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In Depth

Chinese DNA gives life to an American tree

The future of the American chestnut, which nearly vanished last century
By Brandon Keim

A quick primer, in case you've never held an American chestnut: they're hard as a stone but smoother and lighter. Deep lustrous brown, as if carved from mahogany and oiled, and wrapped in hairy sheaths. These drop thumpingly from towering trees with canopies broad enough to shade a picnic.

Bing Crosby sang famously of [chestnuts roasting](#) over an open fire, but as kids my friend Gavin and I never thought of eating them. Chestnuts fit perfectly in the palm. Every fall we gathered them in a sled and threw them at neighborhood bullies. The remainder went to squirrels preparing for a long Maine winter.

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We didn't know how lucky we were to have an American chestnut tree in the neighborhood. An ancient one at that, four stories high with a trunk that provided a final refuge during games of tag. But had we asked, we would have learned that such trees are rare, nearly mythical: we didn't have a tree so much as a botanical magic fountain.

A century ago, as many as one in four eastern trees was an American chestnut (*Castanea dentata*), dubbed "redwoods of the East" for their height. Their lumber supported whole industries, their nuts entire regions of subsistence Appalachia. It was said that a squirrel could travel from Maine to Georgia on chestnut branches without ever touching the ground. Then came *Cryphonectria parasitica*.

"Three-point five billion trees died," says Fred Hebard, staff scientist at the American Chestnut Foundation. "About one in a hundred million survived."

Prosaically known as chestnut blight, *C. parasitica* is a fungus that arrived on Chinese chestnut trees imported into New York City between 1900 and 1908. Unlike their relatives, which had evolved in tandem with *C. parasitica* and thus developed resistance, the American chestnut was utterly vulnerable.

Spread by wind and rain and animals, the blight invaded trees through cracks in their bark, causing disfiguring sores that quickly encircled their trunks and killed everything above. Trees that had lived for four hundred years and stood as tall as the Statue of Liberty died in a single growing season.

It took just forty years for the American chestnut to vanish, though a few diseased remnants survive. In a final cruelty, the blight only kills when trees have reached an inch in diameter: eastern forests are still populated by stunted, sickly saplings doomed to premature death—a reminder of the lost past and, as a reservoir of blight, a guarantee against the future.

But the story isn't over.

Thanks to the [American Chestnut Foundation](#) and a handful of farsighted botanists, the tree may yet return. Over the last twenty-odd years they've painstakingly bred a disease-resistant hybrid population, identical to the original in every way but one: a stretch of blight-protective Chinese chestnut DNA. Scientists don't know exactly how it works. What's important is that it's there.

"We haven't pinpointed the DNA, but we can add it, we can detect it in the progeny: we give them the disease and see how they do. We cross the Chinese and the American, giving us a tree that's half-Chinese and half-American. Then we backcross that to an American, cutting the fraction to one-fourth—then one-eighth, then one-sixteenth, diluting all the traits of the Chinese chestnut tree except blight resistance, which we test at each stage," says Hebard.

Hebard estimates that the Foundation has planted about 6,000 hybrids by hand, and state chapters another 15,000 trees bred to suit local climates and soils.



"We're arriving at the point when we can switch from genetics to deployment," says Brian McCarthy, a restoration [ecologist at Ohio University](#). McCarthy has planted 3,000 chestnuts in the last five years; his specialty is denuded former strip mines—environmental scars that are ironically well-suited to his task, allowing a new generation to grow without competition from plants that have elsewhere replaced them.

"We form these little islands of American chestnuts, and those will bleed out into the forests," says McCarthy. "In a few hundred years, chestnuts will slowly accrete into the landscape. It's nothing I hope to see in my lifetime, but certainly in the next couple."

Whether he'll succeed is an open question. The latest generation of blight-resistant chestnuts is still just five years old. Nobody knows if they'll resist the blight once fully-grown, whether the fungus will evolve to overcome man's biotechnological defenses.

But there's something almost appropriate about this uncertainty. In a world beset by climate change, food riots and environmental upheaval, who knows what life will be like in a generation, much less several hundred years? And it's equally appropriate that, if the restoration succeeds, children will someday have chestnut fights with the seeds of a hybrid—an organism emblematic of both our ancient ecological heritage and 21st century globalization.

Hebard calls his trees "the first seeds of an attempted rebirth."

"We're now at the end of the beginning," he says.



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