VERMONT'S STONE INDUSTRIES & THE USE OF LOCAL STONES IN ARCHITECTURE

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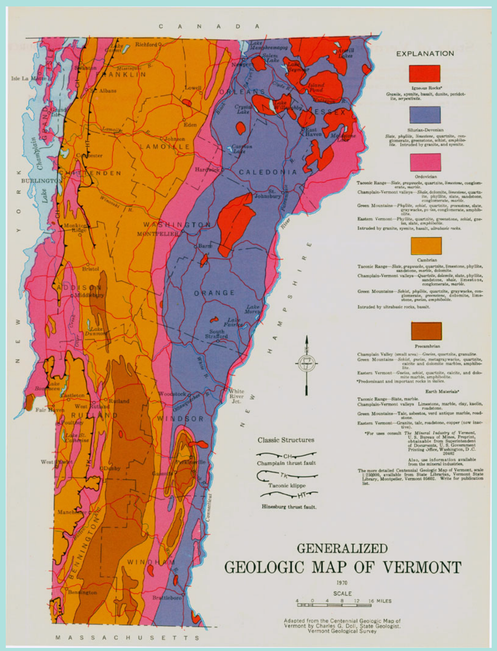
Vermont is home to three distinct and highly valued rocks: marble, slate, and granite. At the height of these quarrying industries in the late 19th century, advances in transportation technology made it possible to export these products nationwide—meaning that local materials, because they were in such high demand, were by in large unavailable for nearby building projects. However, because of this high demand, the use of native materials becomes an indicator of a building of great societal importance. In examining buildings that were constructed of local stones during the height of demand, we come to see architecture as a window into cultural values of the time.

HOW IT ALL GOT HERE:
THE GEOLOGY OF VERMONT'S STONE INDUSTRIES

The complexity of Vermont's geological landscape can be traced back to tectonic events that began over 650 million years ago, when proto-North America, then a part of a much larger supercontinent, began to split apart from what is today the African continent. The rift basin that formed eventually spread into a sea floor, creating the Iapetus Ocean. Over the next 100 million years, as the oceanic crust on the proto-North American plate collided with another oceanic plate, a volcanic arc developed, called the Taconic island arc. This volcanic activity is likely what formed the granite deposits that we see in present-day northeastern Vermont ("Geologic Units"). As subduction continued and the Iapetus Ocean narrowed, sediments scraped from the downgoing crust built up into an accretionary wedge.

When the Taconic island arc finally collided with the continental crust of North America's east coast, a collision known as the Taconic Orogeny, the accretionary sediment that ranged from sandstone to deepwater shale folded over itself in a complex geometry that formed the mineral belts we see today (Isachsen 17). This process resulted in what is referred to as the Champlain Thrust, as layers of tiny clay particles and shale were thrust over shallower sedimentary layers. These slices were metamorphosed over time, resulting in the marble deposits (metamorphosed limestone) of the Champlain Valley and the slate (metamorphosed shale) of the Taconic Mountains. Metamorphism of the sedimentary formations may have occurred over several different time periods, as the Taconic Orogeny was just one of three orogenic cycles that formed the whole of the Appalachian range as we know it today. With each tectonic event, the subduction and orogenic processes increased temperatures and pressure and prompted parts of the rock formation to undergo metamorphosis—resulting in the region's famed marble and slate deposits, which can be found today primarily in the western part of the state (Conrad & Vanacek). Present-day marble belts line the Champlain and Vermont valleys, most likely because glaciers preferentially eroded the marble deposits due to marble's softness compared to the quartzite of the Green Mountains. Likewise, the Taconic Mountains have significantly less dramatic elevations than the rest of the Green Mountains, since slate is more easily eroded than harder, more intensely metamorphosed shale.



Besides Vermont's most valued metamorphic rocks—marble and slate—we also see a variety of other metamorphic outcomes, including phyllite, schist, gneiss, and quartzite. In addition, the region's sedimentary bastion, limestone, can be found in many different geological divisions across the state. Lastly, the highly valued granite deposits are located in the eastern part of Vermont, in pockets throughout the Green Mountain range. (Map taken from Conrad & Vanacek)

WHERE IT ALL WENT:
VERMONT'S STONE QUARRIES & TRANSPORTATION TECHNOLOGY

Marble was the first of Vermont's stone industries to get off the ground. Though the earliest quarries date back to the 17th century, it wasn't until the 1800s that the marble industry picked up speed. Dr. Eben Judd first discovered marble deposits in Middlebury in 1802, and he subsequently pioneered a modern quarrying and finishing process and opened the region's first marble mill (Swift 335).. The marble, whose quality was said to rival that of Italy's, was transported over land and water to Montreal, Boston, New York, and as far south as Georgia (Swift 336). Yet by the 1830s, the Rutland area overtook Middlebury as the center of Vermont's marble industry, in large part because of the Champlain Canal, which opened in 1823 and connected Lake Champlain directly to the Hudson via Whitehall—nearly half as far from Rutland as it was from Middlebury. A symbol of wealth and elegance, Vermont marble in particular had a certain cultural cachet and was used nationwide in tombstones, fireplaces, flooring, and for construction purposes. The slate industry was limited by geological formations to the area between the Poultney and the Metawee Rivers in southwestern Vermont, in towns like Fair Haven, Poultney, and Castleton (Hamblett 102). Unlike marble, slate was not typically used for beautification; rather, its uses were much more banal, from roofing to chalkboards. While Vermont's slate was of higher quality than many other slate slabs, it was not as highly sought after as marble was during the industry's peak. The granite industry, too, takes a back seat in scope and in fame to marble, yet much like marble, it was the industry on which an entire town relied—in granite's case, Barre, Vermont.

When the railroad came to Vermont in 1849, it ushered in a new era of growth for the stone industries. Water transport on Lake Champlain and via the canal could not compare to the ease of shipping that the railroad offered. Greg Pahl writes of the significance of railroad technology, "Railroads not only brought improved transportation to Vermont, they also helped stimulate the national economy, which in turn whetted an appetite for impressive new business structures, many of which were built in stone" (218). It would be almost impossible to overestimate the role the railroads played in Vermont's stone industries, offering as they did the ability to transport quantities of stone with which horsepower could not compete.

> *"A quarry of marble has been discovered in the bank of the river just below the bridge, a continuation of the ledge, which forms the falls. It is both white and dove-colored, elegantly variegated, and of finer texture than any other, which has been wrought hitherto in the United States. It is sawn, ground and polished by water machinery; and is cut and carved, with an elegance not surpassed on this side of the Atlantic."*
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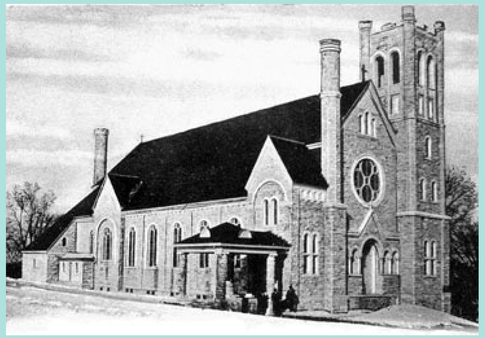
> *- Dr. Timothy Dwight, quoted in Swift 337*

HOW SOME OF IT WAS USED:
LOCAL STONE CONSTRUCTION

Because Vermont's stone exports, particularly its marble, were in such high demand nationwide, the majority of the region's slate, marble, and granite reserves were not used in local buildings. The primary exception is slate, which, in line with architectural trends, began to appear in mansard roofs in the latter half of the 1800s throughout the state. In the southwestern part of the state, where slate quarries and their byproducts were abundant, the use of slate in roofing extended beyond trendiness. During the slate boom, 95 percent of quarried slate was deemed unusable, which allowed residents living adjacent to quarries ample free building material. As a result, slate roofs can be seen on even the most commonplace buildings, "the use of the material extending even to the covering of such a utilitarian structure as an icehouse" ("Architecture," Bearse 104).

On a smaller scale and with less sought-after materials, we do see local materials in a variety of buildings. Houses are by in large made of wood (often local), harkening back to the traditional Vermont farmhouse, so stone is primarily seen in buildings' exteriors in detailing and in public buildings whose patrons were looking to convey a sense of weight and importance. Additionally, because stone is such an intrinsically "Vermont" material choice, often stone construction was closely linked with donated materials and labor. Churches, which have historically been viewed as a community's most significant and evocative structure, are often constructed in stone. Middlebury offers two key examples: the Memorial Baptist Church, built in 1882 of marble blocks from Brandon, and St. Mary's, constructed in 1907, also of Brandon marble, by an almost entirely volunteer labor force (Andres 13, 59-60). Both are elegant, highly detailed structures that evoke the prominence of the church through soaring towers and intricate masonry. Secular buildings, too, used local stone materials to suggest a similar sense of weight: Middlebury College erected Old Chapel in 1835, constructed of limestone from Weybridge and native marble, one of the earliest of the college's buildings that for years housed the library, classrooms, and a chapel. To commemorate the college's 100-year anniversary, the Starr Library and Warner Science Building were built in 1900 of marble from Rutland County (Johnson & Gilbertson 146, 151). Historian and Middlebury professor Glenn Andres writes of the library's use of native materials: "What could be more suitable for a Vermont college than to have a Vermont marble temple for its library?" (65).

St. Mary's Church in Middlebury was originally envisioned in 1892 blue marble to be taken from the quarry at Beldens Falls, located only a few miles outside of the Middlebury village. Due to a lack of funding, however, the project was stalled until 1902, when the church was redesigned and constructed in 1907 of grey marble from Brandon (Andres 59-60). (Image taken from middlebury.edu)



Middlebury College's Starr Library, built in 1899 in honor of the college's centennial, is constructed of marble locally quarried in Rutland County. (Image taken from middlebury.edu)

WORKS CITED

Andres, Glenn M. *A Walking History of Middlebury*. Ed. Greg Pahl. Middlebury: The Henry Sheldon Museum of Vermont History, 1997. Print.
"Architecture." *Vermont: A Guide to the Green Mountain State*. Ed. Ray Bearse. 2nd ed. Boston: Houghton Mifflin, 1966. 101-107. Print.
Conrad, Diane, and Diane Vanacek. "Industrial Minerals of Vermont: 200 Years and Going Strong." *Vermont Geological Survey*. Ed. Sarah King. Vermont Agency of Natural Resources, 2005. Web. 26 Jan. 2012.
"Geologic Units in Vermont." *USGS Mineral Resources On-Line Spatial Data*. US Geological Survey. Web. 26 Jan. 2012.
Hamblett, Barbara Knapp. Rev. of *New Lives in the Valley: Slate Quarries and Quarry Villages in North Wales, New York and Vermont, 1830-1920*. *Vermont History* 68.1 (2000): 102-04. *Vermont Historical Society*. Web. 26 Jan. 2012.
Isachsen, Yngvar W. "Continents Adrift: The Plate Tectonic History of New York State." *Geology of New York: A Simplified Account*. Albany: New York State Museum/Geological Survey, State Education Dept., University of the State of New York, 2000. 11-20. Print.
Johnson, Curtis B., and Elsa Gilbertson. *The Historic Architecture of Addison County: Including a Listing of the Vermont State Register of Historic Places*. Montpelier, VT: Division, 1992. 1-24. Print.
Pahl, Greg. "Four Miles to the Falls: A History of the Beldens Falls Branch Railroad." *Vermont History* 61.4 (1993): 217-33. Print.
Swift, Samuel. *History of the Town of Middlebury, To Which is Prefixed a Statistical and Historical Account of the County*. Middlebury: A.H. Copeland, 1859. *Middlebury College Library*. Web. 23 Jan. 2012.