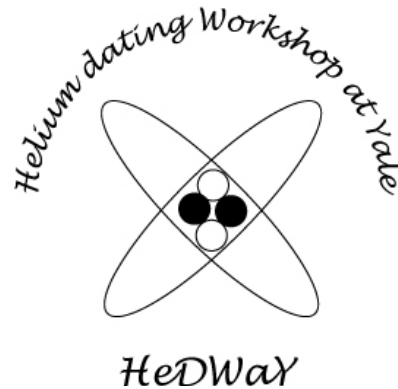


# Undergraduate workshop on Helium Thermochronology at Yale University



HeDWaY 2005

The Helium Dating Workshop at Yale (HeDWaY 2005) is a two-week workshop on thermochronology for undergraduate geology students, aimed primarily at students from undergraduate institutions who are working on their senior theses (or similar final projects) in the summer of their last year. The goals of the workshop are: 1) to provide an opportunity for students to perform (U-Th)/He chronometric analyses on their own samples, related to projects and/or field areas that are part of their larger research project; and 2) to provide training and experience in the fundamentals of geochronology/thermochronology, diffusion, and analytical techniques, as well as an appreciation for the versatility of thermochronologic approaches in studying a range of geologic processes.

HeDWaY 2005 will be run the first two weeks of July 2005 by Peter Reiners and John Garver, and will accommodate 6-7 students. Room and board on campus at Yale will be provided by HeDWaY. More information on the program and updates can be found at: <http://www.geology.yale.edu/~reiners/hedway/>

This year participating students will be selected based on applications comprising a short project proposal and a letter of recommendation from a faculty advisor. Applications are due no later than 5 p.m. (EST), 15 February 2005. Applicants will be notified of the outcome no later than 1 March 2005.

Applications for HeDWaY 2005 should include a 2-3 page description of the background, methods, expected results, importance, and other information on the student's proposed thermochronometric work, and how it complements the larger body of work that will be their senior thesis or other research project at their own institution. In addition, applicants should have their faculty advisor send a letter of recommendation. Applications from students between their junior and senior years are generally preferred, because we prefer work that will be incorporated into senior theses or similar projects, but applications from students at other stages will also be accepted. Send electronic materials or questions to: [peter.reiners@yale.edu](mailto:peter.reiners@yale.edu) and [garverj@union.edu](mailto:garverj@union.edu)

## ***Rationale and general description***

The goal of this workshop is to introduce undergraduate geology students to (U-Th)/He chronometry and radioisotopic dating through analysis and interpretation of their own samples and data, in the context of their own research projects. Through both hands-on analyses and interpretations, as well as daily informal lectures, students will learn fundamentals of radioisotopic dating, laboratory techniques, analytical instrumentation, basics of heat and mass diffusion modeling, and something about each others' research projects and the versatility of thermochronometry.

Each student's project should focus on a small set of samples to be dated by (U-Th)/He methods. Ideally, a student's accomplishments at this workshop should complement a larger research project such as a senior thesis or other type of independent research supervised by the student's faculty advisor at his or her home institution. Examples of potential workshop projects include apatite or zircon He dating of a small group of

samples (5 to 10) intended to: [a] elucidate spatial and temporal patterns of erosion or tectonic exhumation in a regional tectonic or geomorphologic study; [b] date detrital crystals in a sedimentary basin to constrain provenance or depositional age; [c] date an impact site, volcanic unit, or other thermal event. Creative and experimental applications are also encouraged; e.g., attempts to measure helium ages on phases not typically analyzed, such as pseudotachylite, glass, uraninite, magnetite, etc., or attempts to constrain timing and intensity of hydrothermal heating, or measurements of He contents in air.

### ***Important Practical Issues***

[1] Students must arrive with mineral separates already prepared and ready to pick under the microscope. We will not perform mineral separations here, so please insure that good clean mineral separates are completed and available well before the workshop starts.

[2] Students (and their faculty advisors) should be prepared for the possibility that their chosen samples/field area may not have useable material for (U-Th)/He dating. This is especially important for apatite He dating, as the method has stringent requirements of crystal morphology and purity. Please have a backup plan.

[3] There is no requirement for direct faculty involvement in the workshop, beyond general supervision of student research and help with data interpretation at the student's home institution. If faculty would like to attend and participate in the workshop however, they are certainly more than welcome at any point, to learn about the technique and to facilitate future use of the lab by other students or themselves.

### ***Accommodations, food, other logistics***

We are working on the final arrangements for room and board, but will likely be similar to those in HeDWaY 2004 (see <http://www.geology.yale.edu/~reiners/hedway/>). Room and board will be provided, but in general students or their home institutions or departments must pay for travel to Yale. Exceptions to this can be considered for special cases.

### ***Tentative schedule***

The general daily routine will be a combination of laboratory work and one or two one-hour lectures, broken up by lunch. There will be one day of a local field trip, and one day off.

After a day of orientation, lab safety training, and some general introductory stuff, we will start with sample preparation. This mostly involves sample picking under the microscopes for the first few days. Because we only have three picking microscopes, and also because no one can or wants to pick for more than a few hours at a time, students will take turns picking, and doing some library research in the first few days. As samples become ready, students will process them on the He line. This means running the laser to extract He, and operating the programs that spike, purify, and measure the gas.

Students will then perform wet chemistry involved with spiking, dissolution, and measurement of U, Th, and Sm on the high-resolution ICP-MS. After calculating ages from their measured data, and making corrections for alpha ejection, students will learn how to interpret He ages, in terms of forward and inverse thermal models, complexities that arise from topography, non-constant geothermal gradients, and other factors.

Finally, students will compile and synthesize their data and relate them to their larger project, and prepare a short (20 minute) presentation for the group on their results. Presentation at a national or regional meeting will then be encouraged.

*HeDWaY is funded by the National Science Foundation and the Yale Dept. of Geology and Geophysics.*