

NSF/UVM Community Cosmogenic Facility *Guiding Philosophy and Overview*

Introduction

The NSF/UVM Community Cosmogenic Facility (CCF) is a community laboratory targeted at training the next generation of scientists and broadening participation in cosmogenic nuclide methods. The laboratory represents the continuation of a facility that has been active at University of Vermont for over 25 years and has a long history of hosting visitors and performing outreach. We are teaching and training facility; the Purdue Rare Isotope Measurement (PRIME) Laboratory is supported by NSF to provide “fee-for-service” sample processing for those who are interested.

Who We Are

Dr. Paul Bierman is a geomorphologist who has been at UVM since 1993. He has a broad research background focused on understanding Earth’s ever-changing surface with cosmogenic nuclides. Dr. Lee Corbett is a geomorphologist and glacial geologist who has been at UVM since 2008. She is Facility Manager and oversees most of the laboratory’s day-to-day operations. We work together to mentor visitors on a wide variety of projects.

Users

Our primary focus is the teaching and training of faculty, staff, professionals, graduate students, and undergraduate students in cosmogenic nuclide applications and methods. We strive to maintain a diversity of users in the laboratory; prioritization of projects follows these guidelines:

- Our highest priority will be to host visitors (faculty, staff, professionals, and students) who come to University of Vermont for weeks to months at a time and conduct their own sample preparation (after training and with continued oversight). These users will develop a mastery of cosmogenic nuclide techniques, will foster collaborations with University of Vermont faculty and students, and will be poised to have continued involvement in cosmogenic nuclide science.
- We also prioritize hosting visitors who come for a shorter duration of time, usually a week, to observe and learn how samples are processed. These visitors may be considering future cosmogenic projects, starting their own laboratories, or learning about cosmogenic methods for their own education. We will aim to organize observation visitors into groups with similar interests to facilitate learning and discussion, and have at least several dedicated observation weeks each year.
- University of Vermont students use the laboratory and are scheduled as needed to complete degree requirements. They represent a modest fraction of annual capacity.
- Overall, priority is given to collaborators who contact us well in advance of their planned project, ideally during the grant-writing phase or at least prior to sample collection.

Project Size

In order to ensure broad community access to the CCF and a diversity of users, a maximum of 80 *in situ* samples or 112 meteoric samples (the equivalent of about two months of work or eight batches of sample extraction) can typically be processed for any one project in any year. Users with larger projects may visit in consecutive years. Because of logistical and administrative

constraints, minimum project size will typically be one full batch (ten *in situ* samples or 14 meteoric samples).

Capabilities

Visitors can conduct all or only certain stages of sample processing at the CCF, depending on their needs. All visitors coordinate with Corbett to develop a timeline for their project that includes estimates of total duration based on sample number, which stages of sample preparation will be performed at the CCF, and sample lithology.

- The Department of Geology houses a rock room with crushing, grinding, sieving, and powdering capabilities. However, we encourage visitors to do the physical stages of sample preparation at their home institutions whenever possible to minimize cost.
- The Mineral Separation Laboratory includes ten ultrasonic baths and can be used for quartz preparation by visitors. Because quartz preparation typically involves several weeks to several months of work, users may want to perform these steps at their home institution if possible. Otherwise, visitors should plan on a longer stay in Burlington or two separate trips (one to purify quartz and the second to extract nuclides).
- The Cosmogenic Nuclide Laboratory includes separate laboratory spaces for *in situ* and meteoric sample processing. We can process ten *in situ* samples per week and 14 meteoric samples per week.

Schedule

Users work with Corbett well in advance of their visit (at least several months and possibly longer due to high demand for the community facility) to schedule their time at the CCF. We build the schedule based around efficient use of laboratory capacity, our ability to train and mentor visitors, and the opportunity to have visitors with similar interests to work together and learn from one another. Depending on demand and schedule, visitors may need to wait six months or more for time in the laboratory to become available, so we encourage all visitors to contact us as soon as possible. We will schedule down-time periodically to provide a buffer in case of unanticipated delays, to allow us time to perform laboratory preventative maintenance and safety assessment, and to dedicate time to method refinement.

Budget

All laboratory users pay a per-sample fee that will be set each fiscal year by University of Vermont. This fee will include consumables (acid, pipette tips, etc.), long-term laboratory upkeep, ICP-OES fees, and facility access charges incurred with the University. Interested users should contact us well in advance to set up a budget; these fees are currently \$35-65/sample for quartz preparation (dependent on sample lithology), \$200/sample for *in situ* ^{10}Be and/or ^{26}Al extraction, and \$165/sample for meteoric ^{10}Be extraction. All mentoring and training of visitors is supported by NSF. Travel, housing, and sustenance costs are borne by visitor.

Collaboration

Because the laboratory mission is teaching and training, rather than “fee-for-service” sample processing, we strive to develop collaborative relationships with all visitors to the laboratory. We prefer to become involved in projects at the grant-writing stage so that we can work together to develop a sampling plan and ensure that adequate laboratory time will be available to conduct sample processing. We work closely with visitors to teach not only the mechanics of sample

processing but also the concepts behind the methods, sources of uncertainty, and assumptions of cosmogenic nuclide science. After receiving AMS data, we work collaboratively to perform calculations and reduce data. Because of this deep involvement in the science, our collaboration will be most successful if we are involved throughout the project. We seek to ensure that all resulting science adheres to the laboratory's standards of data quality and data reporting.

Our Responsibilities

We provide all visitors with a safe, productive, and collaborative laboratory environment in which to conduct sample processing. Corbett works closely with all visitors during their time at the CCF to train them in safety and methods. Both Bierman and Corbett serve as scientific collaborators, working with visitors to create vetted data, develop ideas, and make interpretations. We provide visitors the opportunity to meet and network with other University of Vermont faculty and students with similar interests as well as the opportunity to give an informal talk or department lecture about their project during their visit.

Visitor Responsibilities

All visitors must operate within the laboratory's safety protocols, which include taking online trainings, participating in significant hands-on training, filling out training logs, and working only while supervision is present. Visitors will coordinate their own travel and housing after working with Corbett to develop a schedule. After receiving AMS data, we assist visitors with presenting their findings at meetings, publishing the data in peer-reviewed journals, and archiving their data in a publically accessible online database in order to comply with National Science Foundation's data availability guidelines.

Schedule

To optimize safety and foster a collaborative group environment, visitors generally work during standard business hours and will always be working with supervision. Except in the case of unforeseen circumstances such as a laboratory infrastructure problem that sets us behind schedule, we do not work nights and weekends. Visitors are encouraged to use their free time to work on non-laboratory tasks, network with department members or other visitors, and explore Burlington and the surrounding mountains and lakes of Vermont.

Sample Material

Visitors may ship their sample material in advance or can bring it with them. Due to limited storage, we are unable to archive excess sample material at University of Vermont beyond the visitor's stay. We encourage visitors to bring all extra sample material (coarse grain size, fine grain size, magnetic material, etc.) back to their home institutions for archiving. We will archive only any extra clean quartz and the aluminum fraction of each sample.

Relevant Links

Purdue Rare Isotope Measurement (PRIME) Laboratory: <http://www.physics.purdue.edu/primelab/>

Lawrence Livermore National Laboratory Center for Accelerator Mass Spectrometry: <https://cams.llnl.gov/>

University of Vermont: www.uvm.edu

University of Vermont Department of Geology: <https://www.uvm.edu/cas/geology>

Paul's webpage: www.uvm.edu/~pbierman

Lee's webpage: <http://sites.google.com/site/lbcorbett>