Join us for the third annual Director’s Lecture Series at the Arnold Arboretum. The series features nationally recognized experts examining an array of contemporary topics related to Earth’s biodiversity and evolutionary history, the environment, organismic biology, and key social issues associated with current science. All lectures are held in the Hunnewell Building Lecture Hall.

Plants, the First Three Billion Years: A Reflection on the Nature of Evolutionary History
William (Ned) Friedman, Director of the Arnold Arboretum and Arnold Professor of Organismic and Evolutionary Biology, Harvard University

Monday, January 14 7:00–8:30pm [HB]
How did plant biodiversity begin, and what are some of the key evolutionary twists and turns that have established a world teeming with photosynthetic life? Join us as we explore how lunch for a unicellular organism inadvertently laid the groundwork for the first plants, and how they then went on to produce exquisitely beautiful multicellular photosynthetic lineages dozens of times, only one of which made it out of the water and onto land 475 million years ago. And finally, we will reflect on what might have occurred if one or two of these events had gone differently in evolutionary history.

Plastic: A Toxic Love Story
Susan Freinkel, Science Writer and Journalist

Monday, March 11 7:00–8:30pm [HB]
As coal fueled the industrial revolution, one could say that plastic built the modern world. But a century into our love affair with plastic, we’re starting to realize it’s not such a healthy one. Plastics draw on dwindling fossil fuels, leach harmful chemicals, litter landscapes, and destroy marine life. And yet each year we use and consume more; we’ve produced as much plastic in the past decade as we did in the entire twentieth century. Journalist Susan Freinkel will speak about our dependence on this material, guiding us through history, science and the global economy to assess the real impact of plastic in our lives. She’ll present a new way of thinking about a substance that has become the defining medium—and metaphor—of our age. Her book, Plastic: A Toxic Love Story, will be available for purchase and signing.

Biodiversity 2013: Crisis and Opportunity
James Hanken, Alexander Agassiz Professor of Zoology, Curator in Herpetology and Director, Museum of Comparative Zoology; and Professor of Biology, Department of Organismic and Evolutionary Biology, Harvard University

Monday, February 25 7:00–8:30pm [HB]
The state of biodiversity in 2013 presents a tremendous paradox. Biodiversity science is more productive today than ever before; the rate of new species discovery, for example, is higher than it’s ever been. At the same time, the rate of species extinction is increasing dramatically due to human-mediated environmental degradation on a global scale. This crisis for the future of biological diversity offers unparalleled challenges and opportunities for the professional scientific community, which is responding with new approaches and a heightened sense of urgency, with increasing focus both on conservation of species and their habitats and on the major drivers of extinction.

The New You: How Symbiosis Studies Have Undercut Biological Views of Individuality
Scott Gilbert, Howard A. Schneiderman Professor of Biology, Swarthmore College

Monday, April 8 7:00–8:30pm [HB]
What defines an individual? Can an animal be construed an individual if its anatomy, physiology, development, and even its immune systems depend on symbiotic microorganisms? What becomes of the genetic and evolutionary individual when inherited symbionts provide selectable variation for the host? Animal plus symbiont equals...what? Super-animal? Team? Holobiont? Have we been lumping and sorting erroneously only to learn through advances in biotechnology that individuals are really communities or, perhaps, relationships? Join us for a mind-bending presentation that may leave you reassessing your place in the biosphere.
From the Director

One hundred forty years ago, the trustees overseeing the will of whaling merchant James Arnold established an arboretum in his name. This living collection in the heart of Boston would “contain, as far as practicable, all the trees [and] shrubs... either indigenous or exotic, which can be raised in the open air.” Scarcely more than a decade had elapsed since the appearance of Darwin’s *On the Origin of Species*, a revolutionary work professing that life’s abundant diversity arose through descent with modification through a branching pattern of evolution. In amassing a collection of plants from around the world and growing similar species side by side for comparative study, the Arnold Arboretum of Harvard University developed into one of the foremost centers for understanding the breadth and beauty of this diversity, and its importance to humankind.

As we confront serious challenges arising from a rapidly changing global climate, the need to investigate and protect the full complexity of life on this planet has never been more critical. The shape of our collective future will rely heavily on the ability of science to steer us toward innovative and credible solutions to the problems that we ourselves have wrought. In this issue of *Silva*, Director of Research Facilitation Dr. Faye Rosin discusses our efforts to contribute to this potential through programs that support the training and work of emerging plant scientists. Endowed through the generosity of friends both past and present, our fellowship and awards opportunities share in common one important requirement—that studies draw on the unique strengths and utility of the Arboretum’s living collections.

In these pages you will also learn how many of our more than 15,000 curated plants are playing an integral part in groundbreaking studies in fields from phenology—tracking the timing of key events in the annual cycles of plants—to DNA technologies that allow us to discover the microbial communities that live in and upon the surfaces of whole trees. If inviting scholars to investigate the remarkable set of living organisms in our landscape holds great value to us as part of Harvard University, sharing them freely and thoughtfully with the public galvanizes our complementary role as a community resource. On this front, I invite you to join our new “Tree Mobs” that spotlight individual plants and projects in our landscape, and to try out new mobile applications that help you explore the Arboretum on your own, right from your smart phone or tablet device.

This fall and winter, we offer multiple avenues for you to enhance your connection to the Arboretum and discover the plants, programs, and people that make it such an extraordinary place. On September 15, I hope you’ll join us beneath our majestic specimens of walnut and hickory at our Members’ Plant Giveaway; our annual opportunity to extend our thanks and offer a token of some of the amazing plants that we steward for your own backyard. """

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

Arboretum Fellowship and Awards Opportunities Boost Research and Careers

An interview with Faye Rosin, Director of Research Facilitation

With the addition of the Weld Hill Research and Administration Building, the Arnold Arboretum offers scientists from a wide range of disciplines state-of-the-art facilities to conduct studies on material collected from living plants in our landscape. To foster both independent and collaborative work focused on its remarkable collections, the Arboretum offers a research fellowship and a number of research awards to students, post-doctoral researchers, and professionals of the biological and horticultural sciences. Endowed through past and present philanthropy, these competitive funding opportunities provide student researchers and scientists with the means and support to launch novel inquiries or to pursue new directions in their ongoing studies. Award recipients not only tap into the Arboretum’s collections and research facilities, but also take advantage of staff expertise and vast information resources to advance their investigations. The awards not only promote the scientific use of the Arboretum, but also contribute fresh perspectives, viewpoints, and ideas to the institution’s network of associates and collaborators.

As Director of Research Facilitation, Dr. Faye Rosin serves on the committees that select the recipients of the fellowship and awards. She also helps orient these individuals as new members of the Arboretum community, introducing them to the full complement of the institution’s resources as a scientific collection, research facility, and division of Harvard University. Part of this coordination involves providing operations assistance and safety training for the use of Weld Hill’s highly specialized equipment for plant study, as well as offering ongoing laboratory support, critical analysis, and a friendly spirit of camaraderie. At every step, Faye helps establish a welcoming and stimulating environment necessary for fellows and award recipients to make the most of their investigations and their overall experience as guest researchers at the Arnold Arboretum.

Q. What types of funding does the Arboretum make available on a competitive basis to student and post-doctoral researchers in the plant sciences?

A. The Putnam Fellowship was established in the 1990s...
and provides salary and research support to a researcher embarking on an independent project utilizing the Arboretum's collections. Funding is granted for a year with an option to renew for a second year. This award is particularly important in that it can really represent a springboard for the career of a young scientist, supporting the critical time between their educational training and dissertation work and their entry into a laboratory or teaching position of their own. Our Putnam Fellows integrate fully into the Arboretum community as a member of the staff, conducting their research but also contributing to the vibrancy of the institution by giving lectures, participating in team initiatives, or writing articles for *Silva* and *Arnoldia*.

In contrast, recipients of our various research awards—the Sargent Award for Visiting Scholars, the Cunin-Sigal Research Award, the Deland Award for Student Research, the Ashton Award for Student Research, and the Jewitt Prize—obtain funding mainly for travel, laboratory work, and supplies, and may not even visit the Arboretum at all if the material they need to study from our collections can be supplied to them by other means. Considered together, our research awards provide backing for a broad range of individuals, from undergraduate and graduate students to post-doctoral fellows and established scientists.

**Q. How are the award recipients chosen, and what do you look for in a winning proposal?**

**A.** We have a rigorous peer-review process to select awardees from the proposals we receive. There really isn't a formula for a successful proposal, other than representing good science, matching any requirements specified by the award endowments, and demonstrating the thoughtful use our collections. Beyond that, applicants need to be realistic and set out goals that are technically feasible under the amount of time and funding requested. After these fundamental considerations, the competitive nature of the process comes to the fore, and we look more critically at the finalists in terms of their creativity, their novelty, and their potential to spur further scholarship on their topic of interest. It’s also highly desirable to us that the work reflect the unique resources of the Arnold Arboretum. If it’s research that can only be done here—with this collection and its curated information—that’s a characteristic we certainly value quite highly.

**Q. How do awards and fellowship recipients participate as part of the Arboretum community and in the broader realm of the sciences at Harvard?**

**A.** Our awardees collaborate not only with other researchers here, but also with our curatorial and horticultural staffs in selecting and accessing plants in the collection. In some cases, the plans of our guest scientists have changed significantly once they’ve conferred with those who track these plants on a daily basis. These relationships are important for us all, and there are side benefits in having outsiders looking closely at our plants. Any time we single out specific organisms for study, we learn new information, and are able to check and verify our existing data on any given accession. These programs also serve to constantly demonstrate the value and relevance of the living collections for research, both to the public at large and to our staff who are responsible for growing and documenting our plants.

Working side by side with Arboretum staff creates real opportunities for a cross pollination of ideas, and our facilities at Weld Hill lend themselves to supporting collaboration. Equipment and workspaces in our open laboratories are shared, along with fresh perspectives and expertise. This environment and their participation in the daily life of the institution really goes a long way toward cultivating a vibrant community for discovery. Awardees in residence are invited to attend our weekly research seminars, which feature our own researchers as well as guest lecturers from other parts of the country and the world. Awardees can participate fully in these offerings, and are encouraged to give research talks of their own design. These opportunities enable them to interact with other researchers in various fields at Harvard and expand their professional network. Experiences like these can also help awardees look outside their own silos to consider other paths of research, which can be quite valuable to an emerging scientist.

**Q. How does the Arboretum gather and leverage new information obtained from projects conducted by its fellows and awardees?**

**A.** The recipients of our fellowship and awards are selected in spring, and by the following December they are required to submit a report on their research and its status, including what they learned, what they may still need to do, and how the outcomes might influence future investigations. Resulting data can be linked to our curatorial information on the plants studied, and is also reported annually to the donors and families who have established the awards. During the course of their stay, awardees often give public talks, or share details of their work on our website and in our publications. In this way, the knowledge accumulated in our collections through these awards feeds back into our core mission to increase the appreciation and understanding of our plants for the benefit of everyone. The interaction of bright minds, outstanding labs, and a richly documented collection of living plants create endless possibilities for new applications and fresh inspiration.
Gardeners know that there is a progression of flowering of different species of plants over the course of the growing season, with many magnolias and forsythias flowering early in the spring, and roses and hydrangeas coming into bloom later in the season. However, there is a surprising lack of information regarding when plants leaf out in the spring. An assumption persists that plants leaf out once the danger of frost has passed, and that plants generally produce their first flush of leaves around the same time. In fact, there is a wide range of leafing out times, following a sequence I investigated as part of a coordinated study this spring at the Arnold Arboretum. Though I observed that the largest number of species leaf out from mid to late April, a ten week span separates those that leaf out first—including certain honeysuckles and privets in early March—and plants like certain pines and evergreen rhododendrons that don’t produce new foliage until the end of May.

In my previous work at the Arboretum, I used herbarium specimens, archival photographs, and personal observations to demonstrate that plants at the Arboretum now flower ten days earlier than a century ago due to warming temperatures. In this new project, I am investigating whether leafing out times can also be an indicator of climate change. Additionally, this study may also shed light on the evolutionary and ecological advantages plants may garner by leafing out at different times. Species that leaf out early in the spring experience a longer growing season that might make them more competitive in the wild, but also exposes their young leaves to possible damage by late frosts. Species that leaf out later are more protected against frost damage, but have less time to develop over the course of the growing season.

Three volunteers and I walked the Arboretum landscape two or three times a week this spring, recording the leaf out times of more than 1,000 species. In order to determine how patterns observed at the Arboretum compare to leafing times of the same species in other parts of the world, I invited several other botanical institutions to replicate our study. The response was surprisingly positive. Participants made observations at gardens in Munich, Berlin, Ottawa, and Beijing, as well as at the U.S. National Arboretum in Washington DC, the Morton Arboretum in Chicago, and Garden in the Woods in Framingham. All told, we have recorded data on more than 1,600 species, with many common species cited in multiple locations.

Professor Charles Davis of Harvard University, Zoe Panchen from Carleton University, and other associates will join me in analyzing this large data set. We hope to identify patterns that might suggest whether shrubs leaf out before trees, if deciduous species leaf out before evergreen species, and how families and genera of plants differ from one another in producing new foliage. We will also see if the sequence of leafing out observed at the Arboretum is similar to the results gathered by observers at the other botanical gardens. In coming years, we will continue our monitoring at the Arboretum and at our partnering botanical gardens in order to develop leafing out time as an indicator of plant response to climate change. With its extensive living collection of woody plants gathered from around the world, the Arnold Arboretum is the perfect place to carry out this work.
Early in May, an assortment of Arboretum neighbors and staff, dog walkers, and some visitors in medical scrubs—likely having just ended their workday at neighboring Faulkner Hospital or the Hebrew Senior Life center—gathered by a Sargent’s crabapple (Malus sargentii, accession 20408*D) on Peters Hill. Some arrived following mapped directions to the site on their cellphones or had printed instructions from our website, while others just chanced upon the scene as they made their way through the landscape. This was our first Tree Mob™, the brainchild of Arboretum Director Ned Friedman, designed to highlight what makes the Arboretum so extraordinary—the more than 15,000 wonderful and diverse organisms grown and documented here.

Tree Mobs are brief encounters with specialists in the Arboretum landscape, designed to encourage visitors to become more intimately aware of the depth and richness of the living collection, one tree, shrub, or vine at a time. In addition to the gnarled specimen of Malus sargentii, “mobsters” observed the pollination droplets exuded by the reproductive structure of the female ginkgo (Ginkgo biloba ‘Hayanari’, accession 824-83*A) to capture airborne pollen from male trees. They’ve pricked fingers on the horrific thorns of the honey locust (Gleditsia triacanthos, accession 1237-79*C) while Ned Friedman described the thorn as a modified stem. Gatherings are weather dependent and may pop up with little notice, particularly when we serendipitously observe intriguing yet fleeting occurrences in our landscape.

Below are images of some recent gatherings. Be sure to sign up on our website for our electronic communications to receive special notification of these events, which occur several times monthly. Mobs will continue throughout the fall and into the winter, so we hope you’ll join us in the landscape for some on-the-spot fun and learning.
Fun and Learning on the Go

Discovery Packs Promote Family Explorations

Julie Warsowe, Manager of Visitor Education

A treasure trove of biodiversity, the Arnold Arboretum invites new discoveries with every visit. This past summer, the Arboretum launched a new way for families to engage with the landscape and learn about plants together. Funded by a gift from the Arnold Arboretum Committee, Explorer’s Club discovery packs are now available to borrow, free of charge, in the Hunnewell Visitor Center. Part of an ongoing effort to further engage young visitors, the backpacks promote compelling explorations of both the Arboretum and the natural world.

Explorer’s Club packs give parents, grandparents, or caregivers the tools and know-how to facilitate fun and informative experiences for kids. Families may choose from two themes, the Living Museum and the Science Lab. The Living Museum packs focus on how the Arboretum collects and cares for living plants and makes them available for public study and enjoyment as a “tree museum.” The Science Lab packs encourage kids to think and experiment in the landscape like plant scientists.

Each pack features four activities, and visitor feedback so far suggests that one activity per visit works well. Many of the activities are designed to be repeated on later visits, so the packs can be borrowed multiple times to experience them in full. Participants may adapt the activities to a wide age range (three and up) while encouraging siblings and peers of multiple ages to make discoveries together. The packs also fit well with after-school programs and other youth groups, provided an adequate number of adults is available to help guide the investigations.

Launched in June, the discovery packs were developed by our Visitor Education team with the assistance of Elizabeth Hilt, an intern from the Harvard Extension School Graduate Program in Museum Studies. “While a family visit to the Arboretum always promises fun,” Elizabeth muses, “the discovery packs take the experience to a whole new level, inspiring new perspectives on what the Arboretum is all about.” One of the activities—Champion Tree Challenge—uses a number of measurement tools and techniques to help children identify the biggest tree they encounter on their visit. While promoting interactive fun, the experiment also shines a light on how and why Arboretum staff monitor the health and growth of each of the plants in the collection.

The discovery packs have already begun to make an impression. One parent recently emailed: “I just wanted to let you know that today my four year old asked if we could play Tree Bingo at home! Thank you for a fun afternoon. We look forward to trying more backpack activities in the future.” Stop in and join our Explorers Club by checking out a discovery pack, and turn your next visit into an Arboretum adventure.
A Leader Among Conifers
A Profile of 2012 Plant Giveaway Offering *Thujopsis dolabrata*

**Kyle Port, Manager of Plant Records**

Each September, the Members’ Plant Giveaway gives Arboretum staff the opportunity to share some of our favorite plants with our community of supporters. Among the event’s diverse selections of trees, shrubs, and vines this year is *Thujopsis dolabrata* (pronounced “thoo-yop-siss do-lah-brah-ta”), an exotic conifer worthy of a closer look.

A species native to Japan, *T. dolabrata* bears hatchet-shaped leaves that are waxy green with conspicuous white stomatal banding on their abaxial (underside) surface. Stomata (or “mouth” in Greek) are openings on the surface of leaves which regulate gas exchange through minute pores. Winter temperatures lower than -5 to -10 degrees Fahrenheit (USDA Zone 6a) can damage *Thujopsis* leaves, compromising what is arguably the tree’s most ornamental structure. Mature individuals bear cones which have been observed over the past several years on a variety of the species (*T. dolabrata* var. *hondae*, 1163-73*A*) grown in the Leventritt Shrub and Vine Garden.

The living collection provides opportunities to observe how species grow outside of their native range. Although *Thujopsis* is formally described as a tree, four of the seven specimens at the Arboretum have displayed decidedly shrubby habits for decades. Though recently each of these four has produced multiple leaders, the tendency of the species to grow low and layer is an important landscape consideration. Among these, the largest and oldest (635-59*A*, circa 1959) stands 15 feet tall with a spread of 20 feet. The remaining three exhibit an arboreal habit and thrive in the Explorers Garden on Bussey Hill in partial shade. Shade-grown *Thujopsis* leaves are darker green and more lustrous than those bathed in full sun, which tend to display more yellowed hues. New growth across various light levels emerges a delicate lime green.

*T. dolabrata* offered at the 2012 Members’ Plant Giveaway come from cuttings collected from accession 1713-77*B*. One of the historically shrub-like individuals at the Arboretum, this specimen has only recently begun to establish leaders. Grown in a display bed on the perimeter of the Arboretum’s Dana Greenhouse, this vigorous specimen was wild collected on a 1977 expedition to Japan and has long facilitated plant material distributions.

Collections development efforts yielded a new accession of *T. dolabrata* var. *hondae* (272-2008) in 2008. A variety considered hardier than the species, this plant was collected by Polly Hill Arboretum staff at the side of a railroad track in Aomori prefecture, Japan. Meticulously cared for by Dana Greenhouse staff, these plants will support research and perhaps inspire the propagation of future introductions. Its collection serendipitously recalls the discovery of *Picea glauca* var. *albertiana f. conica* (dwarf alberta spruce) by famed Arnold Arboretum staff members John G. Jack and Alfred Rehder “…while awaiting a train that was behind schedule near Lake Laggen, Alberta, Canada in 1904.” Everything old is new again, and our time-honored tradition of sharing remarkable plant discoveries with the world continues to enrich gardens closer to home.
Visitors to Peters Hill at the Arnold Arboretum may have noticed a number of rustic headstones clustered beneath the trees near the Walter Street border. How did people come to be buried there so long ago and how did this sacred spot become part of our landscape?

Three centuries ago, farmers in the western part of Roxbury, Massachusetts, found it increasingly difficult to travel to the town center more than three miles away for their devotions. So in the summer of 1706, they submitted a petition to the General Court requesting the creation of a second parish. Though their petition was rejected, the neighbors were undeterred, and they soon built a meeting house with space for a burial ground on Walter Street.

Evidently the town fathers were not pleased with this development, and in April 1711 the offenders submitted a lengthy petition asking forgiveness for their “wrong disorderly steps” and compassion for their “late hour of temptation.” At a town meeting that May, the petition was accepted and the boundaries for the Second Parish were officially laid out. Burials in the churchyard began about that time, and the oldest surviving stone—dated 1722—bears the name Anna Bridge. Continued growth of Jamaica Plain brought about the 1769 formation of the Third Parish of Roxbury (today the First Parish of Jamaica Plain) at the intersection of South and Centre Streets. This location was close enough to the Second Parish that the parishioners decided to take down their meeting house in 1773 and move further down Centre Street toward Dedham.

The burying ground, however, remained in place and continued to accommodate burials into the 1800s, as surviving headstones attest. An inventory in the middle of that century counted 49 stones marking 54 individual burials, as well as at least one crypt. At some point in its history, the site was enclosed by a stone wall. In 1867, development near Stony Brook unearthed remains of Revolutionary War soldiers who had been buried on what was then part of the Loring Estate. They were disinterred and reburied in a tomb at the Walter Street burying ground. Road improvements in 1903, including the widening of Walter Street, resulted in the loss of approximately 300 square feet of frontage, the rebuilding of the perimeter wall, and the relocation of remains of 28 individuals.

Also in that year, the Sons of the American Revolution dedicated a monument to the Revolutionary War soldiers interred in the burial ground, which still honors them today.

In February 1923, the Boston City Council authorized the removal of the wall on the two sides of the lot bordering the Arnold Arboretum. They also approved the planting of trees, and a number of the native tulip trees (Liriodendron tulipifera) growing there date to this period. Nearly 25 years later, in May 1946, the Boston Park Commission turned over responsibility for maintenance of the burying ground to the Arboretum. Today, in addition to the tulip trees, visitors can enjoy specimens of dawn redwood (Metasequoia glyptostroboides), Japanese cypress and Atlantic white cypress (Chamaecyparis obtusa and C. thyoides), alternate-leaved dogwood (Cornus alternifolia), and several rhododendron varieties.

The Walter Street Burying Ground is a peaceful and contemplative place of big trees and dappled sunshine, and many of the surviving headstones are fascinating relics of early American stonemasonry. Make this quaint and historic remnant of the Arboretum’s past a destination on your next visit.

The headstones marking the earthly remains of Hannah Baker (left) and Captain John Baker (center), dating to 1776 and 1781 respectively, are among the grouping of markers gracing Peters Hill.

Lisa Pearson, Interim Library Supervisor
Arboretum Ginkgos Subject of Biome Study

Regarded as a living fossil, *Ginkgo biloba* has long fascinated plant scientists, and its highly unusual morphology and biology have been well studied. Less known are the ways this survivor from the Cretaceous period interacts with its present environment—particularly the microcosm of organisms that it supports. To delve into this question, three 30-foot-tall, 23-year-old ginkgos growing near the Arboretum’s Bussey Street Gate have been sampled from top to bottom as part of the first-ever effort to identify the entire community of microbes found on the above-ground surfaces of a large tree.

Senior Research Scientist Peter Del Tredici and Arboretum Director Ned Friedman are collaborating with Noah Fierer, Jon Leff, and Samantha Weintraub from the University of Colorado to sample and analyze the trees’ microbiome—the complete record of their bacterial associates. While the microbiome of humans has been mapped and well studied, those of plants are largely unknown. The study collaborators hope to fill this gap by identifying what species of microbes live on these trees and how they may vary according to their location from top to bottom on the trees and north and south in the landscape.

Mobile Applications Aid Arboretum Explorations

As people increasingly rely on hand-held devices to deliver information efficiently on the go, the Arboretum is responding with new mobile technologies to put our plants and programs at your fingertips. The Arboretum’s interactive map and its companion application, Arnold Arboretum Navigator, were launched on Lilac Sunday as part of a wider initiative to expand access to the Arboretum’s resources as a landscape for science, learning, and recreation.

Last fall’s launch of the desktop web application Collections Researcher—which links curatorial data on the living collection with the mapping capabilities of a powerful GIS (geographic information system)—represented a leap forward in sharing information about the Arboretum’s plant holdings with global audiences. With the unveiling of the Arboretum’s interactive map and Arnold Arboretum Navigator, visitors may access this suite of orientation tools and information resources on their mobile devices.

The Arboretum interactive map is currently optimized to function using the latest technology from Android manufacturers and Apple’s iOS platforms for iPhone and iPad. It enables you to search the collection, view seasonal plant highlights, and link to individual plants at the Arboretum. Arnold Arboretum Navigator allows users to locate plants in the collection and is compatible with most modern smartphones. Future mobile applications now under development will deliver much of the content published on the Arboretum website to your smart phone or tablet device. Whether you wish to search and reserve a spot at a lecture or class, conduct a virtual tour, search for Arboretum staff, or even view seasonal collections highlights, connecting with the Arboretum is going mobile. Learn more about GIS at the Arboretum during Geography Awareness Week, November 11–17; see page 12 for details.
ADULT EDUCATION OPPORTUNITIES

The Arboretum offers a variety of learning opportunities for adults. Below is a partial list of our fall/winter classes and lectures followed by descriptions of featured programs. In an effort to conserve resources, we are now listing only a sampling of our programs in print. To view all programs by month, please visit our online registration system at my.arboretum.harvard.edu. For additional assistance, call Pamela Thompson at 617.384.5277.

Schedule of Classes and Lectures

September
- 24: A Brief History of Plant Pathology
- 29: Bark Ecology and ID: Get to Know Your Trees
- 30: Nature in Focus: Taking Great Close-ups

October
- 2: Birch: More than Meets the Eye
- 3: Field Trip on the High Line
- 10: What a Plant Knows
- 18: A Rich Spot of Earth: Thomas Jefferson’s Revolutionary Garden at Monticello
- 20: Propagating Trees and Shrubs from Cuttings and Seeds
- 21: Chainsaw Use, Safety, and Maintenance
- 25: The Brookline Troika: Olmsted, Sargent, Richardson, and the Planning of the Model Suburb
- 28: The Art of Photographing Trees
- 29: Gardens for a Beautiful America: The Photographs of Frances Benjamin Johnson

November
- 3: Naturally Curious
- 7: Ants: To Know Them Is to Love Them
- 14: GIS at the Arboretum
- 15: Understanding Mosses
- 17: GIS at the Arboretum
- 28: Coffee Life in Japan
- 29: Audio Ecology: Acoustic Signals in Insects

December
- 2: Introduction to Winter Tree Identification
- 4: Gertrude Jekyll and the Country House Garden

January
- 14: Plants, the First Three Billion Years: A Reflection on the Nature of Evolutionary History
- 26: Pruning in Winter

February
- 2: Pruning in Winter
- 2: Grafting Techniques for Ornamental Trees
- 28: Biodiversity 2013: Crisis and Opportunity

March
- 11: Plastic: A Toxic Love Story
- 16: Pruning Shrub
- 18: Garden as Community: Planting by Guild
- 21: Wilson’s China: Then and Now
- 22: Tree Growth and Care: A Holistic Approach

April
- 6: Growing Plants from Seeds
- 21: The New You: How Symbiosis Studies Have Undercut Biological Views of Individuality
- 20: Ginkgo Fest: A Celebration of Ginkgo biloba

Key to Symbols and Abbreviations
- HB: Arnold Arboretum, Hunnewell Building, 125 Arborway, Boston
- WH: Weld Hill Research Building, 1300 Centre Street, Roslindale

Cancellations and Refunds
You may cancel a class registration by calling the Adult Education Department five days prior to the first class. With such cancellations, a $5 per class cancellation fee will be deducted from your refund. We regret that no refunds or credits can be given for withdrawals from classes in progress or for those you have not attended. We reserve the right to cancel a class; in this case, a full refund will be issued.

Contact
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Field Trip on the High Line
Robin Wilkerson, Gardener and High Line docent
Wed Oct 3 7:30am–7:30pm
Take a day trip to the High Line in New York City. This garden is built on an abandoned mile and a half of elevated railroad line. Native oaks, sassafras, sumacs, and an array of ornamental grasses are some of the plants that fill this narrow but dynamic urban landscape. There will be time for lunch and exploration on your own. Don’t miss this chance to see one of the world’s great urban wonders. Registration deadline: September 19. See full details on our website.
Fee $120 members; $145 nonmembers
Co-sponsored by Garden in the Woods and Friends of Wellesley College Botanic Gardens

What a Plant Knows
Daniel A. Chamovitz, Ph.D., Director, Manna Center for Plant Biosciences, Department of Molecular Biology and Ecology of Plants, Tel Aviv University
Wed Oct 10 7:00–8:30pm [HB]
Join us for a captivating journey into the lives of plants—from the colors they see to the schedules they keep. Highlighting the latest research in plant science, Daniel Chamovitz will take us into the lives of various types of plants, and draw parallels with the human senses to reveal that we have much more in common with sunflowers and oak trees than we may realize. Covering touch, sound, smell, sight, and even memory, this class invites you to consider whether it’s too much to ask if plants are aware.
Fee $5 members; $20 nonmembers

A Rich Spot of Earth: Thomas Jefferson’s Revolutionary Garden at Monticello
Peter J. Hatch, Former Director of Gardens and Grounds at Monticello
Thu Oct 18 7:00–8:30pm [HB]
Were Thomas Jefferson to walk the grounds of Monticello today, he would no doubt feel fully at home in the 1,000-foot terraced vegetable garden where the very vegetables and herbs he favored are thriving. Extensively and painstakingly restored under Peter Hatch’s brilliant direction, the garden is a living expression of Jefferson’s genius and his distinctly American attitudes. Peter Hatch will reveal the bounty and legacy that grows on at Monticello and its continuing influence on the culinary, garden, and landscape history of the United States.
Fee $20 members, $25 nonmembers
Co-sponsored by the Arnold Arboretum of Harvard University, Friends of Wellesley College Botanic Gardens, the Garden Conservancy, and the Thomas Jefferson Foundation, Inc.

The Brookline Troika: Olmsted, Sargent, Richardson, and the Planning of the Model Suburb
Keith Morgan, Director of Architectural Studies, Boston University
Thu Oct 25 6:00pm, reception to follow [HB]
Join us for a glimpse into Brookline’s past—the shaping of its public parks and parkways, private estates, and planned housing developments, as influenced by the Olmsted Office. Architectural historian Keith Morgan will present a selection of the firm’s approximately 150 Brookline commissions that were created over the course of a half century.
Fee Free, but registration requested
Co-sponsored by the Arnold Arboretum, Friends of Fairsted, and the Library of American Landscape History

Gardens for a Beautiful America: The Photographs of Frances Benjamin Johnston
Sam Watters, Historian
2 sessions (select one): Mon Oct 29 10:00am [WH] or 7:00pm [HB]
At the opening of the twentieth century, photographer Frances Benjamin Johnston was front and center in the national movement to beautify America. Gilded Age industrialism had brought a new prosperity to life in the 48 states, but at the price of once-green city streets and country back yards. In response, civic organizations and women’s clubs initiated the Garden Beautiful movement. To promote professional landscape design and horticultural diversity, they turned to Johnston, a pioneering “house and
Arnold Arboretum

"Ants: To Know Them Is to Love Them"
Aaron Ellison and Elizabeth Farnsworth, Ecologists, Harvard Forest
Wed Nov 7 6:30-8:00pm [HB]

Ants...we love to hate them, but what do we really know about them? We’re quick to categorize them as red or black; sugar, medium, or “enormous” without giving them another thought...except to check how well the ant trap is working. However, Aaron Ellison and Elizabeth Farnsworth strive to replace these dismissive generalizations with a more expansive appreciation of the world of ants. They will speak about the more than 130 species of ants found in New England, the social structure of their colonies, and the roles these species perform in many ecosystems: as farmers, predators, decomposers, and more.

Fee Free, but registration requested

Audio Ecology: Acoustic Signals in Insects
Brian D. Farrell, Department of Organismic and Evolutionary Biology, Harvard University
Thu Nov 29 7:00–8:30pm [HB]

What do birds, frogs, mammals, and insects have in common? It may be the acoustic signals they make. Integrating evolutionary and community ecology with conservation and human biology, including the evolution of music, our own acoustic signal, Brian Farrell will reveal some of ways that insects communicate and the likely reasons for the din.

Fee Free for members; $10 nonmembers
Co-sponsored with the New England Wild Flower Society

GIS at the Arboretum
Donna Tremonte, Applications Programmer, Arnold Arboretum
2 sessions (select one): Wed Nov 14 12:15pm–1:30pm or Sat Nov 17 1:00–2:30pm [HB]

Celebrate Geography Awareness Week (Nov. 11–17) and GIS Day (Nov 14) by learning about geospatial technology. Register for a workshop exploring the capabilities of geographic information systems (GIS) at the Arnold Arboretum. Donna will explain the basics of GIS, demonstrate how it is used at the Arboretum, and then lead a tour of the grounds using web-enabled mobile devices to explore the collections with the Arboretum’s mobile web application, Mobile Collections Resarcher. Bring your Apple- or Android-based mobile device to class (we will have some extras for those who don’t have access to one).

Fee Free, but registration requested

The Arnold Arboretum uses geographic information systems (GIS) as a means to visualize, analyze, interpret, and understand geographically referenced information about the plants and trees in the living collection, as well as landscape features and infrastructure. At the Arboretum, there are more than 15,000 accessioned plants, all of which are described in a GIS database. Using GIS, staff, researchers, and visitors can visualize these data, not only about plants, but about soil, climate, and elevation, and navigate to additional sources of information to further enrich their understanding of these plants. Accessible through desktop and mobile applications, the Arboretum’s GIS enables the public to search the database of plants and see where they are located in the collection, as well as learn information about where these plants originated from, their age, and size.

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Fee Free for members; $10 nonmembers
Co-sponsored with the New England Wild Flower Society

Gertrude Jeckyll and the Country Garden House
Judith Tankard, Landscape Historian
Tue Dec 4 6:30–8:30pm [HB]

Judith Tankard celebrates Gertrude Jeckyll’s gardens and her legendary theories on color, planting, and design, discussing a
selection of her most famous collaborations with Sir Edwin Lutyens and other important architects. Join us for a glimpse of the enduring magic of Jekyll’s creative genius.

Fee $5 members; $15 nonmembers

**Wilson’s China: Plants Then and Now**

*Tony Kirkham, Head of the Arboretum, Kew, Royal Botanic Gardens*

**Thu Mar 21 7:00–8:30pm [HB]**

Edwardian botanist Ernest H. Wilson was the foremost plant collector of his generation, singlehandedly responsible for introducing more than one thousand plant species to Western gardens, many of them collected during his extensive travels in China. Enjoy a then-and-now presentation by Tony Kirkham as he re traces Wilson’s footsteps with fascinating insight into the widespread change—and remarkable continuity—in China.

Fee $5 members; $20 nonmembers

**Tree Growth and Care: A Holistic Approach**

*Tony Kirkham, Keeper of the Arboretum, Kew, Royal Botanic Gardens; and Peter Del Tredici, Senior Research Scientist, Arnold Arboretum*

**Fri Mar 22 9:00am–1:00pm [WH]**

Tony Kirkham and Peter Del Tredici team up to present this program about the growth and development of trees and their care and management. Using their combined 70 years of hands-on experience with trees in managed landscapes, they will discuss all aspects of the tree’s life cycle, especially as it relates to their often complex interaction with people living in cities. Topics to be covered will include tree architecture and the development of form, specialized techniques for promoting optimal tree health, the preservation of mature trees, and planning for a future tree canopy, including information about recovery following natural disasters. This will be an informative and entertaining session for anyone with an interest in trees.

Fee $65 members; $85 nonmembers

fee (includes lunch) $65 members, $85 nonmembers (through March 15); $75 members, $100 nonmembers (after March 15)
Visit the Arboretum

Visitor Services
The Visitor Center, located in the Hunnewell Building, is open at the following times:

- Monday–Friday: 9:00am to 4:00pm
- Saturday: 10:00am to 4:00pm
- Sunday: Noon to 4:00pm

See our website for holiday closings.

Telephone: 617.384.5209

Services available in the Visitor Center include:

- Personal assistance to enrich your visit
- Maps and self-guided tour brochures
- Special exhibitions, including “Science in the Pleasure Ground” and seasonal art shows
- Bookshop, featuring a large selection of books and educational items for children and adults
- Restrooms
- Arnold Arboretum Horticultural Library, open Monday through Friday, 10:00am to 3:45pm. For more information, call 617.522.1086, or email hortlib@arnarb.harvard.edu.

Visitor Parking & Driving Permits
Visitor parking is available around the Arboretum’s perimeter. No parking is allowed inside the Arboretum gates. Individuals with special needs may request a driving permit at the Hunnewell Visitor Center, weekdays only, from 10:00am to 2:30pm. For more information please call 617.384.5209.

Family Fun

Foster a sense of wonder for nature in your child while exploring nature, science, and trees at the Arboretum. Here are some ways to dig deeper. Free! See our website for details.

New! Discovery Packs
Be part of the Explorer’s Club: borrow a free pack from the Visitor Center whenever you want more tools and activities for hands-on exploration with children. Perfect for families, homeschoolers, and after-school groups. Find out more on page 6.

Sky Viewing
Saturday, September 22, 7:00–9:30pm
Learn to find your way around the night sky, with and without telescopes. Explore the face of the moon, search for double stars, nebulae, and even the Andromeda Galaxy! Sponsored by the Arnold Arboretum, Harvard College Observatory and Boston Parks and Recreation Department. Check our website for details.

Drop by the Visitor Center for family activities
Saturday, September 29 and October 27, 11:00am–1:00pm
Activities may include scavenger hunts, science investigations, craft activities, stories, guided walks, and more—discover something new each month! Appropriate for ages 4 and up. No registration needed.

Be on the lookout for volunteer Interpreters
Weekends through November 11, 11:00am–3:00pm
Look for friendly faces in green aprons. Volunteers are stationed outdoors, ready to give a boost to your visit with hands-on fun and learning. No registration needed.

Plant Information Hotline
The hotline is available for questions about woody plants hardy in the Boston area. Open live Mondays from 1:00–3:00pm (except December–January), or leave a message any time. Call 617.384.5235 or email plantinfo@arnarb.harvard.edu.
Art Exhibitions in the Visitor Center
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.

Artists in the Arboretum: Looking Closely
A Juried Exhibit in Conjunction with Jamaica Plain Open Studios

See the Arboretum in a different light. Local artists will exhibit Arboretum-inspired work in this juried exhibition organized in conjunction with Jamaica Plain Open Studios. Jamaica Plain Open Studios is the premiere annual arts event in one of Boston’s most vibrant and diverse neighborhoods. For more information, and to preview artists’ work, www.jpopenstudios.com.

Drawn to Woods by Paul Olson
January 19–March 24

Reception: Saturday, January 19, 1:00–3:00pm
Artist’s Talk: Thursday, February 21, 7:00–8:30pm

Sketchbook in hand, Paul Olson walks the Arboretum’s less traveled paths observing and reflecting on the diversity of life and the passing of time. A teacher in the Illustration Departments of both MassArt and Rhode Island School of Design, Olson has created illustrations and paintings in varied subjects over the years. All the works in this new exhibition—from quick sketches to larger drawings and paintings—were completed in the Arboretum landscape.
Free Tours

Free tours begin in front of the Hunnewell Building unless otherwise noted, last approximately 90 minutes, and are geared toward adults. Free tours are for individuals, not organized groups; see my.arboretum.harvard.edu to arrange for a private tour. For more information, or cancellations due to inclement weather, call 617.384.5209.

General Tours

*General tours* offer a window into Arboretum history, special collections, seasonal highlights, and current programs. No need to register. Tours continue through November 28, 2012 and resume in mid-April, 2013.

- Saturdays at 10:30am
- Sundays at 1:00pm
- Wednesdays at 12:15pm

Collections Up Close

*Collections Up Close* offer great ways to explore plants at the Arboretum. Take a guided tour, participate in a fun science activity for kids, pick up a paintbrush, look under a microscope, and chat with knowledgeable staff and volunteers. Save the date for the April maple event; see our website for details on events in May and June.

**Magnificent Maples**
April 21, 1:00–3:00pm
Did you know that maples are among the first trees to flower? Explore our world-class maple collection, and look for blossoms and bright new leaves—tiny, delightful signs of spring.

**Lilac Sunday**
May 12, 10:00am-4:00pm
A beloved Boston tradition. Focus on our lilac collection as well as many other special plant collections. Picnicking allowed on this special day only!

**Rhododendron Ramble**
June TBA, 1:00–3:00pm
Stroll through Rhododendron Dell at the foot of Hemlock Hill and enjoy viewing our diverse display of rhododendrons in bloom.

Theme Tours

*Theme tours* delve into a specific subject or area of the collection. Registration is required; go to my.arboretum.harvard.edu for descriptions and registration information. Meet at the Hunnewell Building unless otherwise specified.

**From Seed to Tree**
*Dana Greenhouses staff*
Tue Sep 4 [Bonsai House Gate] 1:00–2:00pm

**Very Fine Vines**
*Nancy Rose, Editor, Arnoldia*
Thu Sep 13 1:00–2:30pm

**Best in Show: Six National Collections**
*Michael Dosmann, Curator of Living Collections*
Sun Sep 30 2:00–3:30pm

**Calling All Birders!**
*Bob Mayer, Arboretum Docent*
Three Saturdays: Sep 29, Oct 13 [Peters Hill Gate], Oct 20 8:00–10:00am

**Seeds on the Move**
*Rhoda Kubrick, Arboretum Docent*
Sat Oct 20 1:00–2:30pm

**GIS at the Arboretum**
*Donna Tremonte, Applications Programmer*
Wed Nov 14 12:15–1:30pm or Sat Nov 17 1:00–2:30pm

**Winter Wellness Walks**
*Arboretum docents*
Four Sundays: Dec 9, Jan 13, Feb 10, Mar 10 1:00–1:45pm

**Early Spring Bloomers**
*Nancy Rose, Editor, Arnoldia*
Wed Mar 20 2:00–3:30pm

**Spring Into Health**
*Rhoda Kubrick, Arboretum docent*
Two Sundays: Mar 24, Apr 28 9:00–10:30am
Members' Plant Giveaway
at the Arnold Arboretum
Saturday, September 15, 10:00am–noon

What is it?

The Arnold Arboretum’s annual Members' Plant Giveaway event celebrates the Arboretum’s longstanding, mission-based tradition of sharing remarkable woody plants.

The Arboretum traditionally shares choice plants with members of the Friends of the Arnold Arboretum in recognition of their support. This year’s Plant Giveaway provides members with the opportunity to receive free, Arboretum-grown plants, to glean first-hand expert knowledge from our staff, and enjoy the beauty of the landscape.

Where is it, and when?

The event will be held on Saturday, September 15 from 10:00am to noon in the Arboretum landscape at the foot of Bussey Hill and is open to current members (expiration date of September 30, 2012 or later) at all levels.

How do I get there or learn more?

Event schedule, directions, and parking instructions are mailed in advance of the event to members, along with a plant brochure, admission ticket(s) and coupon(s) for free plants. Full event information and directions may also be found on our website at arboretum.harvard.edu.

What else should I know?

Refreshments will be served and staff and volunteers will be on hand to answer questions about woody plants and share their advice on planting and maintaining healthy trees, shrubs, and vines. You may also explore the grounds to visit mature specimens of Giveaway plants growing in the Arboretum’s living collection.

In addition to the many unique giveaway selections there will also be a special Bonus Plant Drawing for some unique plants from the Arboretum greenhouses and chances for you to win additional free plant coupons.

If you are not a member, you may join on the day of the event to attend and receive the free plant benefit. The Plant Giveaway is a rain or shine event. If you are unable to attend on the day of the event, you may send a friend or family member (along with your free plant coupon) to the event to pick up your free plant(s). If you have any questions, or would like to join the Friends of the Arnold Arboretum, please contact membership coordinator Wendy Krauss at 617.384.5766 or membership@arnarb.harvard.edu.
The heart of the Arboretum’s katsura (Cercidiphyllum) collection lies along Meadow Road, a short walk from the Visitor Center. The genus comprises two species: the lesser known Cercidiphyllum magnificum of Japan and C. japonicum of China and Japan. The latter includes our oldest accessions (882*A and 882*B), acquired as seed from Japan in 1878. Now showing their advanced age, the two trees possess numerous stems, many of which have exhibited decline in recent years. However, like a phoenix, this species is adept at regeneration, and 882*B in particular has produced copious basal sprouts. With continued encouragement, these will become the dominant trunks of these individuals in the future.

In curating the Living Collections, future planning plays a critical role, particularly regarding their prudent development. When I started in 2007, the Arboretum possessed a number of fine katuras, but the collection lacked diversity: there were no accessions of C. magnificum, and—except for a small tree from China that later died—all of our wild-collected individuals of C. japonicum originated in Japan. Although single specimens can really catch the eye, Cercidiphyllum truly dazzles when planted in groves. The open space to the west of Meadow Road seemed perfect for this treatment and recent additions of diverse, wild-collected accessions of C. magnificum and C. japonicum now create a well-spaced ensemble to beckon passersby in all seasons. Springtime brings forth reddish-bronze leaves, which become blue-green for the summer, and in autumn turn shades of clear yellow to plum (and emit a pleasing scent of caramel or burnt brown sugar). During winter, one can inspect their handsome trunks, and observe the persistent banana-shaped fruits on female trees.

One tree (12-2007*A) among our more recent acquisitions offers an interesting back story. As a graduate student, I collected C. japonicum seed in Shaanxi Province, China, which I shared with several arboreta. This distribution proved fortunate, for none of the subsequent germination efforts succeeded except those conducted by the Holden Arboretum in Ohio. Several rooted cuttings from a seedling were offered to me in 2005, and today one of these provides further depth to the Arboretum’s collection. It seems that while propagating plants from seed can be a frustrating process, sharing your bounty with others can reward you in ways you didn’t expect.