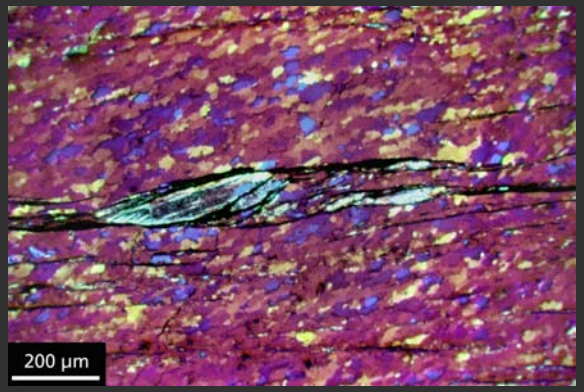
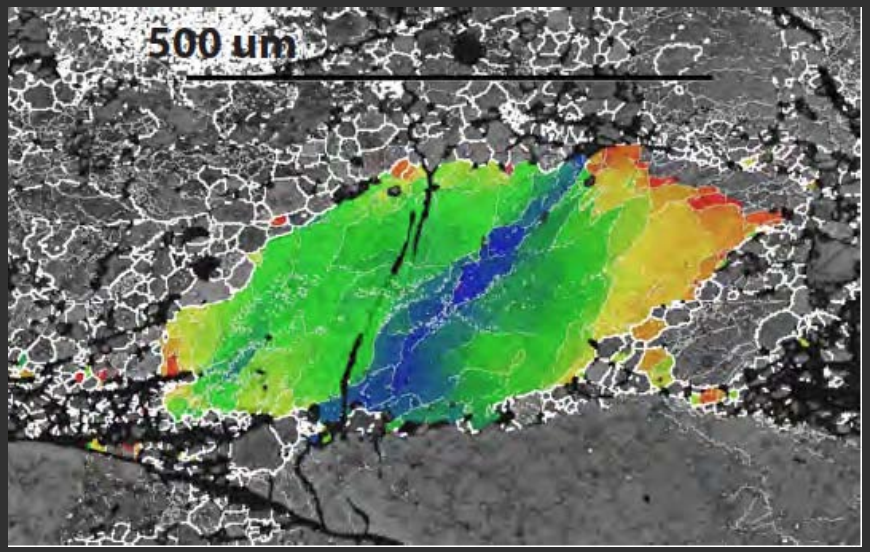
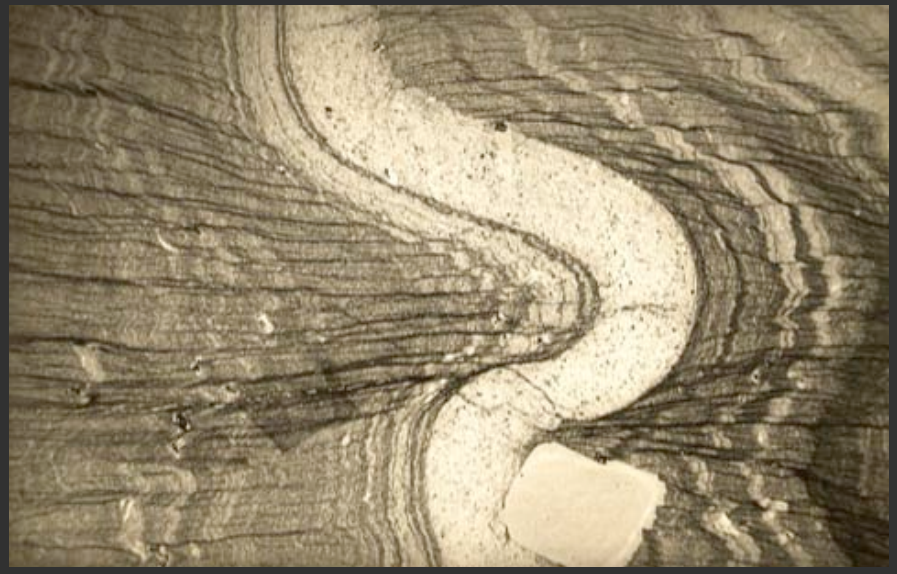
GES 209 MICROSTRUCTURES: WINTER QUARTER

Elizabeth Miller, instructor

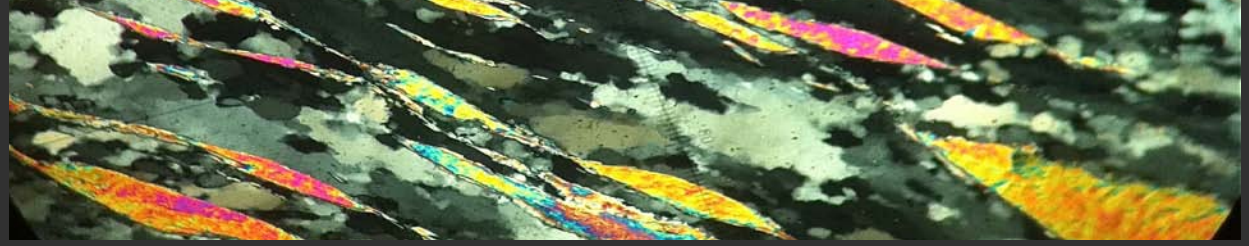
Room 241 Tu-Th 4:30-5:50 pm + lab (to be arranged)







From the atomic to the plate tectonic: How the continents deform



GES209: Microstructures
Winter Quarter 2018

Instructors: Elizabeth Miller
Time: Tuesday and Thursday at 4:30-5:50 pm Geocorner 241 (if conflicts we can work them out)
Labwork is in addition to class time (tba)
Level: Advanced Undergrad/Graduate Class and Seminar
Credits: 4, letter grade
Requirements: GES 110 Structure and GES 103 Rocks in thin-section (or their equivalents)

The interplay between temperature, pressure, and deformation in the Earth's crust produces a wide variety of structural fabrics and metamorphic textures in rocks. The ability to accurately describe, analyze and interpret these fabrics and textures in the field, hand specimen and thin section is essential to anyone interested in the structural and thermal history of metamorphic rocks and the thermo-mechanical behavior of the lithosphere.

This course brings together elements of macro- and microstructural analysis, metamorphic petrology, and geochronology and thermochronology as applied to mostly crustal metasedimentary and metaigneous rocks. It should be be useful to anyone carrying out structural studies (including electron backscatter diffraction or EBSD), metamorphic petrology and geochronology in deformed and metamorphosed terranes.

Topics will include geotherms and their variation, the rheology of the crust and mantle; how and why strain is partitioned and localized in the lithosphere; the meaning and nature of brittle–ductile transition zones; the development of deformation-related fabrics in sedimentary rocks with increasing T's and P's; metamorphic mineral growth; preferred crystallographic orientations; fault and shear zone geometry; the application of electron backscatter diffraction (EBSD) to microstructure analysis; and how best to integrate structural, metamorphic and geochronologic/thermochronologic datasets in holistic fashion.

Practical experience will be obtained by the study of several suites of metamorphic rocks that illustrate commonly observed structural and metamorphic progressions in nature. These include examples of increasing strain toward fault zones, variations in deformation and resultant fabrics with increasing temperature, the contrasts between fabrics and textures developed during burial versus exhumation and the analysis and interpretation of superimposed structural and metamorphic events. Your final accomplishment/exam will involve a description and interpretation of a suite of rocks and thin sections from your thesis/study area (we have a few on hand if you don't have any). Special sessions will be scheduled for these presentations and their critique.

Some useful textbooks:

Passchier, C.W. and Trouw, R.A.J., 2005, *Microtectonics*, Springer-Verlag, 366 p.
Fossen, H., 2010, *Structural Geology*, Cambridge University Press, 480 p.