

AVANCED FIELD SCHOOL 2016
SUMMARY REPORT

Submitted to:
Offshore Energy Research Association of Nova Scotia (OERA)
Student Research Travel Program

Submitted
by:
Corin Jorgenson
Earth Science
Dalhousie University
April 26th – May 23rd 2016

TABLE OF CONTENTS

Introduction	[2]
Trip Details & Background Information	[2]
Benefits and outcomes of Travel	[4]
Significance to Nova Scotia	[5]
Acknowledgements	[6]

Introduction

The 2016 advanced field school trip to Southern Nevada and Eastern California is the fourth year the field course has run, and it was a great success! The course is a month-long intensive mapping oriented field course for the earth science majors of Dalhousie University. The objectives were for us students to improve mapping skills, better understand concepts such as stratigraphy, geomorphology, metamorphic geology, and structural geology. We stayed at three campsites, beginning the project at the Valley of Fire state park, moving to Furnace Creek, Death Valley California for the next two projects and ending field school at the White Mountains near Big Pine, California.

Trip Details and Background Information

There are four main projects in the course that we completed over the four week. One focusing stratigraphy in Rainbow Gardens of southeastern Nevada. We camped in the amazing Valley of Fire state park, see figure 1. We began with an introduction to the Horse Spring Formation in the area. Students were separated into partners and had two days to complete a detailed stratigraphic section of a 50m sections. At the end of this project we handed in a report that outlined the stratigraphy, along with interpretation of depositional environments and the tectonic implications of changing stratigraphy.



Figure 1. Valley of fire, field camp

The next project we moved to Furnace Creek, Death Valley California. In partners students mapped Kit Fox Fan, a faulted alluvial fan. We focused on geomorphology, soil development, and using remotely sense imagery. Using pinning points we determined relative offset of faults, to determine the regional fault vector relative to the Colorado plateau and determine the tectonic history of the area.

The third exercise is in Monarch Canyon on the eastern edge of Death Valley where we mapped a section through a metamorphic core complex. Students were separated into partners again to produce a lithological map, indicating the changing of metamorphic grade by looking on mineral assemblages. We also used kinematic shear sense indicators to determine kinematics of the detachment fault. Additionally, we focused on relative chronology by looking at the changing metamorphic grade and cross cutting relationships of plutons and dykes.

The final project is an individual map of the Poleta Folds area of the White Mountains in eastern California. We had just over a week to produce a 1:5,000 map and a series of cross sections using topographic maps and colored satellite base maps. The area is very complex and involves a number of folding and faulting events, and for many of us was our first time mapping such a large and complex area. See figure 2.

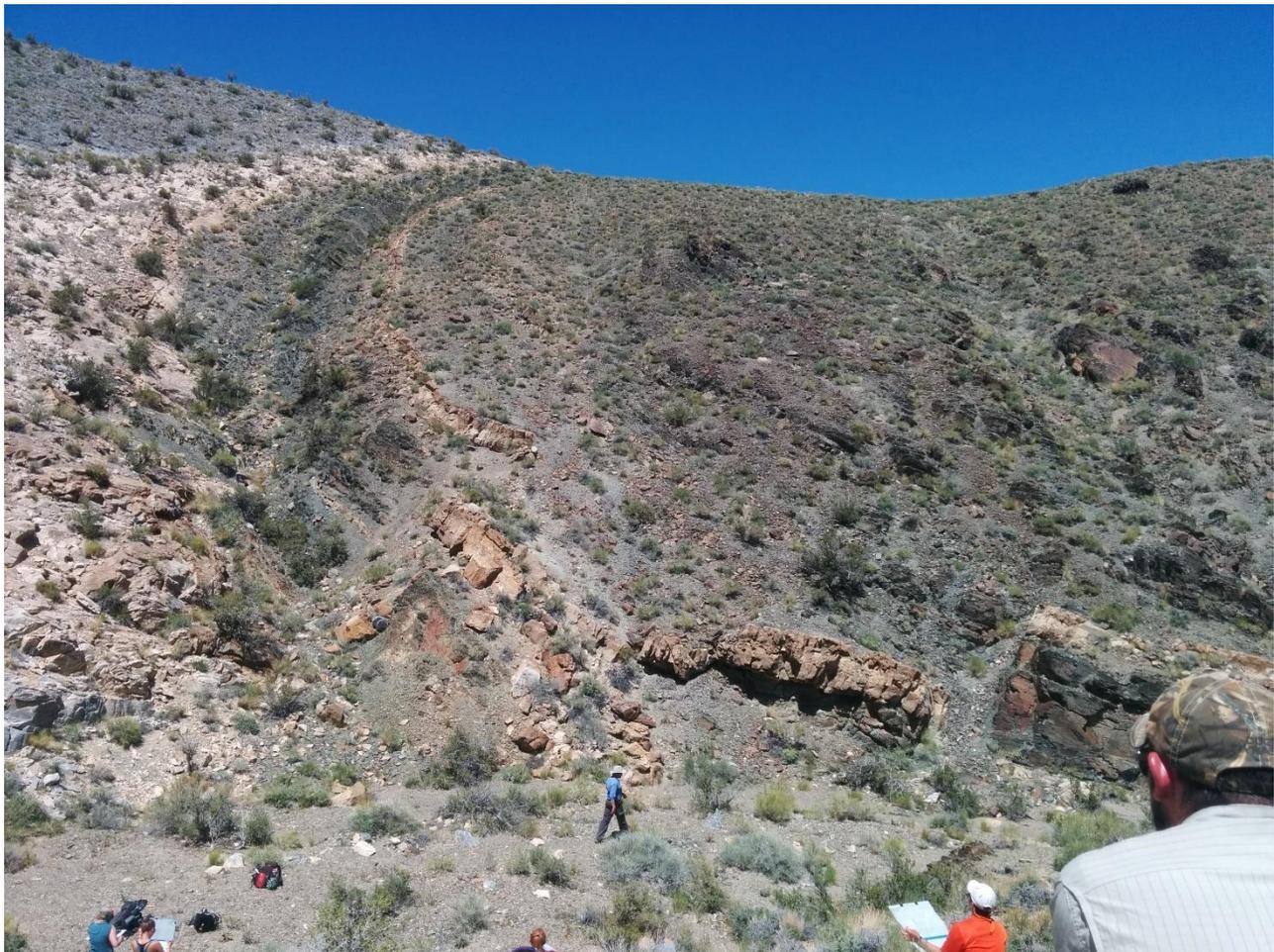


Figure 2. Poleta folds

Between projects on camp move days there were a number of day trips that were conducted to give us an idea of the regional geology and introduce us to the area and concepts we looked at. One

included the Long Valley Caldera and Big Pine Volcanic Field in Owens Valley. There we analyzed a number of volcanic rocks types and textures, many of which we do not get exposure to in Nova Scotia.

Outcomes and Benefits

Each of the projects offer unique learning experiences for all students, and though I cannot speak for every students I'm sure many of the other students had similar learning experience as I did.

At Rainbow gardens we learnt how to use Jacob staffs in order to get accurate strata thicknesses. Additionally, I got a better understanding of the concepts of stratigraphy and how relate sediments to a depositional environment. It also provided an opportunity to see lake derived carbonate sediments, which I have not been exposed in Nova Scotia. I worked with a student who had just finished a co-op semester in Dalhousie's Basin lab, so it was a neat opportunity for me to learn from her expertise. Additionally, we walked through everyone's section as a group so I got to learn from each group about their sections and what they inferred from the sediments.

At the Kit Fox fan I learnt much about working in extreme conditions in addition to geology. The Kit Fox Fan is an alluvial fan in Death Valley California, so it was very hot without any shade. This provided a new experience of learning how to be productive and proactive in some of the hottest weather I've personally ever experienced. I learnt just how important that extra liter of water in my pack is, and how mapping is sometimes more of a mental battle than I previous thought. Geology wise, on the fan I learnt how to recognize fault without seeing obvious stratigraphic offset, and how to determine pinning points to find relative offset. Additionally, I learnt about different methods to determine soil surfaces such as pedogenic carbonate development, and analysis of desert varnish.

Monarch canyon was my favorite exercise and I think I learnt the most there. Nova Scotia has it's share of metamorphism, which was helpful in this exercise. The metamorphic petrology course offered at Dalhousie focuses on looking at metamorphic rocks in thin section (rightly so as it is a petrology course) so field school provided a chance to hone my eyes to the different metamorphic mineral in hand sample in the field. Additionally, this area provided some world class examples of shear sense indicators! Seeing sigmoidals that are as big as a car, see figure 3, was spectacular and I learnt how to properly measure shear sense from these indicators in the field. I also solidified in my mind how accurately project lithologic contacts onto a base map. The large scale shearing from the detachment fault was a bit of a puzzle, which was a lot of fun to discover (maybe with a bit of prodding from the instructors), and something I had not been exposed to previously.



Figure 3. Sigmoids in Monarch Canyon

The last project is at the Poleta Fold area in Eastern California and provided an amazing opportunity to work independently on a very challenging area. Poleta provided many challenges and I found myself constantly asking questions which could only be answered through a careful analysis and accurate measurements of the outcrop. As it was a big area I learnt a lot about prioritizing, and thinking big picture. The area was very complex and was a challenge for all of us. It gave me a much better idea of what a career in mapping could be like, and how challenging it can really be!

In addition to all the things mentioned above we all learnt about and developed a number of skills working in the field that will help us further our careers. From learning to understand how to step back and look at outcrop to understand what is happening, to learning how to set up and take down a field camp we all learnt skills that will continue to be useful throughout our entire careers.

Significance to Nova Scotia

This field school has provided an invaluable learning experience for myself and the other students. The chance to be exposed to such world class geology is one that all my fellow students and I may never experience again. It was especially nice to be exposed to geology that we have not seen so far through our education at Dalhousie University, but may be exposed to in further research or careers. Though much of the geology was different from Nova Scotia, when it was similar it gave me such a better understanding of principles I had already learnt. I truly believe that this trip has and will make me a better geologist, one who is better-rounded and has a solid understanding of many core geologic principles

Acknowledgements

I would like to acknowledge our professors Michael Young and John Gosse, for this trip would not be possible without them. Their organization of the trip and their geologic expertise made the trip truly remarkable. Additionally, I would like to acknowledge the teaching assistants, Arthur Fitzpatrick, Rachel Milligan, and Nicholas Hosek for their assistance in my understanding of concepts and helping make sure camp ran smoothly. I'd also like to acknowledge the other students who attended field school for making the trip so enjoyable.

Additionally I'd like to PDAC, CSPG, private donors, and of course OERA for their generous assistance in making this trip happen. Specifically I would like to thank OERA for their support. The cost of this trip was something that made me consider not going but through OERA's and others generous contributions I was able to go, and I'm so glad I did. I learnt so much more than I thought I could in 4 weeks, and I've made memories to last a lifetime. Thank you for helping that to happen.