Detailed Description of Geol 2 “Think Like a Geologist” Field Trip to Downtown San Jose

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As the title suggests, this field trip aims to get students to think like geologists. For civil engineering majors specifically, the goals are to have the students: 1) view construction materials and design as geologists would, and 2) understand the influence civil engineers have in preventing or lessening the effects of flooding and earthquakes. Here is a link to a Google map of the field trip: <http://goo.gl/maps/r90kh> . Click on each place marker, then “Street View” under the “More” menu, to see what the stops look like. There are street view photos of each stop, except for the starting location and first stop, which are on the San Jose State University campus.

**Stops 1 & 2:** The first two stops on the field trip familiarize the students with macroscopic features of igneous rocks. We observe only the large scale features of the rocks while considering the causes and possible effects of composition, compositional uniformity, and size of the minerals. Students learn that rocks with large interlocking mineral grains indicates an igneous rocks that formed underground. We discuss that these are very durable but dense rocks.

**Stop 3:** At this stop, students compare two types of granite and a sandstone. Students are asked to identify the igneous rock, using knowledge from the previous stops (i.e. they look for the rocks with interlocking visible minerals). Next, students learn to identify the basic minerals present in granite: quartz, feldspars, biotite, and hornblende. This stop introduces students to the first sedimentary rock on the trip, a marine sandstone. They are asked to identify the clasts in the sandstone in order to determine that they come from a beach environment and to differentiate the clasts from the interlocking minerals of the igneous rock.

**Stop 4:** At this stop, we look at the San Jose Art Museum building. We look at igneous and sedimentary rocks again, and also discuss the effects of the 1906 San Francisco earthquake on the building. After identifying the building stone as terrestrial sandstone and contrasting it with the marine sandstone of the previous stop, we discuss possible reasons for construction the building from sandstone rather than the more durable diorite used for the steps. Before moving on, we compare the damage done by the 1906 San Francisco earthquake to the San Jose Art Museum with the lack of damage to the cathedral across the street. We discuss the structural strength of arches and domes and their role in minimizing the effects of the earthquake.

**Stop 5:** Here we see an example of columnar jointing in basalt. We discuss the size differences between the minerals of rocks which solidified above and below Earth’s surface and the causes of fracturing in rocks. The columns are weathered, so we review the principles of mechanical weathering and whether or not weathering needs to be considered when choosing rocks for various applications.

**Stop 6:** Guadalupe River. The steps leading down to the river are made of schist. This is the first metamorphic rock observed on the trip. We take the steps down to the walkway running along this channeled portion of the river and observe the artificial channel. We look at the channel both longitudinally and in cross-section, noting the curvature of the channel in plan view, and the terraced design in cross section. Here, issues of flooding and channeling rivers are discussed along with the specific design features put in place to preserve the riparian environment at this location. Students leave with an appreciation for creating solutions to flooding that respects both the natural behavior of streams, and life in and around the stream.

**Stop 7:** At the Adobe Systems building, we compare and contrast igneous and metamorphic façade stones. By comparing and contrasting the two stones, students learn to identify metamorphic rocks by using characteristics of: rotation and preferred orientation in minerals, shear zones, and folds. We also discuss why these particular rocks are practical only as façades and consider why the beautiful schist used for stairs leading to the river, is not used as building façade.

**Stop 8:** When our field trip coincides with a free admission day at the San Jose Tech Museum, the class makes a stop here. We view the sample seismometer and watch it record vibrations. We try out the hands-on exhibit that simulate stress build up in rocks and play with a shake table. Students ride the earthquake simulator to experience the severity and different characteristics of historic earthquakes from around the world.

From here, we return to the university campus and summarize what we have learned on the trip.