

Summary: Duke’s Shared Materials Instrumentation Facility (SMIF) is offering a hands-on Micro-Computed Tomography (MicroCT) lab experience. MicroCT is a technique that uses x-rays to visualize the 3D internal structure of an object. The lab experience includes an introduction to the MicroCT and a demonstration of the equipment at SMIF. Participants will be introduced to the interpretation of MicroCT images of common household items to gain an understanding of the capabilities of 3D X-Ray imaging. Then students will choose a sample to bring to SMIF, and will image their samples in the MicroCT. This is a chance to learn about the MicroCT and to participate in the acquisition and interpretation of the images!

Target grades: 9-12

Preparation:

- Give out to students sample collection kits and guidelines for collecting samples for scanning in the MicroCT.
- Homework: students collect their samples.
- Watch the MicroCT Coursera video.

Session 1 in your classroom (~1 hour)

- Size and scale activity (provided by SMIF): Students sort images of items that span a size range from microns to kilometers and then apply appropriate units.
- Discuss what can be seen with a visible light microscope compared with a MicroCT machine.
- Give out “mystery objects” (provided by SMIF) consisting of previously scanned items (a lock, orange, remote and flashlight) packaged in order to make identification difficult. Have students guess object based on size and touch.
- Students then guess objects based on animation of raw or cross-sectional data produced by the MicroCT. Objects are revealed to students through 3D reconstruction animations.

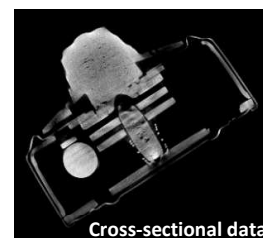
Session 2 visit to Duke SMIF facility (~0.5 hour for each group of 4-5 students)

- MicroCT imaging of samples: groups of 4-5 students will image their samples in the MicroCT. Each student in the small group will participate in part of the scanning process from loading and positioning the sample to turning on and adjusting the strength of the x-rays. While in the small groups students will discuss types of research that utilize MicroCT for data collection.
- Classes of up to 12-15 can be split into 3 smaller groups of 4-5 students each. One group will work on the MicroCT, another will tour the SMIF labs, and the third will work on a hands-on activity to help understand the scanning process. Groups will switch every half hour for a total of about 1.5 hours.

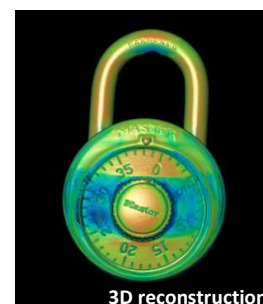
Going deeper: We can work with you to tailor this experience and the type of samples students collect to fit in with your curriculum (botany, zoology, geology, etc.). We can also make this a scientific exploration for students by having them construct a hypothesis and take samples to test.



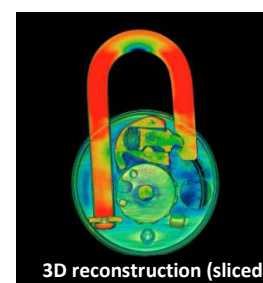
Lock raw data



Cross-sectional data



3D reconstruction



3D reconstruction (sliced)