

New research shows forest trees remember their roots

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When it comes to how they respond to the environment, trees may not be that different from humans.

Recent studies showed that even genetically identical human twins can have a different chance of getting a disease. This is because each twin has distinct personal experiences through their lifetime.

It turns out that the same is likely true for [forest trees](#) as well, according to new research from the University of Toronto Scarborough (UTSC).

"The findings were really quite stunning," says Malcolm Campbell, a biologist and lead author of the study. "People have been talking about a so-called "nursery effect" for a long time."

The study looked at the theory that [trees](#) and other plants, even when they were genetically identical, grew differently and responded to stress differently depending on the nursery that the plants were obtained from. Campbell says the research findings not only provide a strong affirmation of this effect, but also reveal insight on a molecular level. "Our results show that there is a form of molecular 'memory' in trees where a tree's previous [personal experience](#) influences how it responds to the environment."

In the new study, Campbell's graduate student Sherosha Raj used genetically identical [poplar trees](#) that had been grown in two different regions of Canada. These stem cuttings were then used to regrow the

trees under identical climate-controlled conditions in Toronto. Raj subjected half of the trees to [drought conditions](#) while the remaining trees were well watered.

Since the trees were regrown under identical conditions, Campbell and his research group predicted all the [specimens](#) would respond to drought in the same manner, regardless of where they had come from.

Remarkably, genetically identical specimens of two poplar varieties responded differently to the drought treatment depending on their place of origin.

Campbell's research group also showed that this difference occurred at the most fundamental level – the one of gene activity. Even though the specimens were all genetically identical, trees that had been obtained from Alberta used a different set of genes to respond to drought than the ones that had been obtained from Saskatchewan.

The findings of this study are relevant to foresters and gardeners in highlighting the importance of the nursery source for trees and other plants, which can determine how the plant will grow and resist stress in a forest or the garden. Additionally, the "memory" of previous experience discovered in this study could also help determine plant survival in response to changes in climate, or other environmental stresses like diseases or pests.

The study appears in this week's issue of the *Proceedings of the National Academy of Sciences*.

Provided by University of Toronto Scarborough

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