

Geoscience Lesson #3: Thin Sections

Topic: Thin sections/rock saw (laboratory geologist)

Total Time: 50 minutes

Location: 317 and 209 Wallace

Required materials:

- Minimum 9 working microscopes
- A stack of matching thin sections representing Ig, Sed. and Metamorphic rocks
- Large rocks that can be used to demonstrate each of Ig, Sed., Metamorphic
- Several sheets of newspaper (steal from the Manitoban, make sure that content is appropriate)
- Optically pure calcite crystals, at least 15
- A handful of pairs of safety glasses
- Rocks that can be cut up, Lepidolite is perfect -- limestone will do in a pinch
- Paper towels

Class Setup (317 Wallace):

- **Make sure to put a notice on the door so that geology students are not upset about the lab being reserved all day**
- Arrive 30-45 minutes early for setup
- Uncover enough microscopes at the front of the room to be used by a maximum of 15 student
 - uncovered microscopes should be evenly distributed between the three tables
- Place thin sections for the three rock types out on the microscopes, ensuring that each table has only one unique rock type
- Make sure that all microscopes are working, focused, and using plain polarized light, and turned off before the first class arrives
- On the board:
 - 5 rules
 - Education requirements:
 - High School Graduation
 - Take Math, Physics, Chemistry, Geography
 - Go to University: U of Manitoba or Brandon University have geology programs
- Career name: Laboratory Geologist
- On the board, draw three circles in the manner of a microscope viewport, and label them Igneous, Metamorphic, and Sedimentary (order is arbitrary)
 - Leave the insides of the circles blank

Class Setup (209 Wallace):

- Move tables out of the way of the trim saw (small saw overlooking river)
- Ensure that the saw has enough water in it - when you turn it on, it should be wet
 - If you need to add water, simply pour a litre of water onto the table surface
- Make sure that the pieces of rock that are being cut are small enough for the trim saw
 - In order to make this portion of the lesson run smoothly, cutting the lepidolite (or etc.) into thin strips will make it easier for the kids to cut them as they will nicely lie flat on the saw table.
- Check the blade to ensure that it is still safe to touch while running - do this first while the saw is off, and then while it's on - if it is too rough, you will need to skip this part of the demonstration

Before entering class (5 minutes):

- Quick lesson summary before class begins
- Make sure that you go over some ground rules before letting the kids into the microscope lab
 - No touching knobs/dials/levers on the microscopes unless they are specifically told they can
 - No spinning on the spinny chair
 - Emphasize how expensive the equipment is - comparing it to a car seems to work well
- Make sure to tell them to sit at one of the uncovered microscopes, and not in the back corners of the room
- Tell them that the microscopes have not been turned on yet, so they will not see anything interesting yet (it stops them from playing with them)

Lecture section (15 minutes):

- Review rules
- Review education requirements
 - Need math to understand angles, and similar relationships
 - Need physics to understand the properties of the rocks and minerals, like Hardness or Density
 - Need chem to understand the molecular structure of the minerals
 - Need geography to be able to understand maps, and think about things in terms of their position and orientations
 - But, you don't really need to know the human geography portions, like history, etc.
- Ask them to recall the first lesson where we talked about crystals
 - Hand out the calcite crystals, making sure that they are gentle with them
 - have them put the crystals on the piece of some text (newspaper) to demonstrate the light-splitting properties of calcite
 - tell them that all crystals have some special properties, and that's why we look at them through the microscope
 - while collecting the crystals (make sure they don't pocket them), tell them that the slides are really just pieces of rock that are so thin that light goes through it
 - explain that we'll get to see the saw that we use to prepare the slides later
- Ask them to recall the two rock types from the previous lesson (Granite and limestone)
- Impress upon them that the mapping job from the previous lesson is more of a summer job for a geologist, and in the winter, you're likely to spend your time in a lab
- Tell them that they will be looking at three rock types in the microscope that day
 - Demonstrate using the hand samples the appearance of some typical rocks of those three types
 - On the board, for each type, draw what they are expecting to see if they are looking at one of the three rock types
 - For igneous, compare to ice crystals forming frost on a bus window - make sure crystals are drawn with random orientation
 - For sedimentary, compare to grains of sand that have been glued together, make sure crystals are rounded, and not intergrown
 - For igneous, compare to a block of warm butter that someone left out on the kitchen floor, and then someone came along and stepped on it - draw crystals narrow and mostly aligned

Activity #1 (15 minutes):

- Turn on the microscopes (have group leader help if they know how)

- kids will see mostly clear slides in plain polarized light
- Ask each of the tables to guess which one of the three rock types they are looking at in their slides
- Go around and turn on the polarizers, getting them to look again - this is a big "Oh Wow!" moment for the kids
- Once they've looked for a while, draw their attention to one of the microscopes at the front, and show them how to rotate the stage
 - tell them to try **slowly** rotating the stage while looking through the slide
 - Ask them if they can find any crystals that change from white to black to white to black repeatedly
 - Explain that this crystal is Quartz, and this colour change is one of it's special properties, just like how calcite split light
 - Don't worry if the kids are distracted while you are talking during this part - they are always totally silent and in total awe of what they are seeing
- Once they've all seen the slides, ask them again to guess which one of the three rocks they have - they should be closer to the mark this time
- Get all the kids to stand up and rotate to the next table, and get them to view a second rock type
- Repeat for the third rock type, and the kids should have seen all three
- Before leaving, make sure that they have in their mind that the saw they are about to see is connected to the microscopes, since that is how the slides are made
- Ask the kids to meet you in the hall - on your way out, **quickly** put all the microscopes back to plain polarized light for the next class, and turn them all off

Activity #2 (15-20 minutes):

- Lead kids downstairs to 209.
- Before entering room, warn them about a few safety things
 - The room smells like kerosene, but it's not dangerous
 - The saw is safe, but if you have loose clothing, please roll up your sleeves before using the saw
 - If you don't naturally wear glasses, you will need to have safety glasses on while using the saw
 - Lastly, there are rocks around the room that belong to a professor's research - tell them they can look at any rocks they want, but not to move them
- In the room, give them a minute to look around, and call them to the rock saw
- Before turning the saw on, tell them to look at the blade, and touch it (you may have to demonstrate so they aren't afraid)
- Make sure to tell them to never try this with any other saw
- Turn the saw on, and touch the spinning blade with your fingers - allow kids to try this as well - some will be too afraid
- Bring out the pieces of rock they will get to cut, and tell them they can keep a small piece that they cut off
- Demonstrate by cutting one piece, showing still that the saw will not cut you
- Have kids line up to cut pieces off the rocks - they can take these pieces home, so make sure that they are taking small enough pieces that you won't run out of rock during the day
- When they are done cutting, their hands will be dirty - there are sinks in the room

Teardown (end of day):

- In 317:
 - Collect slides, replace microscope covers
 - Discard newspapers

- Carefully rewrap calcite crystals
- In 209:
 - Pull plug under saw to drain water - put a few litres of water on the table surface to wash out basin under the blade
 - With paper towels, clean mud from saw table
 - Replug the drain, and pour discarded water out behind building (not in drain, as it will clog)
 - Replace any tables/etc. that you moved
 - Write in log book that you used the trim saw for about 60 slabs
 - This is so that the university knows that the equipment is being used, and it will continue to be made available in the future