

Redefining archaeological research

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Anthropology professor Andrew Nelson places a 5,000-year-old cuneiform clay tablet into the new microCT scanner at the Sustainable Archaeology Repository, located at the Western-based Museum of Ontario Archaeology. Credit: Paul Mayne, Western News

Gently cradling a 5,000-year-old cuneiform clay tablet from Ur (modern day Iraq), Andrew Nelson wishes he could peel back the layers to find out what makes up this first-generation iPad. And thanks to a new microCT scanner at Western's Sustainable Archaeology Repository (SAR), the Anthropology professor has done just that.

With the touch of a button, the object was scanned, reconstructed and fully rendered using more than 3,000 individual images, allowing for high-quality visualization and inspection.

"Imaging is a signature strength at Western, and that ranges from clinical imaging to the microCT imaging facilities down at Robarts (Research Institute). Western has established this as a No. 1 place for CT imaging," said Nelson, adding he knows of only one similar microCT unit, located at National Research Council in Montreal. Western's [scanner](#) is the only one dedicated strictly to [archaeological research](#).

"What this instrument does is it extends the range

of what we have available. The ability for object size, its power and speed is what really makes this a unique machine. It's the rotating target head also allows us to do very high-detailed CT scans in a short period of time."

This latest addition to the SAR, a collaborative venture between Western and McMaster University, and funded through the Canadian Foundation for Innovation and the Ontario Research Fund, will allow for a range of archaeological research on an unprecedented scale.

Located at the Western-based Museum of Ontario Archaeology, and open since last fall, the facility is closer to being fully operational, said principal investigator Neal Ferris.

"I'm so tired of talking about what we will be doing, so the chance to actually talk about what we are doing is very exciting," said Ferris, adding the facility will be consolidating archaeological collections from across the province into a single digital database and remotely accessible research centre.

With an 18,000-square-foot storage capacity between Western and McMaster - enough for 90,000 boxes of archaeological findings - the SAR works with commercial archaeologists who have meticulously documented the millions of artifacts and organic remains recovered through housing and highway developments.

"The scale of research you can do from a click of a mouse is something that is impossible now because all those collections that will fill these shelves are right now sitting in people's basements or their lock-ups," Ferris said. "No one knows about them and no one can find them."

That's where the SAR comes in.

"The collections here are designed for access for research primarily," said Rhonda Bathurst, SAR

operations manager. "But by digitizing it, we are making it accessible to everyone. That's the beauty of having a digitized collection is that anyone at home can access the cultural history of Ontario, be it a first-grader doing a project on archaeological heritage or be it someone in First Nations who wants to access it to learn a bit more about their cultural heritage.

"It's access to anyone in the world."

An archaeologist by training, Bathurst admits this facility will change everything.

"I had to search down these collections in Toronto, Hamilton, London," Bathurst said of her time as a student. "It took about half a year to a year to get all the information together I needed. And now, it's here. What took me close to a year, I could sit down at a database and it's right there in front on me on the screen, or right here within the building, and away I go.

"It truly liberates cultural heritage in a way we haven't had here in Ontario before; that's pretty exciting."

While the SAR's Object Conversion Lab uses digital X-Rays - and a bank of five laser scanners expected to arrive this summer for building 3D models - the microCT scanner will allow Nelson and other researchers a non-destructive way to look inside objects.

"With the scans, we'll be able to cut sections of the object to see how they were constructed, to see the materials used to make it," he said. "Anything that is ceramic, like the clay tablet or a ceramic vessel, you can now tell how it was made by the image. The tablet looked like there were circular motions to it. It gives us clues into the actual actions of the person and the decision-making process the person is going through. It adds really unique personal dimensions to this object.

"It is no longer a static object, it's the end product of a series of decisions that this individual has made."

Ferris added the microCT scanner opens a whole new raft of material studies research simply not

accessible elsewhere in North America in archaeology.

"You're scanning, for example, a thousand-year-old earthen vessel a woman made in a village during a completely different way of life. You'll get to reveal the entire craft in making the pot," he said. "We're going to be constantly scanning this sort of stuff, so imagine what happens when we have 2,000 of these pots scanned. We'll likely be able to track the history of a particular artisan."

Nelson said other applications for the microCT scanner are possible. For instance, he has a graduate student interested in primate evolution and primate facial morphology; the Earth and Planetary Science team is interested in scans of their meteorite collections; and a luthier from Sudbury is interested in scanning violins to look at what makes a Stradivarius different from a garden-variety violin.

"This is unbelievable," Nelson said. "To have access to a unit like this, that we can really push to the limits of imaging in the archaeological context, is extremely exciting and will really this facility on the map. There are lots of other applications that we are only really beginning to start exploring."

While the facility is in its infancy, the future holds nothing but excitement.

"With these tools we're going to be completely redefining what research in Ontario archaeology is and telling stories people don't even know archaeology can tell right now," Ferris said.

Provided by University of Western Ontario

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