

Grenville Field Trip
Geology in the Field – EPSC 240
Sept 11+14 2019

This assignment is in two parts: the first part to take place during Wednesday lab session (Sept 11) involves locating and describing plutonic rocks, and metamorphic rocks with plutonic protoliths in the area around downtown campus, and the Saturday field trip involves seeing similar rocks “in the wild” at roadcuts through the Grenville Orogen near Grenville, QC. On this trip we will also see some more unusual metasomatic rocks (“skarn”) and build on rock descriptions to start synthesizing some relationships between related rocks.

Meet:

September 11 Wednesday lab: Meet at FDA 348.

September 14 Saturday field trip: 8 am at Milton Gates. We will arrive at outcrop at about 9 am, and leave for home around 4 pm.

Bring: Field kit (notebook, hand lens, pencils, colors, magnet and acid, camera), Lunch, snacks and lots of water

Wear: WARM clothes, rain gear, sun protection, gloves to keep hands warm in the rain.

Marking:

30%: Rock descriptions on/near campus (in notebook)

30%: Rock descriptions on Grenville structural features, contact relations, etc. (in notebook)

40%: Written report including the following sections:

- Introduction, including location, geologic background
- Summary (abbreviated) description of each rock type, assign name
- Description of contact relations between rock types and structural fabrics
- Synthesis of rock relationships from the field
- Inferred order of events (from cross-cutting relationships)

Instructions (Wednesday Lab): The on-campus sites are located on the attached topographic map. Your task is to prepare a field trip guide to plutonic and metamorphic rocks on campus (inspired by this one: <https://www.mcgill.ca/redpath/article/building-stones-and-fossils-downtown-montreal>). The Redpath Museum guide includes A LOT of limestones of the Laval Formation (part of the Trenton Group), which we have already seen *in the wild* at Peel and Pins so we won't focus on those today. In addition to the eight stops marked on the map, please add two (2) new stops of your own! Write a description similar to the other stops and add the locations to the map. Make sure the questions for each stop are answered. If you need a simple sketch in order to assist with your description, Write everything in your notebook.

1. The elevator banks in the McConnell building are faced with a very attractive stone (on floor 3, and maybe some other floors as well). Describe this stone and indicate whether it is igneous, metamorphic, or sedimentary. If metamorphic, make an educated guess about the protolith. Support your answer with observations.
2. On the stairs leading from Milton Gate up to Dawson Hall, there are three stone benches and the stairs themselves are made of stone as well. Determine how many different stones are represented by these four objects. Do a rock description for each and highlight any unique features you find. Are there any clues to the relationship between the different rock types? Note how the stones have been finished (surface texture) differently for different purposes.

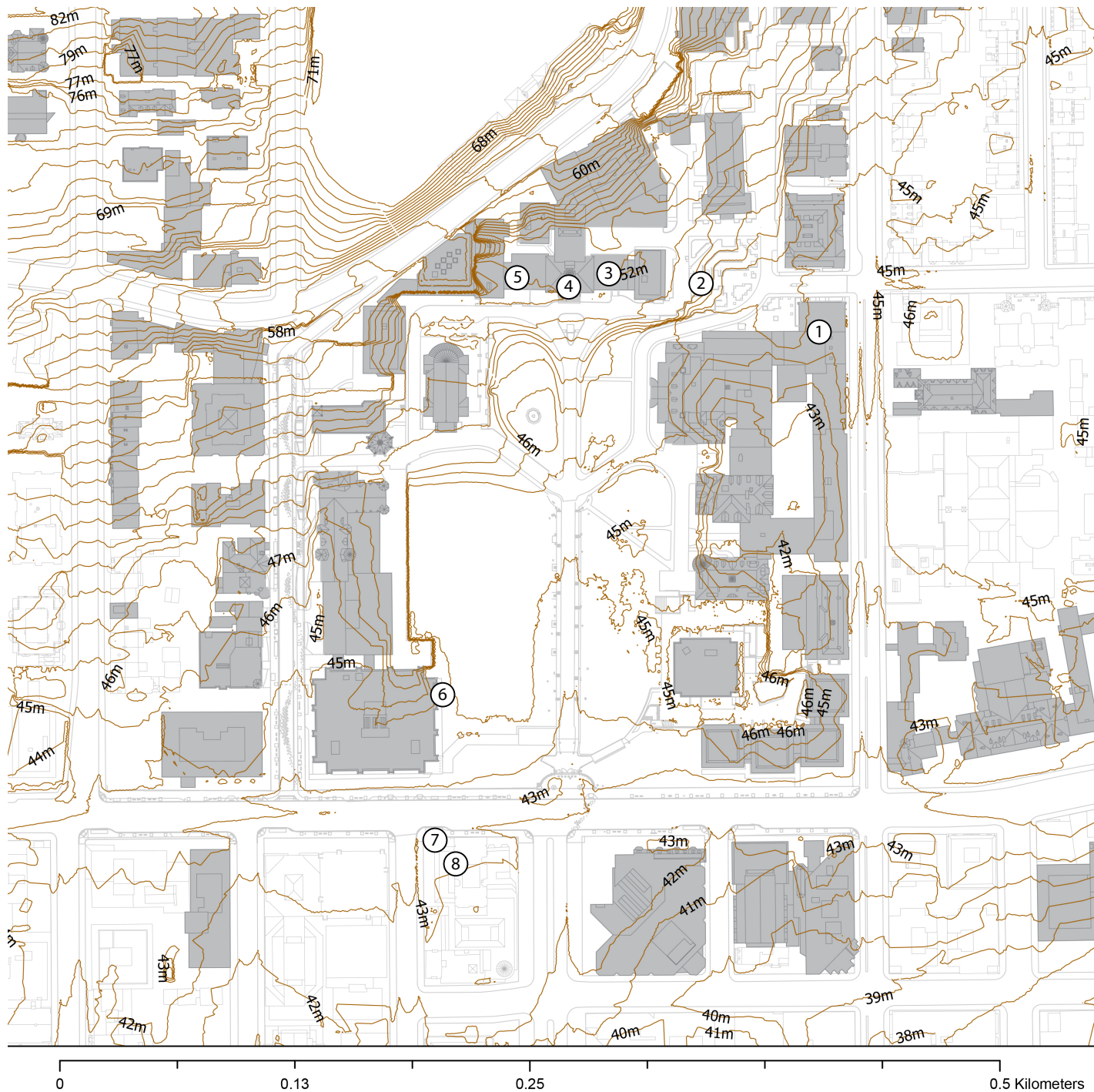


Figure 1: Campus map - topographic contour interval is 1 m. Made by Ian

3. Enter Dawson Hall and pass by the services area to the stairs on the left leading up to the Arts Building. Check out the reddish door jams (slabs of stone in the floor that lie only in the doorway). We haven't seen the exact equivalent of this rock yet - use the figures in your rock description guidelines to describe it and suggest a rock name. Contrast this natural rock to the dark-colored composite (called terrazzo) that makes up the floor in the stairs. Terrazzo is a type of cement which is dyed to produce a range of colors, mixed with an angular aggregate (sometimes natural stone, or chips of cement, or even glass shards). Terrazzo and other concrete products can sometimes fit the description of real rocks. How would you tell this is not a natural stone?
4. The floors of the Arts building on the ground floor are made of an attractive pinkish stone with some squiggly lines in it. These squiggly lines are called "stylolites" and they are common in rocks which are mostly composed of soluble minerals. Where the soluble minerals dissolve into water that flowed through cracks, the trace amounts of insoluble minerals start to accumulate. The walls of the Arts Building are made of an outwardly different, but actually very closely related rock. Do a rock description for the floor and one for the walls - make sure that your description of the planar fabrics in the rocks clearly distinguish between the two different stones.
5. Carry on down the hallway and you will see yet MORE stones used in the Arts Building. McGill budget must have been very different when this was built. Near the big front door, there is a detailed border in the floor with brick-shaped blocks of two stones we haven't yet examined, in addition to the ones we have just seen. The two new stones are white with grey streaks and black. The black stone shows up in larger pieces along the base of the walls in the hallway as well, and more detail can be seen on these larger pieces. A clue: both the white and black stones are closely related to the walls and floor stones you just described. Do a description of each and suggest appropriate rock names.
6. Leave the Arts building (by whatever means necessary, many doors blocked by construction!) and continue west toward McTavish St. On your way you will pass many buildings faced with Laval Formation limestone, the same as what we saw on Mt Royal (there is a lot of variation within the Laval Formation, diversity and abundance of fossils changes a lot). Walk down McTavish nearly to Sherbrooke street and near the bottom of the hill you will see a low, wide stone wall. Take a close look at this wall and do a rock description. How have the different faces of the stone blocks been textured? Key point: if you had only a polished face or a rough face of this rock to look at, would any details of your rock description change? What is better displayed, or obscured, depending on the type of finished face you observe?
7. Cross Sherbrooke St and check out the front wall of the ScotiaBank. The stone is the same across the front of the bank but the texturing is quite different. Similar to the previous stop, do a rock description here and indicate the role of the surface finish in changing what you see. What features are emphasized on either polished or roughened faces?
8. The final stop is the lobby inside the ScotiaBank. Here, the same stone from the front of the building is laid in patterns with another, dramatically banded stone. Do a description of this rock – it's a tough one! and hypothesize what kind of rock it might be, or how it formed.

Instructions (Saturday trip): Follow the Course Handbook guidelines for Notebooks and Rock Descriptions. On the Grenville Field Trip, additionally follow the instructions for Outcrop Descriptions.

At minimum, record at each site:

1. Start with a broad overview of the outcrop, including size, orientation, location, and general characteristics. Draw a quick sketch of the layout so you can mark the locations of subsequent observations relative to the whole scene.

2. How many rock types are present? Name each one and write a description which includes mineralogy, grain size, and the rock fabric (if any). You may wish to take samples of each rock type to help when you are writing up your report.
3. Describe the contact between each of the rock types (as many as are exposed). Determine whether any of the contacts reveal the relative age of the rocks. Record the evidence.
4. What structural features are present? Locate a fault or shear zone, and record a detailed description, including a sketch, orientation, size. Can you determine the direction of slip on the fault or shear zone? If so, report this direction and include supporting evidence.

Source of the Grenville Province Geological map: (<http://geogratis.gc.ca/api/en/nrcan-rncan/ess-sst/8e3bc99e-0b7d-5dae-9f17-ddf6b791f24f.html#distribution>)

The report should include the following sections. Lengths are just guidelines, not requirements, and the observation sections (II. and III.) should be as long as possible to completely report your observations. The three outcrops we have seen should be treated as one set of observations (e.g. do not divide between outcrops, summarize across the whole area):

- (I) Introduction (500 words): Purpose of report, brief description of the Grenville Orogen including appropriate citations, location of field observations.
- (II) Rock descriptions, written out in prose (not bullets). Each rock described should include mineralogy, grain size, and rock fabrics. You may include figures (photos or sketches).
- (III) Description of structures, including scale, appearance, orientation, etc. Illustrate these descriptions with sketches or photos.
- (IV) Interpretation (1000 words): Which rocks are older and younger? What was the sequence of events which affected the rocks in this region? Refer specifically to the observation sections II and III.
- (V) Reference List (if appropriate)

