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Trinity's Trap Rock Exterior

The Stone



Built of the same stone as East Rock Park, Trinity's trap-rock stone tower and walls echoes the tall rock ridges of the [trap-rock mountain](#) range that are part of the [Metacomet Ridge](#) that extends from New Haven, north through the Connecticut River Valley to nearly the Vermont border. In nature, diabase frequently breaks into octagonal and pentagonal columns, creating a "postpile" appearance, which were exposed over

time when weaker soil and stone eroded leaving [strong](#) trap rock pillars looking like temple columns facing a natural rock. The difficulty of smooth dressing the very hard stone apparently prevented its use for pillars inside the church. The church builders also used a much softer [brownstone](#) for trim.

Connecticut Trap rock is often mistaken for basalt, but technically, the stone is [intrusive igneous rock](#) or "[plutonic gabbro](#)" or *diabase* – named after Pluto the Greek God of Hades. Diabase is made of crystallized from volcanic [magma](#) slowly cooling below the surface of the earth, while

basalt is extrusive rock. Trap rock is a dark, fine grained stone, which when broken open is dark grey, but after exposure to weathering, the iron contained in the rock rusts, causing it to turn a reddish color. According to Professor Benjamin Silliman, who became the first American professor of science at [Yale University](#) in 1806 the rocks “received the generic name of Trap rocks, (a name derived from the Swedish word *trappa* a stair).”

**TABLE OF CHEMICAL ANALYSES OF ROCKS, AMERICAN COPPER MINE,
SOMERVILLE, N. J.**

	I. Trap.	II. Shale.	III. Shale.	IV. Purple ore.	V. White ore.	VI. Ore.	VII. Basalt.	VIII. Diabase.
Silica	44.84	57.45	57.02	57.24	59.15	59.68	51.86	51.78
FeO	4.3	1.54	1.93	*6.21	3.57	6.29	3.24	5.25
Fe ₂ O ₃	6.81	9.51	8.72	.....	.....	.....	2.14	3.55
Al ₂ O ₃	17.68	21.19	19.60	24.81	19.07	26.35	16.25	12.79
MgO	3.90	0.83	0.76	3.20	1.74	1.71	7.97	MnO, 0.09
K ₂ O	1.36	0.63	0.75	.....	Trace.	.....	1.05	NiO, 0.02
Na ₂ O	1.80	0.25	0.19	.....	Trace.	.....	1.54	7.83
CaO	10.70	4.00	6.78	5.89	14.64	4.18	10.27	0.39
Ignition	8.20	4.12	4.01	3.68	7.44	1.75	1.33	2.14
Copper.....	{ (H ₂ O, 8.17)	Trace.	Trace.	Trace.	13.01	.....	160.25	10.70
				99.84	.....	.....		.65
								TiO ₂ 1.41
								99.80

* Iron as Fe₂O₃.
† Silver 1.9 ounce per ton.

I. Trap-rock from above ore-bed, American copper mine
 II. First shale layer below ore-bed, " " "
 III. Second " " " " "
 IV. Purple rock of ore-bed, " " "
 V. White spots in " " "
 VI. Ore.
 VII. Basalt—normal rock of Watchung mountain, Orange, N. J
 Bull. 148, U. S. G. S., p. 80.
 VIII. Diabase, West Rock, New Haven, Conn.

According to a Geological Survey (U.S.) report of 1897, Connecticut trap rock such as mined in Meriden is indeed strong: a test of it showed a “first crack” crushing strength of 34,920 pounds per square inch or 241 MPa, while granite has a crushing strength of around 200 MPa. While other states' trap rock have crushing strengths even higher (approaching 55,000 psi or 380 MPa), the trap rock in Eli Whitney's quarry and West Rock, New Haven (column VIII) is lower in crushing strength than Meriden's, making it easier to quarry -- though still stronger than granite. It contains quite a bit of iron – over 12% is some form of Ferris oxide. An analysis of Meridan Trap Rock found that it also contains 2.24% water, which was a problem when a massive lightning strike shattered part of a finial in 2011. It also tends to crack or sheer along straight planes, allowing for better wall construction. Eli Whitney, inventor of the cotton gin and father of the American factory system, built a quarry at East Rock and excavated trap rock, using it to build his forging house for his factory, for his dam, and for the foundation of his barn. Whitney, and the lawyer, real estate developer, anti-slavery activist and politician James Hillhouse, both promoted its use: while primarily crushed and used for paving, roads, rail beds, or concrete; you can see examples of trap rock foundations on homes on Whitney Avenue and throughout New Haven,

and on the beds of the older rail lines in Connecticut.

Buildings

The choice of stone the color of rusted iron and a stone named after Pluto, the Greek God of the dead, may seem odd, but the use of the harder than granite local trap rock stone ties the Church not only with the land around New Haven, but to the entire Connecticut River valley. One mid nineteenth century commentator observed:



“The rocks of these formations afford ordinary building stones of a very enduring sort; but from irregular fracture, and difficulty of dressing, they are little used except for rough walls and heavy work where ornament is not required. When, however, natural faces can be obtained, they make beautiful walls of several soft tints of color, as is seen in Trinity Church in New Haven.”

Not all traprock stone looks like the reddish New Haven stone that varies in color tints from yellow, orange, red to brown.. Another example of Connecticut trap rock is found in the Hubbard Memorial Chapel at the Walnut Grove Cemetery in Meriden, Connecticut. The local Meriden Traprock is more blue and less red than the New Haven Traprock.

Closer to Trinity's colors is the Greek Revival Bloomfield, Ct. home of 19th-century U.S. Sen. and abolitionist Francis Gillette is faced with uneven trap rock blocks.



Another trap rock church is St. Mary's Church, New Haven at 5 Hillhouse Avenue was designed by James Murphy and dedicated in 1874. Most of the stone in the Gothic Revival church is trap rock – though not the same striking red-orange color of stone from the Eli Whitney quarry in East Rock, but stone taken from the West Rock quarry, which is more muted in its colors, more blue than red.

In 1961 changes in fire codes mandated that the upper galleries of Trinity Church have a west

-side egress. Architecture Douglas Orr (1892-1966) designed two extensions that flanked the chancel, providing a sacristy, clergy vesting, rooms, office space, and gallery egress, as well as entrances to a undercroft dug out of the basement. The native trap rock stone used to cover these additions was salvaged from a house being demolished cross the street from Trinity's parish house at the corner of Church and Wall Streets. The house had been constructed about the same time as the church, using stone taken from the same quarry. Thus the appearance of the trap-stone

church was preserved. For more on the 1961 construction that dug an undercroft out from under the church and built the two wing extensions to the chancel, see Joe Dzeda's [Big Dig](#).

One description of the local geology by William Blake in 1886 compares the two stones used on the exterior of Trinity that could almost be a sermon of nature:

“The sandstone hills and ridges of the town are all lower than the chief trap rock ranges, and are smoothly rounded off, with flowing outlines. They extend generally in long and approximately parallel lines, and are highest and most extended under the lee or protection of the chief outbursts of the trap rock; this harder rock having broken the force of the denuding action of the ancient glacier. The sandstone formation is also found overlying the bedded trap rocks, and rises in places almost to the summit of the trap ridges. When hardened and changed by the trappean intrusions it resists decay almost as well as the trap, and forms enduring and picturesque bluffs.”

Today the hard stone is primarily used as it has been since just about the time the church was built as crushed gravel under roads and railroads. When you drive or ride a train, the crushed trap rock is your foundation for a smooth ride. When you visit one of the many early houses of New Haven, it may be the building's foundation stone. When you look at one of the four Trap Rock parks around New Haven -- East Rock , West Rock , Mill Rock, and Pine Rock -- or look at the changing red tints of Trinity Church glowing in the sun, you see something both beautiful and enduring that inspires the mind towards thoughts of nature and nature's God.