

F O R E W O R D

After five decades of probing the mysteries of large animals that vanished at the end of the Pleistocene (the end of the last ice age), I've emerged with some unusual ideas. For example, it's impossible for me to ignore the fact that America today is incomplete. When we lost mammoths, mastodons, and gomphotheres, not to mention native horses, ground sloths of all sizes, and dozens of other genera of wonderful large animals, we lost our American Serengeti. This happened only 13,000 years ago, long after the extinction of the dinosaurs. It was more than an injury; it was an ecological and evolutionary amputation. I dream of a memorial, a cenotaph, or a special mass to commemorate the disaster.

Few if any plants departed with the megafauna, but plants too have suffered the loss, as we shall see. A shared interest in such matters led to a phone call from science writer Connie Barlow, who decided to pursue this secret of Pleistocene ecology when my attempts at some simple answers proved insufficient. Here is the result. Focusing not on the extinct but on the partners they left behind, Connie offers us an intriguing Pleistocene field guide and brings us face to face with a mysterious *quid pro quo*, the ancient agreement between large animals and plants.

The plant side of the story can be seen at a glance in any good supermarket. The exemplar of what I mean is a ripe avocado, its nutritious pulp enveloping a large, inedible or mildly poisonous, ready-to-germinate seed. Other examples include mangoes, papaya, tamarind, peaches, and watermelon. All cater to fruit lovers, animals ranging in size from monkeys up to elephants. The payback to the plant for feeding the animal is dispersal of its seed. No free-market economist should be surprised at this transaction. Yet the animals that coevolved with the avocado are lost in the mists of time.

Years ago, ecologist Dan Janzen was the first to show that many of the larger fallen fruits of the tropics are going nowhere. In Costa Rica Dan ran feeding trials with some of the largest native animals found in tropical forests, such as tapir. They were too small to disperse the seeds of the large fruits. Daring to experiment with domestic livestock (what self-respecting ecologist would stoop to study the food habits of a cow in dry tropical forest?), Dan also discovered that although cattle, horses, and mules are large enough to ingest and disperse many of the larger fruits, they can, at best, suggest solutions, not solve the problem. They are alien newcomers that did not coevolve with the tropical trees of the New World.

In the absence of domestic cattle and horses, it is likely that since the extinction of the great beasts, fallen fruit piled up under calabash, guanacaste, honey locust, and many other trees. Small beetle larvae, many other seed predators, rot, and mildew wasted the crop.

Could this be true? In 1979 Dan Janzen wrote to me about a wild idea he had. I loved it. He sent a draft and asked me to coauthor a manuscript, "Neotropical Anachronisms: The Fruits the Gomphotheres Ate." I added a few more names to

Dan's list of extinct prehistoric animals, and we proudly submitted our paper to the flagship periodical for all who think they have discovered great new stuff: *Science*. It was quickly rejected.

I was ready to quit and try elsewhere, but Dan battled an outraged editor who implied that our paper sounded too much like a Hollywood script to grace the prestigious pages of *Science*. I don't know how Dan managed to get the editors to reconsider. Finally they did, and that's where the story of the gomphotheres and the anachronistic fruits first appeared

No matter where they are published or what their perceived merit, most scientific articles have a short shelf life. I figured I'd seen the last of "Neotropical Anachronisms." So you can imagine how thrilled I am that twenty years later Dan's and my paper has generated a blizzard of citations. Connie Barlow has now brought this literature together in a wide-ranging story that captures, better than anyone has before, the profound influence Dan's idea has had. It illustrates the value of adding a much-needed and often-neglected dimension to ecology: the dimension of time.

Here in her book Connie shows why alternative explanations for the mystery of the fallen fruits are insufficient if not flawed. She brings in Gary Nabhan's idea of how humans could have helped the plants disperse their fruits in the millennia after the native megafauna had vanished. She finds that in city parks, in botanical gardens, at field stations, and in warm temperate woodlands, as well as in the dry and wet tropical forests of the world, Dan's wild idea is gaining traction. She adds some astute ideas of her own. The natural history here is state-of-the-art.

Toward the end Connie tells of an event that I think was the first of its kind, reflecting the spirit of the times. In the summer of 1999, with the support of staff of the Mammoth Site at Hot Springs, South Dakota, Connie helped me organize an unusual requiem, a memorial for the extinct mammoths, mastodons, and gomphotheres. The audience of mourners heard from Georges Cuvier, the first paleontologist to show that mammoths and mastodons were extinct; from Thomas Jefferson, who hoped that they weren't; from geologist Larry Agenbroad, who claimed that frozen tissue from mammoths in Siberia just might yield enough DNA to clone a living woolly mammoth; and from me. I claimed that in the absence of our native American elephants ecologists do not begin to know the nuts and bolts of vegetation dynamics in this hemisphere.

The service ended with a moving soliloquy from a Ms. Honey Locust of New York City. Ms. Locust sported a big green hat bedecked with long, spiraling pods. Honey locust trees may be streetwise, we learned, but their pods miss the megafauna.

Come to think of it, that *Science* editor was right. As Connie Barlow shows us, beyond its merit as an ecological model, the mystery of fallen fruit makes a splendid script.

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