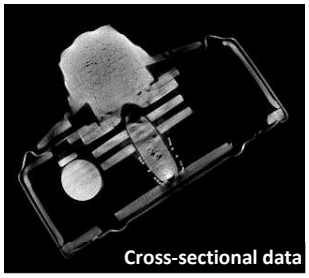
Practicing Your X-ray Vision: MicroCT Lab Experience

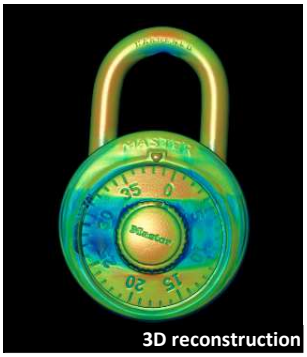
Shared Materials Instrumentation Facility – Duke University

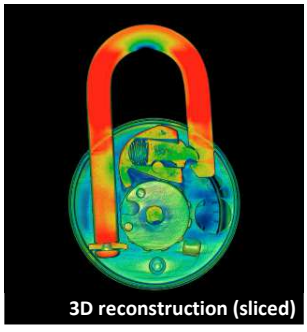
Brought to you by: Research Triangle Nanotechnology Network (RTNN)

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 practice their X-ray vision by looking at CT scans and guessing what common item it represents. Then students will choose a sample to bring to SMIF, and will image their samples in the MicroCT. Forget the combination to the old lock from your locker? Use your newly honed superpower to peek inside and actually see the combination!


Lock raw data


Cross-sectional data


3D reconstruction


3D reconstruction (sliced)

Target grades: 5-8

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.