Ice core collection at risk of being damaged or lost

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The history of the world is carefully documented and kept in a freezer at Ohio State University.

The university has a rare collection of ice cores from remote tropical glaciers that were painstakingly drilled, extracted and returned to a frozen storage facility in Columbus from 16 different countries. If the cores—each a few inches in diameter and a few feet long—were lined up they would stretch about 4.5 miles long.

But the samples are in danger of being lost. The university's freezers are past their life span and researchers are out of room.

When Lonnie Thompson and Ellen Mosley-Thompson started collecting the cores decades ago, they measured for dust particles.

Now as time has passed, technology has evolved. Teams from all over the world use the cores to measure for items including black carbon, bacteria and viruses.

"Everything that's in the atmosphere, it falls down with the snow and is preserved. It's frozen in time," said Thompson, a paleoclimatologist at Ohio State University's Byrd Polar and Climate Research Center.

For example, "pollen tells us about vegetation and how it's changed. We have all the thermonuclear bomb tests that humans have ever done on this earth that have left a radioactive layer. We can measure that because we know when those tests took place, so they give us a timeline. They're really fantastic records," he said. "Unfortunately, they're disappearing."

Tropical glaciers all over the world continue to recede thanks to greenhouse gas emissions. That has caused warming temperatures, which makes the university's collection—kept at -30 degrees Fahrenheit—invaluable.

"We actually look at our projects now as salvage missions. You try to go in, you try to get the cores before they start to melt," Thompson said. That requires navigating through a myriad of red tape including the permission of countries, negotiating with local tribes in some cases and securing permits.

But the freezer rooms that contain the samples, which were installed in the 1980s, are at the end of their life span. If not replaced soon, the collection risks being damaged or lost.

"That archive is kind of like an insurance policy for the next generation of young scientists, because we're not going to be able to go out in the real world and get those samples," Thompson said. "This is the only samples that exist, once glaciers are gone."

There's little to no space left in the freezer, on West campus. Ellen Mosley-Thompson, a senior research scientist at Ohio State University's Byrd Polar and Climate Research Center, has had to

melt ice cores she secured on expeditions in a university parking lot to make room for more.

"What we have to do then is prioritize what are the most important cores? How do we prioritize those? And of course, melting glaciers absolutely have priority," said Mosley-Thompson, who has led nine expeditions to Antarctica and six to Greenland.

The freezer, and the facility in which it is housed, needs upgrading. The price is estimated at $5.5 million but the path to fund the project is still uncertain especially with COVID-19 depleting state revenue dollars.

The Byrd Polar and Climate Research Center conducted a small fundraiser to generate interest in the project. About $100,000 was donated from nearly 200 donors, according to university officials.

"This project is currently 'proposed'—in the early stages of conception—and not reflected on the Ohio State University Capital Plan," said Dan Hedman, director of marketing and communications for the university's Office of Administration and Planning. "Funding for each project is handled on a case-by-case basis and I cannot speak to the Byrd Center's funding plans or a possible future overall funding breakdown."

Jason Cervenec, education and outreach director for the Byrd Polar and Climate Research Center, said the funding for the expeditions over the years has been covered by federal research dollars and private giving.

"If you just think of the overhead and how much that's contributed to the university in the state, as far as notoriety and recognition, it's immense," he said.

The freezer has to have its own foundation with gravel and foam so it can flex a little with the weight of the collection. The mechanics include compressors, evaporators, generators and piping.

The current freezers have a number of problems. The landscape of the university has changed with parking lots surrounding the Byrd Polar and Climate Research Center. That changed the hydrology even with a large retention pond nearby to offset changes.

Ice mounds started growing under the floor of the second freezer closest to the pond, causing it to heave upward. Heater rods had to be installed in the floor to melt the ice very slowly to get the floor back down. The process to melt the ice took more than six months.

"You can still see the cracks in the floor. Heater rods are still in there and they get tested every month. Because if the heater rods go out, our floors are going to heave," Mosley-Thompson said.

Frost formations inside the freezer periodically fall on the floor. The freezer box has shifted on its foundation, which means the freezer doesn't have a proper seal. That allows warm air inside.

Researchers don't want the ice to melt and re-crystalize.

"We want it like it was preserved in nature as a perfect stratigraphic sequence," Thompson said.

For those who aren't into science, Cervenec equated the archives of ice cores to invaluable piece of art like a painting from OSU alum Roy Lichtenstein, at the Wexner Center for the Arts

"They're essential for us to understand our past and understand it in a way that's directly affecting us with climate change. And as time goes on, we understand more, we get smarter tools. This archive becomes more valuable," he said. "Nobody in humanity will ever get access to those that are permanently lost. So it's kind of like taking out art from a museum and just burning it. You don't have access to what it has to teach you."

Thompson has spent a lifetime trying to warn others of climate change documented in his research.

"I first testified to the U.S. Senate on this in 1992. And, unfortunately, nothing has changed, the (global) trajectory we're on is the same. In fact, our rates of increase in CO_2 is actually accelerating. And part of this is because the whole world is

developing. They need energy and 86% of that comes from fossil fuels," he said.

"Most of these mountain glaciers are going to disappear," Thompson said. "The only ice that will be left from there are those that are in the freezer here."