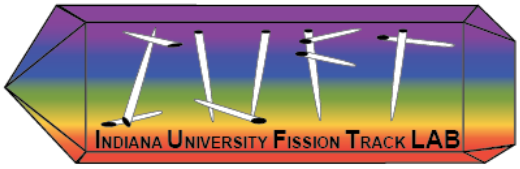

Indiana University Fission Track Lab
Indiana University, Bloomington, IN

Lab Overview:

The Indiana University Fission Track (IUFT) Lab has the facilities to prepare and analyze samples for apatite fission track thermochronology using the external detector method. Key Features of the lab include: 1) An AutoScan fission track imaging and analysis system suitable for taking stacked images of fission track mounts and subsequent offsite analysis; 2) Equipment for mounting and polishing fission track samples; 3) Facilities for etching spontaneous and induced tracks. The lab maintains a license through Indiana University for storing irradiated materials and houses all physical samples permanently.

Expectations for AGeS Projects

Fission track analysis is a time intensive technique that requires sample preparation, a waiting period while samples are irradiated, technique training to calibrate an analyst's zeta, and finally actual analyses of the unknowns themselves. Traditionally, researchers would need to schedule (at minimum) a month on site to complete training and sample analysis alone (this does not include sample prep). The Autoscan software system (TrackWorks, FastTracks) enables the IUFT Lab to complete much of this analysis offsite using the FastTracks software program. This means that a lab visit is only necessary for the time it takes to scan the samples for analysis (1-2 weeks recommended). We also recommend that AGeS projects budget the materials needed to prepare mounts which allows students to inexpensively and flexibly prepare samples at their home institution.

Although scheduling a lab visit is flexible, students will want to plan ahead to ensure they can submit their samples to an irradiation shipment and complete all of the steps needed before the lab visit. Below we have a recommended workflow for students to plan their visits. The table provided includes the timelines and facilities students should consider.

Before Lab Visit

- Students begin training in sample analysis using purchased copy of Autoscan software "FastTracks" to establish zeta (images of standards provided by the IUFT Lab)
- Students acquire the materials recommended to make and polish apatite grain mounts for the external detector method
- Students send polished grain mounts to IU FT lab for etching and irradiation packing

During Lab Visit

- Students scan images of apatite grain mount and irradiated mica print using the Autoscan system and TrackWorks software at Indiana University
- Students discuss samples and data analysis with Stevens Goddard
- Students begin apatite fission track analysis of unknowns onsite at Indiana University

After Lab Visit

- Students complete apatite fission track analysis of unknowns remotely
- Students discuss results and interpretation with Stevens Goddard

Timeline for apatite fission track analysis

Task	Timeline	Location	Personnel
Fission track analysis training and zeta calibration	1 – 3 months depending on student's other commitments	Indiana University OR students with FastTracks software licenses can begin this step remotely	Student
Mount preparation & polishing	~ ½ - 1 hour total per sample	Indiana University OR student can purchase materials and complete remotely	Student
Apatite mount etching	1 hr	Indiana University	Lab PI
Sample irradiation	3 – 6 weeks	Oregon State TRIGA facility	TRIGA staff
Mica etching	1 hr	Indiana University	Lab PI
Sample Imaging	2 – 4 hours per sample	Indiana University	Student
Fission Track Analysis	2 – 4 hours per sample	Indiana University OR Students with FastTracks software licenses can complete this step remotely	Student

Materials & Costs for Apatite Fission Track Analysis

We highly recommend that AGeS projects plan to prepare samples and complete analyses using the workflow described above. Below is a detailed overview of the materials needed to complete the project as described.

Material	Recommended	Alternative
Clean Mineral Separates	Complete mineral separations in advance to ensure that apatite is present for analysis. Target 60 grains per mount for a crystalline/thermally reset sample and 200 grains (1-2 mounts) for detrital samples	
FastTracks software license	~ $1500 USD for permanent license discounted 1 year licenses for students. Visit for a quote: http://www.autoscan.com/	Use IU lab computers for zeta calibration and analysis (this requires a lab visit of minimum 4 weeks and is only recommended for visitors within driving distance)

Epoxy mounting kit	Purchase materials for epoxy mounts (will last for hundreds of samples) ~ $250 from Electron Microscopy Sciences https://www.emsdiasum.com/epo-fix	Visit IU lab to mount samples and pay $36.35/sample
Polishing Materials	Purchase sand paper, lapping paper, and polish powder materials for ~ $100. Consult Lab PI for details.	Visit IU lab for polishing (no cost if also paying for mounting services)

The price estimates for materials, lab costs, and travel/lodging in Bloomington, IN are provided for planning purposes.

Expense	Expense Type	Price	Unit
Fast Tracks Software License	Analysis	$1500	License
Materials for sample preparation	Analysis	$350	Batch
Sample etching & irradiation	Analysis	$47.57	Mount
Training & Equipment Fee	Analysis	$750	Student training
Travel to Bloomington, IN	Travel	$200 - $600	Round trip travel
Housing & per diem in Bloomington, IN	Travel	$160	day

Training & Mentorship

Andrea Stevens Goddard runs and manages the IUFT Lab. Andrea will work with all students to coordinate their project, learn fission track analysis, train in the lab, and interpret data.

Contact Informaton

Researchers interested in using the IUFT Lab should contact Andrea Stevens Goddard at alsg@iu.edu.

IUFT Lab Diversity Statement

IUFT is committed to supporting researchers with diverse identities and learning styles. Our IU research team is trained in bystander intervention and facilitates active conversations about diverse learning and communication styles. At a practical level, we have compiled an internal set of lab documents for fission track analysis preparation, training, and analysis that makes skills and expectations transparent to support researchers from all experience backgrounds in the lab.