

July 2018, GEOL4725-Field Geology of South Australia
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"The way to knowledge of natural history is to go to the fields, the mountains, the oceans, and observe, collect, identify, experiment and study."

Reverend John Walker, 1731-1803.

A contemporary and colleague of James Hutton (Mr. Uniformitarianism, and so-called "father of geology"). Walker taught one of the first systematic courses in geology at the University of Edinburgh, 1781 to 1803.

Instructor

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There's no single location where one can find a sequence of rock layers that truly represents a continuous record of geologic history. But South Australia has a fantastic array of diverse rock types, including one of the best records of the Neoproterozoic, the time when complex life first evolved, that is entirely absent from Colorado.

Our plan is to use a series of field exercises that explore the rocks, geologic structures, and time periods that are showcased in South Australia and use our observations to deduce key aspects of South Australia's geologic history. We'll examine, for example:

- 1) Mesoproterozoic igneous rocks that emit such exceptionally high radiation that they are used by planetary scientists to study the harsh radiation conditions life would have to endure on Mars.
- 2) Neoproterozoic sedimentary rocks that reveal the area's extensional tectonic history, its climate, and evolution of Earth's first complex, multi-cellular organisms.
- 3) Cambrian sedimentary rocks whose history of folding reveals the onset of convergent margin tectonics in Eastern Gondwana and whose Permian erosion history contains important paleoclimatic information.
- 3) Cretaceous sedimentary rocks that reveal the presence of an epicontinental sea and whose diagenetic alteration has produced precious gems.

The emphasis will be on deciphering geologic processes and events through careful field mapping and observation. Certainly since the time of John Walker (see quote above), geologists have come to bring all kinds of modern technological tools to the forefront (from seismic tomography to electron microscopy to mass spectrometry, etc.), but an understanding of basic field relations is still the fundamental means by which we set the stage for solving geologic problems.

A focus point for the course, and part of student evaluation, will be recognizing the key distinction between field observations (i.e. "data") and reasonable inferences about how rocks and structures have come to be (i.e. "models" or "hypotheses"). The business of separating factual information from theorizing is not only part of doing good science,

it's probably helpful in many aspects of life!

You will document your learning via: 1) the keeping of a field notebook that records your observations; 2) completion of a series of group projects. You will participate in a group oral presentation almost every evening and you will also submit relevant written materials that support that presentation; 3) compilation of a concluding essay that summarizes the geologic evolution of South Australia as revealed by your observations during the class.

Student Expectations

On most days, students will be presented with a brief overview of day's activity by faculty directors. Students will then work on field exercise in 3-4 person groups. Although each student will be working in a group, each needs to keep their own field notebook (this will be turned in at end of class and will count towards your final grade). In the evening, each group will prepare and give a presentation for the entire class describing their day's findings.

Grading

Student grades will be based on their participation in daily field exercises (25%), participation in evening discussion (15%), and on quality of their field notebooks and written summations (35%). The culminating activity will be a 3-5 page paper that integrates your field observations into a summary of the geologic evolution of South Australia (this is NOT a library or internet exercise-you must base your paper on observations made during class). The grammar and writing mechanics this paper displays is an important part of the grade (25%).