University of Western Ontario

Society of Economic Geologists – London Student Chapter

Spring Trip: Southwestern United States

Introduction

Between February 14th – 23rd, this year Western University SEG student chapter organized an international field trip to visit prolific copper porphyry mines in the southwestern United States. Eight students had the opportunity to visit two operating mines and several historic and geologic sites in the region. The students attending the field experience were a mixture of graduate and undergraduate members of the Western University SEG student chapter. The main purpose of the trip was to view the outstanding geological variability of the region and to further our understanding of the economically important mineral districts. Visiting these sites allowed students to gain first hand understanding of conditions of formation, mineral deposition, and tectonic factors influencing the geology of the area. The first mine tour of the trip was to Chino Mine outside of Silver City, New Mexico. This is a world class copper porphyry system with varied styles of mineralization; native copper, copper carbonate, and copper sulphide ores. The second tour was to Moss mine outside of Bullhead City, Arizona. Moss mine is a low sulfidation epithermal gold-silver deposit. Plans were made to tour Freeport McMoran's, Bagdad copper porphyry mine, however due to unforeseen weather conditions, the tour was cancelled. Important geologic sites such as the Red Bed copper deposits outside of Socorro New Mexico and the Sandia Peak Lookout in Socorro helped students gain insight to the regional geology and mining history of the area. Our field trip guide was professor Nigel Blamley from Western University. We were also assisted by Andy Campbell from the New Mexico Institute of Mining and Technology

Trip Participants:

Dr. Nigel Blamey – UWO Professor & Trip Leader
Tom Baechler – MSc Student & SEG Student Chapter Vice President
Jason Wozniak– MSc Student & SEG Student Chapter Secretary
Cassandra Powell- MSc Student
Jay Nigim- MSc Student
Remy Klick- BSc student
Tyler Travis- BSc student
Tyler Beattie- BSc student
Anthony Carreli- BSc student

Trip Overview

02.14.2019 – Arrival in Albuquerque, New Mexico

02.15.2019 – Trip to Sandia Peak Lookout. Discussion with Nigel Blamey on large scale tectonic history on South West United states.

02.16.2019 – Lecture from Andy Campbell discussing regional geology of New Mexico. Regional tour of Red Bed Copper occurrences and manganese veins of the Chupadera Mountains.

02.17.2019 – Trip to the basaltic flows of the Valley of Fires and the White Sands National Monument.

02.18.2019 – Tour of Chino Mine lead by Carson Klemp and afternoon visit to the Very Large Array outside of Socorro New Mexico.

02.19.2019 – Travel to Flagstaff, Arizona with stop at Meteor Crater.

02.20.2019 – All day hike of the Grand Canyon.

02.21.2019 – Snow Day. Traveled to Bullhead City, Arizona. Bagdad Mine tour canceled.

02.22.2019 – Tour of Moss Mine lead by Joe Bardswich and Sarah Clark. Travel to Las Vegas

02.23.2019 – Flight back to Detroit, Michigan.

Thursday February 14th

Left London at 1:00PM and drove to Detroit Metropolitan Wayne County Airport (DTW) SW Airlines Flight # 104 departed at 6:25pm from DTW and arrived in DAL at 8:30pm. 1 hour and 20 min layover and then SW Airlines Flight # 1169 departed at 9:50pm from DAL and arrived in ABQ at 10:45pm. Overnight in Albuquerque at the Best Western

Friday February 15th

Visit to Sandia Peak lookout to view the Rio Grande Rift valley. Discussion with Nigel Blamey on the valleys large scale tectonic processes and its influence on the topography and geology of the south western United States. Hiked through the Petroglyph National Monument and then drove to Socorro New Mexico where we stayed at the Econolodge.

Figure 1: Panoramic view of the Rio Grande Rift Valley from Sandia Peak in Albuquerque New Mexico. The Valley is a failed rift system which formed 35 to 29 million years ago. Lithospheric spreading triggered volcanic activity in the system and created the horst and graben topography seen today. The formation of the basin in this area has led to the deposition of sediments almost three miles thick.

Figure 2: A petroglyph from the Petroglyph National Monument of New Mexico. Within this area there are hundreds of petroglyphs which were carved 400 to 700 years ago. These symbols hold cultural significance to contemporary Native Americans as well as show the influence of early inhabitants in the area.

Saturday February 16th

Met with Andy Campbell from New Mexico Institute of Technology and discussed the regional geology of New Mexico. Tour of Red Bed Copper occurrences and manganese veins of the Chupadera Mountains. Returned to the Econolodge in Socorro.

Figure 3: Trip participants standing in front of a historic malachite and azurite mine shaft. Standing on the far left is trip leader and Professor Dr. Nigel Blamey, and on the far right is Dr. Andy Campbell. The red bed copper occurrences in this area formed from the precipitation of copper rich minerals from fluids in the arid desert sediments. These minerals are concentrated in the porous layers of the sediments where they were then mined to extract the copper.

Figure 4: Old mine headframe from historic manganese extraction. Mineralization occurs as black/grey pyrolusite veins and psilomelane blebs. Manganese extraction still occurs in this area to date.

Sunday February 17th

Drove to Silver City, New Mexico in preparation of our tour of Chino Mine the next morning. Stopped at basaltic flows of the Valley of Fires and the White Sands National Monument. Stayed at the Drifter Hotel in Silver City.

Figure 5: Ropey Pahoehoe basaltic flow in the Valley of Fires State Park. These flows are some youngest and best preserved flows in the United States aging about 2000 years old. The small cracks and chasms in the rock are formed by the solidification of the magma and trapping of air bubbles. These bubbles become cannot support the rock above them and the rock collapses.

Figure 6: Trip Participants at the White Sands National Monument. The White sand is actually a gypsum sand formed from the erosion of selenite crystals up wind of the area. The gypsum was first deposited in the Permian period in a restricted evaporation basin. This gypsum was then recrystallized into larger selenite crystals at Lake Lucero where they erode into sand sized grains and travel to the national monument.

Monday February 18th

Tour of Chino Mine operated by Freeport-McMoRan lead by Carson Klemp and afternoon visit to the Very Large Array outside of Socorro New Mexico. Returned to Socorro where we stayed at the Econolodge.

Figure 6: View of the open pit at Chino Mine. This copper-molybdenum mine is host to mineralized stockworks, native copper beds, skarn hosted copper, and malachite-azurite hosted copper. This deposit has been operated since 1909 and continues to be operated. The stockwork veins of the deposit have been enriched by supergene conditions. Occurrences of chalcocite and chalcopyrite help the mine reach economic grades today.

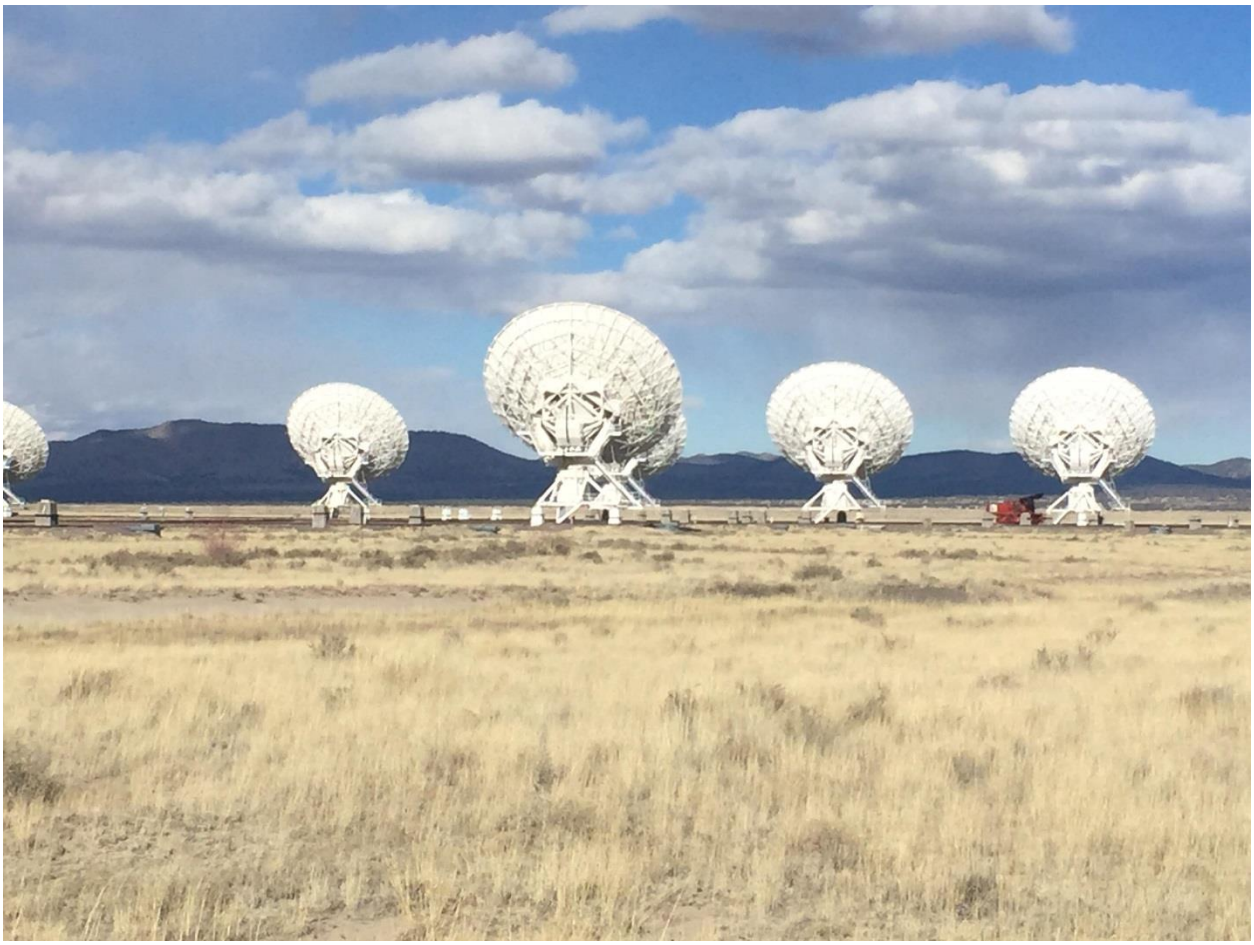

Figure 7: Our visit to the Very Large Array. There are 27 massive dish telescopes which use radio signals to observe planetary bodies and other space objects. These dishes can be moved along rail tracks to set positions to adjust resolution of the image formed by the telescopes.

Tuesday February 19th

Spent the morning at the New Mexico Bureau of Geology Mineral Museum where students viewed a beautiful collection of regional and global mineral specimens. Toured the Campus and were introduced to the campuses analytical equipment. Then Traveled to Flagstaff, Arizona, stopping at Meteor Crater. Stayed at the Econolodge in Flagstaff.

Figure 8: The Western SEG group standing atop the rim of Meteor Crater near Winslow, Arizona. The crater was created about 50,000 years ago during the Pleistocene and is roughly 1,200 meters in diameter and 170 meters deep. The object responsible for the crater's formation is a nickel-iron meteorite about 50 meters across. It is predicted that the meteor impacted at 12.8 km/s.

Wednesday February 20th

Embark on an all day hike of the Grand Canyon. Return to the Econolodge in Flagstaff Arizona.

Figure 9: SEG participants begin their descent down the Grand Canyon (South Rim) through a snow covered South Kaibab trail.

Figure 10: The Western SEG crew standing beside the Colorado River, at the bottom of the Grand Canyon.

Thursday February 21th

Snow Day. Traveled to Bullhead City, Arizona. Bagdad Mine tour canceled. Stayed at the Days Inn by Wyndham.

Friday February 22th

Tour of the gold-silver Moss Mine near Bullhead City. Tour was lead by Joe Bardswich and Sarah Clark. Students viewed outcrop, discussed the structural/local geology, visited the open-pit, studied core and learned about the cyanide heap leach process on site. Travel to Las Vegas where we spent the night at the Aria Hotel.

Figure 11: Trip participants in front of the mill and open pit at Moss Mine operated by Golden Vertex Mining Corp. Golden Vertex's Moss Mine is an Au-Ag epithermal, brecciated, low sulphidation quartz-calcite vein and stockwork system extending over a strike length of 1.4km.

Saturday February 23rd

Flight back to Detroit, Michigan. Everyone had a safe and informative trip.

Thank you to all of our sponsors for your generous support. Without you, this field trip would not have been possible.