

Downtown Rock Hound:

A Seattle Geology Tour

By David B. Williams

This is a revised edition of an article I wrote for the *Seattle Times* on Seattle's building stones. More information is available in my book, *The Street-Smart Naturalist Field Notes from Seattle*.

Introduction

Every time you walk through downtown Seattle you are traveling along a geologic time line. A lengthy stroll could take you from the 1.6-billion-year-old Finnish granite of 1000 2nd Avenue past the Seattle Art Museum and its relatively young, 300 million year old limestone walls. A couple of blocks later you could hunt for fossils, some up to four inches wide, embedded in grey limestone at the Gap on 4th Avenue. Around the corner and underground in the Westlake Mall bus tunnel, you could end your walk near the burnt oatmeal-colored travertine deposited less than two million years ago near the Rio Grande River in New Mexico.

Seattle's use of stone, as opposed to wood, for building began soon after June 6, 1889, the day of Seattle's great fire, which consumed most of the downtown business district. Like most cities, Seattle started with local rock, using material quarried near Tacoma, Index, and Bellingham. Stone spread through the city into street paving, curbs, walls, and foundations. As the city grew and became more wealthy, builders sought out stone from Vermont and Indiana. And finally, with better transport systems and cutting technology, local or regional geology became obsolete as contractors obtained rock from places as diverse as South Africa, Italy, Brazil, and Finland.

Studying the geology of building stone offers an intriguing introduction to the natural and cultural world of Seattle. For the intrepid wanderer, the story is easy to read because it is written on walls all over town.

Chuckanut Sandstone – Pioneer Building 1st Ave. and Yesler Way

Of all the local rocks, sandstone was the most commonly used for building material. Quarries in Wilkeson, Tenino, and Chuckanut Bay, as well as Waldron Island, provided the bulk of the material. These quarries, which opened as early as the 1850s, combined proximity to water or rail transport with a homogenous, well-cemented, low porosity rock.



Most of the Seattle buildings that use local sandstone center around Pioneer Square. These include the Bailey Building, Pioneer Building, Yesler Building, and Elliott Bay Bookstore. Most were built after Seattle's legendary 1889 blaze.

Despite the distance separating the quarries, they share a similar geologic history. All of the sandstone was deposited 40 to 50 million years ago when this region was much warmer and much flatter. The Cascades would not push their way into the picture for at least 15 million years. Low volcanic islands were forming where the Olympics now stand. Water dominated the environment with a sea to the west and rivers and swamps to the east of the land now occupied by Everett, Seattle, and Tacoma. These rivers deposited layer upon layer of sand in a vast swath of deltas, which formed at the sea land

boundary. These layers are still visible in the sandstones used as building stones.

Along with this changed topography was a changed climate. Palm trees, ferns, and magnolias flourished in the subtropical ecosystem that dominated the lowlands, while large herons and small three-toed horses traipsed through the waterways. This warm, flat period did not last long and by 25 million years ago, Washington had started to take on its modern appearance including mountains, conifers, and cooler temperatures.

**Index Granite - Smith Tower
2nd Avenue and Yesler Way**

The other local rock used in the building trade came from a quarry near Index. John Soderburg, who helped found Swedish Hospital, opened the quarry in 1894, just two years after the Great Northern Railroad laid tracks along the Skykomish River. The quarry is now a popular rock climbing area.



Index granite was used in numerous Seattle buildings including the Times Square Building and the base of Smith Tower, and for curbs and paving stones throughout the city.

The salt-and-pepper colored rock formed 33 million years ago, as a wedge of oceanic crust, the Farallon plate, began to dive under the North American continent. As the plate slid deeper, it melted the surrounding dark, iron-rich basalt. This magma began to rise and melt the lighter, silica- and aluminum-rich continental material, converting it to a granite. Continued subduction of the Farallon eventually produced enough heat to generate the Cascade volcanoes.

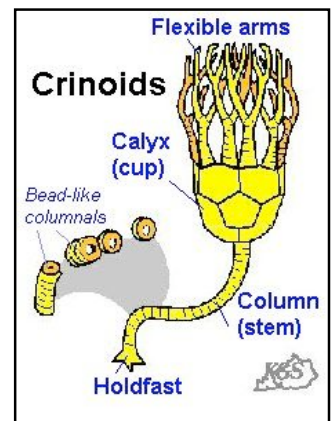
Like many local rocks, the Index granite was popular because it was close to its market. When new rocks hit

Seattle, the Index was left to the province of climbers and geologists.

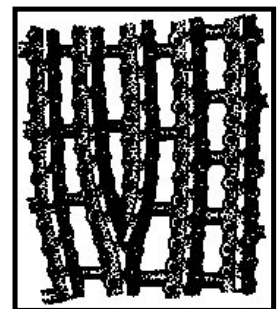
**Salem Limestone - Rainier Club
4th Avenue and Columbia Street**

The most popular building stone in the United States comes from quarries near Bedford, Indiana. Known to geologists as the Salem Limestone, this white to buff rock has been used in the Empire State Building, and San Francisco City Hall. In Seattle it graces the exteriors the Seattle Branch of the Federal Reserve Bank and the Rainier Club.

Deposition of this limestone occurred 300 to 330 million years ago in a shallow, clear, tropical sea. The warm waters supported a diverse range of swimming, crawling, and bottom-dwelling invertebrates. When they died their bodies collected in a watery cemetery on the sea floor, eventually solidifying into a 40-to-100-foot-thick stone menagerie. This matrix of corpses formed a limestone that cuts cleanly and evenly in all directions.



Crinoid stems, small poker-chip shaped discs, are the most common recognizable fossil. They are related to starfish and sand dollars and resemble plants with a root-like base, a flexible stem, and a flower-like top. Another common fossil is from a colonial animal known as a bryozoan. They look like Rice Chex cereal. Wave action from long ago tides destroyed most of the shells from other animals that plied the sea, but careful investigation reveals a smattering of half-inch-long snails, oysters, and clams.



Bryozoans

Italian Travertine – Rainier Tower 5th Avenue and Union St.

Like Rome, Seattle was built on seven hills. Like Rome, many Seattle buildings incorporate a type of limestone known as travertine into their structure. Coincidentally, much of the travertine used in Seattle came from quarries located near Rome, where the 160,000-year old rock has been used for over 2000 years. The best known example is the Colosseum with its massive travertine blocks.



Rainier Tower

Unlike the two other types of limestone discussed in this article, travertine does not form in the sea. Instead, it precipitates from calcite-rich water associated with springs or caves. A good modern example is Mammoth Hot Springs in Yellowstone National Park. As water spilling out of a spring evaporates, any solids carried in solution settle to the ground, like the settling of spices in Italian salad dressing. In travertine, calcite is the primary solid, building up layer upon layer as the spring continues to expel water.

Builders use travertine indoors and outdoors in Seattle. In some structures, like the old Nordstrom building, builders filled in the holes in the rock. This is for preventative maintenance. In a colder location, like Boston, water seeps into the cracks, freezes, expands and breaks the rock. Seattle's moderate winter climate, however, has little effect on the holey, dirty white rock. Good examples are the Washington Federal Savings building, the Rainier Tower and IBM building (both designed by Seattle-native Minoru Yamasaki), and the Pacific Building.

Finnish Granite – City Centre 5th Avenue and Pike Street

In recent years economists have started to bandy about the term "global economy" but it is old hat for those in the building trade. Two thousand years ago, African marble was being shipped to Rome. At the turn of the last millenium, William the Conqueror built castles in England from French stone, which his marauders carried across the channel. Modern contractors have expanded this practice and opened up a world-wide market for stone trading. Finnish rock is a good example

Despite its location almost half-way around the globe, Finland provides many different building stones to the Seattle area. Reddish, pink, and brown granites are used in the U. S. Bank Centre, Key Tower, Westlake Mall Metro bus tunnel, and Century Square. All of these rocks formed more than 1.6 billion years ago.

From a geologist's point of view, the most interesting parts of the Finnish rocks are the large minerals. Several varieties of feldspar, the most common mineral on the Earth's surface, dominate the different Finnish granites. The large crystals, some up to three inches long, indicate that the rock cooled slowly, deep underground.

Suprisingly, the Finnish building stones were not shipped directly to Seattle. Instead, the granite's journey began with a stop in Italy, home of many of the world's premier stone cutting companies.

Contractors often transport rocks to Italy because of lower costs and higher quality stone products. As economists are learning, the global economy is more complicated than it looks.



Pink Finnish granite, Gray Sardinian granite and Black African granite

**South African Granite -
Washington Federal Savings Bank
5th Avenue and Pike Street**

The Washington Federal Savings building displays Seattle's most controversial type of



building stone, a rock known in the construction trade as Verde Fontaine. South African quarries produced this pine green rock, which solidified underground over one billion years ago. The green coloration comes from the mineral chlorite, which forms from the alteration of iron- and magnesium-rich minerals within the rock. (The tan rock is Italian travertine.)

The conflagration over Verde Fontaine began in early January 1989. During the construction of the city's underground bus stations, Eddie Rye of the Black Contractors Coalition notified the tunnel builders, Metro, about the planned use of Verde Fontaine in two of the downtown stations. This directly conflicted with a resolution that Metro, which manages King County's bus system and collects, treats, and discharges Seattle's sewage, had passed only 16 months earlier that prohibited the use of materials "fabricated or manufactured" in South Africa, because of apartheid.

After Rye blew the whistle, Metro Executive Director Alan Gibbs said that even though the use of the rock technically was not illegal because it was only quarried in South Africa and cut and finished in Italy, using the South African granite would "taint the project forever;" therefore, Metro would drop the Verde Fontaine from the project, costing hundreds of thousands of dollars. Citizens and public officials both praised and castigated Gibbs' decision to stop using the green granite. After six additional weeks of meetings, debates, and public input, Gibbs resigned.

The tunnels opened on September 15, 1990, with walls covered in less polemical rock.

**German Limestone - Grand Hyatt Hotel
7th Avenue and Pine Street**

Many people who walk into the Grand Hyatt fail to notice the captivating cast of characters beneath their feet. If they took the time to look down, visitors would find the remains of marine organisms who navigated a sea that covered Europe 155 million years ago in the Jurassic period. The gray limestone comes from German quarries and is known as Treuchtlingen Marble, although it is limestone.



Sponges, bottom dwelling, filter feeders that formed small mounds are darker and quite common. They may be round, C-, U-, V-, straight or irregularly shaped. Two other common fossils include



ammonites, which resemble cinnamon rolls, and belemnites, which look like a cigar. Both were related to squids and octopi. The white specks that look like oatmeal are single-celled sea dwellers called foraminifera.