OF TREES AND TEST TUBES
Building Capacity for Scientific Discovery at Weld Hill

Faye Rosin, Director of Research Facilitation

For 140 years, the Arnold Arboretum’s development of its living collection of trees, shrubs, and vines has provided plant scientists with test subjects for exploring the science of woody plants. Last year’s opening of the Weld Hill Research Building not only signaled the reinvigoration of the Arboretum’s research mission, but also underscored the value of making the collections more accessible to researchers from Harvard and beyond. In addition to the new facility at Weld Hill, the Arboretum’s rising profile in the realm of plant science has been supported by several other new components: new leadership, new undergraduate teaching labs at Weld Hill, and new awards that support emerging research.

For Director Ned Friedman, these developments represent the cornerstone in his vision for the Arboretum as a hub for plant research, centered on remarkable collections of living plants, herbarium specimens, and library and archival resources. “Everything that we collect, document, and preserve at the Arnold Arboretum is intended to be useful and accessible for study at every juncture,” he explains. “The Weld Hill Research Building represents the key to significantly expanding our ability to share these important assets in support of botanical and horticultural research activities around the world and in our own landscape.”

Formerly sequestered in laboratories on Harvard’s Cambridge campus, Arboretum scientists have made a new home for their investigations at Weld Hill. In addition, Weld Hill has become a home-away-from-home for collections-based studies by visiting scientists from around the world. While they capitalize on the facility’s physical proximity to the collections and other scientists, guest researchers can also tap the knowledge and expertise of the Arboretum’s curation staff, librarians, horticulturists, and educators. In many ways, Weld Hill offers valuable opportunities for collaboration, discussion, and learning, whether informally in its labs and in the Arboretum landscape or more formally at weekly research seminars.

One beneficiary of Weld Hill’s unique combination of advantages for scientists is Cary Pirone, a Putnam Fellow at the Arboretum. Cary’s work focuses on pollination in gymnosperms (non-flowering seed plants like conifers and ginkgo), and the complex chemical signals involved that allow the female reproductive structure—the ovule—to detect compatible pollen. Collecting tiny pollination droplets over several months, Cary’s efforts have been greatly simplified by the extensive concentration of gymnosperms in one location at the Arboretum. “Not only can I set up field experiments...”

A new microscopy lab at Weld Hill creates new opportunities for the Arboretum to contribute to undergraduate learning in the plant sciences.
using a diverse set of specimens in the living collection, but within minutes of collecting I can be back in a well-equipped laboratory, processing samples and performing my experiments," she says.

As a part of Harvard University, the Arboretum has also begun to use Weld Hill to support education at the undergraduate level, helping introduce a new generation of scientists to plant biology and the resources of the Arboretum. New undergraduate teaching laboratories—including microscopy, molecular tools, and whole plant physiology labs—have been developed, enabling students to go directly from tree to microscope in pursuit of new knowledge. For those further along in their scientific careers, the Arboretum's research awards and fellowship opportunities give a boost to great ideas while promoting study in the collections. The Ashton Award for Student Research, the Cunin-Sigal Research Award, the Deland Award, the Jewett Prize, the Putnam Fellowship, and the Sargent Award provide funding to help scientists pursue their individual research interests at every stage in their careers.

The experience of recent Deland Award recipient Juan Losada—a Ph.D student from Spain—illustrates how these components of the Arboretum's scientific program can weave together in unexpected and fortuitous ways. Juan received a Deland Award from the Arboretum to advance his dissertation studies on the reproductive biology of apple trees (Malus × domestica). He planned to use his Deland funds to make floral comparisons among closely-related species in the Arboretum's extensive Malus collection, but arrived in Boston just as the blooms were fading. Discussions with Arboretum staff including Curator of Living Collections Michael Dosmann, Senior Research Scientist Peter Del Tredici, and Director Ned Friedman enabled Juan to broaden the scale of his studies to include early flowering plant lineages such as Magnolia. With expert advice and a diversity of options for studying flowering plants at the Arboretum, Juan was able to take his investigation into new and exciting directions.

We are only beginning to see how the sum of these investments can influence botanical and horticultural studies at the Arboretum and in the greater community of plant researchers. As an emerging center for the study of plant biodiversity, the Arboretum stands poised to lead not only in the arenas of research and curation, but also in preparing and helping tomorrow’s plant scientists to make the discoveries that substantiate our mission.

Student Experiments Retrace Darwin's Footsteps

Arboretum Director Ned Friedman has devoted much of his career to investigating the evolution of plants, a pursuit that has fed his increasing fascination with the man whose theories revolutionized our thinking on the subject—Charles Darwin. In his role as Arnold Professor of Organismic and Evolutionary Biology at Harvard, Ned designed and taught a class in fall 2011 to introduce Harvard freshmen to the brilliant mind behind 1859's On the Origin of Species. While an analysis of this monumental work and other writings provided the foundation for "Getting to Know Charles Darwin," the seminar also invited students to re-enact many of the classic Down House experiments that shaped Darwin's theories on evolution and natural selection.

With the Arboretum and other extraordinary collections around Harvard serving as his laboratory, Friedman guided students through recreations of 10 of Darwin's investigations of organisms and their interactions with the environment. These included such diverse inquiries as examining the light-induced growth patterns of grass seedlings, exploring the development of different flower forms in primroses, observing how various insectivorous plants consume their prey, and testing whether earthworms can "hear" sounds. "Darwin's experiments demonstrate the breadth of his interest in science," Friedman said. "His unquenchable curiosity continues to be an inspiration for those who are eager to unravel the mysteries of living things."