

Where's a Good Giant Ground Sloth When You Need One?

By Carol Ann McCormick, Assistant Curator, UNC Herbarium

Herbarium students and staff have been cataloguing pawpaw specimens. The inspiration for delving into *Asimina* came from volunteer Liane Salgado, who shared with us fruit from an *Asimina triloba* cultivar she planted in Chapel Hill. Liane's pawpaws were huge, each the size of a russet potato, and the taste was deliciously tropical, reminiscent of mango and banana. Embedded in the pulp were 4 to 9 large (1–2 inches long), hard seeds. While most Americans have never sampled this fruit, wild pawpaws are common along streams in eastern North America. There is a large stand that reliably produces abundant fruit along Meeting of the Waters Creek on the Nature Trails at the Botanical Garden. Visitors to the Triangle Land Conservancy's White Pines Preserve, in Chatham County, can walk underneath a canopy of *Asimina triloba* along the floodplain of the Deep River.

As I consumed the sweet pulp (and set aside the large seeds) of Liane's pawpaws, I recalled a thought-provoking article I read years ago in *Science*. In 1982 Daniel Janzen and Paul Martin theorized that many neotropical plants bearing very large fruits with large, hard seeds evolved to be eaten and dispersed by extinct megafauna, that is, large-bodied mammals weighing more than 100 pounds. What can be included in "megafauna"? American Mastodons (*Mammot americanum*, 8,000–12,000 pounds), Giant Ground Sloths (*Megalonyx* and *Eremotherium*, 3,000–5,000 pounds), and American Camel (*Camelops hestemus*, 1,300 pounds) are just a few of these very large animals that once roamed the Americas. At the end of the Pleistocene (ca. 10,000 years ago), there was a massive extinction of these animals, and the plants that had evolved to be eaten and dispersed by them were left behind. Without efficient animal dispersers, some plants became extinct, while others experienced a diminishment of their range or a drop in population size. A very few, like the avocado (*Persea americana*), thrive because humans relish the fruit and have taken over as the primary disperser.

In *The Ghosts of Evolution: Nonsensical Fruit, Missing Partners, and Other Ecological Anachronisms*, Connie Barlow expands on Janzen and Martin's ideas about extinct megafauna and the plants they ate. She lists the following characters of a plant whose fruit would be dispersed by a large herbivore: large fruit evolved to be eaten by an animal in one gulp (not eaten piece by piece); fruit that does not open and spill seeds upon ripening; hard seeds that defy total destruction by teeth; and seeds that benefit from, or require, scarification to germinate. Barlow

suggests that we can tell a plant is missing its animal disperser if it has seeds that germinate and grow well in upland habitats when planted, but is a plant that is restricted to floodplains in the wild (if megafaunal dispersers are absent, then gravity and flowing water become the primary dispersers), and if the present range of the plant is inexplicably patchy or restricted.

Based on Barlow's criteria, which North American native plants are good candidates for having had now-extinct megafaunal dispersers? Pawpaw certainly fits in terms of fruit size, seed size and hardness, and present restriction to floodplains. *Gymnocladus dioicus*, Kentucky coffee-tree, also seems plausible. It produces short, heavy, leathery pods with sticky sweet pulp and a half dozen rock-hard seeds. Kentucky coffee trees are difficult to germinate, as the seeds yield to scarification by only the most determined gardener wielding a serrated knife. I can imagine these pods being gulped whole by a ground sloth, the seeds being scarified as they slowly progress through the rough-and-tumble environment of the sloth's long gut, and the seeds being deposited and germinating in a hefty pile of dung.

Barlow theorizes that Osage orange (*Maclura pomifera*) might have been eaten by Pleistocene horses, and honey locust pods (*Gleditsia triacanthos*) might have been relished by mastodons (the long, three-parted thorns may have deterred mastodons from ravaging the trees's twigs and foliage).

If I could time travel, I would certainly visit Pleistocene North Carolina and seek out *Eremotherium eomigrans*, a giant ground sloth that weighed 3 tons and stood 15 feet tall when reared up on its hind legs. Foot-long claws on its front legs served not only to ward off predators, but also to rip vegetation and fruit from tree tops. Until the time machine is invented, I'll have to settle for slurping on pawpaws as I visit the N.C.

Museum of Natural Sciences, in Raleigh, and view the *Eremotherium* diorama, showing a ground sloth in a pine savanna, based on bones found in 1991 in Wilmington.

References Cited:

- Janzen, Daniel H. and Paul S. Martin. 1982. Neotropical Anachronisms: The Fruits the Gomphotheres Ate. *Science* n.s. 251 (4528): 19–27.
 Barlow, Connie. 2000. *The Ghosts of Evolution: Nonsensical Fruit, Missing Partners, and Other Ecological Anachronisms*. New York: Basic Books.

Illustration by Emily Page Bidgood

