



While Angela McDonnell (left) worked on her Ph.D. under advisor Dr. Mark Fishbein (right), she discovered a new species of milkweed – the hairy-faced spiny pod.

## Doctoral student discovers unidentified plant species found only in a corner of Texas

While doing research at the Missouri Botanical Garden in St. Louis for her dissertation, Oklahoma State University graduate student Angela McDonnell came across a mystery. A botanist there showed her a pressed, dried specimen of a milkweed vine plant from Texas unlike any of its closest relatives. The plant hadn't been described or named since first being collected in 1903.

“Dr. [Peter] Stevens [a botanist at the Missouri Botanical Garden who specializes in milkweed vines] thought it was the species *Matelea decipiens*, but he wasn't positive,” says McDonnell, a doctoral student in OSU's Department of Plant Biology, Ecology and Evolution. “He asked me to look at it, and it definitely wasn't *Matelea decipiens*.”

McDonnell began a search to identify the mystery milkweed. That led to new plant species and, as is the scientific custom for the discoverer, she gave the plant its scientific name, *Matelea hirtelliflora*, and its common name, the hairy-faced spiny pod.

“She cast a broad net over this group of plants that she specializes in, and that led her to an inkling that this could be a new species,” says Mark Fishbein, an OSU professor and McDonnell's advisor.

Confirming that the plant was indeed something new became a side project as she worked to complete her Ph.D.

“I study plants that belong to a lineage of around 500 species of milkweed vines called *Gonolobinae*. Within that lineage, I have focused on a smaller group of around 20 close relatives in the genus *Chthamalia* that occur in Oklahoma, Texas and throughout Mexico,” McDonnell says. “I use genomic information to estimate relationships among different species that allow me to better understand how different traits, like growth form, fruit shape and flower shape, have evolved over time.”

# A MILK-WEED BY ANY OTHER NAME

How does a botanist study plants? McDonnell utilized dried, pressed plant specimens held in museum collections, or herbaria, and borrowed samples from institutions across the U.S., including the botanical garden in Missouri, the University of Texas in Austin,

the Botanical Research Institute of Texas and the New York Botanical Garden. Fishbein says McDonnell borrowed hundreds of dried and pressed samples of milkweed species. The specimens are measured, such as flower petal length and width, and described in detail. With *Matelea hirtelliflora*, the flowers are smaller and have hairs not found on related species.

“I had specimens of this unknown species and specimens of what I thought were the closest relatives from mostly the eastern and southeastern U.S., and they were florally pretty different,” McDonnell says. “The flowers are really what differentiates it. Within the first hour of looking at it, I had a pretty strong suspicion. Then you just have to take measurements and mount up the evidence.”

McDonnell says she most enjoys the fieldwork required in her research. She visited a state park in Texas where the plant was collected in 1903 and 1998. Its location further revealed the plant’s uniqueness because of geographic separation from relatives. Its range is limited to the piney woods of Northeast Texas, a tiny area compared with related milkweed vines that prefer oak-hickory forests across the eastern and southeastern U.S. It’s not known why the range of this species is so limited.

“It might be something like the soil, or it might be reproduction that limits it,” McDonnell says. “It could just be doing a bad job dispersing itself.”

With the collection of evidence and assistance from Fishbein, also an expert on milkweed vines and director of the OSU herbarium, McDonnell was ready to write a journal article to announce and provide evidence for her conclusion. She was the lead author with Fishbein on a paper published in *Systematic Botany* in August 2016. The authors described the characteristics and distribution of the plant and made the case for why it was a new species.

But what difference does it make to the world at large if a previously unknown plant or animal is discovered? In the case of hairy-faced spiny pod, McDonnell says describing the plant provides information about the evolution of milkweed vines and how this new plant relates to its lineage and its environment. What feeds on it? What other plants and animals (including humans) depend on it or threaten it? Describing a rare plant alerts people to something that may need protection or simply tells people about a newly discovered plant right under their noses.

This is not the first plant McDonnell has identified. She also discovered a previously unknown milkweed vine in Mexico.



McDonnell studied milkweed in OSU’s herbarium, run by Dr. Fishbein. She earned her Ph.D. in July 2017 and earned a post-doctoral fellowship at Bucknell University.

“I think this kind of work is a cornerstone of biodiversity research,” McDonnell says. “This seems to be a species that’s rather rare, and you can’t really communicate about it or conserve it if it doesn’t have a name.”

With the completion of her dissertation this summer, McDonnell is preparing for a post-doctoral research position at Bucknell University in Pennsylvania, where she has been named the Burpee Post-Doctoral Fellow in Botany. For now, her work with hairy-faced spiny pod is over, but she hopes other scientists will pick up where she left off.

Fishbein says the work of botanists like McDonnell is important because it helps people understand plants around them and realize what could be lost. In modern history, countless plants have disappeared before they were identified. Often, they’re found later as specimens in herbaria but no longer found in the environment.

“We’re still discovering what plants grow in the U.S.,” Fishbein says. “It’s surprising to people that we haven’t identified all the plants that grow here.” 📖

Story by Jeff Joiner | Photos by Gary Lawson