

Dalhousie University: Faculty of Earth Sciences Advanced Field School

Field School Summary

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Offshore Energy Research Association of Nova Scotia
Student Research Travel Program

Grace Honsberger-Grant
Dalhousie University

Introduction

Dalhousie University's faculty of Earth Science has established an important correlation between lecture style learning and hands on field work. This pair is intended to bring the highest level of knowledge to those students who partake in both class and field work. For second and third year earth science students, Dalhousie provides both beginner and intermediate field school courses around the geology of Nova Scotia. These field schools help to consolidate material taught in class, as well as teaching students field techniques. To cap off previous experience with field schools, our two instructors, Mike Young and

John Gosse organized an advanced field school exploring the geology in the South Western US. This year 13 Dalhousie students travelled to Nevada and California from April 26th-May25th 2016 to partake in this fascinating experience. With help from OERA, financial assistance has been provided to these students allowing them to further their knowledge of geology and create relationships with young scientists.

Field School Projects

Over the course of 30 days, we were given four different projects each of which focusing on their own subject matter. Much of the geology explored on this trip was heavily dependent on concepts of depositional environments, metamorphic complexes, and structural geology. Thus far, all of these concepts have been applied primarily to the geology in Nova Scotia posing an extra challenge for students to think past their previous attained knowledge.

- Rainbow Gardens: The first four days were spent analyzing the depositional environment, history and stratigraphy of the sedimentary units in the Rainbow Gardens. Working in groups of 2 we were assigned 100-200m sections of exposed stratigraphy and given the task of creating a stratigraphic log, along with the approximate date of deposition in the area. Having practiced stratigraphic logs along the Bay of Fundy, the fundamental concepts of this exercise were well rehearsed. However, difficulties arose when we were exposed to vastly different sedimentary units.
- Kit fox Fan: Many of the faults in the ECZ can be seen in air photos provided by Google Earth. The intent for this project was to map the disjuncting effect that the extensional regime has caused on the surrounding environments. Fault traces that displaced a large alluvial fan at the base of the Kit Fox Mountain in Death Valley, CA were mapped over the course of four days. Correlating on site knowledge with remotely sensed imagery, we were to distinguish as many faults while predicting and explaining the approximate age and history of these faults based on the quaternary sediments in the area.
- Monarch Canyon: Part of a large metamorphic complex, Monarch Canyon includes three distinct stages of metamorphism and structural

deformation. Each stage was to be described using metamorphic index minerals, mineral overprinting, as well as metamorphic textures. Preliminarily this canyon was divided into three general rock types: gneissic, schistose and marble. These were then further divided into their rock types of pelites, psammities, marbles and semi-pelites. The influence of metamorphism was traced throughout the canyon by disappearance and occurrence of metamorphic index minerals. Along with metamorphic deformation, structural stresses were visible throughout the outcrops in anomalous sizes. For example, there is a set of sigmoidals that reached up to ~7m in length.

- Poleta Folds: The last project took place in the Inyo Mountains in Eastern California. Poleta is globally used as a learning tool for students studying geology. Here we spent 7 days mapping the structural geology within the area based on appearances and rates of occurrences of the 8 familiarized geologic units of Poleta. The massive hills making up our field area were both a source of answers as well as confusion over the days we spent mapping. Here, we were mapping an area without expansive prior knowledge of the area or its history. This lack of knowledge left a lot of room for forming theory based hypotheses. At the end of the week we were asked to individually produce three cross section as well as a map of poleta which was to include: all 8 geologic units, strain indicators and the appropriate mapping symbols used to indicate the structural influence in the area.

Geotourism

Throughout the month, in between each project we took days off as a group to explore the geology within the South Western United States. Here are some photos of the amazing places that we were able to see. These, by far were the most memorable and baffling days. All photos taken by myself.

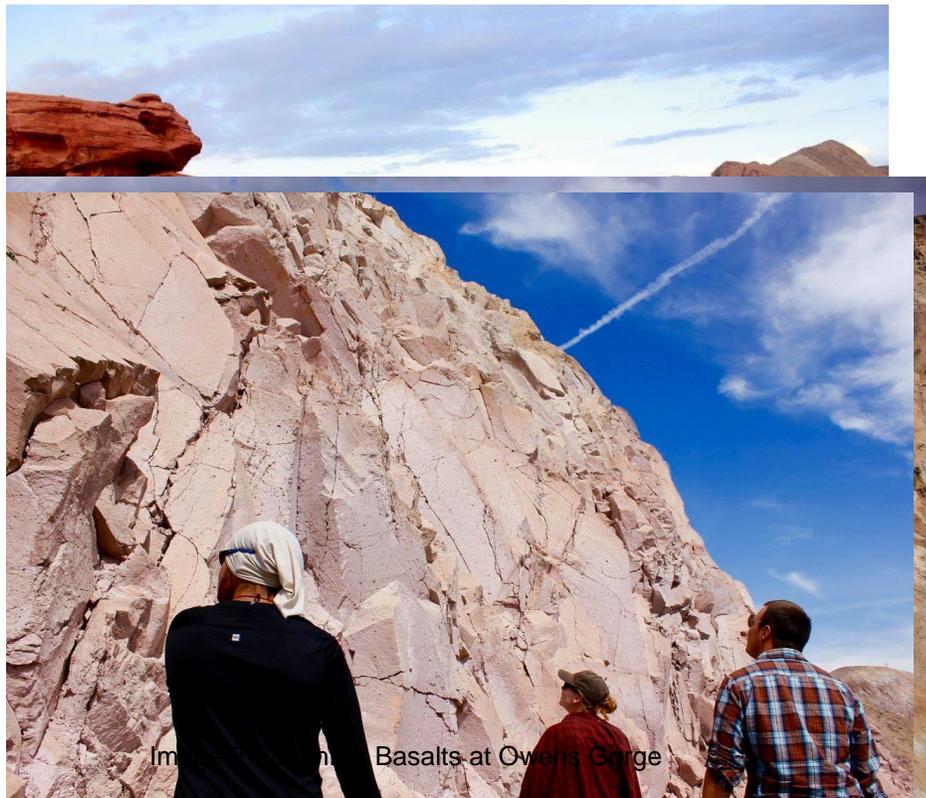




Figure 4: Viewing the Sierra Wave.

Application with Nova Scotia and OERA

Promoting post secondary education for students within Nova Scotia encourages expansion of knowledge and growth of skill. The wealth of information and field techniques taken away from this field school can be applied to geologic exploration and energy research in Nova Scotia. Expanding knowledge on an international scale further enhances scientific ingenuity in the upcoming generation of Earth Scientists.

Acknowledgements

Knowledgeable, passionate, caring, and funny, Mike Young and John Gosse embody all of these characteristics. Without these two this trip would not run as smoothly and amazingly as it does. They, along with our three TA's Art Fitzpatrick, Rachel Milligan, and Nick Hosek all gave a month of their lives to provide such an amazing experience to the 13 of us to further encourage hands on education and knowledge about geology.

A special thanks is given to OERA for providing assistance for students to travel to the United States and further their post-secondary education in an area they feel enthused and passionate about. With travel grants, like the one provided by OERA, the prospect of attending field schools like this becomes more attainable for university students.

Receipts