

12.490 Advanced Igneous Petrology

Calc-alkaline Plutonic Rocks

This set of samples is from the Academy pluton in the western foothills of the Sierra Nevada. The pluton is Jurassic – Early Cretaceous in age and represents an excellent example of a zoned calc-alkaline pluton.

As you work through this lab, use the accompanying paper by Mack et al. and the map to think about the following questions.

- 1) Which of these samples represent liquid compositions and which ones are cumulate residues of crystallization? Hint: Do the Tables of chemical analyses in the paper help?
- 2) Based on the map and your observations in thin section can you distinguish between the emplacement mechanisms illustrated in Fig. 13 and discussed beginning on p. 684?
- 3) Arrange the samples that you examine below in order of increasing bulk silica content and degree of differentiation – e.g. least evolved to most evolved. Does the An content of plagioclase help you out here? Why?

Sample HBG-1 This is the most mafic sample in the suite – a hornblende gabbro.. What are the primary igneous minerals? What was that early-forming mineral that is now altered?

Sample SM-4 and CM-5. These sample are both quartz diorites. Again, choose one of these two samples and identify the major igneous minerals. Are these samples liquids or cumulates?

Sample AC-7 This sample is a norite What minerals are present in this sample?

Sample AC-8 and AC-9. Choose one and these two samples and identify the major igneous minerals. Are these samples more evolved than CM-5 and SM-4? What evidence do you use?

Sample AC-12 This is tonalite. Identify the major igneous minerals, determine the plagioclase composition. Order it along with CM-5 - SM-4, Ac-8 – AC-9 in terms of extent of differentiation.