



CCS Foundation 2016-17 Mini-Grant Proposal
Igneous Geochemistry Project

Applicant: Andrew M. Buddington, Earth Science, Spokane Community College

Project Title: Igneous Geochemistry

Project Originator: Andrew Buddington

Project Description

This mini-grant proposal summarizes the funding requirements for a planned research project involving the geochemical analysis and interpretation of igneous rocks from two Inland Northwest field areas (within the Priest River complex). The first area is in the Mica Creek drainage along the western side of Lake Coeur d'Alene and is an outgrowth of a previous research project (Cougar Gulch Precambrian Research) for which I received mini-grant funding during the 2013-14 academic year. All of the objectives for the previous project were met (see **Recent Research Publications**) and I am now, due to relevant discoveries, examining the geochemistry of Precambrian igneous rocks within the Mica Creek area. From my 2015-16 field work, I have identified three distinctly different rock units, and I plan to characterize each via geochemical analysis and evaluation. The data generated from this portion of the project will allow me to do petrochemical evaluation and source determination for the igneous magmas that formed these rocks during Precambrian time. Ultimately, I will be able to use the data to make tectonic discriminations in order to reconstruct the geologic and tectonic conditions along this portion of ancient (1.85-2.65 billion year old) North America. I will be working with Reed Lewis of the Idaho Geological Survey, and our secondary goal (if applicable) will be to publish the results in an appropriate geological journal. I will involve students (geology majors) in the process of field sampling and sample preparation, and students will have the opportunity to do research on samples and present their findings (see **Student Involvement and Benefit** section below).

The second area that I am concurrently studying also deals with igneous rocks and geochemistry. This part of the project will involve the geochemical analysis of lamprophyric igneous rocks found in Spokane, Pend Oreille, and Kootenai counties. These rocks include the rare and unusual occurrence of lamprophyre dikes found within the suprastructure of the Priest River complex. No geochemical research has been done on these rocks to date and the primary purpose of this part of the project also involves geochemical analysis and evaluation of the units. With the data from both the Mica Creek and lamprophyre-bearing areas, I will be able to reconstruct the geologic and tectonic setting of both igneous rock sequences, and determine their geologic relationships within the regionally extensive Priest River complex of northeastern Washington and northern Idaho.

Along with the geochemical analyses needed to complete this project will be the preparation and evaluation (via microscope analysis) of petrographic thin sections. Thin sections are used to microscopically examine the individual rock samples, which will ultimately allow for the identification of important and characteristic minerals and textures within the different units.

Mini-grant funding will be used to pay for the geochemical analyses done on rock samples collected from both areas. The geochemical analyses will be performed at the Geoanalytical Laboratory at Washington State University. Petrographic (microscope) sections will be made from representative samples and these sections will be contracted out for preparation.

Student Involvement and Benefit

This project is intended to involve geology majors in an important geological research study. I expect to involve three to five students, with two to three students per field area. The students who participate will benefit through the direct involvement of higher-level scientific research. Students will gain valuable hands-on experience via field visits and be taught the procedures of sample collection and preparation. Students will also be involved with the geochemical sample preparation process directly at the Geoanalytical Lab at Washington State University. Finally, students will participate in petrographic specimen (microscope) analysis here at Spokane Community College.

If appropriate, student involvement will culminate in “group” posters where the student researchers will be encouraged to develop research posters that can be presented at the annual undergraduate research conference (Spokane Intercollegiate Research Conference) held locally (alternately each year hosted by Whitworth and Gonzaga). These research poster presentations offer students the unique opportunity to communicate their scientific research and findings in a professional setting.

This project is consistent with a national effort in the Earth Sciences that encourages and promotes student research at an early stage (freshman-sophomore) in the academic process. I'd like to mention that the accumulating data from national studies have clearly shown the benefits to undergraduate students involved in basic research including, but not limited to, higher retention rates, increased GPAs, and higher graduation rates.

Benefits to the SCC Community

Over the last several years the Science Department at Spokane Community College has been very active and successful with regard to student research (see **SCC Geology Student Research Accomplishments** below). Each year, numerous SCC Science students participate in local and national undergraduate research conferences alongside students from major universities. We are helping lead the way in involving CCS students in undergraduate research and the CCS Foundation mini-grants have been critical in this success. Our students who participate in these research opportunities engage with, and ultimately influence, other SCC students that might otherwise be disinclined toward science. The valuable experiences our students gain through this process of research and professional presentation not only makes them more confident and successful but also better prepares them for success in a professional and increasingly technical world. The entire undergraduate research process has many positive outcomes to the CCS community and such student-centered involvement will reflect well on the mission of this institution.

Budget

Sample Preparations

- Geochemical analysis: X-Ray Fluorescence & ICP-MS;
10 total @ \$120/sample = \$1200.00
*price quote from Washington State University Geoanalytical Lab
(<http://cahnr.wsu.edu/soe/facilities/geolab/>)
- Petrographic thin sections; 20 total @ \$18.18/section = \$363.60
*prices quoted from Vancouver GeoTech Laboratory
(<http://www.thinsection.com/>)

Misc.

- Shipping & taxes on petrographic slide orders = \$112.00

Total = \$1675.00

Field Transportation

- Transportation costs to and from the field areas are to be covered out-of-pocket by the project originator.

Timeline

- Field sampling completed by November, 2017
- Laboratory analysis completed by late February to early March, 2017

No future funding for this project is anticipated. This project is receiving no funding at this date and there are no other funding proposals pending.

Recent Research Publications

- **Pre-Belt basement tour: Late Archean–Early Proterozoic rocks of the Cougar Gulch area, southern Priest River complex, Idaho**, 2016, Buddington, A.M., Wang, D., Doughty, P.T.: Geological Society of America Field Guide #41, p. 265-284.
- **Major- and trace element characteristics of Archean and Paleoproterozoic basement rocks near Coeur d’Alene, Idaho**, 2016, Buddington, A.M., Lewis, R.S.: Geological Society of America, Program with Abstracts, Rocky Mountain Section Meeting, Moscow, Idaho.
- **Geology of the Priest River metamorphic complex and adjacent Paleozoic strata south of the Spokane River valley, Washington**, 2016, Doughty, P.T., Buddington, A.M., Cheney, E.S.: *in The Geology of Washington and Beyond: from Laurentia to Cascadia*, p. 77-92, E.S. Cheney editor, University of Washington Press.
- **Two birds with one stone: Undergraduate research and service-learning**, 2014, Buddington, A.M., Geological Society of America, *Field-based Research Experiences for Undergraduates*, Program with Abstracts, Cordilleran-Rocky Mountain Joint Section Meeting, May, 2014, Bozeman, Montana.

SCC Geology Student Research Accomplishments (2013-2016)

Andy Buddington, faculty advisor

- ***Amphibolites of the Saltese Uplands Conservation Area, Spokane County: The High-grade Metamorphic Correlatives of the Lower Belt Supergroup, Moyie Sills:*** Student poster presentation by SCC students, Aaron Cleveland, Jennifer Peterson, and Dillon Smith at the 2015 National Council for Undergraduate Research Conference held at Eastern Washington University, April, 2015
(https://ncurdb.cur.org/ncur2015/search/display_ncur.aspx?id=90929).

*This research poster was also presented at the 2016 Geological Society of America, Rocky Mountain Section Meeting in Moscow, Idaho, May, 2016
(<https://gsa.confex.com/gsa/2016RM/webprogram/Paper274925.html>).
- ***A Student Outcrop Mapping Project:*** student research poster presentation by SCC students Stephanie Herrin, Sara Oberlander, Jacob Barbarino, Charlie Wilkes, Tim Post, and Curtis Anderson, at the 2016 Geological Society of America, Rocky Mountain Section Meeting in Moscow, Idaho, May, 2016
(<https://gsa.confex.com/gsa/2016RM/webprogram/Paper276048.html>).
- ***Geology of the Saltese Uplands Conservation Area,*** final report to Spokane County Parks and Recreation Department, 2015. This student-involved research report was developed for Spokane County and posted to the Spokane County Conservation Futures Research site (<http://www.spokanecounty.org/parks/content.aspx?c=3124>). SCC students: Aaron Cleveland, Dillon Smith, and Jennifer Peterson.
- ***Geologic Walking Tour of the McKenzie Conservation Area,*** posted to the Spokane County, McKenzie Conservation Area website, October, 2015. Student involved research project. Dillon Smith (SCC student) coauthor
(<http://www.spokanecounty.org/parks/content.aspx?c=1890>).
- ***A Geological Study of the McKenzie Conservation Area, Spokane County, Washington,*** final report to Spokane County Parks and Recreation Department, 2014. This student-involved research report was developed for Spokane County and posted to the Spokane County Conservation Futures Research site
(<http://www.spokanecounty.org/parks/content.aspx?c=3124>).
- ***The Geology of Mirabeau Point Park: An Undergraduate Service-learning Project,*** abstract and poster presentation by SCC student Travis Taylor at the Geological Society of America, Rocky Mountain Section conference, Bozeman, Montana, May, 2014
(<https://gsa.confex.com/gsa/2014RM/webprogram/Paper238121.html>).
- ***Geological Field Research and Service-learning: The McKenzie Conservation Area, Spokane County, Washington,*** Jennifer Peterson and Rich Watson, Spokane Community College, Spokane Intercollegiate Research Conference, 2014, Gonzaga University, Poster abstract #113 (<http://www.gonzaga.edu/Academics/colleges-and-schools/College-of-Arts-and-Sciences/SIRC/docs/2014Programfinal2.pdf>).
- ***A Report on the Geology of Mirabeau Point Park: An Undergraduate Service-learning Research Project,*** final report submitted to the City of Spokane Valley, Parks and Recreation Department
(https://users.scc.spokane.edu/ABuddington/docs/Mirabeau_Report.pdf), SCC student coauthors, Travis Taylor and Justin Vaughan, May, 2013.