Teaching (classes, advising, other activities)

Overview

Teaching comprises a large fraction of what I do and enjoy --- it takes place in formal courses, in advising, and in many informal settings on campus and in the field. Most of my teaching and advising is related to my general interests in geology: physical geology, mineral deposits, mineralogy, geochemistry and petrology. I typically am involved in at four courses during the academic year including Physical Geology (251), Mineralogy (306), and advanced lecture classes or seminars. Given Arizona's superb geologic setting and exposures and the importance of a solid foundation in field methods and experience, field trips and field instruction is involved in each course that I teach.

Research -- be it graduate theses, undergrad independent studies, or collaboration on post-doctoral projects, is another rewarding area where I spend much of my time. Advising students is significant part of this, here are many other opportunities for interacting with students outside the classroom or field trips. Current and past projects are summarized on the research group page.

Please see the opportunities page and the Department of Geosciences website for information about educational and research opportunities and for information on admission to the Graduate Program. Visit the LPEG website for information on the Lowell Program in Economic Geology.

Classes

Physical Geology (GEOS 251)

I teach Physical Geology during the Spring semester. The class provides a broad introduction to geology for majors and other interested students. A calendar, syllabus, and other information specific to my class are posted on the web during the semester (the content changes with instructor). The class consists of 2.5 hours of lecture per week, a weekly lab, and up to 6 field trips to geologically diverse areas in southern Arizona (4 required; one of the optional trips is to the Tucson Gem and Mineral Show). Field trips are an integral part of the lab. Class size ranges from 25-40.

Mineralogy (GEOS 306)

Mineralogy is a three unit course required for Geosciences majors and comprises and introduction to the principles of mineralogy and the practical identification of minerals in hand specimen and thin section. After a multi-year hiatus, I have rejoined teaching Mineralogy, now in collaboration with Professor Bob Downs. I tech the second half of the class which focuses on minerals in rocks -- their identification in thin section and the basic nature and principles of their distribution in nature.

Right: A petrographic thin section of a deformed quartz vein. 2 mm wide view in crossed polars with gypsum plate. This illustrates that structural as well as mineralogical information can be obtained from thin sections.

Field Camp (GEOS 414)
In coming years, I will be involved in teaching field camp, probably on a collaborative basis with other Geosciences faculty. In past years (1986 to 1992), I taught field camp at U.C.L.A. and at then at the U. of A.. The focus of field camp has always been on broad-based instruction in mapping techniques that can be applied to many problems from sedimentary systems to structural geology to igneous systems to landscapes to mineral deposits. Learning to record diverse features in the process of making geologic maps and critical thinking are the core of this course.

**Economic Mineral Deposits (GEOS 446/546)**

Economic Mineral Deposits provides an overview of the types, characteristics, distribution, economic significance, and origins of the major families of mineral deposits. Because mineral deposits form in virtually all crustal settings, the course also provides a broad-based review of much of crustal geology and an introduction to the geochemistry of fluids. The course includes several field trips and a weekly lab (the latter only when TA support is available). Spence Titley and I trade-off teaching this course (he currently has responsibility).

*Left:* Students examining tilted section through a hydrothermally altered Proterozoic marine caldera sequence with exposures of jasperoid representing the distal evidence of syngenetic massive sulfide mineralization. Jerome district, Arizona.

**Fluid Petrology (GEOS 596B [seminar in petrology])**

Fluids and fluid-rock interaction play a significant role in every crustal and upper mantle environment -- from weathering and sedimentation to subduction zones and modification of the upper mantle. This course, which is taught intermittently as a seminar, focuses on the geochemical and petrological principles of fluid-rock interaction, a survey of major environments and how to recognize and interpret fluid-mediated phenomena, and an introduction to the application of these ideas to a wide range of geologic issues. The class is primarily a lecture, but has one or more field trips and regular homework sets and reading.

*Above right:* Pressure-temperature diagram showing fluid paths for contrasting geologic processes that produce common vein types in many different settings. Observation of the timing and character of fluid features in the field coupled with an understanding of their origin can help unravel complex structural and petrological, as well as ore-forming histories.

**Advanced Ore Deposits (GEOS 646)**

Designed for students with an introductory background in ore deposits and/or training in petrology and geochemistry, Advanced Ore Deposits focuses on developing the tools and concepts appropriate to a quantitative understanding of the geologic systems that form
mineral deposits and have extensive parallels in many settings). Key elements include: (1) mapping of mineral deposits, (2) involved treatment of representative, diverse ore-forming environments, and (3) introduction and development of the mineralogical, geochemical, petrological, and physical tools that help one understand and predict the behavior of these diverse geologic systems.

Right: Part of a student field sheet showing an example of one method of trench (strip) mapping that we teach in advanced mapping. The goal is to record many features (lithology, structure, alteration, timing, veins) on the same map. This general approach can be applied in many settings besides mineral deposits -- for example, in subduction zone melanges.

Topical Seminars (GEOS 596A,B,C -- in petrology, geochemistry, mineral deposits)

Seminars cover many topics, generally in an informal once-a-week setting, typically with one or more field trips. Topics in recent years have included: porphyry deposits, analytical techniques in the geosciences, paleoclimate and mineral deposits, advanced techniques in mapping, and scientific writing in economic geology. Seminar topics are generally chosen in consultation with students to reflect current interests and needs. They are generally co-taught with other faculty, many with Eric Seedorff.

Other Teaching

I am also involved in short courses, occasional lectures, and beginning in 2005 with the Lowell Program in Economic Geology. Field trips with classes and for other purposes have always been a particularly enjoyable part of teaching. The photo below was taken during the SEG field trip in 2000 (Contrasting Hydrothermal Systems, SEG Field Guide 32).
Advising

Undergraduate Students: Most advising of undergraduate students in Geosciences is carried out through the Department, however, I do work closely with students who have interests in several fields, notably economic geology (mineral resources) and petrology. I am also always willing to discuss opportunities with all students. Over the years, many undergraduates in our group have been informal advisees through roles as field assistants, work study jobs, and independent study projects. In nearly all cases, undergrads have worked closely with one or more other students (graduate or undergraduate) and/or post-docs.

Graduate Students: My major roles with graduate students over the years have been either as major (or co-) advisor or as a thesis committee member. I have also worked with many other graduate students in an informal capacity where interests overlap -- for example in the lab. My commitment as an advisor is to help everyone find a project that excites them and addresses their goals, and then to see that this project is adequately supported, efficiently developed, and completed in a timely manner. This works best when students commit to projects of their own rather than simply fill a pre-defined need. In practice, most theses fit in the context of ongoing research or my overall research interests.

I am also advisor to the Society of Economic Geologists student chapter. As the Lowell Program in Economic Geology becomes active, I plan to be involved with many of the formal projects required for that degree. and have been informally involved with a number of student projects where there is no formal association.