



Archiving into Space

Epiphytic plants adapt to life above the ground.

By JONATHAN ERTELT



Illustrations by BONNIE ARANT ERTELT

OVER THE PAST YEAR many in the Vanderbilt community have noted a fellow, sometimes pushing, usually pulling a cart full of a wide variety of plants through the center of campus. That fellow was me, and for the last six months those plants on the cart have been part of what makes up Vanderbilt's botanical teaching collection.

Shortly after I started working with the collection, I overheard a faculty member commenting on my love for hanging baskets. It is true that I tend to use hanging baskets extensively, for two reasons. First, baskets offer more space for growing and displaying. Second, that is the way the majority of plants grow in the tropics—not in hanging baskets as such, but arching out into space, often high above the ground, with roots anchoring onto bark or into an organic mix of debris that has settled onto branches after falling from branches higher still. Plants that grow in this fashion are known as epiphytes, literally translated as “upon plants.” Unlike parasites, these plants do not put their roots into their host plants, nor derive any nutrition from them.

Epiphytes generally start life in the trees the way most plants start life—as a seed. Some seeds are windborne, while others are transported by ants or by various larger animals (either stuck to fur or feather, or traveling through the digestive system of animals that spend part of their lives in the trees). The seeds are rubbed off or deposited onto bark or branch, anywhere from 5 to more than 150 feet off the ground.

Assuming a seed germinates, the emerging plant grows, using a variety of possible adaptations that enable it to capture moisture and nutrients without the benefit of the more “normal” soil substrate. Light levels are likely much better up in the trees than they would be on the densely shaded forest floor. However, within the large group of plants that grow as epiphytes, some are moisture-loving deep-shade plants, growing

close to the trunk and low in the canopy or close to the ground, while others could almost be desert growers, with extreme exposure at branch tips at the tree top.

Eighty-three families of vascular plants have epiphytic species; of those families, nearly 25 are represented in our teaching collection. Why does the Vanderbilt collection have such a large number of these ecological specialists? Aside from the fact that so many



Pictured from left are three epiphytic bromeliads in the genus *Tillandsia*; upper right: An ant plant grows on the side of a tree.

epiphytes are spectacular to look at, especially when they're in bloom, it is precisely the wide diversity of survival strategies that have evolved across these families that makes them so useful in a teaching collection. Consider the “ant plants” from tropical Asia. From the time they have only four leaves, their stems are swelling, developing an interior catacomb of tunnels and chambers complete with entry and exit doors, inviting ants to move into a ready-made home. Of course, the ants provide nutrients as well as increased carbon dioxide levels, both good for plant growth.

The ants may guard their vegetative home from herbivores as well, and serve as dispersal agents for the seeds.

Some plants have root systems that grow across and into the bark fissures, anchoring the plant to its perch, but also roots that grow straight up into the air. Why? The term “trash-basket root system” has been applied to these plants, which have negatively geotropic roots sticking up, catching debris falling from branches and other plants above. Once the debris is caught, every rain leaches out nutrients that are then absorbed by the roots, allowing for strong growth and flowering far above the forest floor.

Many bromeliads, members of the pineapple family, have leaves that grow in a tight rosette, forming a vase that catches rainwater as well as debris, making a nutrient-rich solution. Not all of these vase-like growths are small, either. The record measurement so far is a plant holding upwards of 30 liters of water—enough to fill a child's wading pool. Then there are orchids, with a number of survival adaptations of their own, but also with their own unique and spectacular flowers. In several of the genera we have, the flower spike comes out of the base of the plant and grows straight down, which would be a problem in a pot but not on a tree

branch or in a loose-fiber basket.

The teaching collection is housed under the auspices of the Department of Biological Sciences. The collection likely started before the first greenhouses were constructed back in the mid-1930s. Attached to the west side of Buttrick Hall, those first greenhouses served the Department of General Biology, then the Department of Biology when the organismic and ecological disciplines split from molecular biology in the early '60s. When I first arrived seven years ago, probably 40 families were represented, with possibly 100 genera present. The collection now boasts a representation of nearly 90 families and 220 genera.

With such a rich variety of plants, the collection offers much to inspire the imagination. Sometimes it's the flower, sometimes the entire plant with a strange adaptation or two, and sometimes what catches the eye is simply the fact that these plants are growing on a branch hanging by a wire. But if the eye is caught, the next step can begin. That step is teaching—helping students gain a better understanding of the world. ▼

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