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NYBG Leads Nationwide Effort to Digitize More Than Two Million Specimens of Some of Earth's Most Interesting and Endangered Plant Species

Supported by a \$2.8 million National Science Foundation Grant, the Three-Year Project Aids the Study and Conservation of Plants Adapted to Extreme Environmental Conditions



Selenicereus boeckmannii, a moonlight cactus native to the Caribbean and Central America, is being digitized as part of the “Endless Forms” project. NYBG Photo

Bronx, NY—Focusing on some of Earth's most interesting and endangered plant species, The New York Botanical Garden is leading a network of 17 collaborating U.S. research institutions that will digitize more than two million preserved plant specimens over the next three years to make this invaluable scientific resource easily available online to plant and conservation researchers, students, and the general public.

The project, “Digitizing ‘endless forms’: Facilitating Research on Imperiled Plants with Extreme Morphologies,” will concentrate on 15 plant families containing species that are carnivorous or succulent or that grow on other plants, known as epiphytes. Among the several hundred thousand species included in the project are such iconic and unusual plants as the Venus’s flytrap, the giant saguaro cactus, and the leafless ghost orchid of southern Florida.

All of the species in the project display, in one way or another, remarkably varied types of adaptations that allow them to grow in extreme environments, including deserts, tropical rain forests, and nutrient-poor bogs. Many of these plants can be challenging to study in the wild and confront elevated conservation threats in the face of rapid environmental change.

The “Endless Forms” project takes its name from the conclusion of Charles Darwin’s landmark 1859 work about evolution, *On the Origin of Species*: “from so simple a beginning endless forms most beautiful and most wonderful have been, and are being, evolved.”

“Endless Forms” is supported by a National Science Foundation grant of nearly \$2.8 million. The principal investigators leading the project are Matthew C. Pace, Ph.D., Assistant Curator of NYBG’s William and Lynda Steere Herbarium, and Barbara M. Thiers, Ph.D., Vice President and the Patricia K. Holmgren Director of the Steere Herbarium. Among the other collaborating institutions are the Missouri Botanical Garden, the California Academy of Sciences, the University of California–Berkeley, Harvard University, and the Field Museum of Natural History in Chicago.

The Steere Herbarium holds an estimated 280,000 carnivorous, succulent, and epiphytic specimens, one of the largest collections in the world. Many of these specimens belong to critically endangered species collected over the past three centuries, often from areas where it is now challenging, if not impossible, to conduct new field research. Because of this, herbarium specimens are an unparalleled window on the past, as well as a critical means for understanding the future of biodiversity.

Digitization—a combination of capturing ultra high-resolution images of the specimens and entering detailed information about each specimen in a searchable database—will make this scientific collection easily available to anyone with an internet connection. Among other benefits, this online resource will help researchers overcome the acute problem of access to specimens of threatened and endangered species. Deeper understanding of the various adaptations of the species and their evolution will make it possible to design better conservation and management strategies. The public’s interest in these charismatic and captivating plants also affords an opportunity to engage students and teachers in discussions about biodiversity and its preservation, plant adaptations, and mutually beneficial species relationships. Additionally, the availability of two million digitized records will enhance the education and enjoyment of citizen scientists, horticultural hobbyists, and other non-academic enthusiasts.

Also as part of “Endless Forms,” Drs. Pace and Thiers will moderate an ethical specimen data-sharing workshop in May 2019 during the annual meeting of the Society for the Preservation of Natural History Collections in Chicago. The workshop will bring together stakeholders to make recommendations about the best practices for handling data involving rare species.

The sharing of endangered species geographic data is a hotly debated topic among scientists. Plant research collections have been digitizing their holdings as a way to facilitate research and democratize access to data, but poachers have also used scientific specimens and papers to determine the locations of these valuable species, potentially hastening their extinction. By establishing guidelines on how and when to share data and, just as important, when to hold back that data, the workshop represents an important opportunity for the scientific community to strike the optimal balance between access and protection.

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The New York Botanical Garden is a museum of plants, an educational institution, and a scientific research organization. Founded in 1891, the Botanical Garden is one of the world's preeminent centers for studying plants at all levels, from the whole organism down to its DNA. Garden scientists conduct fundamental research on plants and fungi globally, as well as on the many relationships between plants and people. A National Historic Landmark, the Garden's 250-acre site is one of the greatest botanical gardens in the world and the largest in any city in the United States, distinguished by the beauty of its diverse landscape and extensive collections and gardens, as well as by the scope and excellence of its programs in horticulture, education, and plant research and conservation. Learn more: nybg.org

The New York Botanical Garden, 2900 Southern Boulevard, Bronx, New York 10458

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