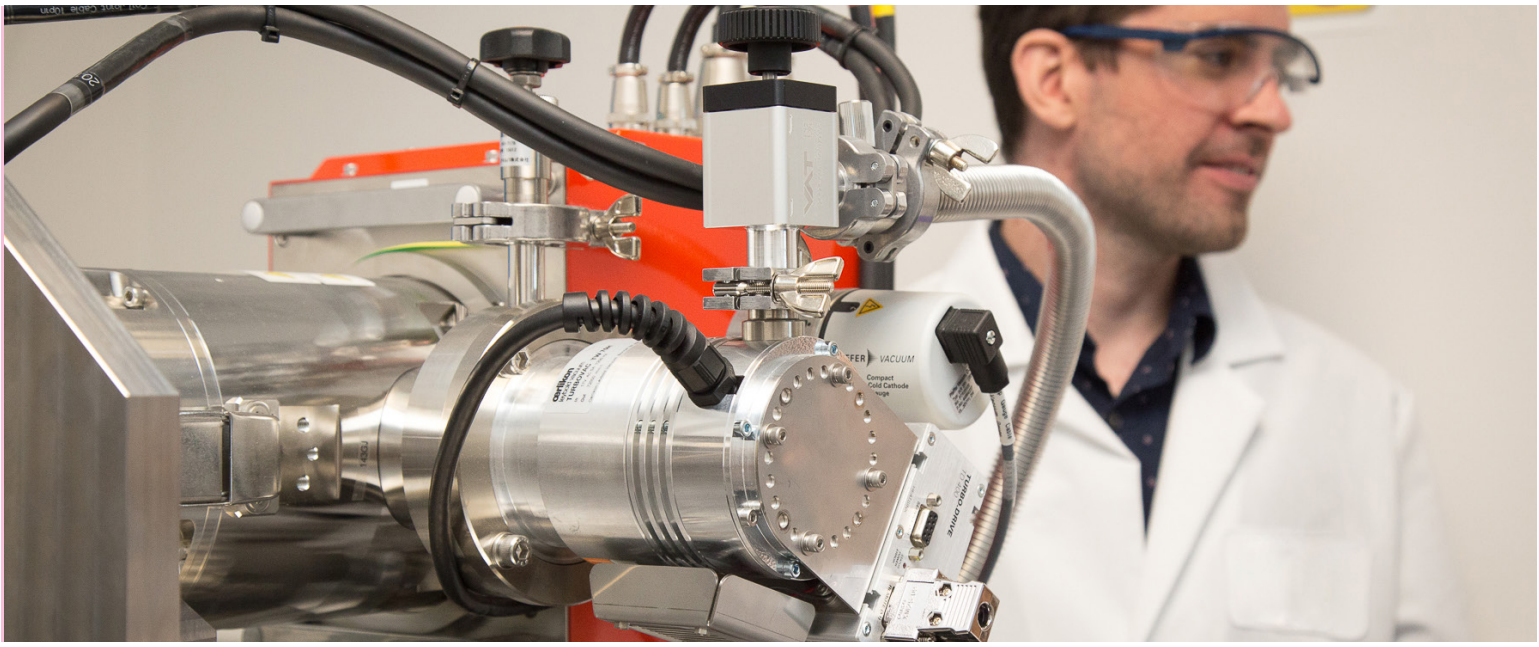


microCT

The source is an open-type Hamamatsu L10711-19 customized specifically for microCT application. This version includes a diamond window as standard and a new cut-away front of the source. The secondary sources have been considerably reduced to significantly reduce artifacts related to difference imaging. The geometry and the basic specifications are:

- Maximum tube voltage: 160 kV
- X-ray tube setting range: 20-160 kV
- Minimum resolution: 0.8 µm
- X-ray output window material: diamond
- Maximum target current: 100 mA

Reconstruction Workstation

2x Dell PowerEdge T630 Rackmount with 768 GB of RAM each and 2x Intel Xeon E5-2687W v4 3.0GHz, 12-core CPUs.

Image Processing

HP Z840 workstation with two Intel Xeon processors, 256 GB of RAM and fast GPUs for efficient processing. Software includes Avizo Fire, ImageJ, DragonFly, etc.

Oregon State University

COLLEGE OF ENGINEERING

OSU microCT User Facility

MICRO-COMPUTED TOMOGRAPHY

The OSU microCT user facility, housed in the College of Engineering at Oregon State University, provides unique opportunities for conducting high-resolution and high-fidelity three-dimensional imaging of otherwise opaque objects. It allows researchers to study form, structure, and function at the micron scale of a vast variety of materials.

The instrument incorporates a source that has been customized specifically for micro-CT application through a development with Hamamatsu. It combines helical scanning (allows for long vertical scans, up to 200 mm travel), autofocus alignment, novel air-bearing stages, and eventually region-of-interest imaging, and dynamic (4D) imaging to allow for characterization of materials from rocks to plants, to human bones, and micro-skeletons. However, as high fidelity imaging relies on X-ray attenuation, optimal application is anticipated in the materials science domain.

The focal spot size of the instrument is 630 nm, and we currently effectively generate high-fidelity images in the 1-2 micron range. Successful imaging requires very stable mounting and temperature control, and customers have access to a variety of specimen mounts and rotational stage arrangements to achieve high image quality. However, no specific sample preparation is needed. We are able to image objects as soft as sea anemones and flower buds, to bone, rock, and X-ray transparent metals (Al, Ti etc.).

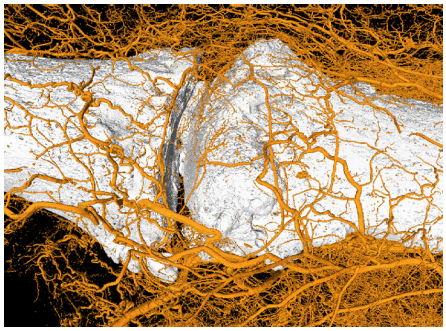
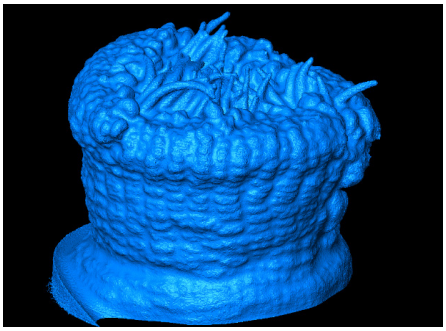
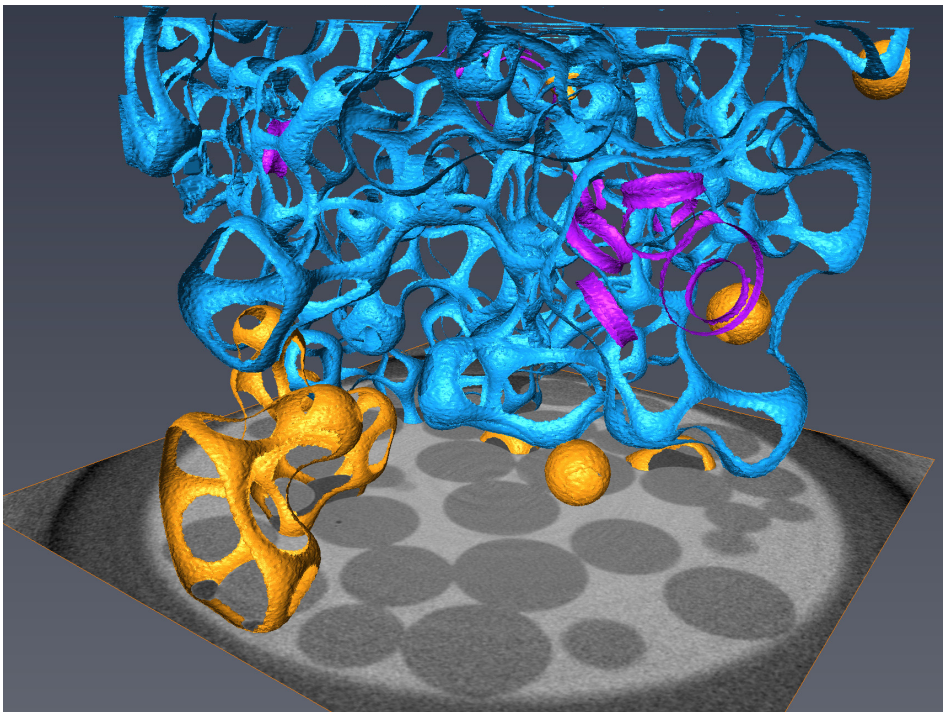


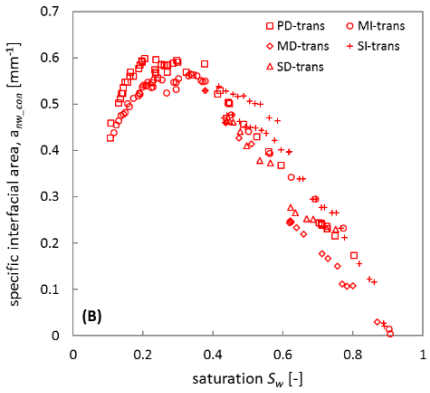
Image of right thumb of a 86-year-old female, allowing for mapping of small veins. Image resolution is 14 microns. (Specimen courtesy of Brion Benninger, Medical Anatomy Center, Western University of Health Sciences.)



X-ray CT scan of a sea anemone *(A. elegantissima)* by Allison Tep, undergraduate student in the Weis Lab at Oregon State. people.oregonstate.edu/~weisv

SAMPLE IMAGE AND DATA PLOTS





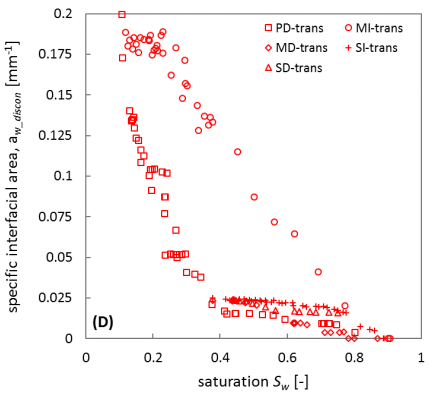


Image illustrating pore-scale multi-phase fluid flow in porous media (glass bead packing), with interfacial surfaces between the immiscible fluids outlined (connected water phase in blue, disconnected water phase in purple, and disconnected air/oil/CO_2 phase in yellow). Two plots illustrate the difference in the amount of interface present between the connected (left) and disconnected (right) water. Multi-phase fluid dynamics, and mass transfer (reaction) kinetics depend on the interfacial area available, and measurements such as these therefore support theory and model development relevant to groundwater remediation, CO_2 sequestration, enhanced oil recovery, fuel cell efficiency, among other applications.

WHAT CAN BE IMAGED?

- Opaque objects consisting of non-metallic material (aluminum and other X-ray transparent metals OK).
- Object sizes up to a maximum of approximately 130 mm, depending on composition. (Very dense objects are harder to accommodate.)
- For soft materials, a full 150 mm x 150 mm can be imaged.
- Samples weighing 3-5 kg.

WHAT DATA TO EXPECT?

- High resolution, potentially into the submicron range for small objects.
- For a 150 mm wide (softer) object, expect image resolution around 50 µm.
- For a 15 mm wide sample, expect image resolution around 5 µm.
- Helical scanning trajectory that allows for long vertical scans (up to 200 mm travel).
- 3k x 3k detector and other hardware providing superior image quality and fidelity.
- But also very large data sets.

MAJOR RESEARCH INSTRUMENTATION PROGRAM (NSF)

Support for the microCT User Facility at Oregon State University comes from the National Science Foundation through its Major Research Instrumentation Program.

The MRI program catalyzes new knowledge and discoveries by empowering the nation's scientists and engineers with state-of-the-art research instrumentation. The MRI program enables research-intensive learning environments that promote the development of a diverse workforce and next generation instrumentation, as well as facilitates academic/private sector partnerships.

USER ACCESS

Investigators may reserve time on the microCT (the scanner itself) or the image processing workstation.

Current fee structure, online scheduling tools, and ready-to-print user agreement are available at: **microct.oregonstate.edu/make-reservation.**

For more details, please contact:

Dorthe Wildenschild
Principal Investigator
dorthe@engr.oregonstate.edu

microCT User Facility
Oregon State University
116 Johnson Hall
Corvallis, OR 97331
541.737.8050 | microct.oregonstate.edu