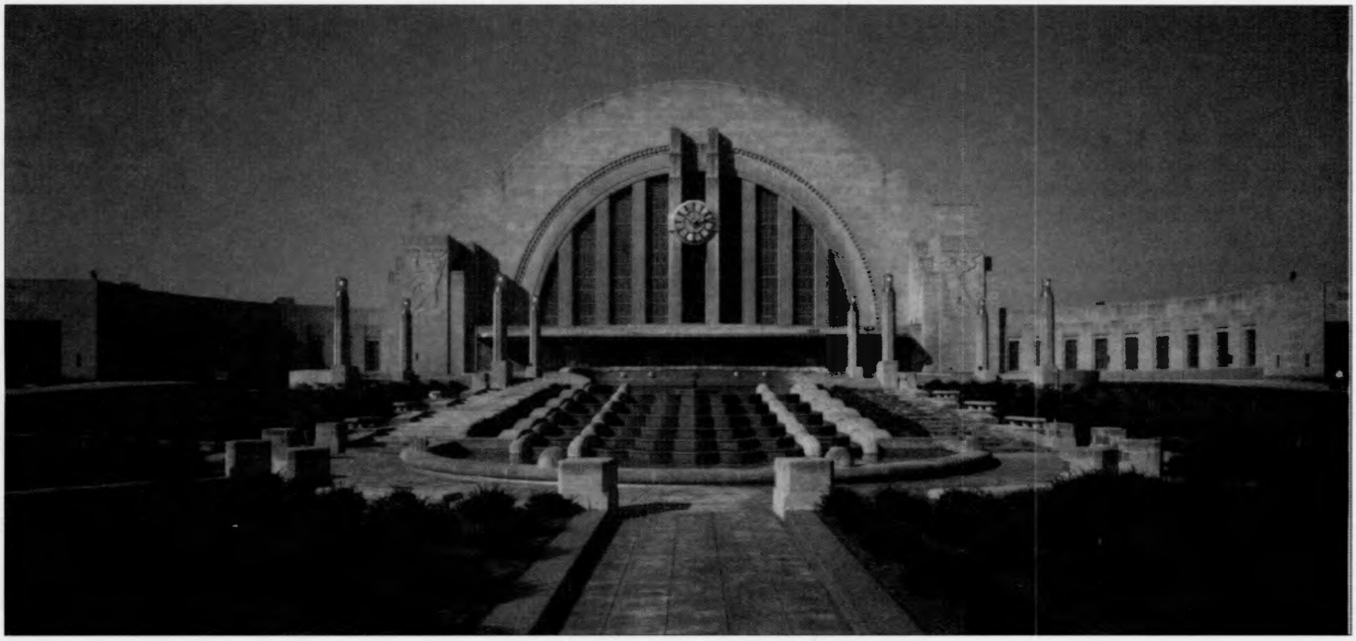


FIGURE 36.—Union Terminal (Museum Center). Photograph, taken in 1991, courtesy of The Museum Center at Cincinnati Union Terminal.

FIGURE 37.—Stone workers for the Union Terminal project, 1931. The partly completed terminal can be seen in the background. Photograph courtesy of Hummel Industries, Inc.

Cincinnati's Union Terminal (fig. 36), located on the west end of Ezzard Charles Drive, was completed in 1933 (fig. 37). It was one of the last great railroad stations built in the United States. The building is an Art Deco masterpiece. Beginning in 1987, the structure was renovated to become the Museum Center, and it now is the home of the Cincinnati Historical Society and the Cincinnati Museum of Natural History.

The exterior of most of the building is faced with Salem Limestone (*Indiana limestone*). The pylons and low walls in front of the building also are made of Salem Limestone. Fossils that can be seen in this stone at the Terminal include sea lily fragments (similar to those shown in fig. 19), bryozoans, brachiopods, snails, and horn corals. Trace fossils, 0.25 to 2 cm in diameter, and stylolites can also be seen. (See Stop 13, St. Louis Church, for more information on Salem Limestone.)

Pink porphyritic granite containing prominent crystals of pink feldspar is used in the fountain area and along the base of the main entrance of the Terminal. At least some of this stone is *Rockville granite* (see Stop 1, Fountain Square, for more information on this stone). Morton Gneiss (*Rainbow granite*) is used as facing under the marquee at the main entrance to the building (see Stop 19, Cincinnati and Suburban Bell Telephone Building, for more information on Morton Gneiss).

Most of the stonework in the expansive main concourse (fig. 38) of the Terminal is *Red Verona marble* (Anonymous, 1933a), a nodular, orange-colored limestone quarried in the Verona area of Italy. *Red Verona* is found in the lower portion (the nembro courses) of the famous *rosso ammonitico* (red ammonitic) beds. The red color is due to the presence of the mineral hematite. This stone is an open-ocean deposit of Middle to Late Jurassic age (Albertini, 1987). These deposits were lain down in the Tethys Sea, a great body of water that then separated the land masses which are now referred to as Africa and Eurasia. The sediment that formed this limestone probably was deposited little by little over a long period of time and may also have been re-exposed at times; thus, it is considered a condensed limestone (Goldring, 1991, p. 77; see also Sellwood, 1978, and Jenkyns, 1974).

FIGURE 38.—Rotunda of Union Terminal. Photograph, taken *ca.* 1933, courtesy of The Cincinnati Historical Society.

Numerous fossil ammonites (fig. 39), up to 22 cm in diameter, can be seen in the interior walls of Union Terminal. The ammonites vary in preservation. Some have unbroken shell outlines and well-preserved internal partitions (**septa**). Others are very poorly preserved and have incomplete or broken outlines and septa. These differences in preservation are due to the condition of the shell when it fell to the sea floor, to dissolution and fracturing of the shell before and after burial in limy sediment, and to replacement of the original shell material with other minerals (Schlager, 1974; Albertini, 1987; Tucker, 1991). In life, most of these shells would have been even larger. Characteristically, the large outermost whorl of the shell is no longer preserved; only the inner portion, with its closely spaced septa, is preserved. This select preservation may be due to the biting off of the body chamber by predators (Gerd Westermann, personal communication, 1992).

Some *Yellow Verona marble* is used in the Losantiville Room and other parts of the Union Terminal. This stone, which also contains ammonites, is the same age and is generally similar in composition to *Red Verona* but, because of the presence of **limonite** rather than hematite (Albertini, 1987, p. 35), differs in color. More information on various *Verona marbles* can be found in Albertini (1987).

The stone along the base of the walls in the rotunda is a dark variety of *Tennessee marble* (Anonymous, 1933a). This

FIGURE 39.—Close-up of *Verona marble* in the entranceway of Union Terminal (Museum Center). The fossil in the center of the photograph is an ammonite, seen in an oblique cross section, and is about 6 cm in diameter. Photo taken in 1992.

dark-red limestone contains abundant bryozoans and sea lily columnals (see Stop 3, Carew Tower, for more information on *Tennessee marble*). Bands of another variety of reddish-purple *Tennessee marble* are used in places. This stone includes fossils of straight-shelled cephalopods up to 2½ feet long. Also in the rotunda are bands and countertops of *Virginia Black marble* (Anonymous, 1933a), a black limestone quarried near Harrisonburg, Rockingham Co., Virginia (McClymont, 1990). This stone, from the Edinburg Formation, is Late Ordovician in age (D. Allen Penick, personal communication, 1992). A mill for producing slabs of this stone for use in building was first built in 1933 (Bowles, 1939, p. 206); thus the use of this stone in Union Terminal was one of the earliest. Terrazzo flooring in the rotunda includes marble chips.

In the Collett Gallery, the lower part of the wall is faced with *Tennessee marble,* and the same stone is used for a fountain. The ice cream shop off the rotunda contains beautiful examples of Rookwood pottery (see Stop 7, Dixie Terminal, for more information on this type of pottery).

Massillon sandstone (*Briar Hill sandstone*) is used for parts of a number of building fronts in the Cincinnati Historical Society's Front Street and Main Street exhibits. These exhibits were built in imitation of Cincinnati buildings built in the 1820's through the 1860's. One of these structures is a replica of a sandstone building, a composite based on designs of present buildings on Ninth Street. Finer grained sandstone, probably *Buena Vista sandstone,* and *Dayton limestone* were used for the original buildings. The light-beige varieties of *Briar Hill sandstone* used in the exhibits were quarried in Coshocton County (Jerry Parsons, personal communication, 1992). The stone has some light-brown mottling. (See Stop 4, Tower Place, for more information on *Briar Hill sandstone.*)

Paving, cobblestones, and sidewalks of these exhibits are made of faux stone.

Among the exhibits in the Cincinnati Museum of Natural History is a reconstruction of the Cincinnati area as it appeared during the last glacial period. This exhibit includes replicas of various prehistoric inhabitants of the Cincinnati area, including a mastodon.

The Union Terminal was constructed in the valley of Mill Creek, a tributary of the Ohio River. The site was below flood stage of the Ohio River. In order to raise the level of the building above potential floodwaters, fill material was brought in and spread over an area a mile and a half long and almost a quarter of a mile wide—in some places to a depth of 58 feet. For this purpose, 5.5 million cubic yards of Ordovician limestone and shale were brought from Bald Knob, a large hill on the west side of the valley and somewhat to the north. To support the massive building, 60-foot concrete pilings were set into the ground (Anonymous, 1933b; Giglierano, Overmyer, and Propas, 1988).

ADDITIONAL SITES

Many additional sites in Cincinnati are worth investigating. We have listed some below, generally arranged in west-to-east order.

Most of the Dalton Street Post Office, located at Dalton and Sherman, is faced with a commercial variety of Berea Sandstone known as *Silvertone Gray Amherst sandstone,* quarried in the Amherst area by the Cleveland Quarries Company. The base of this building is granite.

The former Queen City Boxing Club, located at 810 Plum Street, has a foundation made of limestone from the "River Quarry Beds." Most of the remainder of the building is made of limestone from the "Hill Quarry Beds" (see fig. 3). Trim is sandstone.

The Textile Building, located at Fourth and Elm Streets, has a baseboard of green marble, low wainscoting of gray *Tennessee marble,* and high wainscoting of red *Tennessee marble.*

The First English Lutheran Church, located on Race Street between Twelfth and Thirteenth Streets, has an exterior made of two red sandstones. The brick-red stone is *Portage Entry Red sandstone,* quarried from the late Precambrian Jacobsville Sandstone in the Upper Peninsula of Michigan. Jacobsville Sandstone was a popular stone in 1895, when this church was built. (See Hannibal and Schmidt, 1992, p. 9, for more information on this stone.)

Mayor's Jewelry, on Race Street between Fifth and Sixth Streets, has a rapakivi granite and a brecciated limestone at street level. The rapakivi is *Baltic Brown granite* (see Stop 21, Convention Center, for more information on rapakivi granite). Several other downtown buildings have some facing of this stone.

McAlpin's Department Store, located at 13 West Fourth Street, occupies what originally were three buildings. The oldest portion, on the east end, was built in 1857 for the John Shillito Company; the central section was designed in 1873; and the western part was built in the early 1900's (Giglierano, Overmyer, and Propas, 1988). The lower portions of the three buildings are obscured by a facade put up after World War II. Between the windows on the ground floor are slabs of what appears to be a red granite, but is, in fact, a manmade, terrazzolike material. Its commercial name is Granux and it was once manufactured in the Chicago area (Jodie Moore, personal communication, 1992). Ironically, some years ago, when it became necessary to replace some of the slabs of faux granite, real stone (*Royal Red granite* or a similar looking stone) was used because the company that manufactured the Granux had gone out of business. Thus the real stone was used to replace the fake, which apparently had been intended to mimic the real!

Fine carvings of elephants and eagles can be seen on the facade of the Lawyers Building, formerly headquarters of a political group, at 125 East Ninth Street. These figures are carved in Salem Limestone (see Stop 13, St. Louis Church, for more information on this stone).

Mercantile Center, 120 East Fourth Street, makes extensive use of travertine. That used for the floors is polished. The larger holes in the travertine flooring are filled with cement. Travertine also is used around the entranceway of the adjacent Contemporary Arts Center. This complex is an excellent locality for examination of bedding and other features of travertine (see Chafetz and Folk, 1984, for illustrations and discussions of such features).

The present-day Queen City Club, located at Broadway and East Fourth, was erected in 1926-27. It is faced with *Variegated Indiana limestone* (Salem Limestone) (Anonymous, 1927). (See Stop 13, St. Louis Church, for more information on Salem Limestone.)

There are a number of interesting structures in Eden Park, which is located about 1 mile (1.6 kilometers) northeast of Fountain Square. Elsinore Tower is located in the southwest part of Eden Park, on the northeast corner of Gilbert Avenue and Elsinore Place. It is next to the Cincinnati Museum of Natural History's Collections and Research Center. The Tower was built in 1883 as a valve house to control the flow of water from the Eden Park Reservoir into downtown Cincinnati. It is made with rock-faced blocks of stone from the Fairmount Member of the Fairview Formation (*Hill Quarry limestone,* also known as *Cincinnati limestone*) set in courses.

The Cincinnati Art Museum is located northeast of, and uphill from, Elsinore Tower. The exterior of the original (1886) part of the Cincinnati Art Museum is made of *Cincinnati limestone* and is trimmed in light-red granite (Bownocker, 1915, p. 23, pl. 1; Fenneman, 1916, pl. 7B). The red granite is *Missouri Red granite* (Buckley and Buehler, 1904, p. 74) (see Stop 16, City Hall, for more information on this stone). The newest portion of the museum is faced with Salem Limestone; steps and pavers at the entranceway are granite.

The Art Academy of Cincinnati (Art Institute), now linked to the Art Museum with a brick addition, also was constructed with *Cincinnati limestone* (Fenneman, 1916, p. 178, pl. 7B). The limestone blocks are rock faced. This building also has red granite pillars at the entrance and trim of red sandstone.

Various medium- to dark-blue to blue-green igneous rocks are used as facing for portions of downtown buildings. These rocks are composed primarily of blue grains of feldspar which commonly have a beautiful sheen. Most of these stones are of **Permian** age and were quarried in Norway. A medium-blue variety of *Blue Pearl granite* is used for facing of Newstedt Loring Andrews Jewelers, 27 West Fourth Street, and for facing of the former Mutual Savings and Loan Company, 1648 Vine Street. A darker blue stone (*Emerald Pearl granite*?) is used for facing of Fidelity Federal Savings, 631 Walnut Street.

Finally, one should note that many of the old curbstones found scattered throughout the downtown area are made of stone from the Dayton Formation (*Dayton limestone*) or gneiss. Modern curbs are concrete.

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GLOSSARY

ammonite An extinct type of shelled **cephalopod.** It has a multichambered, generally coiled shell through which passes a tube called a **siphuncle.** The chambers of ammonites are separated by complexly corrugated partitions called **septa.** Ammonites were open-ocean predators.

anorthosite A **plutonic** rock composed almost entirely of **plagioclase feldspar.**

anticline A fold in a set of rock layers, the core of which contains older rocks than the flanks. Anticlines are characteristically convex upward. They may be feet to miles in width.

ashlar Masonry consisting of stone cut into rectangular blocks.

bedrock The solid rock that underlies a particular region.

belemnite An extinct type of shelled **cephalopod.** It has a tripartite internal shell. One part of this shell, a cigar-shaped element, is most commonly fossilized. In cross section, radial features can be seen within this element.

bench mark A durable marker, generally embedded in stone or concrete, that indicates the location and in many cases the elevation of a particular spot. Bench marks are used as standards for making other measurements of location and elevation.

biotite A common black, dark-brown, or dark-green **mica** containing iron and magnesium.

body fossil The actual or mineralized remains of an organism, or a mold or cast of an organism. Body fossils are distinguished from **trace fossils.**

brachiopod A marine invertebrate with a shell that superficially resembles that of a clam. The shell consists of two valves that are each bilaterally symmetrical, but, unlike the shells of most clams, each valve is not the mirror image of the other.

breccia A rock composed of large, angular rock fragments with finer grained material in between.

brownstone A brown, reddish-brown, or red **sandstone** used for buildings.

bryozoan A small, aquatic, **colonial** invertebrate. The individual tubes within a bryozoan colony are characteristically less than 1/2 mm wide. Forms commonly found as fossils may resemble small twigs or miniature, lacy fans (See Davis, 1985, for more information).

building stone A natural or manmade stone used for building.

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 $CaCO_3$. A common natural form is the mineral **calcite.**

Cambrian Period The earliest geologic period of the **Paleozoic Era.** It began about 570 million years ago and lasted until about 505 million years ago.

carbonate Material, such as limestone, composed of oxides of calcium and carbon.

Cenozoic Era The large division of geologic time following the **Mesozoic Era,** spanning from about 66 million years ago to the present.

cephalopod A member of a group of marine invertebrates that includes octopuses, squids, and their relatives, modern and extinct, including shell-bearing forms, such as the pearly nautilus.

coarsely crystalline An adjective used to describe a rock in which the individual crystals are larger than the grains of table sugar.

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, especially in shallow, tropical seas. Some corals live as separate individuals, others are **colonial** and form extensive reefs.

Cretaceous Period The most recent geologic period of the **Mesozoic Era.** It began about 144 million years ago and lasted until about 66 million years ago.

cross-stratification The layering of **sediment** which is inclined at an angle to the horizontal.

deltaic Related to a delta, which is a deposit of **sediment** formed where a river flows into a lake or ocean.

Devonian Period A mid-**Paleozoic** period of geologic time. It began about 408 million years ago and lasted until about 360 million years ago.

dike A tabular body of **igneous** rock that cross-cuts another body of rock. A dike therefore must be younger than the rock that it cuts.

dolomite A light-colored mineral composed of calcium and magnesium carbonate, $(CaMg)CO_3$. It is fairly soft and dissolves in weak acids, but effervesces less than **calcite.** It is a common mineral in some **limestones** and in many **marbles.** The term also is used for a rock dominated by the mineral dolomite, as an alternative to the term **dolostone.**

dolomitic Used to describe a rock that contains **dolomite.**

dolomitization The process by which a **limestone** is changed into a **dolomite** or is greatly enriched in magnesium.

dolostone A rock composed primarily of the mineral **dolomite.**

erratics Pieces of rock carried by ice away from the main body of rock from which they are derived.

esplanade A level open space that may be raised. An example is a platform at the top of a flight of stairs.

fecal pellets Waste material excreted by organisms. They are oval to elongate particles, commonly about a millimeter or less in width. Characteristically, fecal pellets found in **sediment** were made by invertebrates.

feldspar The general name given to any of a group of common rock-forming aluminum **silicate minerals** that contain the elements potassium, sodium, calcium, or some combination of these. There are two major divisions: **plagioclase feldspars** and **potassium feldspars.**

ferruginous Pertaining to stone, which is typically red, that has its grains cemented together with iron oxide.

field stone Rough, generally elongate, but in some cases rounded, stones that may be found on the surface in fields and which are used for **building stone.**

fluvial Relating to rivers.

foraminiferan A type of single-celled organism with a hard supporting structure consisting of one to many chambers.

formation A particular body of rock or sequence of rock strata. It is identified by its composition and texture, and its position relative to other rock units. Formal formation names consist of two parts: the name of a locality and either the word formation or the name of a type of rock (*e.g.,* **sandstone, shale**).

fossil Any preserved remains or trace of prehistoric organisms.

fossiliferous Containing **fossils.**

freestone A fine- or medium-grained stone, typically a **sandstone** or **limestone,** which can be cut easily in any direction and which will not split in any particular direction.

gabbro A dark-colored, **coarsely crystalline, plutonic** rock composed primarily of iron- and magnesium-rich minerals, calcium-rich **plagioclase feldspars,** or some combination of these minerals.

gneiss A banded **metamorphic** rock. The principal minerals in gneiss are usually **feldspar, quartz,** and **mica.**

granite A light-colored, **coarsely crystalline, plutonic** rock that consists primarily of **potassium feldspars** and **plagioclase feldspars** and contains **quartz.** Granite also may contain **mica** and other minerals. Builders and architects use this term in a broader sense to indicate any very hard crystalline rock used for building purposes.

granite gneiss A **granite** that has been **metamorphosed.**

granodiorite A **coarsely crystalline, plutonic** rock intermediate in color and composition between **granite** and **gabbro.**

groundmass Finer crystalline material in a **porphyry.**

group A term for two or more associated **formations.**

hematite A reddish-brown to black mineral composed of iron oxide.

honed A type of smooth rock finish with a dull sheen.

horn coral A solitary **coral** having a cup or hornlike shape. They are common in many **Paleozoic limestones.**

hornblende A dark-green to black **silicate mineral** containing iron and magnesium; in rock, hornblende is generally distinguished from **biotite** by the elongate shape of its crystals compared to the flat crystals of biotite.

igneous A rock that crystallized from hot, fluid rock material either below the Earth's surface (**plutonic**) or at the Earth's surface (volcanic). Igneous rocks consist of interlocking mineral crystals.

Jurassic Period 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.

limestone A **sedimentary** rock composed predominantly of the mineral **calcite.** Many of the rocks called "marbles" by builders and architects are actually limestones.

limonite A type of naturally occurring yellow to brown mineral material composed of iron oxides.

magma Hot, fluid rock material beneath the surface of the Earth.

magmatic Related to **magma.**

magnetite A black, magnetic iron oxide mineral.

marble A rock resulting from the **metamorphism** of **limestone** or **dolomite.** Builders and architects use this term in a broader sense to denote any stone, typically composed of **calcite** or **dolomite,** that is capable of being polished.

marbleized Made to resemble marble. Marbleizing commonly is done by use of paints and varnishes.

member A subdivision of a **formation.**

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 The collective name for all of the various processes that alter pre-existing rock buried within the Earth. The changes result from heat, from the pressure of overlying rock, from the pressures related to mountain-building activities, or some combination of these. Alterations that may occur in the pre-existing rock include recrystallization of minerals, formation of new minerals, and rearrangement of crystals or other particles in the rock.

metamorphosed Altered due to heat and/or pressure within the Earth.

mica A group of common rock-forming minerals that have a flat shape and cleave easily into thin layers or sheets. One common mica is **biotite.**

microcline A type of **potassium feldspar** common in granites.

migmatite A rock containing both **igneous** and **metamorphic** minerals. Such rocks are commonly banded.

Mississippian Period A late **Paleozoic** period of geologic time. It began about 360 million years ago and lasted until about 320 million years ago.

Ordovician Period A period of geologic time during the early **Paleozoic** that spanned from 505 to 438 million years ago.

orthoclase A common rock-forming **potassium feldspar** ranging in color from white to red.

outwash Sand, gravel, and other material washed away from a glacier by meltwater streams and deposited in distinct layers.

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. Pelmatozoans are relatives of starfish and sea urchins; some are known informally as **sea lilies.**

Pennsylvanian Period A late **Paleozoic** period of geologic time. It began about 320 million years ago and lasted until about 286 million years ago.

Permian Period A late **Paleozoic** period of geologic time. It began about 286 million years ago and lasted until about 245 million years ago.

phenocryst One of the large crystals found in a **porphyry.**

pilaster A vertical element projecting from a wall, resembling a column, but rectangular in shape.

pitched A type of stone dressing in which the edges are cut back at a constant distance to create a framelike effect for **rock-faced** stone blocks. Originally, this type of dressing was done by hand with a pitching chisel.

plagioclase feldspar A common rock-forming **silicate mineral** ranging in color from white to gray.

Pleistocene Epoch A subdivision of the **Quaternary.** The Pleistocene began about 1.6 million years ago and ended about 10,000 years ago.

plutonic An **igneous** rock, or relating to igneous rock, that crystallized below the surface of the Earth. The crystals in a plutonic rock are the size of grains of sugar or larger.

porphyry An **igneous** rock that includes large crystals (**phenocrysts**) in a **groundmass** of smaller crystals. Many igneous rocks used for **building stone** are porphyritic in texture.

potassium feldspar A common rock-forming **silicate mineral** characteristically ranging in color from white to pink and red, but which may be blue, gray, or green.

Precambrian 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."

pyroxene A type of dark **silicate mineral.** Crystals of pyroxene are typically more blocky than crystals of **hornblende** and other dark minerals.

quartz A common glassy, clear to gray rock-forming mineral composed of **silica.**

quartz monzonite An **igneous** rock composed chiefly of **plagioclase** and lesser amounts of other **feldspars,** dark minerals, and a small amount of **quartz.**

quartzose Said of a **sedimentary** rock composed mostly of **quartz.**

Quaternary The most recent period of the **Cenozoic Era.** It began about 1.6 million years ago. We are still living in the Quaternary today.

random ashlar A pattern of **ashlar** masonry in which rectangular slabs, usually cut to two or more sizes, are set with sides of the slabs oriented either horizontally or vertically, but in an offset pattern.

rock faced A rough type of facing, resembling a natural surface, used for the exposed side of blocks of **building stone.**

rock-unit name The name given to a body of rock, such as a **formation,** at the time of its first formal geologic description.

sandstone A **sedimentary** rock composed of sand-sized grains (between 1/16 and 2 mm in diameter), held together by mineral cement.

sea lily A colloquial term for certain types of **pelmatozoans.**

sediments Solid materials, such as sand and silt particles and **fossil** fragments, that have been transported by wind or water or both. Sediments are characteristically deposited in layers.

sedimentary Relating to or consisting of **sediment.**

septa Internal partitions within the shell or skeleton of various types of animals, for instance, within the shells of **ammonites.**

serpentine A typically green mineral, rich in iron and magnesium, found in some **metamorphic** rocks, such as ***Verde Antique.***

serpentinite A rock consisting primarily of **serpentine.**

shale A **sedimentary** rock composed of clay minerals or clay-sized particles (less than 1/256 mm in diameter), distinguished from the slightly coarser rock, **siltstone,** by its smooth feel. A true shale also can readily be split into thin layers.

shell marble A general term for some **limestones** containing **fossils** that are used for building and ornamental stonework.

silica Silicon dioxide, SiO_2, a rather hard material common as cement in **sandstones.** Chert, jasper, and **quartz** are made of silica.

silicate mineral A mineral containing silicon and oxygen as major constituents.

siltstone A **sedimentary** rock composed of silt-sized grains (between 1/256 and 1/16 mm in diameter), distinguished from **shale** by its gritty feel.

Silurian Period 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 through much of the length of a **cephalopod,** passing through the **septa.**

slate A rock derived from the **metamorphism** of **shale.** Slate is harder and more durable than shale, but breaks easily into thin layers.

stromatoporoid An extinct, spongelike organism. Stromatoporoids generally are finely layered when seen in cross section.

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.

terminal moraine A mass of sand, gravel, etc. that accumulates as a ridge at the farthest edge of a glacial advance.

terra-cotta A baked clay used to make tiles, panels for building facing, and statuary.

terrazzo Flooring composed of stone chips set in a cement matrix.

Tertiary Period 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 footprint, trackway, burrow, or other indirect evidence of a prehistoric animal. Trace fossils are distinguished from **body fossils.**

tracery Ornamental work, commonly made of stone, surrounding and as part of a window.

trade name A manufacturer's name for a product, such as a **building stone.** The names *Buff 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 Period The earliest geologic period of the **Mesozoic Era.** It began about 245 million years ago and lasted until about 208 million years ago.

unconsolidated Composed of grains that are not firmly cemented together.

vein Any type of linear feature that appears to cross through a **building stone.**

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. This term also is used to refer to the material used for the lining.

TABLE 1.—*Simplified geological time scale showing the geologic periods during which building stones used in downtown Cincinnati were deposited or formed*

Era	Period	Millions of years ago	Building stone
CENOZOIC	Quaternary		*Colorosa travertine, Villa de Este travertine, Roman travertine*
		1.6	
	Tertiary		*Carrara marble, Red Levanto marble, Tavernelle Perlato marble*
		66.4	
MESOZOIC	Cretaceous		*Dolcetto Perlato marble, Hauteville marble*
		144	
	Jurassic		*Botticino marble, Red Verona marble, Rosato marble, Yellow Verona marble, Verde Issorie marble*
		208	
	Triassic		*Black and Gold marble*
		245	
PALEOZOIC	Permian		*Blue Pearl granite*
		286	
	Pennsylvanian		Massillon sandstone
		320	
	Mississippian		Buena Vista Member, Salem Limestone
		360	Berea Sandstone, *Bleu Belge marble*
	Devonian		Grand Tower Formation
		408	
	Silurian		Dayton Formation
		438	
	Ordovician		Columbian Marble Member, Edinburg Formation, Fairmount Member, Holston Formation, Oneota Dolostone, *Vermont marble*
		505	
	Cambrian		*?Cardiff Green marble,* Maryville Limestone
		570	
PRECAMBRIAN			Bayfield Group, *Carmen Red granite,* Graniteville Granite, *?Imperial Red granite,* Marcy Anorthosite, Milbank Granite, Morton Gneiss, *Opalescent granite, Rockville granite,* Town Mountain Granite

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 1-23 in downtown Cincinnati*

Building stone	Use	Source	Age
STOP 1.—FOUNTAIN SQUARE			
Bavarian porphyry	rim of basin and base of fountain	Weissenstadt, northern Bavaria, Germany	
Opalescent granite	benches and paving stones in plaza area	Cold Spring, Minnesota	Precambrian
Rockville granite	stairs, railings, trim	Rockville, Minnesota	Precambrian
STOP 2.—WESTIN HOTEL			
Town Mountain Granite (*Sunset Red granite*)	exterior, parts of interior	Burnet Co., Texas	Precambrian
STOP 3.—CAREW TOWER			
Salem Limestone (*Indiana limestone*)	exterior	Bloomington-Bedford, Indiana	Mississippian
?*Rosetta Black granite*	Race Street entrance	Mellen, Wisconsin	
?*Andes Black granite*	Race Street entrance	South America	
Villa de Este travertine	entrance of Omni Netherland Plaza Hotel	east of Rome, Italy	Quaternary
Holston Formation (*Tennessee marble*)	steps	Knoxville area, Tennessee	Ordovician
Roman Breche marble	foyer of hotel	Rousillon, France	
Flêur de Peche marble	Hall of Mirrors of hotel	?France	
STOP 4.—TOWER PLACE			
Massillon sandstone (*Briar Hill sandstone*)	around entranceways	Coshocton Co., Ohio	Pennsylvanian
Oneota Dolostone (*Mankato-Kasota stone*)	facing	southeastern Minnesota	Ordovician
STOP 5.—CENTRAL TRUST BANK TOWER			
finely crystalline white marble	facing of first three floors	Vermont	Ordovician?
Morton Gneiss (*Rainbow granite*)	steps on Vine Street	Morton area, Minnesota	Precambrian
Roman travertine	entrance interior	Tivoli, Italy	Quaternary
Rosato marble	large fluted pillars in main banking lobby	Verona region, Italy	Jurassic
Cardiff Green marble	part of pillars, mural	Cambria, Harford Co., Maryland	?Cambrian
Imperial Pink travertine	banking counters, mural	Austria	
Cunard Pink marble	banking counters, mural	Chiampo, Italy	
Montana Rose Tan travertine	wainscoting	Montana	Quaternary
Verde Antique	mural	Italy	Mesozoic
Verde Issorie marble	mural	Valle d'Aosta, Italy	Jurassic
Colorosa travertine	mural	Rocky Mountains west of Canon City, Colorado	Quaternary
Skyros marble	mural	Island of Skyros, Greece	
Red and Yellow Verona marbles	mural	Verona area, Italy	Jurassic
Breche Violet marble	mural	Seravezza, Italy	
Flêur de Peche marble	mural	France or Italy	
Eastman Cipollino marble	mural	West Rutland, Vermont	Ordovician
Alps Green marble	mural	Alps region	
STOP 6.—INGALLS BUILDING			
Vermont marble	exterior of first three stories	Vermont	Ordovician
STOP 7.—DIXIE TERMINAL BUILDING			
Salem Limestone (*Bedford stone*)	exterior	Bedford area, Indiana	Mississippian
Deer Island granite	exterior	Crotch Island, Maine	Devonian
Botticino marble	interior wainscoting	Brescia region, northern Italy	Jurassic
Holston Formation (*Tennessee marble*)	floors and stairs	Knoxville area, Tennessee	Ordovician
STOP 8.—ROEBLING SUSPENSION BRIDGE			
limestone	first 25 feet of masonry	Ohio and Indiana	Paleozoic
Salem Limestone (*Indiana limestone*)	interior of piers	southeastern Indiana	Mississippian
Buena Vista Member (*Buena Vista stone*)	exterior of most of piers	Green Township, Adams Co., Ohio	Mississippian
Fairmount Member (*Cincinnati limestone*)	abutments	Cincinnati area, Ohio	Ordovician
STOP 9.—FEDERAL RESERVE BANK			
Columbian Marble Member (*Pearl Danby marble*)	exterior	Danby, Vermont	Ordovician
Roman travertine	interior	Tivoli, Italy	Quaternary
Opalescent granite	plaza area	Cold Spring, Minnesota	Precambrian

TABLE 2.—*Summary of uses, sources, and ages of major types of building stones used for Stops 1-23 in downtown Cincinnati*—Continued

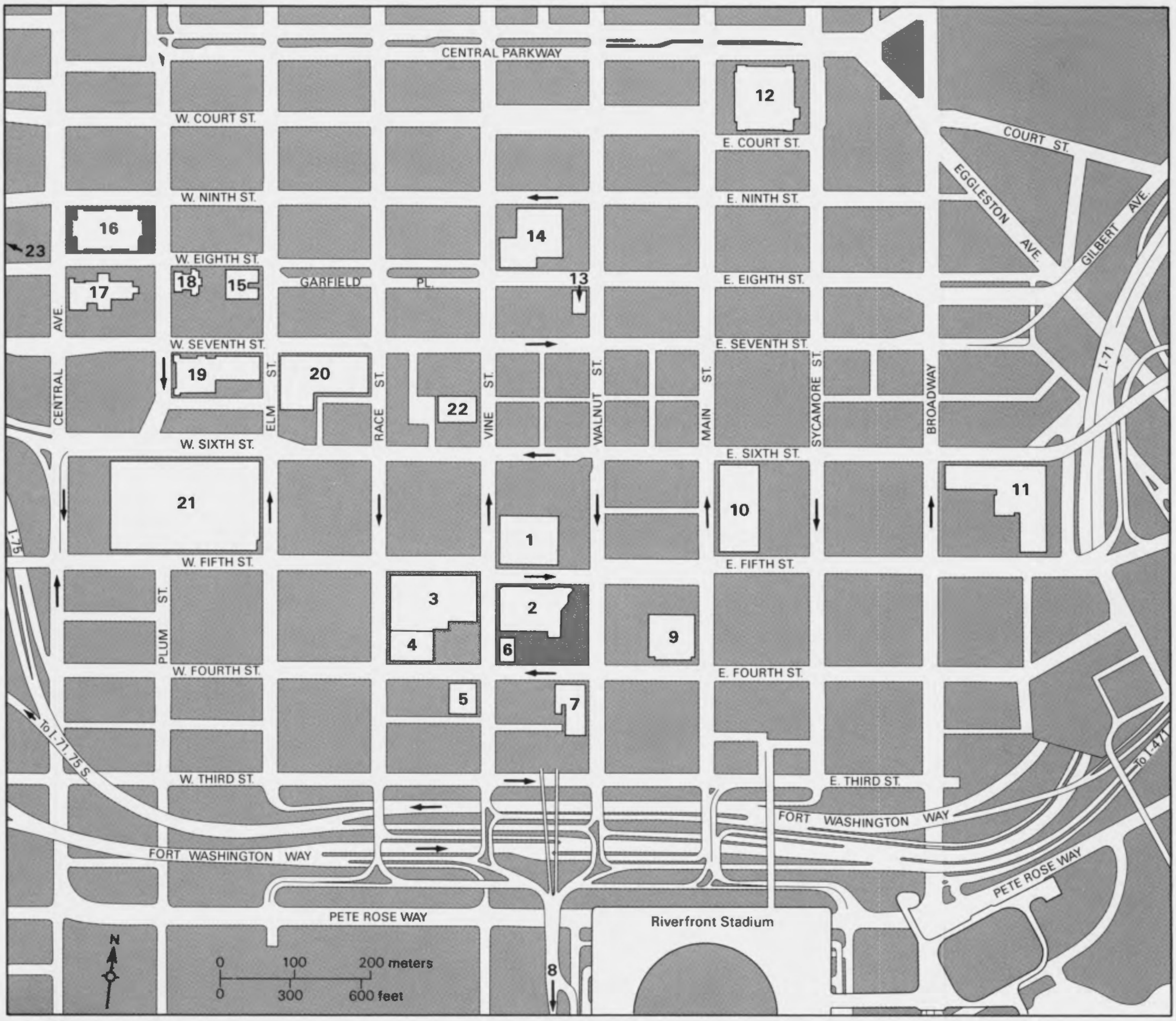
Building stone	Use	Source	Age
STOP 10.—FEDERAL BUILDING			
Marcy Anorthosite (*Cold Spring Green granite*)	facing of ground floor	Jay, Essex Co., New York	Precambrian
Salem Limestone (*Indiana limestone*)	exterior	Bloomington-Bedford, Indiana	Mississippian
white granite	exterior and interior columns		
STOP 11.—PROCTER AND GAMBLE COMPANY HEADQUARTERS			
Salem Limestone (*Gray Indiana limestone*)	much of exterior	near Oolitic, Indiana	Mississippian
Columbian Marble Member (*Montclair Danby marble*)	portions of exterior	Danby, Vermont	Ordovician
gray granite	parts of exterior and interior		
Columbian Marble Member (*Imperial Danby marble*)	entrance pavilion of building	Danby, Vermont	Ordovician
Holston Formation (*Tennessee marble*)	interior	Knoxville area, Tennessee	Ordovician
STOP 12.—HAMILTON COUNTY COURTHOUSE			
pink granite	steps, foundation	New Hampshire	
Salem Limestone (*Indiana limestone*)	exterior facing	Bloomington-Bedford, Indiana	Mississippian
Holston Formation (*Tennessee marble*)	interior flooring, walls and ceiling of main hall	Knoxville area, Tennessee	Ordovician
Hauteville marble	wainscoting of main hall	Hauteville, Ain, France	Cretaceous
Verde Antique	flooring		
STOP 13.—ST. LOUIS CHURCH			
Salem Limestone (*Indiana limestone*)	exterior	Bloomington-Bedford, Indiana	Mississippian
pink granite	base of exterior		
Red Levanto marble	exterior and interior pillars	eastern Liguria, Italy	Tertiary
Grand Tower Formation (*Ste. Genevieve Golden Vein marble*)	wainscoting	Ozora, Missouri	Devonian
Holston Formation (*Tennessee marble*)	flooring	Knoxville area, Tennessee	Ordovician
Verde Antique	small columns, communion rail		
STOP 14.—PUBLIC LIBRARY OF CINCINNATI AND HAMILTON COUNTY			
?*Imperial Red granite*	exterior of northeast corner of library	Sweden	Precambrian
Wausau Red granite (*Bright Red granite*)	benches and other parts	Wausau, Wisconsin	Precambrian
Péribonka granite	pillars	Quebec	Precambrian
STOP 15.—COVENANT-FIRST PRESBYTERIAN CHURCH			
Fairmount Member (*Cincinnati limestone*)	base	Cincinnati, Ohio	Ordovician
Buena Vista Member (*Buena Vista stone*)	trim	southern Ohio	Mississippian
Dayton Formation (*Dayton limestone*)	windowsills of older portion	Dayton area, Ohio	Silurian
Salem Limestone (*Indiana limestone*)	newer addition	Bloomington-Bedford, Indiana	Mississippian
STOP 16.—CITY HALL			
Graniteville Granite (*Missouri Red granite*)	base of exterior	Iron Mountain area, Iron Co., southeastern Missouri	Precambrian
Bayfield Group (*Lake Superior brownstone*)	portions of exterior	Houghton, Wisconsin	Precambrian
Berea Sandstone (*Buff Amherst stone*)	portions of exterior	Amherst area, northern Ohio	Devonian-Mississippian
Red Verona marble	flooring	Verona area, Italy	Jurassic
Holston Formation (*Tennessee marble*)	interior	Knoxville area, Tennessee	Ordovician
STOP 17.—ST. PETER IN CHAINS CATHEDRAL			
Dayton Formation (*Dayton limestone*)	most of exterior	Montgomery Co., Ohio	Silurian
Buena Vista Member (*Buena Vista stone*)	large exterior columns	southern Ohio	Mississippian
Salem Limestone (*Bedford stone*)	window tracery, low street-level walls	Bedford, Indiana	Mississippian
Maryville Limestone (*Imperial Black marble*)	walls of the atrium, narthex, nave, other areas	Thorn Hill, Grainger Co., Tennessee	Cambrian
Tavernelle Perlato (*Cream Tavernelle*) *marble*	base of pillars, pulpit	Chiampo area, Vicenza, northern Italy	Tertiary (Eocene)
Dolcetto Perlato marble	flooring	Mount Erice, western Sicily, Italy	Cretaceous
Verde Issorie marble	walls	Chambave, Valle d'Aosta, northern Italy	Jurassic

TABLE 2.—*Summary of uses, sources, and ages of major types of building stones used for Stops 1-23 in downtown Cincinnati*—Continued

Building stone	Use	Source	Age
Bleu Belge marble	pillars of main altar	Bioul, Belgium	Devonian or Mississippian
Carrara marble	altar in Archbishop's chapel	Carrara, Italy	Tertiary (Miocene)
STOP 18.—PLUM STREET TEMPLE			
Fairmount Member (*Cincinnati limestone*)	base of building	Cincinnati area, Ohio	Ordovician
Buena Vista Member (*Buena Vista stone*)	trim	southern Ohio	Mississippian
STOP 19.—CINCINNATI AND SUBURBAN BELL TELEPHONE BUILDING			
Morton Gneiss (*Rainbow granite*)	base of building	Morton, Minnesota	Precambrian
Salem Limestone (*Indiana limestone*)	upper part of building	Bloomington-Bedford, Indiana	Mississippian
STOP 20.—JOHN SHILLITO COMPANY BUILDING			
Salem Limestone (*Select Buff Indiana limestone*)	placed over most of original brick facade	Bloomington-Bedford, Indiana	Mississippian
Milbank Granite (*Dakota Mahogany granite*)	exterior of ground floor	South Dakota	Precambrian
Holston Formation (*Tennessee marble*)	inside lobby walls	Knoxville area, Tennessee	Ordovician
STOP 21.—CONVENTION CENTER			
Impala Black granite	base	Rustenburg, South Africa	Precambrian
Carmen Red granite	exterior	Kotka area, southeastern Finland	Precambrian
white marble	old Albee Theater facade	?Vermont	?Ordovician
STOP 22.—CINCINNATI ENQUIRER BUILDING			
Salem Limestone (*Indiana limestone*)	exterior	Bloomington-Bedford, Indiana	Mississippian
Black and Gold (*Portoro*) *marble*	first floor entranceway; parts of lobby	probably La Spezia area, Liguria, Italy	probably Triassic
Holston Formation (*Tennessee marble*)	sidewalk just outside entrance	Knoxville area, Tennessee	Ordovician
Verde Antique	flooring		
STOP 23.—UNION TERMINAL (MUSEUM CENTER)			
Rockville granite	fountain area	Rockville, Minnesota	Precambrian
Salem Limestone (*Indiana limestone*)	exterior of most of building	Bloomington-Bedford, Indiana	Mississippian
Morton Gneiss (*Rainbow granite*)	base of main entrance	Morton, Minnesota	Precambrian
Red Verona marble	main concourse	Verona area, Italy	Jurassic
Yellow Verona marble	Losantiville Room and other areas	Verona area, Italy	Jurassic
Holston Formation (*Tennessee marble*)	along base of walls in rotunda, other areas	eastern Tennessee	Ordovician
Edinburg Formation (*Virginia Black marble*)	trim, countertops	Harrisonburg, Virginia	Ordovician
Massillon sandstone (*Briar Hill sandstone*)	Historical Society exhibits	Coshocton Co., Ohio	Pennsylvanian

TABLE 3.—*Trade names and rock-unit names of building stones and the buildings in downtown Cincinnati for which they are used. Only stones for Stops 1-23 are included*

Building stone	Building
Alps Green marble	Central Trust Bank Tower
Andes Black granite	Carew Tower
Bavarian porphyry	Fountain Square
Bayfield Group	City Hall
Bedford stone	Dixie Terminal Building, St. Peter in Chains Cathedral
Berea Sandstone	City Hall
Botticino marble	Dixie Terminal Building
Bleu Belge marble	St. Peter in Chains Cathedral
Black and Gold marble	Cincinnati Enquirer Building
Breche Violet marble	Central Trust Bank Tower
Briar Hill sandstone	Tower Place, Union Terminal
Bright Red granite	Public Library of Cincinnati and Hamilton County
Buena Vista Member of the Cuyahoga Formation	City Hall, Covenant-First Presbyterian Church, Plum Street Temple, Roebling Suspension Bridge, St. Peter in Chains Cathedral
Buff Amherst stone	City Hall
Carmen Red granite	Convention Center
Cardiff Green marble	Central Trust Bank Tower
Cincinnati limestone	Covenant-First Presbyterian Church, Plum Street Temple, Roebling Suspension Bridge
Cold Spring Black granite	Fountain Square
Cold Spring Green granite	Federal Building
Colorosa travertine	Central Trust Bank Tower
Columbian Marble Member of the Shelburne Formation	Federal Reserve Bank, Procter and Gamble Company Headquarters
Cream Tavernelle marble	St. Peter in Chains Cathedral
Cunard Pink marble	Central Trust Bank Tower
Dakota Mahogany granite	John Shillito Company Building
Dayton Formation (*Dayton limestone*)	Covenant-First Presbyterian Church, St. Peter in Chains Cathedral
Deer Island granite	Dixie Terminal Building
Dolcetto Perlato marble	St. Peter in Chains Cathedral
Eastman Cipollino marble	Central Trust Bank Tower
Edinburg Formation	Union Terminal
Fairmount Member of the Fairview Formation	Covenant-First Presbyterian Church, Plum Street Temple, Roebling Suspension Bridge
Flêur de Peche marble	Carew Tower, Central Trust Bank Tower
Grand Tower Formation	St. Louis Church
Graniteville Granite	City Hall
Gray Indiana limestone	Procter and Gamble Headquarters
Hauteville marble	Hamilton County Courthouse
Hill Quarry limestone	Covenant-First Presbyterian Church, Plum Street Temple
Holston Formation	Carew Tower, Cincinnati Enquirer Building, City Hall, Dixie Terminal Building, Hamilton County Courthouse, Procter and Gamble Company Headquarters, St. Louis Church, John Shillito Company Building, Union Terminal
Impala Black granite	Convention Center
Imperial Black marble	St. Peter in Chains Cathedral
Imperial Danby marble	Procter and Gamble Company Headquarters
Imperial Pink travertine	Central Trust Bank Tower
?Imperial Red granite	Public Library of Cincinnati and Hamilton County
Indiana limestone	Carew Tower, Cincinnati and Suburban Bell Telephone Building, Covenant-First Presbyterian Church, Dixie Terminal Building, Procter and Gamble Company Headquarters, Roebling Suspension Bridge, St. Louis Church, John Shillito Company Building, Union Terminal
Lake Superior brownstone	City Hall
Mankato-Kasota stone	Tower Place
Marcy Anorthosite	Federal Building
Maryville Limestone	St. Peter in Chains Cathedral
Massillon sandstone	Tower Place, Union Terminal
Milbank Granite	John Shillito Company Building
Missouri Red granite	City Hall
Montana Rose Tan travertine	Central Trust Bank Tower
Montclair Danby marble	Procter and Gamble Company Headquarters
Morton Gneiss	Central Trust Bank Tower, Cincinnati and Suburban Bell Telephone Building, Union Terminal
Opalescent granite	Federal Reserve Bank, Fountain Square
Portoro marble	Cincinnati Enquirer Building
Pearl Danby marble	Federal Reserve Bank
Rainbow granite	Central Trust Bank Tower, Cincinnati and Suburban Bell Telephone Building, Union Terminal
Red Levanto marble	St. Louis Church
Red Verona marble	Central Trust Bank Tower, City Hall, Union Terminal
Rockville granite	Fountain Square, Union Terminal
Roman Breche marble	Carew Tower
Roman travertine	Central Trust Bank Tower, Federal Reserve Bank
Rosato marble	Central Trust Bank Tower
?Rosetta Black granite	Carew Tower
Salem Limestone	Carew Tower, Cincinnati and Suburban Bell Telephone Building, Covenant-First Presbyterian Church, Dixie Terminal Building, Hamilton County Courthouse, Procter and Gamble Company Headquarters, Roebling Suspension Bridge, John Shillito Company Building, St. Louis Church, St. Peter in Chains Cathedral, Union Terminal
Shelburne Formation	Ingalls Building
Skyros marble	Central Trust Bank Building
Ste. Genevieve Golden Vein marble	St. Louis Church
Sunset Red granite	Westin Hotel
Tavernelle Perlato marble	St. Peter in Chains Cathedral
Tennessee marble	Carew Tower, Cincinnati Enquirer Building, City Hall, Dixie Terminal Building, Hamilton County Courthouse, Procter and Gamble Company Headquarters, St. Louis Church, John Shillito Company Building, Union Terminal
Town Mountain Granite	Westin Hotel
Verde Antique	Carew Tower, Central Trust Bank Tower, Cincinnati Enquirer Building, Hamilton County Courthouse, St. Louis Church
Verde Issorie marble	Central Trust Bank Tower, St. Peter in Chains Cathedral
Villa de Este travertine	Carew Tower
Virginia Black marble	Union Terminal
Wausau Red granite	Public Library of Cincinnati and Hamilton County
Yellow Verona marble	Central Trust Bank Tower, Union Terminal



1) Fountain Square
2) Westin Hotel
3) Carew Tower
4) Tower Place
5) Central Trust Bank Tower
6) Ingalls Building
7) Dixie Terminal Building
8) Roebling Suspension Bridge (off map)
9) Federal Reserve Bank
10) Federal Building
11) Procter and Gamble Company Headquarters
12) Hamilton County Courthouse
13) St. Louis Church
14) Public Library of Cincinnati and Hamilton County
15) Covenant-First Presbyterian Church
16) City Hall
17) St. Peter in Chains Cathedral
18) Plum Street Temple
19) Cincinnati and Suburban Bell Telephone Building
20) John Shillito Company Building
21) Convention Center
22) Cincinnati Enquirer Building
23) Union Terminal (Museum Center) (off map)

MAP OF DOWNTOWN CINCINNATI INDICATING LOCATIONS OF STOPS 1-23