



Homo sapiens have been directly responsible for an untold number of animal extinctions. But while humanity's disruptive appetites have been supercharged in the industrial age, it's hardly a new phenomenon—we've been wiping out inconvenient and/or delicious species **since prehistoric times** (<https://www.sciencedaily.com/releases/2008/08/080811200028.htm>).

The good news is that the same skills that made us such a problematic force in nature might also allow us to *undo* some of the damage. The Long Now Foundation's **Revive & Restore** (<http://reviverestore.org/>) project wants to utilize **advances in genetics** (<http://www.pcmag.com/article/347145/only-20-years-until-humans-no-longer-use-sex-to-make-babies>) to bolster endangered populations and *bring back* extinct species through cloning, which they matter-of-factly call "de-extinction."

This concept may sound like something out of the sci-fi super future, but there have already been somewhat successful de-extinction efforts. In 2009, a team of researchers cloned a *bucardo* (a type of wild goat) whose last natural-born member died nine years prior, but the clone survived for only a few minutes due to respiratory complications. While the heartiness of clones has been a known issue since **Dolly the sheep** (<http://www.animalresearch.info/en/medical-advances/timeline/cloning-dolly-the-sheep/>), scientists have greatly improved their track record in recent years (in fact, if you're a carnivore, **you've probably eaten meat from a cloned animal** (<https://www.scientificamerican.com/article/are-we-eating-cloned-meat/>)).

To find out what animals might soon be making an encore, we invited Ben Novak, the lead scientist for Revive & Restore, to join us for a recent episode of ***The Convo*** (<http://www.pcmag.com/article/346681/the-convo-pcmag-nerds-it-up-with-the-worlds-most-interesti>) (embedded above), our live-streaming Q&A show where we talk to the boldest minds in science, technology, and geekdom.

Sorry, No Dinos

This might sound reminiscent of a certain 1993 sci-fi blockbuster, but the good (or bad) news is we probably don't need to fear being hunted down by a cloned amusement park T-Rex anytime soon.

"The process of de-extinction is about working with a genetic code of an extinct species," Novak explained. "And dinosaurs went extinct way too long ago for us to retrieve any DNA from their fossils. DNA might last a million years if it's frozen in permafrost, but otherwise, it degrades really quickly.

"So, we're restricted to working with things in the 10,000- to 100,000 year timeframe," he said.

(And no, despite Michael Crichton's promises, DNA won't even survive inside a mosquito preserved in amber. Following some pushback on the dino front from commenters and the host, Novak explained that he spent the early part of his twenties looking for useful dinosaur DNA and "there's nothing there.")

But even if there are no dinosaurs on the horizon, that doesn't mean there aren't some really cool de-extinctions on the horizon. Currently, Revive & Restore is pursuing several de-extinction and genetic rescue projects: The black-footed ferret; heath hen; passenger pigeon; and the one I'm most excited about: the **woolly mammoth** (<http://www.livescience.com/50275-bringing-back-woolly-mammoth-dna.html>), which is being run out of Harvard under Dr. George Church.



In fact, right now, the mammoth revival team "has a Petri dishes full of elephant cells carrying 14 to 16 mutations from mammoths affecting traits for things like hair growth, fat development, and other traits," Novak said. "The question is less about how do we make a woolly mammoth, but how do we make an elephant that is able to survive in Siberia where it's cold that's essentially what the woolly mammoth is."

While the mammoth team could probably create an embryo right now, they will first create stem cells and grow different types of mammoth tissue in the lab (skin, blood, fat, etc.) to observe if the mutations are indeed leading mammoth traits as opposed to elephant traits. After this research is complete, the team will move onto cloning attempts, possibly in the next few years.

It would be amazing to see some of these creatures again, but this isn't just science entertainment; there is an ecological purpose to de-extinction. The passenger pigeon, for example, once played a critical role in preserving the health and diversity of forests in eastern North America before they were **hunted to extinction** (<http://news.nationalgeographic.com/news/2014/08/140831-passenger-pigeon-martha-deextinction-dna-animals-species/>) in the early twentieth century. Since their disappearance, no other animal has stepped up to fill this ecological niche. Meanwhile, the mammoth (which has been MIA for at least 10,000 years) may play a key role as grazers on grasslands in the arctic tundra, which are being newly restored to offset climate change.

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Jurassic Park may remain a bit of fantasy, but there's a very good chance that we will see a **Pleistocene Park** (https://en.wikipedia.org/wiki/Pleistocene_Park) in our time. Good work, humans.

Correction: In addition to its de-extinction projects, Revive & Restore is also pursuing various genetic rescue projects in which the organization is attempting bolster endangered species using genetic technologies— the black-footed ferret is one of these projects.

Additionally, an earlier version of this story stated that cloned mammoths might be used to graze on new grasslands which have been exposed as a result of climate change. Actually, these mammoths might become grazers in grasslands that are being restored in the arctic tundra in order to combat climate change. The current text has been updated to reflect these changes.

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