Laboratory Exercise 1:
Intro to siliciclastic rocks

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Background material:

Principles of Sedimentology and Stratigraphy, (Third Edition), by Sam Boggs, Jr., Prentice Hall, 1987.

Goal:

The objective of this lab exercise is to introduce you to some of the varied rock types found in Ohio's sedimentary layers and provide an introduction to identifying and describing siliciclastic rock types. Part two of the lab will give you an opportunity to examine some rocks under the petrographic microscope.

Instructions:

Please work in lab groups of 2 people. All lab partners are expected to participate equally in the exercise and write-up. 4 rock samples are provided. Using the appropriate Rock classifications found in Boggs, place each rock into a classification and include a written description of each sample. Note fossils, sedimentary structures, grain sorting and size and any other pertinent characters. Figure 5.5 requires that you know the percentage of feldspar and matrix, you may note be able to determine this without thin sections, in such a case use figure 5.4. Your **typed** rock descriptions will be due at the beginning of the next lab period. Each person should submit their own lab report, but include the name of all group members.

Part 2 Thin Sections

1. This is a thin section made from a sandstone with both carbonate and quartz cement. Start by looking at the circled portion of the slide with the X10 objective. Look at the slide with the analyzer in (the sand grains will appear to be white, gray and black). What happens when you rotate the microscope stage? Now look at the slide with the analyzer out, the grains should appear clear with lots of impurities in the quartz grains. Do you notice a pattern to these impurities (look at

these with the analyzer out)? (hint: they should outline some of the grains? What do you think may have caused these outlines and what do you think they represent? Next hint: the quartz on the outside of the "outlines" caused by impurities is the cement. *Make* a quick drawing of 5 or 6 grains to show their original shape and their shape after the rock was cemented. Now move the slide around with the analyzer in (grains with be black, white or grey) look for an area with a dirty tan (pink/purple) stuff in-between the grains; this is the carbonate cement.

2. This is a thin section of the Sharon Sandstone from Virginia Kendal Park. Look at the small slide first without the analyzer (grains will appear clear). The light blue color between the grains is blue epoxy that was injected into the rock. Describe the porosity of the rock (and magnification you used)? Does the lack of cement explain why the rock crumbles so easily? Now look at the large thin section, this is also from the Sharon Sandstone. This thin section is too thick and is a little hard to look at. After you have looked at it with the petrographic scope, use the stereo dissecting scope to look at it (with the lighting from the top). What do you think the cement is? The cement in the large slide dissolves quartz as it grows. Look at the small slide and notice the jagged edges on the sand grains. Given this information, do you think that the cement from the large slide may have existed in the rock from the small slide at one time? Why?

3. There are 3 samples to look at here, all from the same rock. Classify the rock using the sheet provided to you during lab. One sample has been chipped from the outcrop, one has been polished and last has been thin sectioned. Look at the thin section with the stereo dissecting microscope with the light coming from the bottom of the microscope (transmitted light). Briefly describe what you see. What do these 3 sample tell you about how preparation methods alter what's visible? Would your description of this rock have been different if only the smaller untreated sample were available? How would it differ?

4. This is a thin section from a rock similar to one found in your hand sample. Look at the slide with the analyzer and without. The quartz grains will appear black/white/gray and the clay cement will appear in the brownish range of colors including minerals of white mica and biotite. Biotite is the light brown/yellow mineral and is pleochroic, meaning when you rotate the stage it changes

from light brown to almost opaque. Once again describe and classify the rock using the thin section and handsample.

5. This is a thin section and handsample of the Berea Sandstone. Look at the thin section with and without the analyzer in and once again classify and describe the rock. Based on your observations, between the Berea Sandstone and the Sharon Sandstone, from which would you rather build your house? Why?

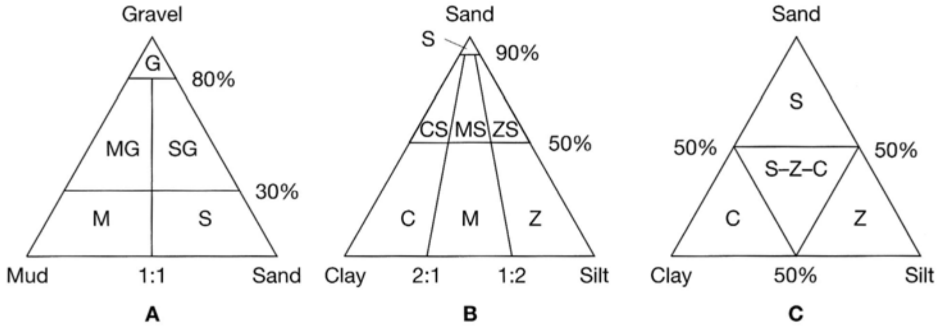

Figure 5.4
Nomenclature of mixed sediments. A, B. Simplified from Folk, C. After Robinson. G = gravel, S = sand, M = mud, C = clay, Z = silt, MG = muddy gravel, SG = sandy gravel, CS = clayey sand, MS = muddy sand, Zs = silty sand. [Reprinted from Folk, R. L., 1954, The distinction between grain size and mineral composition in sedimentary rock nomenclature: Jour. Geology, v. 62, Fig. 1a, p. 346, and 1b, p. 349, reprinted by permission of University of Chicago Press. Robinson, G. W., 1949, Soils, their origin, constitution, and classification, 3rd ed.; Murby, London.]

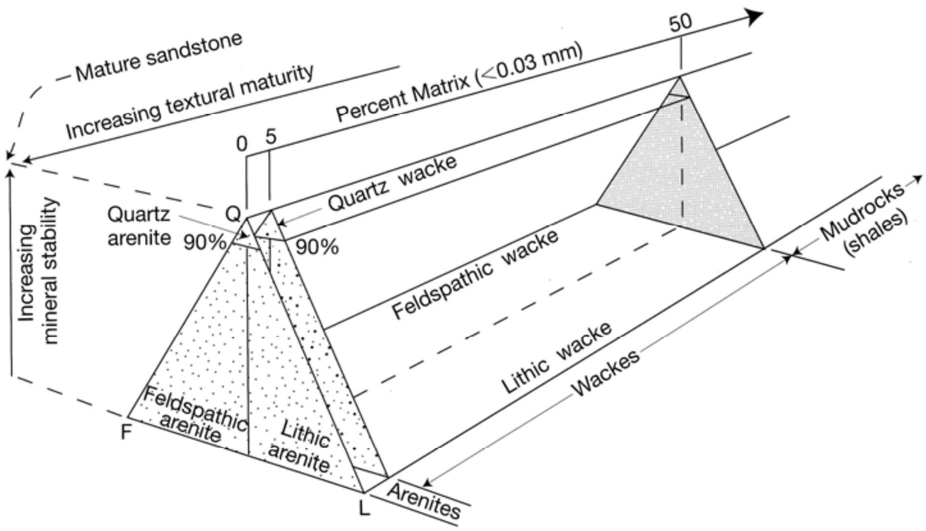

Figure 5.5
Classification of sandstones on the basis of three mineral components: Q = quartz, chert, quartzite fragments; F = feldspars; L = unstable, lithic grains (rock fragments). Points within the triangles represent relative proportions of Q, F, and R end members. Percentage of argillaceous matrix is represented by a vector extending toward the rear of the diagram. The term arenite is restricted to sandstones containing less than about 5 percent matrix; sandstones containing more matrix are wackes. [After Williams, H. F., F. J. Turner, and C. M. Gilbert, 1982, Petrography, an introduction to the study of rocks in thin section, 2nd ed., W.H. Freeman and Co., San Francisco, Fig. 13.1, p. 327. Modified from Dott, R. H., Jr., 1964, Wacke, graywacke, and matrix = what approach to immature sandstone classification: Jour. Sed. Petrology, v. 34, Fig. 3, p. 629, reprinted by permission of SEPM, Tulsa, OK.]

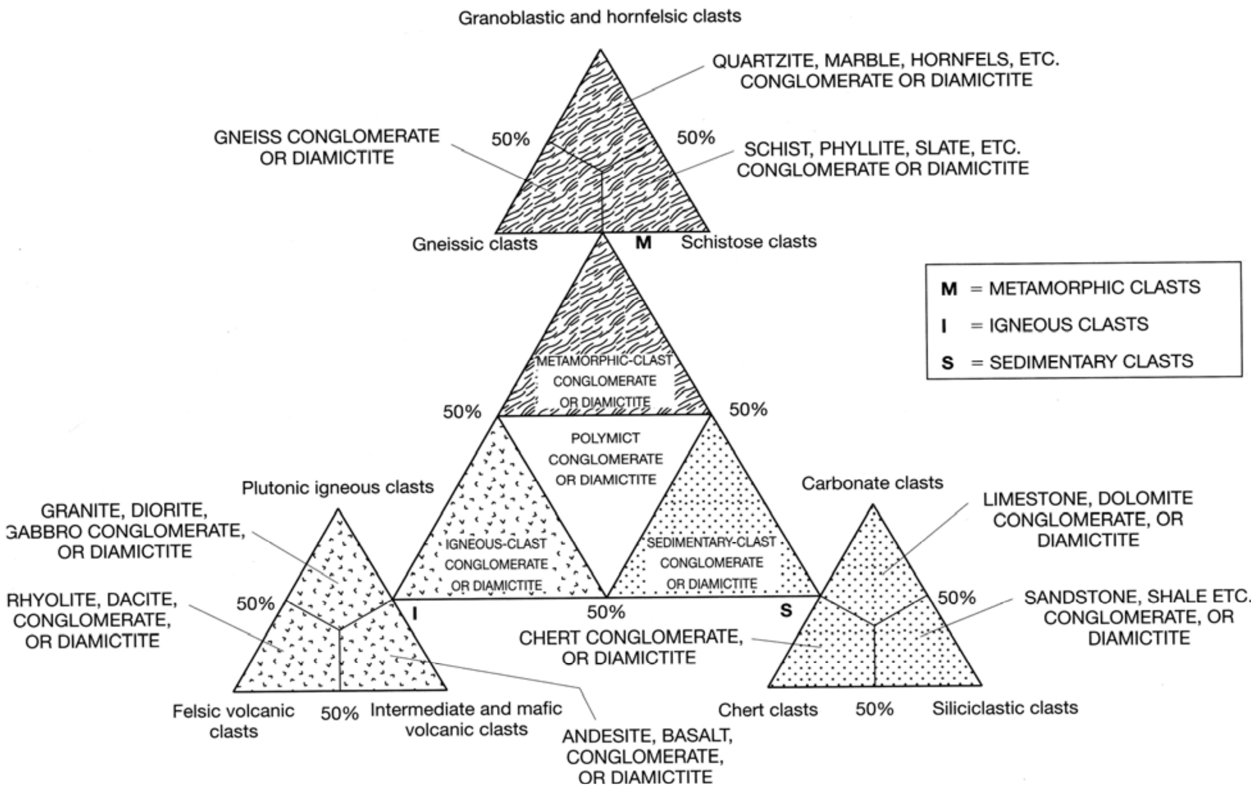

Figure 5.9
Classification of conglomerate on the basis of clast lithology and fabric support. [From Boggs, 1992, Petrology of sedimentary rocks, Fig. 6.3, p. 220: Macmillan Publishing Co., New York, reproduced by permission of Prentice Hall.]

Table 5.7 Classification of Shales

Percentage clay-size constituents			0–32	33–65	66–100
Field adjective			Gritty	Loamy	Fat or slick
NONINDURATED	Beds >10 mm		Bedded silt	Bedded mud	Bedded claymud
	Laminae <10 mm		Laminated silt	Laminated mud	Laminated claymud
INDURATED	Beds >10 mm		Bedded siltstone	Mudstone	Claystone
	Laminae <10 mm		Laminated siltstone	Mudshale	Clayshale

Source: Potter, P. E., J. B. Maynard, and W. A. Pryor, 1980, *Sedimentology of shales:* Springer-Verlag, Table 1.2, p. 14.

Gritty: Gritty

Loamy: smooth with some grit

Slick: smooth