

# One of the world's most popular trees arose near the Arctic Circle

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9/26/2017



This white oak's ancestor came from the Far North.

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By [Elizabeth Pennisi](#) Sep. 26, 2017 , 3:54 PM

It's the national tree of the United States, Germany, and a dozen other countries—as well as the stuff of corks and fine wine barrels—yet little is known about where the North American oak tree came from. Now, biologists have pieced together the past of the most dominant species of oaks and come to a startling conclusion: The mother of all oaks didn't arise in the tropics, as many botanists thought, but rather near the Arctic Circle, then spread southward.

“This is perhaps the most spectacular example to date for a [tree] where ecological opportunity in the south allowed explosive species diversification,” says Toby Pennington, a botanist at the University of Exeter in the United Kingdom who was not involved with the work.

To reconstruct the mighty American oak's history, Andrew Hipp, a plant systematist at the Morton Arboretum in Lisle, Illinois, and colleagues obtained tens of thousands of pieces of DNA from 300 trees representing 146 oak species. That enormous amount of genetic material allowed the team to conduct comparisons that revealed which species are most closely related, and avoid the confusion created by genes that jump between the branches of a family tree when two species interbreed. “This is a demonstration of the power of next-generation sequencing techniques to unlock some previously intractable problems,” Pennington says. Hipp's team also used oak fossils to help it date when certain branches of this family tree arose.

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Some 45 million years ago, the first American oaks populated what was a temperate environment in northernmost Canada. This [ancestor eventually divided into the red and white oaks](#), today's most dominant species of oak, Hipp and his colleagues report this month in *New Phytologist*. As North America chilled, "tropical trees there started dying off and the oaks were able to spread across the continent," explains co-author Jeannine Cavender-Bares, an evolutionary ecologist at the University of Minnesota in Minneapolis. Both types of oak spread first to California as polar ice caps expanded, and some of both kinds wound up east of the Rockies and headed to the East Coast and eventually to Mexico. Both kinds of oaks were able to spread easily—thanks to their hardy acorns and wind-assisted pollination—and thus were shoe-ins for adapting to the range of environments to the south, she adds.

To most people, red and white oaks seem pretty similar, save for the shapes of their leaves, and one might expect they would compete with each other for space in the forest. To the contrary, the reds and whites likely helped each other get started, as both depend on the same underground fungi to grow, Cavender-Bares says. So if whites were present, reds could easily get established, for example. Furthermore, the two kinds are susceptible to different pathogens, and red oak seeds take 2 years to mature whereas white oak seeds take only one, so they may complement each other in a landscape, she notes.

Today, both red and white oaks have subgroups in California and in the eastern United States. Both groups are also quite diverse in Mexico. "The two have done it in parallel," says co-author Paul Manos from Duke University in Durham, North Carolina. And in doing so, he says, these magnificent trees have shaped landscapes across North America and Mexico.