Silva

Fall/Winter 2007-2008

news, classes & visitor guide
Fifty years after his appointment as director of the Arnold Arboretum, Charles Sprague Sargent discussed the future needs of the institution in 1922: “If the Arboretum is to become a great institution...[its work] should be extended over the rest of the world...for the trees of the tropics this is now important as tropical forests are fast disappearing.” With the appointment of E. D. Merrill as director in 1935, the Arboretum began a major expansion of its interest in the flora of tropical Asia, an expansion that continued for the next seventy-two years.

In 1979 Professor Peter Shaw Ashton, a world expert on the forests of South and Southeast Asia, became director of the Arboretum and soon initiated a network of permanent forest plots in a number of Asian countries. In these plots, all the trees were identified to species, measured, and monitored through repeated censuses. This network of permanent plots grew into a collaboration with the Smithsonian Institution and became known as the Center for Tropical Forest Science. In the past two decades, the Center has expanded to include permanent forest plots in Africa and in Central and South America.

The Arboretum remains deeply involved in the Asian portion of the network and some of these plots have begun to yield the kind of long-term ecological and floristic data that have become very relevant to our growing concerns about global climate change and its impact on the environment. An example of such an impact is recounted in this issue of *Silva* describing the research of Ken Feeley, a post-doctoral fellow of the Center working at Harvard and studying the effects of increasing global temperatures on the growth rates of tropical forest trees.

For many years the Center for Tropical Forest Science was located at the Smithsonian Tropical Research Institute in Panama. Dr. Stuart Davies, director of the Center and a former Ph.D. student of Peter Ashton, will relocate the directorship of the Center to the Arnold Arboretum at Harvard this summer. Professor Ashton was recently awarded the prestigious Japan Prize for his role in creating the Center and for his many contributions to our understanding of the forests of tropical Asia.

The Arnold Arboretum will continue its commitment to research that deepens our knowledge of Asian tropical forests and that is critical to their sustainable management and conservation in the future.

—Robert E. Cook, Director of the Arnold Arboretum
Leadership By Design
The Legacy of John Furlong at the Landscape Institute

John Furlong will be stepping down as director of the Landscape Institute of the Arnold Arboretum this fall after leading and nurturing the program for more than a quarter century. Colleague and fellow instructor Phyllis Andersen provides the following tribute to John and the tremendous influence his work has had on the Institute and the profession it fosters and advocates.

John Furlong might best be described as a force of nature. As head of the Arboretum’s Landscape Institute, John is a friend, mentor, and advocate to generations of students and faculty. He encourages students anxious about entering a new field, and transforms working professionals into seasoned instructors. His distinctive good humor and enthusiasm underscores a deep commitment to landscape education. For over twenty-five years his passionate love of landscape study has influenced all parts of the program. He is a distinguished practitioner as well as educator. Acknowledging his contribution to both areas, he was elected a Fellow of the American Society of Landscape Architects in 1998.

After teaching for several years in what was the Radcliffe Institute Program in Landscape Design, John became the Coordinator in 1981. He expanded course offerings in design, increased the number of studios, and integrated new technology into courses in landscape construction and graphic presentation. He expanded the program’s offerings in landscape history, which resulted in additional certificates in history and preservation. John also developed an agenda of extra-curricular activities: lectures and symposia that attracted a wide audience, and national and international tours that heightened the program’s visibility.

John crafted a definition of the landscape design profession that embraced an integration of physical design, land history, and long-term management. He challenges all of us in the program to think beyond traditional ways and engage landscape ideas and issues with independence of mind. As he moves from administration of the program to teaching and private practice, his challenging spirit will continue to enrich the work of the Landscape Institute.
On April 22, 1970, over 20 million people participated in the first Earth Day. Looking back at the 37 years since that first national recognition of environmental concerns, I marvel at the dramatic changes in the field of horticulture and the American landscape. Not long after the inaugural Earth Day, the first “lab” in my high school’s vocational horticulture program centered on methyl bromide as a cure-all for soil-borne plant pathogens and weed seed; despite the lessons learned from Rachel Carson’s *Silent Spring*, chemicals were still dominating the horticultural tool box. In an era of seeming innocence and most certain ignorance, “invasive plants” had yet to enter the horticultural lexicon, while hemlock woolly adelgid, winter moth, and a host of other new pests and pathogens were still below the radar or yet to arrive in North America.

Fast forwarding to 2007 reveals a world transformed by environmental, societal and technological change. Challenges posed by introduced insects and pathogens, invasive plants, and shifting climate are pushing the boundaries of horticultural knowledge and practice. Perhaps more importantly, we find a field inspired by a renewed commitment to achieving sustainability in our interactions with plants and the land.

In an era of remarkable challenge, the horticulture staff—with particular kudos to our horticultural technologists, arborists, and gardeners—have continued to excel, integrating new methods and information to combat introduced pests, improve cultural conditions for living collections, and find innovative approaches to environmental stewardship.

Yet in reviewing our operations, policies and procedures in 2005, we knew we could do even more. Later that year, we established a new mission statement conveying our intention to “attain a leadership role in the management and presentation of botanical collections and landscapes.”

Toward this goal, I joined horticulture managers Julie Coop, Kyle Port, and Tom Ward in investigating the best practices and aspirations of four outstanding sister institutions: the Holden Arboretum in Kirtland, Ohio; Morris Arboretum of the University of Pennsylvania, Philadelphia; Morton Arboretum, Lisle, Illinois; and the U.S. National Arboretum, Washington, DC. In addition, associate manager of horticulture Steve Schneider consulted with Longwood Gardens in Kennett Square, Pennsylvania, reviewing that institution’s nationally respected integrated pest management program.

Our study of other gardens as well as analysis of our own operation identified three initiatives critical to achieving new standards of excellence:

### Landscape Management

Our investigations at sister arboretums examined the various management systems used to deploy staff and other resources in caring for complex landscapes and collections. Site visits and discussions with professional peers underscored the benefits of systems that provide each horticulturist with assigned responsibility for specific landscapes and collections. This site-specific focus yields substantial cumulative knowledge, enabling staff to provide increasingly effective horticultural care and to serve as “local” experts on soils, pests and disease, collections development, hardscape maintenance, and visitor needs and impacts.

Following a history of more broadly deploying staff, implementation of such an approach is now underway at the Arnold Arboretum. Our 265-acre landscape has been divided into six regions, largely defined by topography or...
landscape type (e.g. collections area, natural area, urban wild). These regions are further divided into 62 management zones comprised of contiguous areas that share similar collections themes or horticultural challenges. Each zone has been placed under the care of a staff horticulturist who will play an essential role in completing the new system. Toward the creation of a comprehensive annual care plan, they will further assess the special needs of individual collections, natural areas, and historic features.

In a second phase to be completed next year, we will expand the new Landscape Management Plan to include curatorial initiatives, cultural resource management goals, and longer-term capital projects. The end result will be a comprehensive vision for the Arnold Arboretum landscape.

**Collections Development**

Our study also identified a strong need to develop a highly systematic approach to collections development. As we enter our 136th year, the Arboretum collections are distinguished by their maturity, with over 500 accessions that exceed 100 years in age. In anticipation of a gradual “changing of the guard,” the coming decades will bring important opportunities to increase age and genetic diversity, and further build our national collections in *Acer* (maple), *Carya* (hickory), *Fagus* (beech), *Syringa* (lilac), *Stewartia*, and *Tsuga* (hemlock). In addition, we look forward to strengthening collections for research, with a particular focus on increased representation of the disjunct genera of eastern Asia and North America. Other essential tasks include curatorial review of space-constrained collections as well as updating policies and procedures for potentially invasive taxa.

In January of this year, Dr. Michael Dosmann, a recent graduate of Cornell University’s doctoral program in horticultural science, joined the Arboretum staff as curator of living collections. A former Arnold Arboretum Putnam Fellow, Michael brings strong expertise in both hardy woody plants and collections management. In the coming months, he will provide leadership in creating a collections development plan to guide the acquisition of new accessions and establish curatorial priorities over the next five years.

**Plant Health Management**

A final initiative seeks to further optimize the health of our collections and landscape. As the management of pests and diseases will be critical to this effort, it is useful to once again consider historical changes within horticulture. During my horticulture career, the approach to plant-feeding insects and pathogens has evolved beyond the control of individual organisms to an increasingly holistic perspective that examines the ecosystem and larger environment to assess the diverse factors affecting plant and landscape health.

In the coming months, we will create a new staff position to focus exclusively on implementing comprehensive approaches to plant health, with a strong emphasis on integrated pest management. Increased monitoring of critical environmental factors over time, including pest populations, soil pH, and soil moisture, will be essential to the success of this program. This work will also provide important opportunities to better understand the impacts of introduced organisms, climatic shifts, and other forces of long-term ecological change.

***

These three initiatives promise to place the Arnold Arboretum in the forefront of professional practice, while also supporting our growing commitment to research based in our collections and landscape. These highly ambitious plans will require significant investment but will ultimately achieve the standards of excellence and innovation befitting an internationally respected botanical institution.

---

Join Richard for a presentation on managing the Arboretum’s world-class living collection.

**Building Arboretum Collections: What We Grow and Why**

Saturday, Oct 27 1–2:30pm

See page 16 for details.
Renovation Creates a Brighter Azalea Border

This spring, horticulture staff devoted considerable time and energy to rejuvenating the colorful and historically significant display of azaleas and other members of the Ericaceae along Meadow Road. With the assessment of existing collections and the addition of a number of new plantings, the Arboretum’s renovation of Azalea Border seeks to invigorate a major landscape design project begun nearly sixty years ago.

Famed landscape architect Beatrix Farrand, retained as a consulting landscape gardener by the Arboretum in 1946, suggested installing azalea beds along the east side of Meadow Road. Many plants were relocated from Azalea Path on Bussey Hill, where the plants had suffered through several successive dry summers. The massed beds included native American sweet azalea (*Rhododendron arborescens*), rose-shell azalea (*Rhododendron prinophyllum*), and other azaleas arranged according to flower color. Other members of the Ericaceae were interspersed in the planting scheme, including *Vaccinium* (blueberries), *Enkianthus*, *Lyonia*, and *Zenobia*.

Azalea Border has diminished over the years as the wetlands of the meadow crept closer to Meadow Road, effectively drowning the border plantings. Other plants, suffering from perpetual “wet feet”, have either declined or been removed, and the beds have lost their original shape due to the fluctuating water table of the area. Staff are examining the hydrology of the planting beds and planting new azaleas on the higher ground found closer to the road.

Arboretum curator Michael Dosmann and horticulture manager Julie Coop traveled to Apalachee Nursery in Tennessee to procure plants for the renovation. The nursery, which specializes in ericaceous plants, maintains seed provenance records for its stock, greatly enhancing their scientific value. The resurrected collection will feature more native azaleas, including *Rhododendron arborescens*, *R. periclymenoides*, *R. atlanticum*, and *R. viscosum*. The latter two, known commonly as coastal azalea and swamp azalea respectively, are more water tolerant and may prove to be happier in the site than past residents. These species are also deserving from a collections standpoint, as the addition of more wild-collected material increases the size and value of our holdings. With the successful establishment of new plantings and curatorial review, the collection may continue to expand in future seasons.
As Hotspots Grow Hotter

Arboretum Study Suggests Slower Growth in Tropical Forests

Jon Hetman, Development Manager

The Arnold Arboretum has conducted significant research on the effects of global climate change on the living collection in recent years, notably Richard Primack’s studies of blooming times and leaf stomata morphology. Valuable insight concerning the impact of warming trends on tropical forests is now beginning to emerge through investigations utilizing data amassed by the Center for Tropical Forest Science (CTFS), a program cosponsored by the Smithsonian Institution and the Arnold Arboretum. Research led by Dr. Kenneth Feeley, a post-doctoral fellow with the Arboretum, indicates that trees of most species in two CTFS forests have actually grown more slowly over the past two decades, possibly in response to higher temperatures.

Previous research in the Amazonian forests of Brazil had shown that trees have been growing at faster rates in recent years. Since trees require carbon dioxide to synthesize sugars through photosynthesis, this growth spurt seemed to suggest that plants were becoming more vigorous as carbon dioxide in the atmosphere increased global temperatures. Much of the carbon remains locked up in the woody tissues of the tree, giving rise to the tantalizing proposal that rapidly growing forests around the world would provide the side benefit of pulling greater amounts of carbon out of the atmosphere.

Ken studied CTFS data to investigate whether two of its earliest censused forests—Barro Colorado Island in Panama and Pasoh, Malaysia—have experienced similar growth increases. Since CTFS plots are large (50 hectares, or more than 120 acres), and can contain several hundreds of thousands of stems representing over 1,000 different species, the program’s immense and growing database offers a valuable source for studying how these forests behave and respond to environmental change. Using records of growth gathered for a quarter century, Ken found that the vast majority of trees at these sites, with remarkable consistency across a range of species, are growing as much as 50 percent more slowly now than when the censuses began.

Ken also observed that daily minimum temperatures have risen and that the number of rainy days has increased, possibly explaining the reduced productivity. With less energy created through diminished sunlight, and higher nighttime temperature increasing the amount of energy required for respiration, Ken believes that the trees have fewer resources to invest in growth. He also speculates that competition from lianas, aggressive woody vines, could be another factor, reducing light levels and consequently, tree growth.

The existence of contradictory results from studies of the Amazon and CTFS plots support Ken’s contention that tropical forest behavior is complex and difficult to generalize. More study is needed to predict how climate change will affect tree growth around the world. Next steps might include enlarging the study to encompass other sites, or isolating other environmental factors contributing to diminishing growth in Pasoh and Barro Colorado. Whatever its cause, a widespread slowdown in the growth of tropical trees could seriously impact forest watersheds, plant and animal life, and the sustainability of local industries such as forestry.

Results of the study appear in the June 2007 issue of the journal Ecology Letters. Ken’s research was conducted in collaboration with Drs. Stuart Davies of the Smithsonian Tropical Research Institute and the Center for Tropical Forest Science, S. Joseph Wright from the Smithsonian Tropical Research Institute, and M. N. Nur Supardi and Abd Rahman Kassim of the Forest Research Institute of Malaysia.

Post-doctoral fellow Ken Feeley, right, examines herbarium specimens with Harvard University Herbaria colleague Walter Kittredge.
A Continuing Legacy
Hybrid Marvels of Wilson Plant Introductions

Michael Dosmann, Curator of Living Collections

When it comes to plant explorers, few are as celebrated as the Englishman Ernest Henry Wilson, who on behalf of the venerable nursery Veitch and Sons conducted two impressive plant collecting expeditions to China. In 1907 he began his tenure with the Arnold Arboretum, returning to China two more times, and carrying out one trip to Japan and another to Japan, Korea, and Taiwan over the next 15 years. These six expeditions were amazingly successful based on the number of herbarium specimens he collected and germplasm (mostly seed, though some plants and cuttings) collections he gathered. Among his numerous introductions are noteworthy ornamentals such as the dove tree (*Davidia involucrata*), the royal lily (*Lilium regale*), the paperbark maple (*Acer griseum*), the tea crabapple (*Malus hupehensis*), and the beautybush (*Kolkwitzia amabilis*)—a personal favorite of the explorer (see back cover: In the Collection). These taxa, and countless others, are grown and revered not only in arboreta and botanical gardens, but in home gardens and landscapes as well.

Wilson plants, as they are often known, have been written about profusely since their introductions. Innumerable profiles about them have regularly appeared in issues of *Arnoldia*, and its predecessor *The Bulletin of Popular Information*, as well as the popular press and gardening literature. Wilson himself was a prolific author, and his book *China—Mother of Gardens* rests on my shelf within easy reach, as does another impressive treatise, *Plantae Wilsonianae*, the three-volume book edited by Charles Sprague Sargent enumerating those species collected by Wilson during his four trips to China.

However, when examining the impact of Wilson’s (or anyone’s) exploration efforts, it is important to realize two things. While some of the scientific and horticultural benefits are immediate, many are not realized for decades. And those impacts may extend well beyond the lives of the initial introductions, particularly if plant breeding is involved. Here at the Arnold Arboretum a number of Wilson plants have played prominent parental roles in both spontaneous and intentional hybridizations. The term “hybrid vigor” exists for a reason, and these are but three robust examples among many such Wilson legacies. No doubt, there are others still to be found, some of which might reveal themselves yet this year, and others which may not be realized for another 100 years.

*Hamamelis × intermedia* ‘Arnold Promise’

In 1863, Philipp Franz von Siebold introduced *Hamamelis japonica*, the Japanese witch hazel. A large spreading shrub, this species produces early spring flowers of yellowish hue, though generally not in profusion. However, its showier relative from China, *Hamamelis mollis*, received a great deal of acclaim following its introduction in 1878 by Charles Maries. In April of 1907, while exploring in Western Hubeh Province, Wilson also observed a *H. mollis* in bloom with distinguished golden yellow petals and chocolate bases. He returned to the same site in November, collected seed, and sent it back to the Arboretum, where it was initially accessioned in February of 1908. This fine-looking specimen caught the eye of William Judd, Arboretum propagator, who in 1928 collected open-pollinated seeds and germinated them the following spring. However, all of the resulting seedlings...
appeared unusual, sharing traits with both the maternal *H. mollis* and what turned out to be a nearby paternal plant of *H. japonica*. In 1945, after collectively examining these seedlings, Alfred Rehder described the new hybrid as *Hamamelis × intermedia*. In 1963, after yet several more decades of evaluation, one of these seedlings growing near the Hunnewell Building was selected for its superiority and introduced as ‘Arnold Promise’. Among its spectacular qualities are consistent prolific displays of bright yellow, spicy-scented flowers, at times beginning in January and lasting to March. The upright and spreading shrub maintains a wonderful form, and in the autumn the leaf color is bright yellow.

**Forsythia ‘Meadowlark’**

In 1918, Wilson introduced the early forsythia, *Forsythia ovata*, from the Diamond Mountains of Korea. The initial Arboretum accession was instantly appreciated for its reliable flower-bud hardness and bright yellow blooms. Through the 1930s and 1940s, Karl Sax began to experiment with the Wilson plant, crossing it with a variety of other forsythias including *F. ‘Arnold Giant’*, itself a product of his previous breeding work. Among the progeny of the cross between *F. ovata* and *F. ‘Arnold Giant’* was one choice plant christened in 1956 as *Forsythia ‘Beatrix Farrand’*. However, it was a non-descript hybrid between *F. ovata* and *F. europaea* made by Sax and his assistant Haig Derman in 1935 that was to become, in time, remarkable. During the particularly frigid winter of 1966-67, Harrison Flint noticed that while the entire mass planting of *Forsythia × intermedia ‘Spectabilis’* on forsythia bank failed to flower due to winter injury, a lone shrub was in full floral display. This plant was the handiwork of Sax and Derman three decades before. Flint propagated it, and USDA trials found it hardy to at least -35°F. In 1984 the hybrid was registered as *Forsythia ‘Meadowlark’*, and it can be found in northern landscapes where minimum temperatures limit the plant palette.

**Stewartia ‘Scarlet Sentinel’**

The beautiful Japanese stewartia, *Stewartia pseudocamellia*, with its camellia-like flowers and sinewy, exfoliating bark, was initially introduced from Japan by Thomas Hogg in 1874. In 1917, while he was exploring the Korean Peninsula during his final trip to East Asia, Wilson collected seed of *Stewartia koreana*, which is now considered just a geographic variant of *S. pseudocamellia* with greater cold hardiness. The collection was accessioned by the Arboretum in January of 1918, and two extraordinary specimens still grow on Bussey Hill on Chinese Path. Nearby is another fine specimen of the North American *S. ovata var. grandiflora* known for its flowers of purple stamens, yet non-descript bark. Peter Del Tredici, eager to acquire a *S. pseudocamellia*, collected a seedling from below the Wilson tree in 1982, on the assumption it was true to type. However, its performance prior to blooming could be liberally summed up as lackluster, particularly because its bark was far from showy—a primary reason one would wish to grow the species. When the plant did flower in 1992, its true colors (figuratively and literally) were revealed: in the center of the large flowers were vibrant scarlet anther filaments instead of the purplish or yellow filaments of *S. ovata var. grandiflora* and *S. pseudocamellia*, respectively. In 2002, this spontaneous hybrid was introduced as *Stewartia ‘Scarlet Sentinel’*. 
The next best thing to experiencing our historic landscape and world-class living collection is visiting the Arnold Arboretum website at www.arboretum.harvard.edu. With its first major redesign since 2002, the site’s recent transformation is an important step in the institution’s growing commitment to share its wealth of botanical, horticultural, and educational resources.

Since its initial launch in 1996, the website has become one of the most significant tools in the Arboretum’s education and outreach efforts. As the convenient, go-to spot for information related to the institution, the website offers visitor assistance, supports educational programs, assists with increasing membership support, and provides unprecedented access to our living collections, research activities, and library and archival resources. Officially launched on April 17, the updated site features a fresh visual design and new features to help you make the most of your online—and on site—visits to the Arboretum.

The new face of the website is evident from your arrival on the homepage. Designed to showcase the breadth of the institution’s activities and provide easy access to features, news, and special events, it also makes more effective use of the Arboretum’s rich and beautiful collection of historical and contemporary photographs. From the homepage, a click to “Visit” will provide you with all the details you need to make the most of your trip to the Arboretum, including family activities and information on exhibits in the Visitor Center.

Do you want to know what you can do here on any given day? A new calendar feature allows you to see at a glance all events scheduled on a particular day or month, or a filtered selection by interest. The calendar provides details on family activities, adult education, and Landscape Institute offerings, and provides links to news and events features to keep you up to date with the latest happenings at America’s first public arboretum.

The most exciting and innovative addition to the site is a detailed interactive map of the grounds. Featuring descriptive plant content, seasonal highlights, historic landscape images, and self-guided tours, the map provides a level of detail and accessibility unprecedented in botanical garden websites. The map also has a zoom feature, and may be printed in a number of ways to enhance your visit to the Arboretum.
One of Ernest Wilson’s favorite introductions from western China was *Kolkwitzia amabilis*, a plant he found quite worthy of its common name: beautybush. While on expedition for England’s famed Veitch Nursery, Wilson collected the plant in western Hubei province between the Yangtse and Han Rivers and introduced it to cultivation in 1901. *Kolkwitzia* was, and remains, so rare in the wild that he never encountered it on expedition again. The plant was quickly embraced by the West and achieved great popularity in the 1920s and 30s, but quickly fell out of fashion and remains less common today. The sole representative of its genus and closely related to *Abelia* and *Dipelta*, *Kolkwitzia amabilis* forms a 6- to 10-foot, vase-shaped mass with ascending inner stems and the outer branches arching to the ground. The flowers, appearing in late May and early June, are produced along the whole length of the branches in clusters at the ends of short, leafy shoots. They are tubular with a gaping mouth, deep pink in color with mottled yellow-brown to orange on the lower throat and lip. The pedicels and ovary are clad with spreading, white, bristle-like hairs which add to the attractiveness of the inflorescence and persist on its crimson fruits. After shedding its leaves in the fall, the plant continues to please the eye with its attractive, pale-colored, flaking bark. A cutting of the Arboretum’s original 1907 accession from Veitch grows on Chinese Path, but the most striking beautybush in the collection grows on Bussey Hill Road near the entrance to the Dana Greenhouse. Charles Sprague Sargent, remarking on the plant in the *The Bulletin of Popular Information* shortly before his death in 1927, wrote “the graceful habit of the plant, its free flowering qualities and pleasing color, combined with perfect hardiness, make this one of the most beautiful, as well as most useful, shrubs that China has given to the gardens of this country.”

*Top* a 1930 E. H. Wilson photograph of the beautybush on Bussey Hill Road, AA accession 18090A, and the same plant captured in 2007. *Left* a detail of the flowers on one of the Chinese Path individuals, AA accession 816-84A.