Spring/Summer 2017

news,
classes &
visitor guide

Silva

The ARNOLD ARBORETUM of HARVARD UNIVERSITY

Bringing Science Learning to Life

With a mission to foster scholarship and encourage public engagement with plants and science, the Arnold Arboretum offers free opportunities for schoolchildren and their teachers to learn, discover, and grow through programs designed to enhance life science curricula in public schools.

The Summer Institute

Helping Teachers Boost Life Science Education

The Summer Institute builds on the Arboretum's educational partnership with Boston Public Schools by focusing on teacher training and development. New programming gives teachers the resources to better utilize the Arboretum landscape and other outdoor spaces to improve approaches to teaching elementary science.

The four-day workshop provides teachers with knowledge about plants, exposure to using the outdoors as a learning environment, and a variety of resources, teaching ideas, and materials to enrich life science education. The Arnold Arboretum Summer Institute 2017 "Build a Plant: Bottom to Top" will take place **August 21–24, 2017**. For more information or to apply for this free program, visit arboretum.harvard.edu or call Ana Maria Caballero, Children's Education Fellow, at 617.384.9032.

Volunteer as a Field Study Guide

Every year, hundreds of students in Pre-K to grade 5 visit our landscape to participate in guided explorations of the meadows, ponds, and woodlands of the Arnold Arboretum. Led by trained volunteers, students learn about plant science in a setting that emphasizes inquiry and hands-on learning.

If you enjoy engaging with the natural world and have some prior teaching experience, make a difference in your community and share the wonders of the Arboretum with the next generation by volunteering as a Field Study Guide. Guide training for spring begins **March 30** and for fall on **August 31**. For more information, please visit arboretum.harvard.edu or call Nancy Sableski, Manager of Children's Education, at 617.384.5239.

Your Support Matters

Children's Education initiatives at the Arnold Arboretum are made possible by the generosity of our donors. Please consider making a donation to support this vital and unique programming at arboretum.harvard.edu.

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What does the Arnold Arboretum stand for, and what does it mean to the world at large?

If you follow *Posts from the Collections*—my weekly blog spotlighting the Arboretum landscape and plants—these interrelated questions may already be familiar to you. As a new year begins and we contemplate unsettling circumstances in our country and around the globe, I want to assure our community that the Arnold Arboretum continues to champion four basic and unalterable principles in pursuing our mission of research, horticulture, and education.

The first of these values is ***a commitment to protect and celebrate global biological diversity.*** Our founding directive to collect all woody plant taxa that can grow in Boston continues today with renewed vigor through our 10-year Campaign for the Living Collections. These global expeditions—including a collaborative trip to the southeastern U.S. profiled in this issue of *Silva*—place the Arboretum among the world's most ambitious botanical gardens in the realm of collecting and protecting examples of our natural history. The second principle is ***a commitment to social and economic justice (human diversity).*** As economic disparity continues to grow, the Arboretum is one of the only botanical gardens in the world that is free and open to all, every day of the year. The many free learning programs for children, families, and adults described in these pages extend from the notion that we are an agent for social good and human enrichment.

The third value we uphold is ***a commitment to rationalism and fact-based science inquiry.*** Despite a troubling (and growing) disregard for science and rational thought, the Arnold Arboretum has strongly invigorated and expanded its scientific operations with faculty, postdoctoral researchers, graduate students, and undergraduates—from Harvard and around the world. One of these scientists—our Putnam Fellow, Kasia Ziemińska—writes in this issue about her use of the collections to investigate wood anatomy in 23 plant families. Last, but certainly not least, is ***a commitment to the finest horticultural and landscape care.*** In a time of flat budgets, we have added staff and created new leadership positions in our horticultural operations to improve the health and value of our accessioned plants and the condition of the landscape they inhabit. An initiative to create sustainable meadow habitats in areas like Kent Field in our Conifer Collection is just one example of how our standards of care and display have flowered in recent years. Visit us this spring and enjoy the glorious results of our horticultural renaissance.

Collect, share, study, steward. These are the values that the Arnold Arboretum stands for, and what we commit to preserving for future generations. Thank you for the part you play in preserving the Arnold Arboretum as a treasured resource and refuge for all.

—William (Ned) Friedman, Director of the Arnold Arboretum & Arnold Professor of Organismic and Evolutionary Biology, Harvard University

Collecting High and Low

Living Collections Fellows Explore the Southern Appalachian Mountains

Robert Dowell and Jenna Zukswert, Living Collections Fellows

The small metal tags hanging from Arboretum plants carry robust information about each accession's identity and origins, often including the name or names of their collectors. For a number of the plants acquired last year as part of the Campaign for the Living Collections, we will have the honor of lending our own names to the rich documentation supporting these plants through their lifespans and beyond. This is because we had the very good fortune to participate in field excursions this year as part of our work as Arnold Arboretum Living Collections Fellows.

Robert Dowell

The tranquil scenery of Sam's Knob, a 6,000-ft mountain in the Pisgah National Forest, North Carolina, where the Arnold Arboretum joined cross-institutional partners to collect plant material for the Campaign for the Living Collections.

The Living Collections Fellowship provides a unique opportunity for aspiring public garden professionals like us to gain practical experience through special two-year projects. Jenna's fellowship is based in horticulture and landscape management, through which she is coordinating revisions to the Arboretum's landscape management plan. Robert's fellowship focuses on curation and plant exploration, particularly the planning of acquisition efforts for the Campaign's list of targeted species. This work entails detailed research into the native ranges of many species, and pouring over herbarium specimens to gather location details. Assembling all of this location information reveals "hot spots"—areas where the target populations of many taxa under consideration overlap. These hot spots serve as natural staging grounds for expeditions.

One such hot spot is the Southern Appalachian region of Tennessee, North Carolina, and Georgia. This area offers a wealth of biodiversity, and many microclimates supporting unique taxa and unique populations of taxa not found elsewhere. The presence of dozens of Campaign *desiderata* species in this region, confirmed by herbarium vouchers, and the relative ease of reaching this location made it a logical area for Robert to design and execute a collaborative plant collecting expedition.

For a variety of reasons, expeditions benefit through a group effort. Many hands make light work as they say, but the synergies created when several institutions collaborate can lead to great success. The Polly Hill Arboretum on Martha's Vineyard shared our interest in exploring populations of mountain stewartia (*Stewartia ovata*) in Kentucky, and invited Jenna to join them in a joint expedition last September. Collecting further south in Southern Appalachia's mountains also appealed to both institutions, so we arranged to have Tom Clark—Polly Hill's former curator and current research associate—join Jenna and Robert on a 500-mile loop through Tennessee, North Carolina, and Georgia, venturing from valley floors to mountains over 6,000 feet in elevation on the hunt for our targets.

Expeditions always benefit from the cooperation of local experts, and ours was no exception. During our time in North Carolina, we visited and collected seed in the Southern Highlands Reserve, a native plant arboretum in Lake Toxaway. Executive Director Kelly Holdbrooks and Director of Horticulture Eric Kimbrel generously hosted

our visit and assisted our collections of southern red oak (*Quercus falcata*), minniebush (*Menziesia pilosa*), and Virginia pine (*Pinus virginiana*) in their site's natural forests. In Georgia, naturalist Jack Johnston served as our guide and contributed his immense knowledge of local plants and pinpointed their locations from memory. While herbarium vouchers can provide accurate location information, local experts can prove invaluable in finding discrete populations and ultimately proved crucial to our success in sourcing 40 plant collections, including 29 taxa.

For each of these collections, we obtained either seeds or cuttings, which are now growing in the Arboretum's Dana Greenhouses. We also made pressed herbarium specimens to voucher the original plants yielding the germplasm and to help guide the efforts of future explorers in the region. We also carefully documented each of the plants we collected through written descriptions, photographs, and exact GPS (Global Positioning System) locations.

Tom Clark

Living Collection Fellows Jenna Zukswert (*left*) and Robert Dowell obtain a herbarium specimen of *Magnolia macrophylla* in Cherokee National Forest, Tennessee. Read more about this species on the back cover ("In Our Collection").

Beyond the documentation curated along with the plants, each of our collections has its own story, most notably one of our greatest success stories, pirate bush (*Buckleya distichophylla*). This endangered species only occurs in a few isolated communities in Tennessee and North Carolina. Records show that Charles Sprague Sargent had previously collected this taxon in 1888 on the border of North Carolina and Tennessee, along the banks of the French Broad River. We were thrilled to find it still growing there nearly 130 years later. We were also enthralled to find that the population, while small, bore an abundance of ripe fruit which fell with the slightest touch. We had arrived at the perfect time. Nearby, on the North Carolina side of the river, we gazed at geometric designs etched into the face of the rock cliff—the famous pictographs of Paint Rock, estimated to be some 5,000 years old—adding to the majesty of an incredibly successful collection on our first day in the field.

> "Each of our collections has its own story."

Some stories also emerged from our failures, such as our attempt to collect seed from American yellowwood (*Cladastris kentukea*). The hunt for *Cladastris* took us through a gorgeous moist cove forest in Georgia, where we were awed by immense trees, alarmed by the abundance of poison ivy, and, for the three of us unfamiliar with the area, feeling hopelessly lost. Finally, after ascending 1,000 feet in elevation, we found *Cladrastis* but were disappointed to find no seed. The hike down proved treacherous, as we scrambled through mountain laurel and rhododendron thickets along a steep hillside (aptly referred to by locals as "Rhododendron hells") and were temporarily stranded on a small rock outcrop along a steep slope. All in a day's work, as they say.

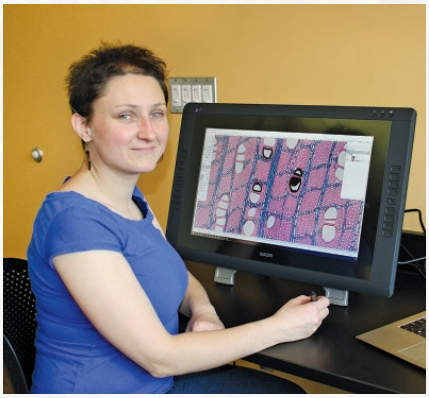
For both of us, these experiences offered an amazing learning opportunity. We experienced firsthand the incredible amount of research, planning, and preparation that must precede a field expedition, from designing the target list to securing collecting permits and planning day-to-day travel logistics that may require change at a moment's notice. We learned that the assistance of local collaborators, even for a single day, can greatly improve success. Best of all, we became intimately acquainted with our target plants and their wild ecology, learning how to identify them and how to spot their "look-alikes." Back at the Arboretum, we assisted in all the documentation, propagation, and distribution of collected material that follows exploration, and, eventually, we will discover how these plants will fit into the Arboretum landscape. It feels satisfying and even humbling to be part of an initiative like the Campaign for the Living Collections and to know that the fruits of our adventures (literally) will live on at the Arboretum as vital examples of our natural heritage.

A Thirst for Knowledge

Putnam Fellow Study Illuminates How Plants Store and Regulate Water

Kasia Ziemińska, Katharine H. Putnam Fellow

Summer 2016 represented another record-breaking year for global temperatures, and the Northeast experienced one of the most severe droughts in memory. We know that the ability of plants to store water in their tissues can serve as a buffer against drought and its detrimental effects, yet how they do so is not well understood. As a Katharine H. Putnam Fellow, my research at the Arnold Arboretum focuses on water storage in trees—particularly how much water can be stored in the woody stems of trees and shrubs and how much of that water can actually be used. In untangling some of the uncertainty surrounding water storage and the strategies employed by plants under water stress, we may be able to improve our predictions of how our trees and our forests will respond to a changing climate.



Jon Hetman

2016 Putnam Fellow Kasia Ziemińska

Anatomical studies can be revealing in understanding how plants function, so my research combines *in situ* (on site) measurement of water storage and anatomical measurements of plant tissues. The woody stems of trees, shrubs, and vines consist of many cell types, but primarily include fibers for mechanical support, parenchyma for transporting and storing carbohydrates, and vessels for transporting water from roots to leaves. Fibers and parenchyma are the two most abundant tissue types and together they make up the bulk of what we refer to as wood. While recent studies suggest that fibers play the pivotal role in water storage, how they do so and the mechanisms that control water release remain unresolved.

So what are the possibilities? Parenchyma cells lie closer in proximity to vessels than the fiber cells, so potentially the water stored in parenchyma may be released more readily into vessels. On the other hand, the water in fibers is free and not bound to other substances as it is in the parenchyma, so hypothetically it could move more easily between tissues. I hypothesize that trees with a higher water demand (those "thirstier" than others) will exhibit larger water storage depletion to meet high water demand, and that their anatomical structure facilitates this behavior. Also, my study aims to determine whether the structural requirements for water storage are compromised by the structural requirements of two other functions played by fibers and parenchyma. Presumably, the stronger the twig, the less space is available for storing water or food.

My research at the Arboretum comprises a wide-ranging comparative study of anatomical and functional traits and a physiological study of the hydraulic mechanisms in fibers versus parenchyma. The first project seeks broad trends across a diverse species set, and the second will investigate the structural mechanisms driving those trends. The trees I selected for the study cover a varied range of anatomies and include a diverse suite of 30 deciduous, flowering plant species from 23 families. Last summer, I collected small twigs, each about one centimeter (0.4") in diameter, and measured how much water was stored and released during the day. I also collected data on leaf water potential (indicates how "thirsty" a tree is), wood density, tree height, and mechanical strength. In the Weld Hill labs, I investigate the anatomical structure of these samples using microscopy and image analysis techniques. Taken together, this information will reveal how much water is stored and released and any correlations between anatomical structure, water storage, and the other traits measured in the study.

The Arnold Arboretum provides an excellent study site for this work due to its diverse living plant collections growing in a common environment and their close proximity to state-of-the-art laboratories. Through my Putnam Fellowship, I hope to make significant advances in our understanding of the structural diversity of plants and how these differences affect how they grow and their capacity to survive extreme conditions. Since water and carbohydrate storage create important buffers that plants can tap into during periods of stress, understanding their hydraulic behavior will facilitate more accurate predictions of current and future responses to our changing climate. On a broad scale, forests play a major part in the global carbon cycle, but altered water regimes may modify this role—and hence the trajectory of climate change. The more we know about how plants store and release water the better we can manage and protect our trees, our forests, and our future.

New Life in the Meadows

Meadow Management Focuses on Preserving Wildlife Habitat

Meghana Srinivasan, Marketing and Communications Specialist

Inhabiting the 281 acres of the Arnold Arboretum are over 15,000 accsessioned woody plants, each with significant horticultural, scientific, and educational value. Careful planning and meticulous curation are involved with each of these plants, from planning their location on the grounds to determining what type of care they will need. Though this landscape's design (originally developed by Frederick Law Olmsted) primarily serves the goals of cultivating and preserving our curated plant collections, it also has a wilder side. Scattered among the curated collections are several areas that grow in a more "natural" state: the Arboretum's meadows.

In the meadows, grasses and other non-woody plants are allowed to grow to maturity, creating habitat for local wildlife as well as accentuating the landscape with natural flora. Some notably beautiful meadows include the wet meadow in front of the Hunnewell Building, the two meadows bordering the footpath going up Peter's Hill, and the Weld Hill meadow, where bountiful lupine and goldenrod create a stunning backdrop for the LEED-certified research building. While the Arboretum takes a passive management approach with several grassy meadows throughout the landscape by reducing mowing to once or twice a year, several "natural" areas also receive intentional landscaping and cultivation.

In Kent Field—the grassy meadow that spreads out below the Conifer Collection—the Arboretum's curation and horticulture teams selected a set of native wildflower species to plant that would attract a diverse array of pollinators and create a colorful accent to the scenery. In order to keep maintenance needs at a minimum, they chose species that thrive in full sun and can tolerate both saturated soils and drought, as well as resist herbivory. The four species that met the criteria were whorled milkweed (*Asclepias verticillata*), common boneset (*Eupatorium perfoliatum*), great blue lobelia (*Lobelia siphilitica*), and short-toothed mountain mint (*Pycnanthemum muticum*).

Visiting student interns from Norfolk Agricultural High School helped carry out the preparation and planting of the wildflowers. They mowed, trimmed, and tilled the beds, and then used rakes and shovels to manually remove the remaining roots and grassy material from the soil in order to minimize the amount of competition the new plants would have to face for resources. The interns then helped the Arboretum's horticulture crew plant over 800 wildflower plugs in Kent Field, with beautiful as well as ecologically beneficial results. The blue and white flowers add visual interest to the grassy area and enhance the view of the Conifer Collection, and all four wildflower species are highly valued for attracting and sustaining pollinators. In particular, mountain mint and boneset dazzle with long bloom periods and abundant clusters of flowers, and are among the most effective pollinator plants in our region. The wildflower plantings and the area have become a hotspot for butterflies, bees, wasps, flies,

Jon Hetman

Practicum interns from Norfolk County Agricultural High School plant wildflower plugs in Kent Field below the Conifer Collection.

spiders, and praying mantises. Of notable value is the addition of whorled milkweed, which is a host plant for the threatened monarch butterfly.

Creating multiple types of habitats in the meadows supports a diverse range of wildlife and provides important benefits to the Arboretum's animal residents. In addition to serving as overwintering sites for insects and small mammals, grassy meadows like the ones on Peter's Hill offer nesting sites, shelter, and foraging areas for field sparrows, swallows, and other animals. Early morning visitors have even spotted deer foraging and resting in the cover of the tall grasses. In fact, the discovery of a pair of nesting bobolinks on Peter's Hill prompted the designation of a "no-mow" area to increase the chances that the birds, rarely seen at the Arboretum, would successfully breed there. The meadow continues to provide habitat that supports an abundance of bird life including barn swallows, tree swallows, and red-tailed hawks.

In addition to supporting local populations of insects, birds, and mammals by expanding available habitat, meadows offer other benefits for the Arboretum community. The growth of grasses can help reduce erosion in watersheds, and curtailing mowing in these areas can help reduce carbon emissions and noise pollution. The natural-looking grassy areas offer stunning viewsheds in the landscape, creating visual contrast and highlighting various aspects of the topography. The contours of the "no-mow" areas form long, curving swaths of grassland that hark back to the Arboretum's agricultural past and add a wilder, more natural feel for visitors to enjoy. As meadows generally exist in areas that are hard for landscaping equipment to reach, reducing mowing also allows the horticulture staff to focus their time and labor on caring for curated collections.

The goals and results of the Arboretum's meadow management efforts have been inspiring for an institution historically committed not only to its collections, but also to its community. Going forward, the Arboretum plans to keep track of the occurrence of noteworthy species in the meadows, opening up possibilities for further study of the interactions between plants and other organisms in this diverse landscape.

From top: Common boneset (*Eupatorium perfoliatum*), great blue lobelia (*Lobelia siphilitica*), and short-toothed mountain mint (*Pycnanthemum muticum*) blooming in Kent Field. All photos by Pamela Thompson.

Pest Detectives in the Landscape

Arboretum Assists Federal Survey Targeting Potential Insect Invaders

Nichole Carrier, Pest Survey Specialist, USDA

Each year, the United States Department of Agriculture, Animal & Plant Health Inspection Service, Plant Protection and Quarantine (USDA APHIS PPQ) conducts early detection surveys for exotic pests that may be introduced into Massachusetts through global trade. The Department of Homeland Security's Customs and Border Protection inspects cargo, commercial vessels, and international passenger baggage to stop exotic agricultural pests from entering the country. PPQ's domestic exotic pest surveys are conducted to further safeguard our nation's agriculture and natural resources. In 2016, we conducted a limited survey around Boston targeting pests associated with the cut flower trade. We targeted pests commonly intercepted on cut flower imports because Boston is one of the largest ports of entry for cut flowers. In 2015, for example, Boston imported more than 2.5 million flower stems during the Valentine's Day season.

William (Ned) Friedman

Pest survey traps were placed in several Arboretum trees including this weeping Yoshino cherry (*Prunus* x *yedoensis* 'Shidare Yoshino', 22542*A) as a part of a USDA APHIS PPQ study last summer.

Many of the exotic pests intercepted on cut flower imports are considered dangerous to multiple host plants that include both agricultural and horticultural taxa. During our 2016 survey, we placed three universal bucket traps baited with species specific pheromones for Old World bollworm (*Helicoverpa armigera*), silver Y moth (*Autographa gamma*), and cabbage moth (*Mamestra brassicae*) in host trees at the Arboretum. All three of these species are exotic to the U.S. and are agricultural pests of economic consequence in their native and introduced ranges around the world. The larval stage of the pests causes the most damage, feeding on crops.

For our survey, we hung the traps in cherry (*Prunus* spp.), pine (*Pinus* spp.) and oak (*Quercus* spp.) trees to avoid intercepting large numbers of native pests that closely resemble our targets. For example, Old World bollworm very closely resembles the native corn earworm that commonly infests corn in the United States. By placing traps in hosts that are not usually infested, we can limit the amount of insects that will require more difficult identification procedures. We conducted the survey from late June through September when the adult target moths are expected to emerge. The species specific pheromones attract the male moths to the traps. We checked traps every two weeks and all insects were collected for further screening and identification in the lab. We did not collect any exotic species during our 2016 survey in Massachusetts.

The Arnold Arboretum's diverse collections and landscapes make it a unique location to conduct early detection surveys. We are able to place traps in a wide variety of hosts with additional potential hosts for these exotic pests nearby. Placing traps in hosts outside of commercial agricultural crops helps to limit the potential for collecting similar native pests that can further complicate identification of exotic species. It also limits the trap exposure to routine pest control management practices that can limit the trap's effectiveness. In addition, the Arnold Arboretum offers us the opportunity to place traps where the public may see them and be introduced to some of the early detection work that we conduct around the state. We appreciate the support of the Arboretum to conduct our early detection surveys. We have worked together on multiple exotic species projects in the past and look forward to continuing this valuable partnership to protect our environment.

Majesty Through the Seasons

A Closer Look at the Arboretum's Beech Collection

Danny Schissler, Research Assistant, Friedman Lab

> He halted in the wind, and what was that
> Far in the maples, pale, but not a ghost?
> …A young beech clinging to its last year's leaves.
>
> —Robert Frost, "A Boundless Moment"

Among the Arboretum's hardwoods, I know of no tree that exudes as deep a sense of living history as the beech. To stand beneath an old and stately beech is to take in decades or centuries of slow and steady growth. Gnarled, sinuous roots radiate in all directions, buttressing a stout and powerful trunk. Its wide-spreading canopy, dense with long, low-hanging branches, sweeps a forest floor thick with last season's bronze litter. Many admire its silver-blue bark, smooth but for the scars of fallen limbs and the rough-carved notes of passers-by.

The beech provides four seasons of interest. Dormant buds awake with spring's warmth, swelling and elongating in the waxing daylight. Between the parting copper scales, hints of green appear in early April. The first young leaves unfurl, covered in miniscule hairs (trichomes). Among the tender foliage, male and female catkins open inconspicuously, preparing to release and receive pollen, respectively, by means of May's winds. Later on, in summer's heat, the beech appears most grand. Now fully-formed, its large serrated leaves provide a shady respite beneath a broad canopy. Within its small and spiky fruits, a crop of nuts matures through the season. By fall's arrival, seeds are shed amidst a crescendo of gold and orange. At season's end, leaves retained provide a blaze of color against a wintry backdrop.

The Arnold Arboretum collection holds over 130 beech trees, representing eight distinct species. Of these taxa, the European beech (*Fagus sylvatica*) stands out for its superb ornamental qualities and tolerance of urban conditions. As wide-spreading as it is tall, *F. sylvatica* is a fine shade tree capable of reaching tremendous size. Prized specimens over 100 feet tall grace parklands, botanical gardens and cemeteries throughout the United States and Europe. Indeed, the incorporation of the European beech into the changing nineteenth century American landscape, particularly in Boston and its surrounding suburbs, marked the influence of eighteenth century English ideas on America's early landscape architects.

Among the Arboretum's large and notable Beech Collection grow many striking cultivars of *F. sylvatica*, exhibiting a range of unique characteristics. The much-loved weeping beech, *F. sylvatica* 'Pendula', features bowing, contorted limbs that often reach the ground, forming new root systems over time. Cultivars in the Heterophylla and Purpurea groups bear distinctive leaf-shapes and brilliant colors, respectively. Additional beech species in the collection are natives of China (*F. engleriana*, *F. lucida*), Japan (*F. crenata*, *F. japonica*), and Eastern Europe (*F. orientalis*, *F. moesiaca*).

While less valued ornamentally than its European cousin, American beech (*F. grandifolia*) plays an important role in forest ecology in the Northeast. It commonly grows in forests in the final stage of succession, or ecological transition, alongside mature sugar maple (*Acer saccharum*), yellow birch (*Betula alleghaniensis*), and eastern hemlock (*Tsuga canadensis*). American beech is more suited to asexual reproduction than other members of its genus, and readily forms dense stands of root suckers. The Arboretum's grove of young saplings, rising up through the litter of mature specimens, offers a glimpse of a plant population in perpetual self-renewal.

Beech trees provide a valuable source of food to insects, birds, and mammals. A variety of lepidopteran species browse on its tender leaves. Beechnuts, nutritious and high in fat, appear after 40 years of tree growth, and reach peak production by year 60. Humans have made use of nearly all parts of the beech tree throughout history, from using its nuts and young foliage in cooking to crafting

A year in the life of an American beech (*Fagus grandifolia*, 14585*D). *Left to right from top:* [1] Many beeches retain their spent leaves through winter (marcescence). [2] Dormant buds are characteristically long and slender with coppery bud scales. In late winter/early spring, the buds begin to swell. [3] Tender leaves and flowers emerge through April. [4] Juvenile leaves expand and darken as the season progresses. [5] Male, pollen-bearing catkins are more conspicuous than female flowers, which occur on the same stem. [6] Within spiky husks, beech nuts develop and are shed mid-autumn. [7] Autumn brings a show of gold and orange foliage. Photos by Danny Schissler.

its tough and dense timber into tools, building materials, and musical instruments. Germanic peoples commonly used beech tablets as an early writing medium, the word "book" deriving from the Old English word for beech (*bōc*).

In its form and essence, a mature beech tree represents a powerful living record, both of its own slow, meandering growth, and of those who have taken solace beneath its bowing limbs. While many of the Arboretum's beeches bear the incised marks of visitors, this seemingly innocent practice can have grave consequences for a tree. Penetrating the bark lowers its natural defenses and leaves the tree vulnerable to insect pests and disease. By protecting our beeches, we preserve these venerable trees for future generations to study and enjoy. Visit our Beech Collection for a special *Collections up Close* event on Sunday, May 21 and discover the many sides and seasons of these majestic trees.

"Since youthful lovers in my shade
Their vows of truth and rapture made…
As Love's own altar honour me:
Spare, woodman, spare the beechen tree!"

—Thomas Campbell, "The Beech Tree's Petition"

Learn at the Arboretum

Featured Programs

March

Woodwork and the Arts of Japan

Monday, March 27, 7:00–8:30pm [HB]

Yukio Lippit, PhD, History of Art and Architecture, Harvard University and Johnson-Kulukundis Family Director of the Arts, Radcliffe Institute

Material culture in Japan is distinguished by its heavy reliance on wood in art-making. For over a millennium, the rich biomass heritage of the country has provided a foundation for the work of master carpenters and the emergence of a wide array of remarkable techniques for the wood-related arts. Yukio Lippit will examine how wood selection and the materiality of wood conditioned the development of these arts in a Japanese context. His lecture provides a lens into the man-nature relationship and wood artistry in Japan.

Free member and student, $5 nonmember

April

The Songs of Trees: Stories from Nature's Great Connectors

Wednesday, April 12, 7:00–8:30pm [HB]

David George Haskell, PhD, Professor of Biology, University of the South, Sewanee

Award-winning teacher and writer David George Haskell expands his focus from one square meter (*The Forest Unseen*) to the expansive networked communities of life as observed in the presence of trees around the world. A keen observer of all living things, Haskell brings together ecological understanding with poetic narrative as he describes discoveries from root to branch tip, from one specimen to a forest of collaborators. Join us as Haskell expounds upon webs of connections that weave through the environment, human nature, science, and ethics. His book, *The Songs of Trees*, will be available for purchase and signing.

Free member and student; $10 nonmember

The New American Chestnut

Monday, April 17, 7:00–8:30pm [HB]

William A. Powell, MD, PhD, Director, Council on Biotechnology in Forestry, SUNY, Environmental Science and Forestry and Co-Director, New York State American Chestnut Research and Restoration Program

Much effort has gone into attempting to bring back the American chestnut (*Castanea dentata*), decimated by the exotic chestnut blight fungus (*Cryphonectria parasitica*) beginning in the late 1800s. Breeding by crossing and backcrossing with Japanese and Chinese species has produced positive results, but genetic engineering is proving more viable. William Powell will speak about transgenic research that has produced a tree that is 99.999% American chestnut and the possibilities for reviving a species once ubiquitous in eastern North American forests.

Free member and student, $10 nonmember

SYMBOL KEY

DG Arnold Arboretum, Dana Greenhouses
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HB Arnold Arboretum, Hunnewell Building
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See all classes and register at **my.arboretum.harvard.edu**

Poems to the Earth
A Public Celebration through Poetry

Saturday, April 22, 3:00–4:45pm [HB]

On Earth Day, poems honoring the planet we inhabit will be read from the front steps of the Hunnewell Building. Bring your own writing to share or read a favorite poem, hear published poets, or write a poem on the spot about the natural world.

Free, no registration necessary

May

Conifer Pollination: Sex among Evergreens

Wednesday, May 3, 6:30–8:00pm, Weld Hill Research Building

Andrew Leslie, Assistant Professor of Ecology and Evolutionary Biology, Brown University

Cones scattered on the ground beneath an evergreen; hemlock seedlings sprouting through duff...it is easy to find evidence that conifers reproduce. But how? Andrew Leslie will explain conifer reproduction with a close look at pollen. He will begin in the Weld Hill Lecture Hall and then walk to explore the Arboretum's conifer collection.

$5 member, $10 nonmember

Witness Tree: A Year in the Forest

Friday, May 5, 6:00 pm: reception, reading, and book signing [HB]

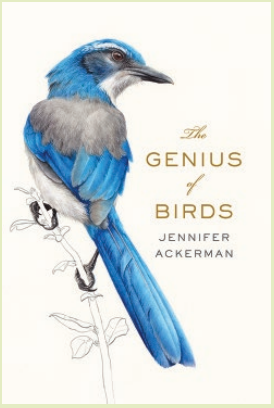
Lynda Mapes, 2014–2015 Bullard Fellow in Forest Research, Harvard Forest, and Staff Reporter, The Seattle Times

Ever wonder about the inside of a tree or how a tree functions? Or, what a single tree can tell us about climate?

The Genius of Birds

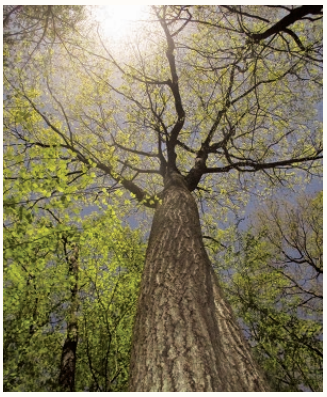
Tuesday, April 18, 7:00–8:15pm [HB]

Jennifer Ackerman, science writer and author



Jennifer Ackerman shares stories about her travels and cutting-edge research on the newly discovered brilliance of birds. Learn how birds craft and use tools, solve complex problems, sing to one another in regional accents (wicked cool), make sophisticated navigational decisions, demonstrate astonishing feats of memory, eavesdrop, give gifts, and even kiss to console. Discover the intelligent behavior of birds evident in our backyards, city streets, and country skies around the world. *The Genius of Birds* will be available for purchase and signing.

Free, registration requested.
Offered by the Arnold Arboretum and Papercuts JP.



Seattle Times reporter Lynda Mapes spent a year embedded with scientists at the Harvard Forest to explore a single, 100-year old oak, from the symbiotic relationships in and around its roots and branches to the daily and seasonal changes of the canopy. Hear Lynda discuss her experience studying a rooted tree for a year and how this specimen is one of many in the remarkable, six-state recovery of forests that is currently underway on former farmland throughout New England.

Free, registration encouraged

Nature Photography Workshop

Saturday, May 6, 12:30–400pm [HB]

Erik Gehring, Freelance Photographer

Improve your photographs of nature in this half-day workshop, an instructive talk followed by hands-on experience in the Arnold Arboretum landscape at one of the most beautiful times of year. Learn about composition, color, light, depth of field, and focus. Bring your camera and manual and familiarize yourself with the operation of your camera prior to the workshop.

$70
Offered with the Eliot School of Fine & Applied Art

On the Wing

Tuesday, May 9, 6:30–7:30pm [HB]

Lorna Gibson, Salapatas Professor of Materials Science and Engineering, Massachusetts Institute of Technology

American goldfinch, photo by Robet Mayer

What do you get from a bird lover who is a materials science engineer? A close look at feathers and the remarkable diversity of form and function they exhibit. In this talk at the Arboretum, MIT Professor Lorna Gibson will discuss how the microscopic structure of feathers makes hummingbirds' feathers iridescent, ducks' feathers water repellent, and owl ruff feathers collectors of sound.

Fee Free, but registration requested.

June

Identifying Boston's 25 Most Common Trees

Sunday, June 11, 9:00am–1:00pm [HB]

Kyle Port, Manager of Plant Records, Arnold Arboretum

In just a few hours you can learn to identify 90 percent of the trees growing in Boston, both native and nonnative. Beginning in the classroom, you will briefly review the characteristics of the 25 most common trees and learn the botanical terminology necessary to describe them. You will then walk the grounds of the Arboretum to look at mature specimens of these trees. Bring a notebook or clipboard for this information-rich program.

$45 member, $60 nonmember

Warren Manning: Landscape Architect and Environmental Planner

Thursday, June 15, 5:30 Reception, 6:30pm lecture
Location: Weld Hill Research Building

Robin Karson, Executive Director, Library of American Landscape History

Warren H. Manning (1860–1938) developed more than 1,600 design and planning projects throughout North America, from small home grounds to estates, cemeteries, college campuses, parks, and new industrial towns. Trained as a horticulturalist and apprenticed with the

Hope in a New Ecology

Wednesday, May 31, 7:00–8:30pm [HB]

Oswald J. Schmitz, Oastler Professor of Population and Community Ecology, School of Forestry and Environmental Studies, Yale University

Anthropocence—the "Age of Humans"—is the scientific name for our new future, in which humankind is the dominant force of nature that stands to determine our ecology and the fate of all life on Earth. Though many see anthropocence as the foreshadowing of widespread species extinction, scientist and author Oswald Schmitz will discuss a different view. In this talk, he will explain how ecology is evolving to provide new understanding about how humans can engage with the natural world to maintain and enhance our planet's environmental performance and ensure a sustainable future.

Fee: Free member, $5 nonmember, free student

Olmsted firm, Manning went on to mentor important designers such as Fletcher Steele and Dan Kiley. Under Robin Karson's direction, contributors to the Warren H. Manning Research Project have worked for more than a decade, locating and assessing current conditions of his built projects. Karson will reveal the scope and significance of Manning's career, showing how his approach to design and planning projects distinguished him from his early twentieth century colleagues.

Free, but registration requested. Seating is limited.
Offered with Friends of Fairsted

In the Groves: A Summer Solstice Journey

2 Sessions (select one): Friday, June 16, or Saturday, June 17, 6:30–8:30pm [HB]

Diane Edgecomb, Storyteller, and Margot Chamberlain, Celtic Harpist

Enjoy an enchanting evening of Tree Myths, Songs and Summer Solstice Legends. Diane and Margot spin tales of the human connection with trees and the deep meaning we have assigned to them through the ages. This unique performance, designed specifically for the Arnold Arboretum, travels through the landscape with story and music. Each story is told under a different tree or among a unique collection of Arboretum plants, culminating with the haunting Czech legend "The Wild Woman of the Birch Grove" told amid the birches at sunset.

$20 per person through June 10;
$25 per person after June 10

July

Gardens from Groceries: Family Fun

Wednesday, July 12, 1:00–3:00pm [HB]

Kate Stonefoot, Manager of Visitor Engagement, and Pamela Thompson, Manager of Adult Education; Arnold Arboretum

Put a bit of potato in a saucer of water and watch it produce roots and a stem. Transplant it into soil, and then harvest the potatoes produced, as if digging for natural treasure. This simple project and others like it can inspire a life-long love of gardening. Bring a child to this hands-on workshop to learn how to start a variety of plants from commonly found vegetables and fruits and even from food scraps. Kate Stonefoot and Pam Thompson will guide you through several activities and send you home with items raring to grow and more ideas for growing from groceries.

$20 adult; $5 per child
(Limit: 2 children per 1 adult registration)

Horticulture Classes

Learn techniques for growing and maintaining your plants.

March 18:
Planning and Creating a Compact Orchard

April 1:
Seed to Seedling

April 9:
Growing Gourmet Shiitake Mushrooms

June 11:
Identifying the 25 Most Common Trees in Boston

July 11:
Drought-Tolerant Plants for the Dog Days of Summer

September 27:
Plant Combinations for Beneficial Home Landscapes

Join us for a Tree Mob

Tree Mobs™ are interactions with scientists or other specialists that provide a pathway to learn little-known facts about our living plant collection, its relevance today, and its importance to future generations.

Plan to spend approximately 30 minutes learning about an interesting component of our collection, after which you can continue your exploration of the Arnold Arboretum on your own.

Visit our website to check for upcoming Tree Mobs and sign up to receive email notifications with their dates, times, and locations. Join us in the landscape and discover something new.

Visit, Explore, Discover

Visitor Information

The Hunnewell Building is open for restroom access and business guests on weekdays 9:00am to 5:00pm and on weekends 10:00am to 5:00pm. **The Visitor Center** in the Hunnewell Building is open 10:00am to 5:00pm; closed Wednesdays and holidays.

Services in the Visitor Center include:

- Personal assistance to enrich your visit, including tour recommendations
- Membership information
- Maps and postcards
- Changing exhibits including books and objects from the Arboretum archives
- Seasonal art exhibitions
- Activities for children and families
- Lost and found: 617.384.5209. Unclaimed items are donated to charity after two weeks.

Plant Information Hotline
Run by knowledgeable volunteers, the hotline is available for questions about woody plants hardy in the Boston area. Leave a message any time. Email plantinfo@arnarb.harvard.edu or call 617.384.5235.

The Arnold Arboretum Horticultural Library is open Monday through Friday, 10:00am–3:45pm. For library information, visit our website, email hortlib@arnarb.harvard.edu or call 617.522.1086.

Visitor Parking and Driving Permits
Street parking is available along the Arboretum's perimeter. Individuals with special needs may request a driving permit at the Visitor Center, weekdays only (closed Wednesday), from 10:30am to 3:00pm. Please call 617.384.5209.

Art Exhibitions

From Sicily to the Arnold Arboretum: Sicilian Wildflowers in Art and Words

Susan Pettee, botanical artist and Mary Taylor Simeti, writer

On view May 12–July 16, 2017
Saturday, May 20, 12:00noon–1:00pm: Presentation by Mary Taylor Simeti and 1:00–3:00pm: Opening Reception

Susan Pettee and Mary Taylor Simeti bring their creative vision and exploration of the wildflowers of Sicily to the Arboretum for this first look at an exciting illustration and research project that will eventually culminate in a book entitled *The Garlands of the Gods: Wild Flowers from the Greek Ruins of Sicily*. Elegant illustration and articulate text for each plant assume a more urgent relevance in light of climate change and how the increased use of herbicides threatens to forever alter the flora of Sicily.

Graduate of Radcliffe College and botanical artist, Susan Pettee has had her art included in numerous botanical art exhibitions. Writer Mary Taylor Simeti, also a graduate of Radcliffe College, has authored a number of books and articles, including *On Persephone's Island: A Sicilian Journal* and *Pomp and Sustenance*.

Acanthus by Susan Pettee

The Evolution of an Urban Landscape: Recent Paintings of Forest Hills

Andrew Haines

On view July 21–October 15, 2017
Opening Reception: Thursday, July 27, 4:00-6:00pm and Artist's Talk: Saturday, September 16, 1:00-2:00pm

A missing link in Boston's Emerald Necklace is a "green" connection between the Arnold Arboretum and Franklin Park. In 2015, the Casey overpass came down, creating a new opportunity for a better connection between the parks.

Artist Andrew Haines has seen many changes in this Boston area, and it has informed his art. In exquisite and observant paintings, Haines' Arnold Arboretum exhibition brings to life our neighborhood and the vibrant story of its evolution and new link between the landscapes of the Arnold Arboretum, Franklin Park, and the Forest Hills neighborhood.

Haines is known for detailed, painterly realism that captures his subjects in very specific light. He has exhibited widely, won awards, and has his work in many private and public collections.

South Street Looking North by Andrew Haines

Exhibitions are displayed in the Hunnewell Building Lecture Hall, which is occasionally reserved for meetings and classes. Call 617.384.5209 for exhibition availability; see page 14 for Visitor Center hours.

Special Events

Lilac Sunday

Sunday, May 14, 10:00–3:00pm

Of the thousands of flowering plants in the Arboretum, only one, the lilac (*Syringa* spp.), is singled out each year for a daylong celebration. With more than 380 lilac plants of 172 kinds, the Arboretum holds one of the premier lilac collections in North America. Join us to explore the beauty and diversity of these fragrant shrubs and the coming of spring on Mother's Day at the Arboretum.

Enjoy guided and self-guided tours of the lilacs and other special collections, fun family activities, picnicking (on this day only), and food trucks make for a memorable day in our landscape. Be a part of this beloved Boston tradition.

Collections Up Close:

The Beech Collection

Sunday, May 21, 1:00–3:00pm

Collections Up Close events offer a great way to explore one of the many plant collections with Arboretum staff to learn more about their unique qualities.

The Beech Collection (*Fagus* spp.) comprises more than 100 individuals and has representatives from eight different species. It is an extremely rich collection with many specimens from the late 1800s and early 1900s as well as a number collected by Arboretum explorer Ernest Henry Wilson. Witness the majestic outline, graceful branches, slender buds and beautiful leaves of the beech. Join us on the slope near the South Street Gate for a tour provided by Arboretum staff, chat with an Arboretum Interpreter about the differences between the American Beech and the European Beech, or participate in a family activity. Or, simply stand or lie under a tree and soak up the nobility of the beech.

Landscape Explorations

Guided Tours

Free landscape tours are available on Saturdays at 10:30am and Sundays at 1:00pm from April 15 through October. Weekday tours will be available on Mondays and Thursdays at 10:30am during May, June, September, and October. For additional details on Arboretum tours and full schedule, visit my.arboretum.harvard.edu or call 617.384.5209.

Jon Hetman

Theme Tours

Look into a special focus or area of the Arboretum. Geared toward adults, free, and registration requested.

Spring into Health
Rhoda Kubrick, Arboretum Docent
Two Sundays: March 19 and April 23, 1:00–2:30pm

The Shape of Things: Plants and their Structure
Rhoda Kubrick, Arboretum Docent
Sunday, April 9, 1:00–2:30pm

Early April Exploration
Nancy Rose, Editor, Arnoldia
Tuesday, April 11, 5:30–7:00pm

A Hidden Treasure: Arnold Arboretum Herbarium
Irina Kadis, Curatorial Assistant
Thursday, April 20, 2:30–4:00pm

Birding 101!
Bob Mayer, Arboretum Docent
3 Saturdays: April 29 [Arborway Gate], May 6 [Peters Hill Gate], May 20 [Arborway Gate], and Sunday, May 7 [South Street Gate], 8:00–9:30am

Lilacs, Lilacs, and Lilacs, oh my!
Chris McArdle, Arboretum Docent
Saturday, May 13, 12:30–2:00pm

Hidden in Plain Sight
Michael Dosmann, Curator of Living Collections
Wednesday, May 17, 5:00–6:30pm

Discover Peters Hill
Kevin Schofield, Arboretum Docent
Thursday, June 1, 5:00–6:30pm
[Peters Hill Gate]

Science and Beauty in the Arboretum Collections
Florrie Wescoat, Arboretum Docent
Saturday, June 10, 1:00–2:30pm

Edibles in the Arboretum
Rachel Brinkman, Assistant Manager of Horticulture
Sunday, June 11, 11:00am–12:30pm

Olmsted and the Arboretum
Florrie Wescoat, Arboretum Docent
Saturday, July 15, 1:00–2:30pm

International Tours
The Arnold Arboretum grows plants from around the globe, so it is fitting to talk about them in many languages. This June, look for tours each Saturday at 2:00pm in languages like Spanish, Chinese, and Russian.

Bonsai/Penjing Pavilion Open House
Select Thursdays and Sundays, see online calendar for listing.

Be on the Lookout for Volunteer Interpreters!

Friendly volunteers in green aprons will be stationed in the landscape, weekends mid-April through June from 1:00–3:00pm, ready to give a boost to your visit with hands-on fun and learning.

For Families with Children

Discover the Arboretum on guided walks especially for families. Walks develop observational skills in children, and are suitable for children ages four through eight. Meet at Visitor Center.

Barking up the Right Tree
Saturday, April 29, 11:00am–12:30pm

Let's Get Blooming! Buds, Blooms, and Blossoms
Sunday, May 28, 11:00am–noon

Let's Get Journaling: A Walk for Budding Naturalists
Saturday, June 17, 11:0am–Noon

Let's Get Buggy! Exploration of Insect Pollinators
Saturday, July 8, 12:30–1:30pm

Make the Most of Your Membership!

Support from our members is vital to the well-being and care of our magnificent landscape and living collections and sustains our programs in science, horticulture, and education. We invite you to share the experience and take advantage of our numerous membership and public program offerings. To learn more or view the full calendar, please visit our website arboretum.harvard.edu. For membership questions, please contact 617.384.5766 or **membership@arnarb.harvard.edu.**

Arbor Day Seedling

Members at the Sustaining level and above will be invited to receive a specially chosen plant gift in April in honor of Arbor Day. Invitations will be mailed to eligible members in mid-February. RSVP required.

The seedling selection for Arbor Day 2017 is the lovely *Cornus kousa* var. *chinensis* (Chinese dogwood). Arboretum Founding Director Charles S. Sargent described this noteworthy plant with four seasons of ornamental interest as one of the greatest gifts to North American gardens.

Save the Date!

Members' Tour Day

Saturday, October 21, 2017
10am–noon

Our Members' Tour Day offers an opportunity for members to gather and enjoy theme tours led by our staff experts. Join us to explore the Living Collections in autumn and experience an array of seasonal highlights. Invitations will be mailed in early September and registration is required.

Sargent-Olmsted Society

Named to commemorate the founding director of the Arnold Arboretum and its famed landscape designer, the Sargent-Olmsted Society recognizes a community of plant, garden, and science enthusiasts who provide philanthropic support to the Arnold Arboretum of Harvard University and its mission to explore, document, and preserve Earth's temperate biodiversity.

Sargent-Olmsted Society members enjoy exclusive access to the Arnold Arboretum, its collections, and expert staff through select benefits including special programs and signature events.

We invite you to cultivate a deeper understanding of the botanical world and the role of the Arnold Arboretum in the realms of discovery, horticulture, and conservation by partnering with us as a charter member of the Sargent-Olmsted Society. Visit us online to learn more, or call 617.384.5763.

Do you know about these great membership perks?

- Free or discounted admission to Arboretum classes and lectures
- Special admission or discounts at 300 gardens and arboreta worldwide via the American Horticultural Society's Reciprocal Admission Program (RAP)
- Discounts at participating nurseries and garden centers

The ARNOLD ARBORETUM of HARVARD UNIVERSITY

125 Arborway
Boston, MA 02130-3500

visit us online at arboretum.harvard.edu

In our Collection

Magnolia macrophylla

Jon Hetman, Director of External Relations and Communications

In a living collection comprising thousands of distinctive plants from around the world, bigleaf magnolia (*Magnolia macrophylla*) makes quite a big impression. Living up to its common and scientific names—*macrophylla* literally means *big leaf*—bigleaf magnolia bears the largest simple leaf (up to 30 inches long) and flowers (up to a foot in diameter) of any temperate North American tree. These outsized attributes hint at the tree's ancient evolutionary history, a legacy now threatened by the severely limited scope of its natural range. In fact, the unique ornamental qualities and relative rarity of the species made bigleaf magnolia among the prized targets in the Arboretum's collaborative expedition to the Southeastern U.S. last fall (see "Collecting High and Low," page 2).

Kyle Port

The large flower and leaves of *Magnolia macrophylla* (961-89*A), photographed on a 28-year-old accession of the tree in the Hickory Collection along Valley Road.

Originally discovered in 1789 near Charlotte, North Carolina, by French naturalist and explorer Andre Michaux (1746–1802), *M. macrophylla* occurs in natural populations from southern Ohio to the Gulf Coast, but it isn't really common anywhere. It grows at a moderate rate into a medium-sized (30–50 feet tall) tree, pyramidal in habit but prone to developing a spreading, rounded crown in maturity. Its giant flowers—fragrant, open, and cup-shaped—bloom in May, and are white with a distinctive rose-purple stain at the base. Pollination is carried out not by bees or butterflies but by beetles attracted to its strong fragrance—another indicator of its primitive past. Flowers give way to ovoid, cone-like aggregate fruits about three inches in length that mature to red in late summer and release red-coated seeds that attract birds. Leaves are a rich green above and silvery-gray below, and may turn yellow in autumn before defoliating.

Though its large leaves command attention when grown as a specimen plant, they make it a considerably less attractive choice as a street tree because of leaf litter in fall. This quality, along with shallow roots that make it difficult to garden beneath, make it best suited to a natural area. It is somewhat shade-tolerant, but can also grow in full sunlight. A location offering moist, loamy soil is preferred because *M. macrophylla* can suffer during droughts.

At the Arboretum, you may visit eleven accessions of bigleaf magnolia. Look for three young specimens growing amid the Arboretum's extensive Magnolia Collection behind the Hunnewell Building, and visit a number of mature specimens along Valley Road near the Centre Street Gate in the Hickory Collection. Enjoy the sizable charms of a fascinating relict of evolution this growing season at the Arboretum, and keep an eye out for our latest acquisitions of bigleaf magnolia gathered this year for the Campaign for the Living Collection to be planted out in coming years.