INTRODUCTION

Building stone is rock that has been quarried, cut, and used in construction. Stones’ edges are usually sharp and faces smooth when a building is new. A stone and a building show their age by rounding of corners and roughening of surfaces. The degree of recent weathering, mineral composition, color and texture of many stones provide clues to the kind and source of minerals present in the stone; processes of ancient weathering; agents of sediment transport; physical, chemical, and biological environment of deposition; and changes that have occurred since deposition.

The attached table provides information about some building stones on the Cornell campus. This worksheet and map give examples of the information available from the study of these stones, as well as stories related to the campus. You are asked to share your discoveries, so they may be included in future course materials.

Stop 1: Snee Hall
The interior wall on the west side of Snee Hall displays two pieces of Triassic Connecticut shale. The horizontal piece shows dinosaur footprints, ganoid fish scales, possible raindrop marks, and symmetrical ripple patterns. Note that these features are not all on the same layer within the shale. Fossil footprints are occasionally distorted and may be misinterpreted if seen on shale layers that were some distance below the surface when the print was made.

While in the west corridor of Snee Hall be sure to look at the water flume. This clear, plastic box contains unconsolidated sediments, including quartz sand and darker, heavier minerals. Push the red button and adjust the slope of the flume to experiment with ripple marks.

Outside Snee Hall, in the parking area, examine the south wall of Hollister Hall. This is a cement-block wall covered with a thin veneer of the local sand/siltstone. Quarrymen call this stone Llenroc (Cornell spelled backward) and it is found on many of the newer campus buildings. Llenroc can be distinguished from Enfield and Ithaca sandstone by its orientation. Llenroc is used as a veneer, not as part of the building’s support. Llenroc is applied at 90° to its original sedimentary bedding plane. Because of this, water, salt, and plant roots can enter the thin laminations in the siltstone and single bedding layers may fall from the wall. This form of weathering is seen in early spring.

About ten meters to the left of the stairs leading up to the Engineering Quad, at waist level, you can see a V-shaped flute cast (a specific type of sole mark). It is about ten cm by ten cm and indicates current flow across the Devonian seafloor 365 million years ago. Further to the left are smaller, cylindrical marks, more randomly oriented on the bedding plane. They are the ancient burrows of soft-bodied Devonian animals. Worms mostly. When a surface is extensively burrowed these marks are called bioturbation. Further left, at eye level, are Llenroc surfaces with shelly fossils. Finally, yet further to the left, near ground level, there are small, white dots on the Llenroc. These are the remains of recent ivy holdfasts. Llenroc is too fragile, too easily weathered, to allow ivy covered walls on the Engineering Quad.

As you follow the service road from the Snee Hall parking area to its intersection with College Ave., stop to examine the kimberlite dike that crosses Cascadilla gorge just upstream from the College Ave. bridge. This igneous, intrusive rock cuts through the Devonian siltstones beneath
Snee Hall. It is seen most easily in the fall just upstream from an abandoned flight of stairs that led from CollegeTown to the creek.

At this point you can also examine the granite curbstones. The university hopes that granite will weather less quickly than the shale and concrete curbstones found on other parts of campus.

**Stop 2: College Avenue Bridge**

The bridge is made from blocks of Enfield sandstone, laid up for the most part with the bedding planes in their original, horizontal orientation. The top surface of the guard rail is a good place to look for flutes, flute casts, worm burrows, tool marks, bioturbation, and ripple marks. Can you determine if the ripple marks are asymmetrical (indicating a unique paleocurrent direction) or symmetrical (indicative of to-and-fro wave action)? What structures would help you determine that a particular block is upside down (turned 180° from its original, Devonian position)?

The random compass headings of worm burrows help distinguish them from sole marks, which give hints about ancient current direction. Some shelly fossils are also present.

**Stop 3: Performing Arts Center and Cascadilla Hall**

The Performing Arts Center opened in 1989. It is covered with Crystal Stratus marble from Vermont. Marble pieces are hung, somewhat like posters in a dorm, a short distance from the supporting wall. Lower courses of marble show the result of freeze/thaw cycles when snow becomes packed behind the plates. The surface of the marble provides a nice point of comparison with other Vermont marbles on older campus buildings.

Cascadilla Hall is the oldest building on the Cornell campus. Indeed, it dates from before the opening of the university. Cascadilla was originally a water-cure sanatorium. It was acquired by Ezra Cornell so he could compete for the award of federal land to finance the New York State land-grant university. Other competitors in 1864 included a large brick building south of Watkins Glen and a Civil War hospital in Willard, New York. The Watkins Glen building is presently the New York State Fire Academy and the Willard buildings are part of a state drug treatment facility.

Cascadilla Hall housed students, faculty, classrooms, dining halls, and laboratories during Cornell’s first semesters. Near neighbors included a grist mill and a hog farm. Students helped with road grading and construction of buildings on the Arts Quad as part of their tuition.

**Stop 4: The Cornell Law School, Myron Taylor Hall**

The present Law School was built in phases. The northern part of Myron Taylor Hall was built in 1932 from Enfield Shale. An addition, on the banks of Cascadilla gorge, was constructed from the same stone in 1988. The Devonian siltstone shows interesting color changes after almost seventy years exposure to Ithaca weather. Would you attribute this to physical, chemical, or biological weathering?

Above the entrance to the new part of the building is an engraved block of limestone. The engraving reads:

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Cornell Law School
in honor of
Jane M.G. Foster LL.B.’18
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The last line with Ms. Foster’s name, degree, and class is a separate block of stone. This stone replaces what was, perhaps, the most expensive typo on campus. When the dedicatory limestone block was first carved, the degree and date read: L.L.B.’18. The proper abbreviation for the degree of Bachelor of Law (a degree no longer awarded in the U.S., having been replaced by the J.D.) is LL.B. Because of the extra period the original limestone was recut and the new piece added. This
limestone, and other pieces used around windows, etc., are made on many broken pieces of fossil shell. What clue does this evidence provide about the energy in the original depositional locality?

Inside the new addition, low on the wall that was originally an exterior wall of the older portion of the building, is a nice clam fossil in cross section. The floors in the Law Library stacks are made of large pieces of slate, suspended at their edges on a metal frame. The interior of the library is one of the most impressive spots on campus.

The sunken courtyard of the Law School has been used for various ceremonies, motion pictures, and plays. The wall toward College Avenue shows evidence of creep. A nice crinoid head may be seen on the limestone handrail of the western balcony.

Stop 5: Uris, Olin, and Kroch libraries
The carved heads visible on the exterior of Olin Library (and in its interior stairwell) were originally part of Boardman Hall. Boardman served the Cornell Law School from 1892 to 1932 and the departments of Government and History from 1932 until it was torn down in 1959. The heads were carved locally from Cleveland sandstone. There are competing theories about the models for and significance of these heads.

Kroch Library is attached to Olin and is almost completely underground. A special drainage system and pumps protect Kroch’s collections from groundwater. When the library was built Devonian bedrock was blasted. The Geological Sciences Department monitored the blasts using a seismic network. Some of the rock from this site was installed at the corner of College Avenue and the Snee Hall service road.

Stop 6: Morrill, McGraw, and White Halls, the Ezra Cornell Statue, and the Tarr Boulder
Morrill, McGraw, and White Halls were the first classroom buildings at Cornell. Morrill is named for the legislator who sponsored the federal Land Grant University act. Many state universities have a Morrill Hall somewhere on campus. These three buildings are constructed from Ithaca sandstone. The quarry for this stone was just to the west on Lib slope. The slope of one quarry wall is still visible beneath the grass.

The limestone surrounding the windows and trimming the stairs is extremely rich in fossils. Corals, brachiopods, clams, crinoids, and bryozoans are found easily. This stone was quarried twenty five miles north of campus, near the campus of Wells University. Why do these older buildings use local stones, while more recent additions to campus use such a variety of stone? Can you tell where the Ithaca shale has been repaired? Can you distinguish repairs made using Enfield sandstone from those made using cement block and Llenroc veneer?

McGraw Hall was an early home of the Geology Department. Geology professor Ralph S. Tarr is memorialized by a boulder at the corner of Morrill Hall. Tarr studied glaciers, traveled with Adm.
Peary to Greenland in 1896, and named a 
glacier there after Cornell. The Tarr Memorial 
Boulder is anorthosite, originally from 
northern New York. It is a glacial erratic 
found on the Hart farm two miles south of 
campus. The nine-ton boulder was moved to 
its present location October 26, 1915. Prof. 
H.S. Gutsell modeled the plaque on a photo 
of Tarr, but left out Tarr’s often-present pipe.

A metal statue of the university’s founder, 
Ezra Cornell, sits atop a block of Devonian 
granite. Notice the telegraph instrument on 
which Cornell leans. The beginning of Ezra 
Cornell’s fortune (and the beginning of 
Cornell University’s endowment) rests upon 
his association with Samuel Morse and the 
emerging telegraph industry. Cornell 
acquired forests of telegraph poles to string 
the wires. He was well informed about such 
things when the federal government made 
western lands available to eastern states under 
the Morrill Act.

**Stop 7: Baker Lab, Goldwin Smith Hall, Sheldon Exedra**
The Chemistry department laboratory sits on a steep-sided bluff. This is the delta built by an earlier 
Fall Creek into a postglacial lake. Clearly the lake level was much higher than today’s Cayuga 
Lake. Notice the combination of Enfield sandstone and Llenroc used around Baker.

Goldwin Smith Hall was once the home of the College of Agriculture. Notice the carvings around 
the projecting porch seats on the building’s north wall. These are instruments used in the 
determination of butterfat content in milk. Columns on the west side of Goldwin Smith show 
weathering related to the direction of major winter storms and the protection provided by the 
overhanging roof.

At the south end of Goldwin Smith, resting atop the subterranean Kroch Library, is the Sheldon 
Exedra. An exedra is a curved bench where in classical times Greeks and Romans gathered for 
informal conversations. Notice the weathering on this beautifully carved Carrara marble. How 
does it compare with the Vermont marble seen on the Performing Arts Center?

**Stop 8: A.D. White House, Uris Hall**
The A.D. White House was the home of Cornell University’s first president. Both the exterior and 
the interior are made of interesting stones. Many contain fossils. The gardens behind the house are 
a popular spot for alumni weddings.

Uris Hall (not to be confused with Uris Library) was built in 1972 from a somewhat unusual steel. 
This metal is an alloy of iron, manganese, copper, nickel, and chromium. It was designed to 
combine with sulfur in the atmosphere and produce a tough, tightly-bonded layer of iron oxide 
(rust). The rusty layer was intended as a substitute for paint on the building’s exterior. Any small 
scratch paints itself over automatically. It was not intended for the rusty layer to be quite so water-
soluble and paint the surrounding concrete.
Uris Hall contains the famous Cornell Brain Collection. Several of the more interesting human brains are on display outside of Room 211, the offices of the Psychology department.

**Stop 9: Sage Hall**
Sage College was Cornell’s first home for women students. In 1998 it underwent extensive renovation to become the home for the Johnson Graduate School of Management. The older portion of the building is chiefly of brick; the renovations used many colored stones from Canada and Brazil. All of this stone was shipped to Carrara, Italy to be cut to size, before being shipped to Ithaca for installation.

Notice how the old bricks have been repaired and the weathered mortar replaced.
SOME OTHER PLACES ON CAMPUS:

Mann Library:
Look for fossil snails and clams in cross section in the gray siltstone walls of the entry foyer. There is an especially nice snail shell at about eye level to the left of the door leading from the small foyer into the larger lobby.

Also watch for the stylolites that crisscross the somewhat metamorphic limestones and marbles used as floors, stairs, and bathroom walls on the Ag Quad. These structures are named for their jagged, pointed (like a stylus) shape. They remind some people of a row of sharp teeth or the record of an earthquake. Stylolites form when some minerals in limestone dissolve under pressure. A jagged surface of the darker, less soluble minerals is left behind. The stylolite surface (seen in cross section as a jagged line) is at right angles to the applied stress.

Morrison Hall:
The entry foyer is one of the best on campus. Note how the red granite of the exterior gives way to a softer, reddish limestone on the interior. The limestone is rich in fossil crinoids. Look for the five-pointed stars at the center of the crinoid stems. This feature is the hallmark of the echinoderms.

Also examine the horse head in Vermont marble by E. Abbe.

Cornell Plantations:
Look for Devonian fossils in the shales and siltstones of the Herb Garden by the Plantations Headquarters building.

Federal Nutrition Laboratory:
A very nice pegmatitic granite used as the front doorstep has wonderful crystals.

Campus bathrooms:
In general, architects put some of their nicest stones on bathroom walls. Take a closer look.

The Uris Hall--Statler Inn Bollard:
Bollard is a nautical term for the short pillar on a dock to which ships tie their lines. An interesting red pillar between Uris Hall and Statler Inn is used to block vehicular traffic on a pedestrian path. This stone is a syenite. It looks like granite and, like granite, contains feldspar and mica. Unlike granite, syenite has no quartz.

NOTES:
QUESTIONS

1) How do you distinguish a siltstone from a shale?

2) How does a flute or flute cast allow you to interpret the paleocurrent—the direction that water was flowing when the original sediments were deposited?

3) Find and record a campus location showing delamination of Llenroc.

4) Select a campus bathroom, record its location, and survey its stones. Are the stones in the bathroom similar to other stones used in the building?

5) What is the minimum number of dinosaurs needed to produce the tracks seen on the large, horizontal slab in the ground floor corridor of Snee Hall?

6) Which stone records a high energy environment of deposition (that is rough water as opposed to calm): Enfield shale or Onondaga limestone? Cite evidence for your conclusion.

7) Marble is a metamorphic form of limestone. One “age” of a marble is the time the limestone was deposited. Another possible “age” is the time the limestone was changed to marble. If fossils can be recognized in the marble, from which “age” are they?

8) Locate one of the three Triassic marbles and one of the four Ordovician marbles on campus. Compare and contrast the two stones.

9) Is the kimberlite dike in Cascadilla gorge older or younger than the Devonian bedrock that it intrudes?

10) Many campus buildings are made of brick or concrete, which are essentially artificial rocks. What stone is brick most similar to? What stone does concrete most closely resemble?

11) There are no campus building stones identified from the Cretaceous or Permian periods. The end of both these periods is marked by a major biologic extinction event. Do you suppose that there is a relationship between the extinction event and the lack of building stone? Why/why not?

12) Imagine a stream like the ancient river that drained the Devonian Acadian mountains. It carries a variety of things as it flows downhill—dirt, rocks, dead bugs, leaves etc. Think about the deposition of the particles carried downstream, and also about the dissolved materials transported by water—salt and other soluble minerals. Make a sketch showing specifically where sand-sized particles are found, where silt-sized particles are found, where clay-sized particles (the smallest) are found, and where soluble minerals will be found.

13) Do you think that stone weathers more quickly in its original location in a natural outcrop or in its new location as part of a campus building? Explain.
Figure 3. Bryozoans of the fan-like form.
Figures 4-5. Rugose corals, solitary.
Figures 6-7. Tabulate corals.