

# How Did Cactuses Evolve



**In a groundbreaking new study in the June issue of *American Naturalist*, Erika J. Edwards (Yale University and University of California, Santa Barbara) and Michael J. Donoghue (Yale University) explore how leafy, "normal" plants evolved into the leafless succulent cactus.**

"The cactus form is often heralded as a striking example of the tight relationship between form and function in plants," write the authors. "A succulent, long-lived photosynthetic system allows cacti to survive periods of extreme drought while maintaining well-hydrated tissues."

Recent molecular phylogenetic work has confirmed that *Pereskia*, a genus that consists of 17 species of leafy shrubs and trees, is where the earliest cactus lineages began. Using field studies and environmental modeling, Edwards and Donoghue found that the *Pereskia* species already showed water use patterns that are similar to the leafless, stem-succulent cacti.

"[Our] analyses suggest that several key elements of cactus ecological function were established prior to the evolution of the cactus life form," explain the authors. "Such a sequence may be common in evolution, but it has rarely been documented as few studies have incorporated physiological, ecological, anatomical, and phylogenetic data."

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