



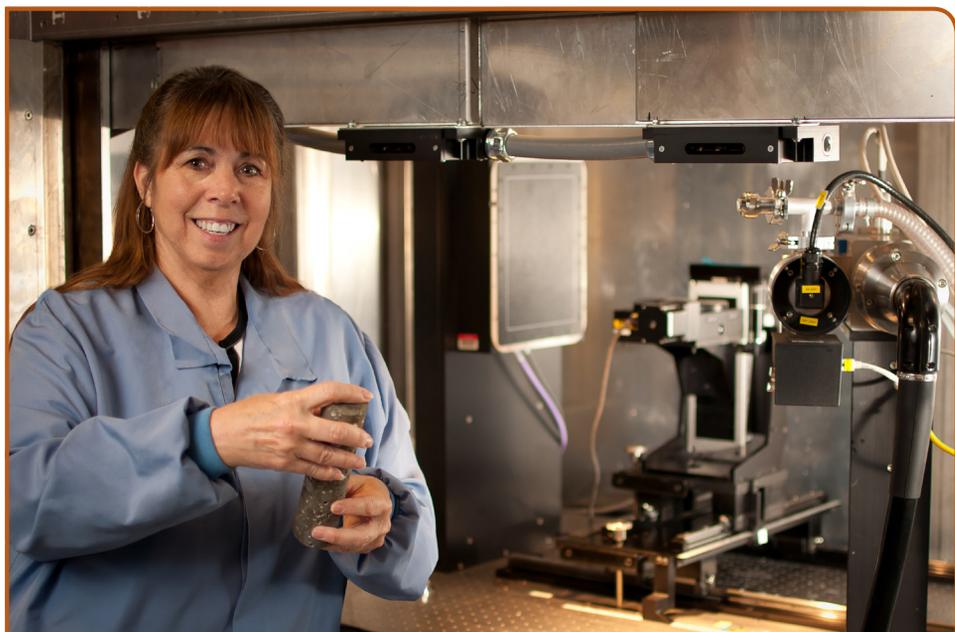
Pacific Northwest NATIONAL LABORATORY

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X-Ray Microfocus Tomography

Does your research work require visualization and a complete analysis of the internal structure of a sample? The X-Ray Microfocus Tomography (XMT) system, located in the Sigma 5 Building at Pacific Northwest National Laboratory, is designed to analyze the internal structure of various types of organic and inorganic samples in solid or semi-solid forms. These characterization data are used by environmental research teams to develop effective, science-based solutions to solve complex environmental and climatic challenges.

Scientists running samples on the XMT are supporting diverse projects such as carbon sequestration in geologic formations, subsurface contaminant transport studies, and biological studies involving fish and other wildlife. These studies, among others, are helping scientists to better understand and predict environmental impacts, and advance understanding of subsurface science for environmental remediation.



Instrument Information and Sample Scheduling

Trained technicians are available to operate the X-Ray Microfocus Tomography system and process samples collected onsite or offsite. To schedule a sampling activity, or if you have questions regarding instrument capabilities, please contact Toni Owen from the Geosciences Group:

Toni Owen

Pacific Northwest National Laboratory

P.O. Box 999, MSIN K6-81

Richland, WA 99352

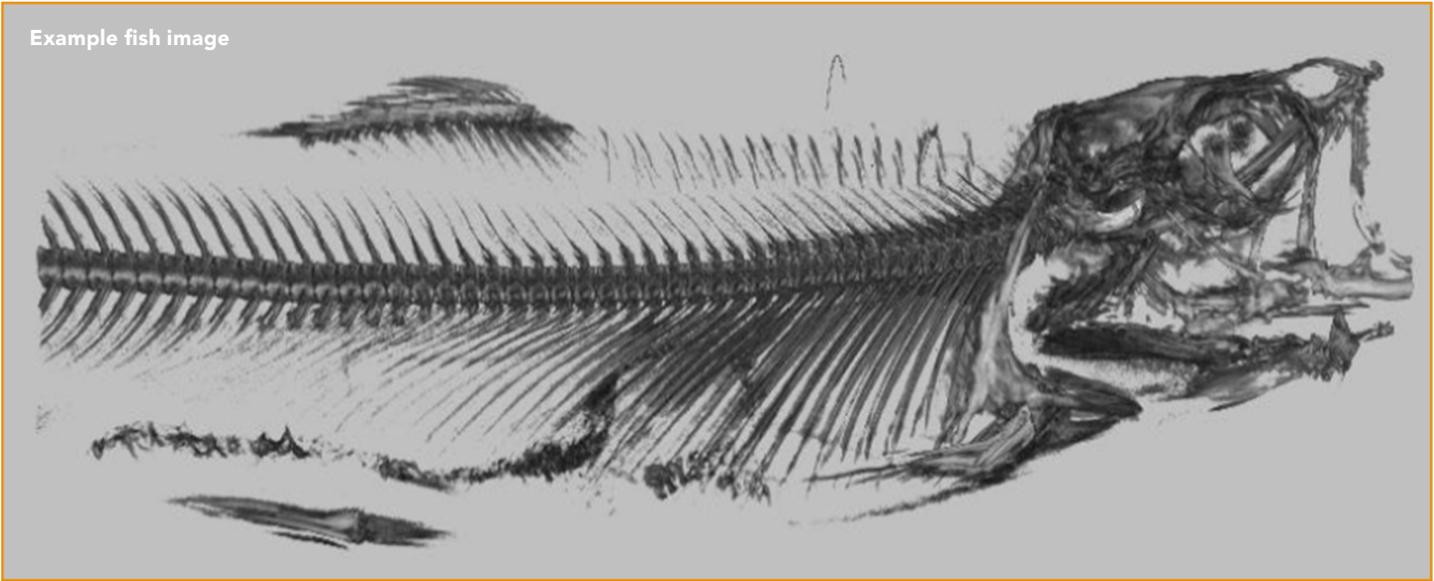
(509) 371-7092

toni.owen@pnnl.gov



U.S. DEPARTMENT OF
ENERGY

Example fish image



Common sample types include the following:

- ▶ metal and precious metal samples
- ▶ rocks
- ▶ cement columns
- ▶ soil columns
- ▶ slurries
- ▶ organic matter (vegetation and animal matter).

Samples, which can be up to 6 inches in diameter and 8 inches in height, are placed inside the XMT chamber and slowly rotated at 360 degrees; two views of the sample are taken every 1 degree during the rotation process for a total of 720 X-rays. The X-rays—or raw images—are then transferred to reconstruction and visualization software that renders the images into a three-dimensional model of the sample that can be rotated, sliced, and

reconstructed on the computer screen, similar to an animated video. This comprehensive analysis of the sample provides data on the following:

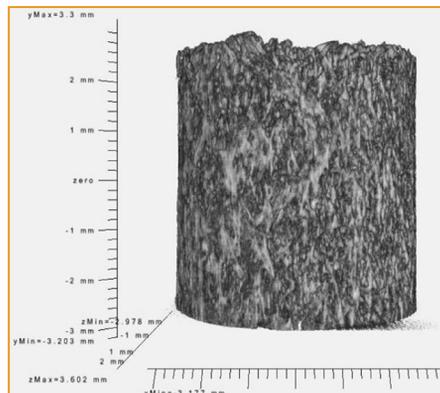
- ▶ external and internal structural and pore characteristics
- ▶ exact measurements of sample and internal characteristics (microns and millimeters)
- ▶ mixed particles, such as air pockets, fractures, embedded objects, or chemicals.

Additionally, column flow studies can be conducted within the XMT, enabling researchers to gather real-time data on multiphase flow and contaminant transport, as well as the effect of chemical-induced reactions on porosity and permeability.

Geosciences Group

The Geosciences Group's primary goal is to solve complex environmental challenges with earth-science solutions. Our fundamental approach is to apply our technical expertise in geosciences to develop, deliver, and deploy transformational science and technology solutions for our clients.

To learn more about the Geosciences Group, please contact **Chris Brown**, Geosciences Group Manager, at (509) 371-7389 or visit our website at <http://geosciences.pnnl.gov/>.



Example image showing foam core



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