

**EarthScope Student Geochronology Research and Training Program Laboratory Plan**  
NSF/UVM Community Cosmogenic Facility  
Updated January 2019

***Laboratory Overview***

We are a hands-on, community and learning centred laboratory funded by the National Science Foundation and housed at University of Vermont. We host student, faculty, and staff visitors of all experience levels to process samples for cosmogenic nuclide analysis, learn laboratory methods, collaborate, and work with a community of colleagues from around the world.

The Community Cosmogenic Facility (CCF) is equipped with all of the facilities required to separate and isolate both *in situ* and meteoric cosmogenic nuclide  $^{10}\text{Be}$  from soils, rock and sediment for measurement by accelerator mass spectrometry (AMS). We can also process samples for  $^{26}\text{Al}$ , produce low blank  $^{10}\text{Be}$  carrier, purify quartz, and test quartz purity.

For meteoric samples, equipment includes HF- and Perchloric acid-handling facilities, Pt crucibles, MilliQ water supply, balances, hot plates, pipettes, laminar-flow HF-safe fume hoods, ovens, a fluxing stand, a torch, Pt-tipped tongs, plastic forceps and rods, a centrifuge, tubes and beakers and sufficient lab-ware supplies for processing 14 samples each week along with an associated blank and internal standard.

For *in situ* samples, equipment includes HF- and Perchloric acid-handling facilities, teflon labware, MilliQ water supply, balances, hot plates, pipettes, laminar-flow HF-safe fume hoods, ovens, a centrifuge, tubes and beakers and sufficient lab-ware supplies for processing 10 samples each week along with an associated blank and internal standard.

Appropriate isotope carriers, acid and base solutions, and Nb for oxide cathode packing are also provided. Rock crushing, milling, sieving and magnetic and density separation facilities are available, should students' home institutions not be equipped for the initial mineral separation steps.

***Time Frame***

Each batch of samples takes a week of hands-on work, not counting initial preparation steps (quartz purification for *in situ* samples, powdering for meteoric samples). Visitors can also purify quartz at the CCF if needed, a process that can take from several to numerous weeks depending on the number of samples and sample lithology. We can provide a more definitive schedule once we have details about your project.

AMS measurements are performed at outside AMS facilities including Lawrence Livermore National Laboratory Center for Accelerator Mass Spectrometry (LLNL-CAMS) and Purdue Rare Isotope Measurement (PRIME) Laboratory. Students can arrange to visit these labs in order to learn measurement techniques. We can facilitate communication, but visitors must make their own arrangements to pay for AMS analyses.

For *in situ* sample preparation, the processing steps visitors could learn are:

- Magnetic separation
- Sample etching to purify quartz
- Pre-dissolution quartz purity testing
- Carrier mass addition and sample dissolution
- Ion exchange chromatography
- Sample precipitation and oxidation
- Nb mixing and cathode pressing

For meteoric sample preparation, the processing steps visitors will learn are:

- Sample powdering
- Massing and carrier addition
- Fluxing
- Purification
- Column chemistry
- Yield testing
- Sample precipitation and oxidation
- Nb mixing and cathode pressing

### ***Costs***

Because of funding from the National Science Foundation, all training, mentoring, and collaboration are covered by our grant. Visitors pay only for laboratory consumables. Costs (which may evolve slightly in future fiscal years) are \$35-65/sample for quartz purification (depending on sample type and lithology), \$220/sample for *in situ* extraction, and \$175/sample for meteoric extraction.

Costs for AMS measurements are additional and need to be arranged for by the visitor with the AMS laboratory.

### ***Preparation for Visiting***

Further information is available on our website, [www.uvm.edu/cosmolab](http://www.uvm.edu/cosmolab) (click on Visitor Information in the left-hand menu, then select Sample Processing Visit). Please read through the information provided, then send the Project Inquiry Form to get started.

Due to significant demand for laboratory time, we ask visitors to contact us as early as possible. We often book several months to 6+ months in advance.

### ***Laboratory Staff***

Visitors will work primarily with Dr. Lee Corbett, who is a Research Scientist at University of Vermont and runs the day-to-day operations of the laboratory. She is funded by the National

Science Foundation to oversee the facility, conduct visitor training, and collaborate on visitor projects.

Visitors will also work with Dr. Paul Bierman, a Professor at University of Vermont and the director of the CCF. He will collaborate on visitor projects and assist with data interpretation and publication.

### ***Data Reduction and Interpretation***

After AMS measurements are received, visitors will be guided through the basic calculations required to convert AMS ratios to nuclide concentrations, including the proper methods for propagating errors. Visitors will be introduced to the commonly used surface exposure age calculators used for surface exposure age estimates including bedrock and clasts and depth profile sampling as well as erosion rate estimates from river sediment and outcrops. Instruction in nuclide interpretations will vary with the application, nuclide and type of geologic feature sampled.

### ***Contact Information***

All questions regarding laboratory facilities and capabilities should be directed to both Dr. Paul Bierman (Paul.Bierman@uvm.edu) and Dr. Lee Corbett (Ashley.Corbett@uvm.edu). Additional information is also available on our website, [www.uvm.edu/cosmolab](http://www.uvm.edu/cosmolab). To see our daily operations and visitors working in the laboratory, follow our Facebook (“NSF/UVM Community Cosmogenic Facility”) and Instagram (“uvmcosmolab”) pages.