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U of A PhD student looks to the ice age to predict the future of forests

With global warming rapidly melting arctic permafrost, it's hard to imagine the planet was once encased in ice. But just 20,000 years ago—mere moments in the Earth's 4.57-billion-year history—life forms on Earth evolved in a landscape of ice and snow.

In this palaeoclimate, trees grew in pockets of earth between glaciers. As the ice age retreated, forests grew to cover large areas of terrain. Nowadays, climate change is rapidly changing forest conditions and tree species aren't as well-adapted to their environment as they once were. This is creating challenges for both the health of the environment and the forestry industry.

David Roberts, a PhD student in the Department of Renewable Resources at the University of Alberta, is part of a research team working to understand the effects of climate change on forest ecosystems and to mitigate the impacts. "Part of what we want to look at is whether tree populations are capable of dealing with the magnitude of change on their own," he says. To help answer this question, Roberts is using statistical tools to recreate the migration of forest populations during the ice age. "I want to look at what kinds of migration rates we encountered in the last glaciation," he says. "So, as the continental ice started to retreat, how well were tree species and forests able to repopulate those areas?"

Because trees are long-lived species and adapt slowly, it's very possible that they won't keep up with the rapid environmental changes happening in this century. As a result, foresters may need to help tree species with measures like sourcing seeds from other geographic regions to make populations better suited to their current environment. It's likely that, in the coming century, there will be a substantial loss of aspen and poplar habitat throughout Alberta because of precipitation changes resulting from climate change. "In fact, aspen die-back has already been observed," says Roberts. However, he stresses that any prediction comes with a great deal of uncertainty. He says it's hard to guess the future severity of climate change or potential mitigation measures because of a largely unpredictable human element.

A long-time outdoorsman, Roberts took a winding road to a PhD in forest ecology and historical biogeography. Towards the end of a history degree at the University of Calgary, he was fascinated by a geography class, and decided to do a double major. He worked in industry for a couple of years before applying to be a master's student with Dr. Andreas Hamann at the University of Alberta, whose hardwood genetics research is partly supported by Alberta Innovates Bio Solutions. Within a few months, he'd upgraded to a doctoral program. "I recognized in the first semester that he was a very capable scientist and I allowed him to move to a PhD," says his supervisor. "He has a creative streak—he asks creative questions. In science, asking the right questions is half the ticket, but most people never do."

Hamann has supervised many graduate students over the years and says the young scientist stands out. Roberts has a cumulative GPA of 3.9 (out of 4.0) and his CV is filled with various scholarships, but he's also a leader who's won awards for conference presentations and often steps up to organize events. All of this makes Roberts well-prepared for a career as a university researcher.

Nonetheless, it's curiosity and concern for the environment that's driving Roberts' success as a young researcher, not accolades. Even when he finds the time to go hiking in the Rockies, he can't help but notice how the environment is changing and his mind returns to his research.

Roberts doesn't subscribe to climate change doom-and-gloom and looks at the matter in practical terms. He's happy to report that Alberta's forestry industry has been very supportive of the work he and the other PhD students are doing in Hamann's lab. This is significant, since helping the environment requires productive partnerships between academia, industry, and government. "You really need good collaboration between these groups, because without one of them, nothing will get done."

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