Ice Age clues unearthed from construction hole

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Long before the finishing touches are made to UW-Madison's Microbial Sciences Building, a small but significant bit of science has emerged from the hole where the $120 million, 330,000 square-foot structure is emerging.

Using relatively new dating techniques and ancient glacial till and lake sediments gathered from the enormous, 35-foot-deep pit where the building is now rising, Wisconsin geologists have obtained the first reliable dates for the last time a massive ice sheet enveloped what are now Madison and the UW-Madison campus.

"I could have taken a guess at when the ice was here last," says Dave Mickelson, emeritus professor of geology and geophysics. "But it would only have been a guess."

Mickelson, however, and fellow geologist Tom Hooyer of the Wisconsin Geological and Natural History Survey, can now move beyond guesswork. Their studies of the glacial relics retrieved from the campus construction site have effectively dated the last glacial epoch of the region to about 25,000 years ago.

Previously, the only reliable dates obtained from physical evidence were for areas far to the south of Madison, in Illinois where during the last ice age expansive spruce forests covered the landscape and left organic evidence that could survive the ages and be radiocarbon dated. Ice Age Dane County, says Mickelson, was tundra, little more than permafrost

and grass. There were no trees to leave a record.

Wisconsin may have been subjected to as many as 15 episodes of glaciation beginning more than 700,000 years ago. Each time, in response to geological and astronomical events, ice accumulated into vast sheets that ebbed and flowed over the landscape. The last episode, known as the late Wisconsin glaciation, covered much of northern North America with an ice sheet perhaps two or three miles thick at its center over Canada, and occurred between 25,000 and 10,000 years ago. The ice was responsible for sculpting much of the landscape of the northern U.S., including such prominent features as the Great Lakes and New York's Finger Lakes.

Working with University of Illinois at Chicago researcher Steve Foreman, Mickelson and Hooyer were able to date sediment that was laid down in a lake near the ice margin, a lake that encompassed parts of the UW-Madison campus and the city that are now high and dry. This lake was then covered by the glacier as the ice advanced to its westernmost extent near Cross Plains.

"This lake must have been at least 20 feet higher than Lake Mendota is now," says Hooyer.

To date the sediment, the researchers used a technique known as optically stimulated luminescence. The technique depends on the ability of minerals found in the sediment to record the time since they were exposed to sunlight. When tiny grains of minerals are exposed to sunlight, as they might be when suspended in the water column of a glacial lake, their clocks are reset. When the sediments are buried, electrons begin to accumulate within the minerals at a predictable rate, jumpstarted by ionizing radiation from surrounding sediment. Exposing the mineral sample to light under controlled conditions in the laboratory allows scientists to measure the number of electrons that have

accumulated, and determine the length of time since burial.

"Exposure to sunlight zeroes the clock," Mickelson explains. "Once reburied, the electrons build up again in the mineral" and the clock begins to keep time again.

Using the technique, Mickelson, Hooyer and Foreman were able to definitively date the presence of the last glacier that covered most of Wisconsin with a massive sheet of ice.

For Mickelson, the work is validation for time spent haunting local and campus construction sites over the years in an effort to get a glimpse of geological history. He had noticed the ancient lake sediment at least twice before, once in the early 1970s when UW-Madison's Weeks Hall was under construction, and again when Grainger Hall was built in the early 1990s.

When the glaciers were melting away, runoff trickled into a large lake known as glacial Lake Yahara, which extended roughly from Stoughton to Cherokee Marsh to Middleton, and also covered parts of what is now the UW-Madison campus. The runoff carried sediment, including tiny mineral grains, which settled to the bottom of the lake and were buried over time.

"It is not unreasonable to think we had a big lake here (on campus) when the ice advanced as well," Mickelson says. "Sediments from this older lake are the sediments we are dating".

Taking advantage of the deep construction pit for the new Microbial Sciences Building, Mickelson and Hooyer were able to obtain samples of the sediment for testing, and to refine the dates for when Madison last experienced an Ice Age.

Source: University of Wisconsin