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FEATURE STORY

Mammoth Mystery

Page 4

The drastic environmental changes we've wrought in our own times help account for the shift in thinking among paleontologists. "Places I went in the sixties that were wild are wheat fields today," says Anthony Barnosky, a paleoecologist at the University of California, Berkeley. "When you've seen that kind of change in your own lifetime, it's not so hard to believe humans drove the Pleistocene extinctions."

Barnosky began his career in the 1970s, about 10 years after Martin went public with his theory. "At that time my view, and the popular view among my colleagues, was that the humans of 11,000 years ago could not have wiped out the megafauna," he remembers. By the 1980s, when Barnosky revisited the question, he, like Martin, was struck by the unique pattern of the late Pleistocene die-off.

In the mid-eighties, Barnosky was working at Porcupine Cave, a site high in the Colorado Rockies where predators through the ages have dragged their prey for a quiet meal, leaving a library of bones behind. The cave also contains ancient pack-rat middens, a treasure trove of bones hundreds of thousands of years old. Porcupine Cave gave Barnosky a window into the mid-Pleistocene, more than 700,000 years in the past, allowing him to track the changes that time and shifting climate had wrought there long before the first human laid eyes on North America.

Throughout Pleistocene time, as global temperatures rose and fell, glaciers retreated and advanced. Many of the creatures at Porcupine Cave were affected: One species of rabbit or mouse might decrease or disappear, while another became more abundant. But overall, the animal community remained stable and big species were little touched. "You don't see big changes in populations of large mammals," says Barnosky, "until the mass extinctions at the end of the Pleistocene."

Barnosky now believes that "humans and climate change were the one-two punch that drove the late Pleistocene

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extinctions." The mammoth and the mastodon died out at a unique point in the earth's history -- a moment when human populations were growing dramatically and temperatures were climbing fast. "What's happening today is the same thing magnified," he says. "We have global warming at a rate unprecedented in mammalian history. Human populations continue to expand, and now, as conditions change, animals can't move around the landscape as they once did to find usable habitat. We've surrounded them with cities, farms, and ranches that block their way."

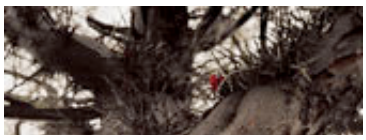
Barnosky suggests that the best way to protect biodiversity in this dire scenario is to restore and connect natural areas. That's an utterly reasonable idea, based on decades of research in conservation biology. But Paul Martin and some of his followers have a more radical plan.

Martin, now in his 70s, has spent a busy career pondering the lives of Pleistocene monsters, puzzling over the ways in which their disappearance might have changed the landscape they left behind. He's the kind of scientist who analyzes the dung of extinct sloths and then searches out the plants they ate to sample a few bites himself. He's never been short on imagination, and he's always liked to think big. Martin was the first to start talking about bringing wild elephants back to North America.

In August 2005, the prestigious journal *Nature* published a commentary written by Josh Donlan of Cornell University, and signed by Martin and 10 others, advocating "Pleistocene rewilding" -- the introduction of elephants, lions, and other large Old World mammals to the North American plains. Depending on which expert you ask, the idea represents either a brilliant revolution in strategy for conservation biology or a burst of communal insanity.

Martin, Donlan, and their colleagues have begun to look to the living megafauna of the Old World, now endangered on their home turf in Africa and Asia, for insights into America's Ice Age ecosystems and clues on how to restore them. They argue that the African savannah, where lions, elephants, and zebras survive, resembles Pleistocene North America more closely than any of our own wilderness preserves.

African elephants play a pivotal role in shaping their habitats, thinning out dense stands of shrubs and small trees and, when they dig for water in the dry season, creating water holes used by other species. In Kenya's Amboseli National Park, wild elephants and domestic cattle partner in an ecological dance, the cattle grazing in areas where elephants have cleared away trees, the elephants browsing on new shrubs that sprout in the wake of grazing cattle.



Martin would like to recreate a Pleistocene ecology that he believes depended on the mammoth and the mastodon.

With its foot-long, honey-rich seedpods and clusters of hazardous thorns, the ancient honey locust tree, *Gleditsia triacanthos*, was designed to both attract and repel hungry megafauna.

He argues that elephants in North America once formed, and could form again, the same sort of partnership with bison that Amboseli's elephants have with cattle. Seven species of American elephant were lost at the end of the Pleistocene; tuskers once ruled the Western Hemisphere, from the woolly mammoths of the Arctic to the gomphotheres of South America. Plants that coevolved with the giant herbivores, and relied on them to disperse their seeds, still grow from Brazil to New York City, mute witness to their importance in Pleistocene ecosystems. The nutritious fruits of the mesquite and the honey locust are attractive to a hungry elephant, and enclose hard-cased seeds designed to travel intact through a herbivore's gut.

"We tend to think that what Lewis and Clark found in the American West was exactly what nature intended, and that we shouldn't fool with it," says Martin. "But 200 years ago our wild areas were already impoverished, stripped of all the biggest species." In deciding what is and is not natural, Martin would say, we need to overcome the hubris of the present.

The *Nature* article widens his original argument for the return of the elephant, suggesting that other endangered Old World species, like the African cheetah and the Asian ass, could fill empty niches left by extinct American cheetahs and horses. Expanding the range of these animals into North America, the article says, could be the best hope of preserving healthy populations: The whole wildly unconventional plan would be a great boost for global biodiversity.

The rewilding proposal appalls many conservationists involved in the uphill struggle to restore dwindling native species in the West. The Great Plains today are empty of free-ranging bison, for instance, and black-tailed prairie dogs survive in only 5 percent of their historic range. These, like the African elephants in Kenya, are both keystone species, animals that help create habitat needed by many other types of wildlife. "It would be the height of folly," says Steve Forrest of the Northern Great Plains office of the World Wildlife Fund, "to suggest that we introduce non-native animals when we haven't even established healthy numbers of our own keystone species."

Page: 1 2 3 4 5

Photo: Masood Kamandy

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