

SUMMER 2022

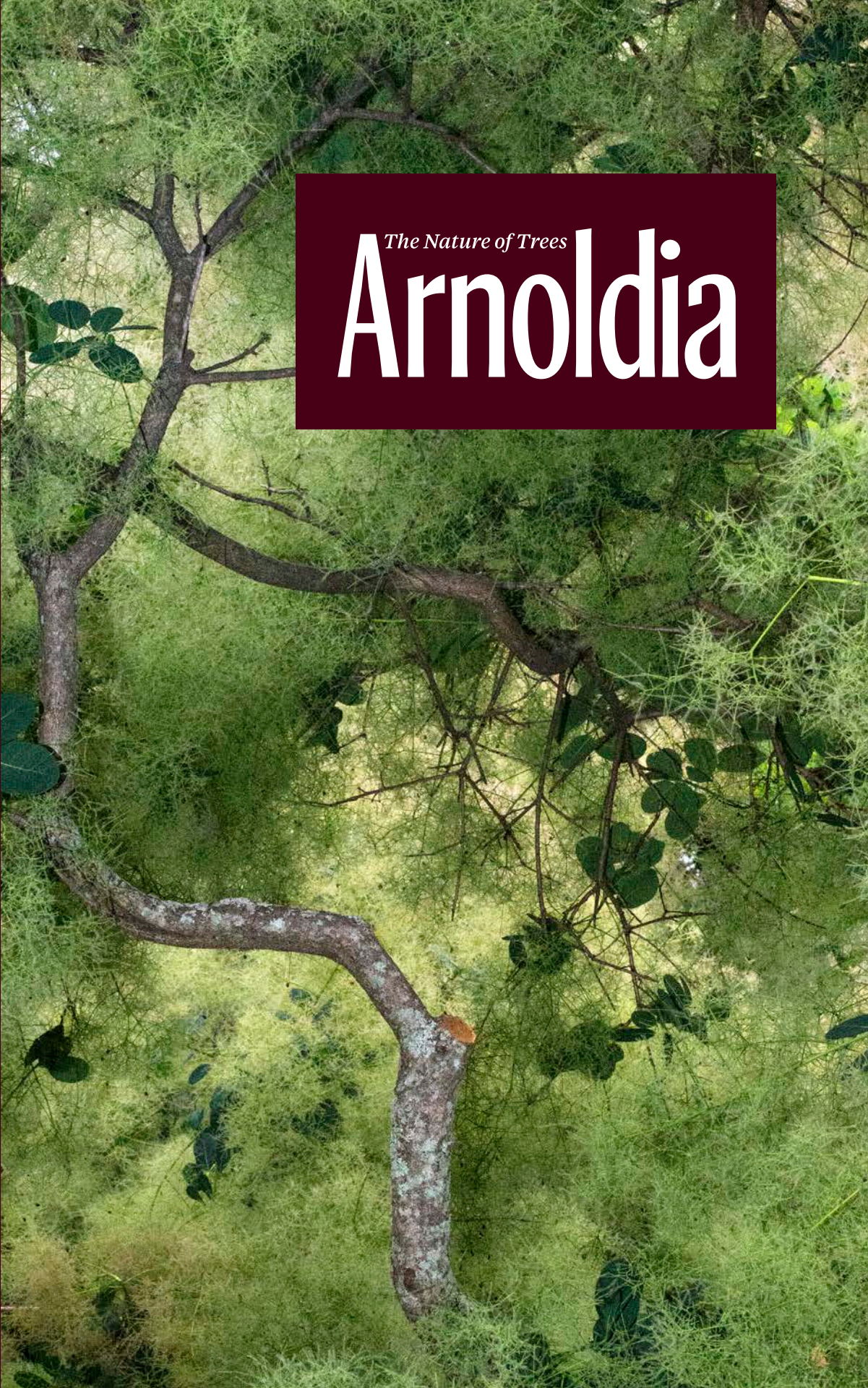
*Trees and the City*

*Questions of Species*

*Transatlantic Arboreta*

*To Wander About*

*The Nature of Trees*  
**Arnoldia**







# To Wander About

By William (Ned) Friedman

To wander about among a vegetation which is new to one is pleasant and instructive. It is the same with familiar objects: in the end we cease to think about them at all. What is seeing without thinking?

—Johann Wolfgang von Goethe

**W**e live in an age of ecosystems and genomes, where the scale of biology is usually presented at one of two extremes, global or genomic. There are good reasons for humanity's focus on the global scale of biology here and now in the Anthropocene. With human-induced climate change in the process of permanently altering the natural trajectories of nearly four billion years of evolution and ecological interactions between species, there is an intense focus on documenting and predicting what our single species has unleashed on the many millions of species of life with whom we have inherited and currently share the planet.

At the same time, the miracles of DNA sequencing technologies have allowed us to understand, in ways previously unimaginable, our own extraordinary evolutionary journey of becoming human, connecting us back in time to the first single celled forms of life. Reading the DNA has also provided amazing insights into everything from the genes responsible for making a flower to the genetic coding that maps out neural networks in fruit flies.

If one views the living natural world predominantly through the lenses of ecosystems and genomes, however, then something has been lost. I am an organismic biologist, a plant morphologist to be more precise. Simply put, this means that when I think of a "unit" of biology, I am thinking about single organisms, just as you and I, as members of the human species, are single organisms. We are conceived as a zygote, develop into an embryo, are born, grow, learn to walk and speak, have interactions with other human organisms, and eventually complete an arc of life that returns our carbon to the earth. Of course, there is no such thing as a single organism—all organisms depend on a web of myriad other species—but I *identify* as an organism, knowing full well that there are roughly as many bacterial cells in my body as there are human cells. And the tree outside of my window, even though I know it has complex associations with mycorrhizal fungi and bacteria, is still a unit of biology that can powerfully be *seen* as an organism.

I yearn to see organisms—individual trees—to meet them, witness them, learn from them, and indeed, to age with them. And this is the beautiful thing about the Arnold Arboretum and its roughly 16,000 accessioned woody plants. Each has provenance—an organismic history with an origin story, and all that goes with siting, planting, and caring for an individual plant over decades and even centuries. I can reflect on the magnificent twisted European beech (14599\*A) that was collected in the wild in France, transported to Royal Botanic Gardens, Kew, and then sent on a journey to the Arnold Arboretum in 1888. I can imagine a mere sapling being planted in the ground on the south flank of Bussey Hill in the beech collection. My mind reels in the magnitudes of time as I reflect on the generations of horticulturists who have cared for this one individual. And here, more than a century later, I can rejoice in its magnificent fall colors, its snow-covered spiraling branches, the light-green and delicate newly-flushed leaves in the spring, and the deep greens of summer. At the Arnold Arboretum, everything is truly about paying it forward.

Not long after settling into the Arboretum, I resolved that I would never let a week go by without getting out onto the grounds to look at and photograph the woody plants that had beckoned me here. On every walk, I bring my small pocket camera and take pictures. Each night, I select the better ones, and spend additional time reflecting on what was revealed to me. By simply taking the time to observe, I feel as though I have gotten to know these non-sentient organisms on *their* terms: not as extensions of *me*, but rather as fellow living beings that can reveal their lives, history, complexity, beauty, architecture, and basic natural history.

Over the years, from these meandering walks, I appear to have developed several of what I now refer to as (healthy) *obsessions* with phenomena which, once I observed them in the Arboretum, I became acutely interested in seeing in all of their manifestations. These obsessions include my ongoing

Discovering plants as individuals, organisms to be reckoned with and reflected upon, is a journey worth taking.

annual spring quest to witness the brilliant hues of ovulate (seed-bearing) conifer cones; the exuberance of budbreak among the horsechestnuts and buckeyes; a fixation on the magical dispersal of pollen from rhododendron flowers; magnolias in fruit (and always, the bigleaf magnolia in flower); smooth bark (especially among snakebark maples in the winter); the startlingly bizarre naked resting buds of India quassiawood and the Arboretum's single specimen of Caucasian wingnut; looking straight up the trunks of large trees in all seasons; acorns in August (and the mad dash to finish filling up the fruit in the early fall); and the act of shattering birch infructescences to gaze upon their minute, delicately winged seeds, which immediately lift from my palm and are carried off by the wind.

Discovering plants as individuals, organisms to be reckoned with and reflected upon, is a journey worth taking, and one that never ends. It is a journey that enriches my life every day, in ways that I could not have imagined as I made my first focused perambulation on the grounds of the Arnold Arboretum years ago. It is also a journey that will be unique (and uniquely rewarding) to each person who sets out to discover the *essence* of plants by meeting these magnificent organisms on their terms, simply by looking and reflecting.

If we are ever to save the planet from our destructive tendencies, of warring with nature and each other, I would like to suggest that it can start by regularly walking in a garden, a park, the woods, or one's backyard, and learning to rejoice in the extraordinary beauty of organisms that can't talk to us, and indeed are wholly indifferent to our very existence (although certainly not unaffected)—but whose presence is a constant reminder of the nearly miraculous complexity and interconnectedness of life. 🌿

WILLIAM (NED) FRIEDMAN is the eighth director of the Arnold Arboretum and the Arnold Professor of Organismic and Evolutionary Biology at Harvard University.



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A boardwalk leading through the Acadian forest on Maine's Mount Desert Island, where landscape architect Beatrix Farrand took inspiration. *Photograph by Rodney Eason*





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Smoketree on Meadow Road

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Illustration by Shyama Golden

# Arnoldia

The Nature of Trees

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## LETTERS

### Legacies of Inspiration

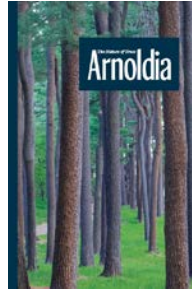
I very much enjoyed Michael Dosmann's article in your recent issue ("The Third Fifty Years of the Arnold Arboretum," Spring 2022). As a matter of minor interest, Karl Sax was the Ph.D. advisor to my own advisor at Michigan State University, Jonathan W. Wright, and his interests and experiences were important influences on me. Wright did most of his research at Harvard Forest, but he had stories about Sargent and Rehder and of course the Arnold. I think it was through Sax that he landed the job of driving Göte Turesson, author of the ecotype concept, across the U.S. and back on a private tour. After Harvard, Wright worked for many years as a USDA Forest Service scientist attached to the Morris Arboretum. He and I spent our lunch hours together nearly every day for four years.

*Kim C. Steiner*

*Professor Emeritus and Founding Director  
The Arboretum at Penn State,  
University Park, PA*

### Welcome Evolution

Longtime user of the Arboretum (the "Arbs," as we called it when I was growing up in Jamaica Plain), first-time writer to *Arnoldia*. Writing this note on a warm April day when the magnolias, willows, and crocuses are flowering gloriously, I want to let you know that I greatly appreciate the magazine's efforts to widen and deepen visitors' knowledge and appreciation not only of the Arboretum's collection but trees generally. In this era of anxious, apocalyptic, and therefore renewed appreciation for the holistic value of a forest's (or arboretum's) biodiversity, not to mention our still-emerging understanding of trees as social beings that exchange nutrients, information, and who



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knows what else, I am excited to see how both the park and the magazine will evolve.

Josh Glenn

West Roxbury, MA

### Flexing Our Wings

I so enjoyed the new-look *Arnoldia*. Rather than the usual four articles and a book review, a dozen authors get to flex their wings. *Arnoldia* has always been a perfect vehicle for botany, horticulture and conservation education, and it is crucial that people of science learn to translate their work to those outside the field. I learned to write by writing for *Arnoldia*; that so many others now get the chance, and a greater diversity of voices get to be heard, is refreshing.

Rob Nicholson (Retired from a 43-year career caring for New England botanical gardens and collecting plants worldwide.)

### A Great Start

I really enjoyed reading the new *Arnoldia*. The articles are informative. The writing is superb. There is an interesting mix of long articles that are well-grounded in science, shorter articles with “meat on their bones,” literary features of both essays and poetry, and introductions to some of the staff that keeps the Arnold Arboretum humming along. All of this complemented by fabulous photography and impressive artwork. I especially liked the art on the inside covers—beautiful!

The new layout with its increased white space makes for easier reading and is quite appealing.

You're off to a great start. I'm eager to see what is coming in the next issue.

Dorothea Coleman

Managing Editor, Public Garden

American Public Garden Association

A dozen authors get to flex their wings.



## A Logo for Arnold Selects

The logo for Arnold Arboretum's plant-introduction initiative, Arnold Selects, features one of the Arnold's grandest cultivars, 'Merrill' Loebner magnolia (*Magnolia x loebneri*, below), from an etching by artist Bobbi Angell (see her Visual Essay starting on page 42). The emblem captures the splendor of this 1939 hybrid. Named for the late Arnold director Dr. Elmer Merrill, the cross is a product of the breeding program of his successor, Dr. Karl Sax. Started in 2021, Arnold Selects provides the nursery trade storied cultivars with rich provenance, history, and ornamental attributes. Offerings for 2022 include 'Gus Mehlquist' sprawling sand cherry (*Prunus pumila* var. *depressa*; rerelease) and 'Crimson Gem' bracted viburnum (*Viburnum bracteatum*).



# Notes from the Field



## Hedging Our Bets

At the Minnesota Landscape Arboretum, **Mary H. Meyer** and **Nick Kreevich** explore the human side of hedges.



Arnoldia | Summer 2022

**Mary H. Meyer**, Professor emerita at the University of Minnesota, has worked at the Minnesota Landscape Arboretum for 35 years, currently serving as Curator of the Grass Collection.

**Nick Kreevich** is Cartographer and Plant Recorder at the Minnesota Landscape Arboretum.

Believe it or not, a hedge collection can be full of surprises. Take the row of 20-25 foot-tall Jack pines, *Pinus banksiana*, just one of the 73 taxa in the Hedge Collection at the Minnesota Landscape Arboretum (MLA). These tough natives have great cold and drought tolerance—but what are they doing, unpruned, in this formal hedge collection? The historical documentation of the collection provided crucial clues: From early curatorial records, we learned the Jack pine hedge was made up of plants grown from seed collected by Al Johnson, an early MLA curator, from a witch's broom in Chittamo, Wisconsin. In slides, we found pictures of plant people with

witch's brooms, from which they coveted seed in hopes of finding new dwarf plants. While the story of the Jack pines is clearer now, broad questions remain: What did record-keeping look like in 1967? Whose idea was it to start the collection? Was there an initial donor or collection goal?

These were some of our questions when we began to write our new ebook, *Hedges: A Brief History and the Minnesota Hedges Collection* ([pressbooks.umn.edu/hedges](http://pressbooks.umn.edu/hedges)), and document the institutional knowledge of the collection. Although each plant had its own record with basic provenance information, our questions were not easy to answer. When we tell people (even horticulturists) that we wrote a book about hedges, they often look puzzled; when we ask if they grew up with a hedge, or if they ever pruned a hedge, however, most often the answer is yes. We ask them to think about why the hedge was there, and what it might have meant to their family and neighbors. And for many people, a light comes on as they connect their hedge to the landscape and its cultural meaning.

Established in 1958, the MLA began as a horticultural research site for testing winter hardiness of plants (USDA hardiness zone 4), including plants commonly used in hedges. The MLA Hedge Collection is one of the oldest such assemblages, due in part to the boom in popularity that hedges saw throughout the 1960s, thanks to the postwar building boom and the growth of suburbia.

Sifting through thousands of more-than-60-year-old, 3 × 5-inch accession cards, filed in Steelmaster card cabinets, is like discovering an old journal or generational photo album at a yard sale: as soon as you start moving your fingers across the edges of the cards, musty whiffs of past time bring on a feeling of nostalgia. With each flip of



a card, organized alphabetically by generic, specific, and cultivar epithets, you begin to build a historical portrait of the MLA collections dating from 1958. These index cards, also known as accession records, reveal that acquiring a plant and giving it a number did not necessarily coincide with when it was planted. Documentation on the cards also includes notes on fall color, winter injuries, fruit set, and overall growth habit—all important considerations when assessing the ornamental value of a hedge. It is clear from the records that prior keepers prized foliage density, foliage color, and winter hardiness above all. We could even trace the impacts of weather on the hedge collection, with two of the coldest winters in recorded history (1978-9, with an average temperature of 9.4°F, and '77-8, with an average temperature of 10.5°F) apparent in plant-record notes on injury and severe dieback. Natural selection certainly took its course with those back-to-back weather events, but also provided the staff with critical knowledge of how particular hedge plants respond to extreme cold.

For many people, a light comes on as they connect their hedge to the cultural landscape.

We also interviewed a number of employees, current and retired, to record their memories and discover the origins of some of the more unusual plants in the collection. Kathy Allen, Andersen Horticultural Librarian, assisted with locating the early Arboretum annual reports, which add critical details regarding scope of and support for the collection. “The collection was planted to show which plants were the best for formal hedges,” recounts Director, Peter Moe, himself a longtime MLA employee. “There were fewer compact forms of many species at that time and many people tended to try to keep large plants such as Amur maple as medium-sized hedges.” Height, density, and diversity could be shown in a planting a variety of hedges, which at the time were an extremely common and desirable landscape element.

Three taxa of boxwood (*Buxus* ‘Glencoe’ Chicagoland Green™; *B. microphylla* var. *koreana*, and *B. sempervirens*) are the only broadleaved evergreens in the collection. Notes from early Arboretum newsletters express interest in this genus, though it was

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#### GREEN PLANET

## The number of trees on Earth

For all their diversity, trees share significant characteristics—and impacts. Measuring worldwide tree diversity is thus crucial to long-term planning for planetary health, argues a study published in the *Proceedings of the National Academy of Sciences*. Such work faces challenges, however—not only logistical and financial, but theoretical, when definitions of both “tree” and “species” are contested (see Michael J. Donoghue’s “What in the World is a Species” on page 48). With 148 authors contributing, the *PNAS* report compiles a massive dataset, including figures from the Global Forest Biodiversity Initiative and information on some 6 million individual trees worldwide. Together, these data suggest that some 73,300 species of tree currently live on earth—a figure about 14% higher than the current number of known species, with nearly 4,000 species yet to be discovered in South America alone.

Cazzola Gatti et al. “The number of tree species on Earth.” *PNAS* Volume 119 No. 6 (January 31, 2022).



ROSETTA ELKIN

thought not to be winter hardy by many. Accession records and notes from the '60s to '70s document the overturning of this wisdom, with comments such as "best in collection" and "very good hedge material." Although the plants show winter burn in the spring many years, the hardiness of boxwood hedges is no longer a question.

Guided by prior documentation standards at the MLA, evaluating our current hedge collection for ornamental value sometimes felt like being a judge for the Westminster Kennel Club Dog Show, looking at one favorite after another. Usually, the first concern when pondering a hedge is its performance as a barrier. Yet not all hedges intend to create a barrier, but may instead provide ornamental value to an existing landscape or garden. The latter is mostly a matter of opinion: some may be wowed by the texture or height of a hedge, while others are more interested in the seasonal changes such as flower, fruit, and fall color.

Our *Thuja occidentalis* 'Wareana' (American arborvitae) was the clear winner in terms of privacy, reaching heights of up to ten feet at maturity, with very dense, evergreen foliage. On the opposite end of the density spectrum, a hedge like *Hydrangea arborescens* 'Annabelle' (smooth Hydrangea) needs consistent renewal pruning to provide what it is best known

Our reaction to plants is often subconscious; we rarely realize how deeply they affect us.

for: its large, rounded flower heads. While the 'Annabelle' hedge can reach heights that garner it semi-private status, there is no hiding behind this deciduous shrub come winter. Deciduous hedges vary greatly as the seasons change, and will react strongly to weather anomalies. Early in the growing season, *Philadelphus coronarius* 'Aureus' looks like a candidate for removal, but its charm and value for use in a hedge come to fruition in the summer, with its beautiful chartreuse foliage.

Such factors are boldly visible through the seasons at the MLA, when you drive over the crest of a small hill and 73 neat hedges suddenly spread before you. It is hard to not notice them! Our hedge collection is a document of human intervention in the landscape. While it is doubtful that we would plant a hedge collection in a public garden today, there is value in keeping historical horticultural garden elements intact for future study. This preservation effort encompasses both plants and the records we keep of them.

And so a word of advice to anyone thinking of fleshing out historical documentation for a plant collection: much institutional knowledge exists only in the memory of long term staff. Documenting this tacit knowledge, with audio or video recordings if possible, as well as continuing to keep records beyond mere accession numbers, will help curators, horticulturists, and other Arboretum staff understand the goal and educational purpose of a collection. Rarely do we over-document the details of our plant collections. As authors on hedges, our perspective has become more complex, realizing that people subconsciously use hedges to take control of their property and show authority. Some may balk at using the word "authority" in connection with a hedge. Our reaction to plants is often subconscious, however; we rarely realize how deeply they affect us. A well-pruned hedge subconsciously communicates human control, and implies a safe, managed landscape. Our species' role in the landscape is readily seen, but often not fully recognized, when we encounter a hedge. 🌿

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#### WELL SAID

"Trees happen to be quiet constituents. Rarely will an email, phone call, or press conference intervene when a community tree is suffering."

**Matthew Stephens** in "Of Trees and the City," which begins on page 60.





## Quest for Southern Red Oak—North of the Mason-Dixon Line

Anthony S. Aiello and Peter J. Zale seek native trees that can adapt to the shifting climate.

**Anthony S. Aiello and Peter J. Zale** are Associate Directors for Conservation, Plant Breeding, and Collections at Longwood Gardens in Chester County, Pennsylvania.

While plant collecting is often romanticized as occurring in pristine natural habitats, much of the most successful seed collecting is done in more prosaic locations. This is especially true when searching for tree species, where roadsides or power line rights-of-way provide light (for tree growth) and ease of access to fruiting branches (for collecting convenience). This certainly was the case in September 2020, as we searched for *Quercus falcata* (Spanish oak, or southern red oak) in southern Chester County (PA). After a fruitless morning at

the Goat Hill Serpentine Barrens Preserve, we found much better success along local county roads.

Why *Quercus falcata*? Based on biological and climatic threats to tree species traditionally grown at Longwood Gardens, we have focused recent efforts on native species that combine ornamental traits with disease resistance and greater heat tolerance. For example, red oak (*Quercus rubra*), one of the more prominent shade trees at Longwood Gardens, in recent years has been among the most susceptible to bacterial leaf scorch (*Xylella fastidiosa*), which can weaken and eventually kill mature trees. As possible substitutes for this and other susceptible oaks, we targeted populations of *Quercus phellos*, *Quercus michauxii*, and *Quercus falcata* native to southeastern Pennsylvania. Maturing at approximately the same size as red oak, all three are potential substitutes as high-canopy, overstory shade trees. Each of these three species, which are widespread further south, reach the northern limits of their native ranges in southeastern Pennsylvania, southern New Jersey, and Long Island. Southern red oak barely extends its range into southeastern Pennsylvania, southern New Jersey, and possibly Staten Island and Long Island. In fact, due to its rarity in Pennsylvania (fewer than fifteen populations are known in the state), the Pennsylvania Natural Heritage Program lists it as a species of special concern (an S1, for those familiar with the coding).

Faced with travel restrictions due to the COVID-19 pandemic, starting in the late summer and fall of 2020, we decided to look for local opportunities for collecting seed, pursuing a range of regional collecting objectives that we had previously not achieved. This included targeting the southern ranges of northern species (such as *Larix laricina*) and, vice-versa, the northern limits of southern species (for example *Quercus virginiana*), with the goal of growing plants suitable for changing climatic conditions in the Delaware Valley. For those southern species that reach into the mid-Atlantic, the extreme populations



FROM THE ARNOLD

## Rites of passage

What is a sesquicentennial if not a celebration? A partnership of the Arnold Arboretum, arts organization Castle of our Skins, and artist Daniel Callahan, *MassQ Ball 2022: Origin* brings that celebration to the Arnold's multicultural community. In a culminating event on July 9, performers will share a range of cultural expressions, including dance performances by Jessica Chanhee Park (Korean fan), Andrew StrongBearHeart Gaines Jr. (Indigenous), and Ramiro Vaughan Purpose (hip-hop); Japanese Taiko drumming by Karen Young; and Black classical music curated by Castle of our Skins, all within the folds and rises of the conifer collection. With nature as a staging ground, attendees will be encouraged to discover and reveal themselves through "MassQing" (masking), then join in a journey through exhilarating performances and encounters. Connecting or reconnecting with nature through art provides a pivotal juncture that continuously draws us together. The Ball will be an unfolding and collection of the many things unique to each person—and unique in the Arnold Arboretum's Sesquicentennial.

might possess traits, including cold tolerance, that provide opportunities to grow these beyond their traditional horticultural ranges. Conversely, for the northern species, the southernmost populations could possess greater heat tolerance, allowing us to continue to grow these as their native populations retreat northwards in the face of warming climates.

In September 2020, we focused our collecting on nearby populations of *Quercus falcata*, which occur on serpentine soils and their associated barrens. (Serpentine barrens, with thin, nutrient-poor soils, support high levels of unusual, rare, or endangered species, in contrast to adjacent areas.) We had targeted Goat Hill based on recent herbarium records from this location, but we did not find any southern red oaks there. Collecting was easy along the county roads, however, where we made three separate collections from trees whose acorns were within reach of our pole pruners. These three populations, within two miles of each other, were made up of large mature trees that were at least 50 feet tall. *Quercus falcata* stand out among other oaks, having coarsely lobed leaves with sickle-shaped (falcate) terminal lobes, and dense grey down (pubescence) beneath. For two of these collections, the southern red oaks were mixed among other native trees species in a dense forest; the third location was a grove of separate mature trees growing in a heavily grazed cow pasture, all within sight of the Herr's Snack Factory, a local landmark.

Seeking additional Pennsylvanian locations of *Quercus falcata*, we pored through herbarium collections shared through the Mid-Atlantic Herbaria Consortium. Historical records from the late 1800s through the mid-1900s show a distribution in southeast Pennsylvania along much of the Piedmont-Coastal Plain boundaries, including southwest Philadelphia. But due to urbanization of much of this historic range (which includes Philadelphia International Airport), herbarium collections since the late 1980s center on three areas: southern Chester County near the



Maryland border, southern Montgomery County along Militia Hill in Fort Washington State Park, and southern Bucks County along the Delaware River.

While collecting southern red oak within a few square miles of West Nottingham Township (Chester County), we came across a remarkable diversity of eight oak species—in addition to *Quercus falcata*, we also encountered *Q. alba*, *Q. ilicifolia*, *Q. marilandica*, *Q. prinoides*, *Q. rubra*, *Q. stellata*, and *Q. velutina*. Though familiar with the local diversity of oaks in southeast Pennsylvania, we rarely see this number of species in a single day's outing. Together, these represent a significant portion of the 11 oaks reported by Hugh Stone in his two-volume 1945 *Flora of Chester County Pennsylvania*, and nearly half of the approximately 20 oak species found in Pennsylvania. This wealth of oak species serves testament to the richness of the Chester County flora, historically the most botanically diverse in the state, though heavily impacted by human activities since the publication of Stone's *Flora*.

We returned in 2021 to make duplicate collections from the easily accessible roadside trees found in 2020. Oaks are famous for having years of heavy acorn production (most years) followed by years of lower production. In 2020, we experienced a post-mast year when looking for *Quercus phellos* in southern Bucks County. Despite seeing a few dozen trees during a day in the field, we did not see a single acorn on any of these. Our luck was better with *Quercus falcata*: in 2020 we collected a total of approximately 250 acorns, and in 2021, just under 200 acorns.

As with seed collecting, patience is the main ingredient needed to grow oak seedlings. To germinate, acorns usually need a few months of cold treatment, followed by warm conditions and the increasing day lengths of spring. Ultimately the seedlings derived from these collections will be evaluated in our Research Nursery for growth rate and form, disease resistance, and fall color, before being introduced into public areas of Longwood Gardens. 🌿

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# Hybrids Hiding in Plain Sight

Bryan Connolly finds a new dogwood cross for New Jersey.



Last summer, while working as a consulting botanist for the Environmental Protection Agency's National Wetland Condition Assessment project in Allamuchy Township, New Jersey, I found an unusual colony of shrubby dogwood in the genus *Swida* (previously known as *Cornus*). The research plot was in a seasonally flooded meadow, with broad-leaved cattail (*Typha latifolia*), ironweed (*Vernonia noveboracensis*), and reed canary grass (*Phalaris arundinacea*) present. The site was previously cleared and looked to have a long history of human disturbance. The location is now set aside as town open space, and secondary succession is occurring, with woody plants increasing in dominance. *Swida*, or shrubby dogwoods, are known as old-field colonizers, and also as wetland species. There were two species present at this locality, *S. racemosa*, gray dogwood, and *S. amomum*, silky dogwood. In my experience, *S. racemosa* is more of an old-field colonizer, while *S.*

*amomum* tends to favor wetlands. The area was both an old field and a wetland, and so it made sense that the species were co-occurring and abundant at the site.

I noticed one *Swida* colony that did not cleanly fit into either *S. racemosa* or *S. amomum*. *Swida racemosa* generally has narrow (lanceolate) leaves, white fruit, gray bark, white pith, and upright growth habit; while *S. amomum* has broader (ovate) leaves, reddish-purple bark, brown twig pith, blue fruit, and a mounded growth form. The atypical plant I spotted had *S. racemosa* characters, including narrow leaves 2.5–3.8 cm wide and verrucose gray bark on the older stems, but also displayed the *S. amomum* traits of blue fruit and brown twig pith. Additionally, the growth form was unusual: it was a tall plant, about 2–3 m in height, and somehow both upright *and* mounded, intermediate between the habits of *S. racemosa* and *S. amomum*. The pedicels or flower stalks were also reddish-maroon, not the typical

**Bryan Connolly** is an assistant professor in biology at Eastern Connecticut State University.

Thanks to the ESS Group, Inc. scientists James Treacy, Joe Bertherman, and Heidi Fisher.



bright red of *S. racemosa*. With this combination of characters, I thought it was likely to be a hybrid of the two species. From my experience working with coauthors on *The Vascular Plants of Massachusetts: A County Checklist*, I remembered a *Swida* hybrid, though I couldn't recall the parental species or if it was named. Additionally, from my wanderings and botanical work in the Northeastern US, I have published many new records of hybrid taxa—and I could not place this plant among them.

After a long day in the field I returned to my hotel room, fired up Go Botany (the online database of the Native Plant Trust), and confirmed that *S. racemosa* and *S. amomum* do in fact hybridize. On the account of my vague *Swida* hybrid recollection and my previous encounters with hybrid taxa, I wasn't surprised that a cross was known, but was glad that my hybrid hypothesis was supported by the literature. To my delight, the hybrid was listed as a nothospecies (a direct hybrid of two

I have published many new records of hybrid taxa—and I could not place this plant among them.

species) with the name *Swida* × *arnoldiana*. The original description, by Alfred Rehder, was made in 1905 from a row of shrubs growing at the Arnold Arboretum.

This individual could just represent variation found within *S. racemosa*, which occasionally can have brown pith or light blue fruit. But I find it unlikely that a plant would exhibit both these traits while also co-occurring with plants that have the morphology of *S. racemosa* and *S. amomum*. I thus believe this plant to be *S.* × *arnoldiana*. If I am correct, then it is a state record for New Jersey! According to *Flora of North America*, the hybrid has only been found in Massachusetts, Missouri, Ohio, and Pennsylvania.

The specimen voucher will be deposited at the Arnold Arboretum herbarium. This unique hybrid individual spotted in the field offered a nice little puzzle to solve—and it was gratifying to learn that it is named after a wonderful arboretum I know and love! 🌿

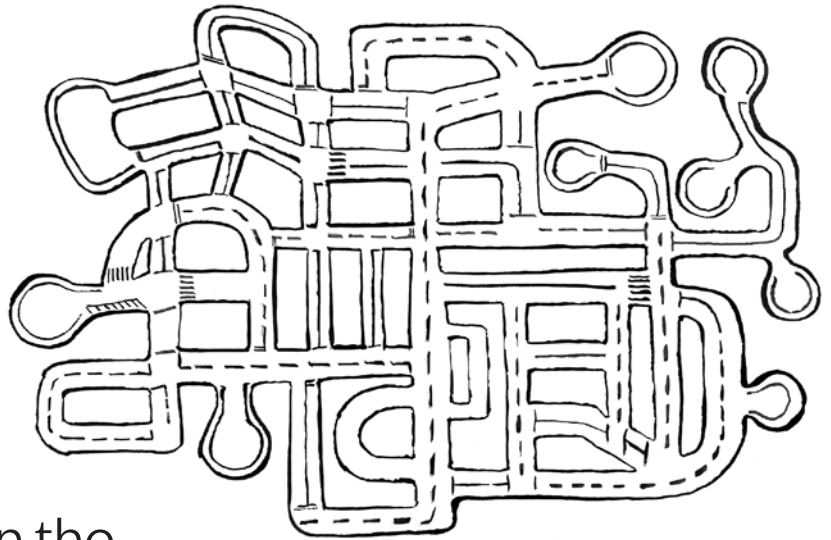
## OUR PUBLIC PARKS

### Inheritance

As with the Arnold Arboretum, 2022 is the 150th anniversary of Yellowstone National Park. To celebrate, you can now purchase a \$1500 “Inheritance Pass”—redeemable in 150 years. Described as a “timeless legacy,” the pass will be valid for entrance to Yellowstone in 2172, sufficient for “one solar-powered flying car’s worth of your future loved ones.” With 80 percent of the park in tree cover, Yellowstone is a crucial refugium for forest biomes; may it remain so for generations to come. *For more information, see [www.yellowstone.org/inheritance-pass](http://www.yellowstone.org/inheritance-pass)*



Thomas Moran, Grand Canyon of the Yellowstone (detail, 1872). Interior Department Museum



## Somewhere in the Panhandle of Florida

**Tim Boland and Elizabeth Thomas** find a stand of silky stewartia, resilient and vulnerable, amid the cul-de-sacs of an unbuilt suburb.

Somewhere in the panhandle of Florida, traveling for miles within a labyrinth of perfectly paved yet utterly empty roads, we blindly followed our guide, Bob, to a population of our target species, cracking jokes as we drove about the sinister fate awaiting us. We were in the ghost of a ghost town: the skeleton of a subdivision that was never built, planned for a population that never came. Every street is identical, save for the occasional cul-de-sac jutting into scrubby second-growth forest. Not only did the people never arrive, but the houses were never constructed; hundreds of miles of paved roads were laid here in the 1990s, only to be left abandoned, another suburban dystopia created by Florida's rich history of speculative development.

Bob pulled his Prius to the side of the road, and we parked behind him. We'd been put in touch with Bob, a local resident and active amateur botanist, by our contact in the Florida Forest Service; it had been Bob who discovered this population of *Stewartia malacodendron*, and he was eager to share

it with trustworthy enthusiasts. Known commonly as "silky stewartia" or "silky camellia" due to its showy, camellia-like blooms, *S. malacodendron* is a small deciduous understory tree native to the southeastern coastal plain of the United States, from Virginia to the northeast and Texas to the southwest. Traveling from the Polly Hill Arboretum on Martha's Vineyard in the late summer of 2021, we had come to harvest fruits (and thus, seed) of this species to grow into plants for our *ex-situ* living collections. As co-holders of the Plant Collection Network's National Collection of the genus *Stewartia* with the Arnold Arboretum, we were hoping to collect from populations at the southernmost edge of its range, heretofore unrepresented in our living collections.

Grabbing our gear, we ambled through the woody goldenrod and beautyberry, enjoying the fresh light of an early September morning pouring through the sparse canopy of southern magnolia and live oak. We were only about 100 feet from the road when we stumbled across our first stewartia

**Timothy M. Boland and Elizabeth Thomas** are Executive Director and Plant Recorder at the Polly Hill Arboretum in West Tisbury, Massachusetts.

tree, standing like a sentinel at the rim of a large, sunny slope dropping down to a sinkhole pond. Our satisfaction to find it fruiting quickly turned to excitement and then overwhelm as we spotted at least a dozen more of them spread across the face of the slope, each one dripping with plump, green fruits larger than we had ever seen before. Normally about an inch in diameter, these were more akin to fuzzy ping pong balls or small crabapples. Balancing on the scrubby slope and madly scribbling collection numbers on sandwich bags, we exchanged involuntary expletives as we took in the superlative bounty of fruits. Were we harvesting germplasm, or were we apple picking?

Of conservation concern throughout most of its range, silky camellia is a protected endangered species in the state of Florida. Protected in theory, at least: as we began to stuff the plump green fruits into plastic bags, we gazed across the sinkhole, where a collage of zig-zagging tire tracks defaced the far slope all the way down to the shore of the pond. With its bleached, eroded sands, this local party spot is visible even from satellite images.

Liz heard Bob holler from somewhere upslope to her left. Though she couldn't make out what he was saying, she knew he'd found yet another group of exceptionally fecund trees. This good news found her in a fluster of multitasking, as she scrambled to capture location coordinates on our GPS unit, measure and record specimen data and collection numbers by hand in our field book, label baggies and herbarium samples, take pictures, and collect fruit. Sharpie cap in mouth and hair sticking to her sweaty forehead, she wondered whether we'd be late to our next stop that morning, meeting our next guide at a site about three hours west. We'd expected this to be a quick roadside stop, not an absolute windfall.

This expedition is our most focused effort to collect this species since an Alabama excursion in 2007. Our founder, Polly Hill, was among the first private collectors to grow this plant, with our oldest tree dating back to 1962. The mild maritime climate and acidic soils of Martha's Vineyard

Somehow, this spectacular hillside of trees was spared the backhoe and bulldozer—for now.

happily support the cultivation of this stunning, small, flowering tree.

Most of our expedition planning is done months ahead to arrange for a seasoned naturalist or professional botanist to lead us to target species. Admittedly, we get into some very wild places to collect the silky stewartia. Usually, we find them after rugged hikes into deep wilderness. Yet here on this fine morning, just off an intersection crossroad, we had found the most robust population of silky stewartia Tim has witnessed in 15 years of pursuing it. Slicing into the globose fruits, we found dark brown sclerified seeds that shone brightly in the late morning light.

This unexpected and surreal discovery was a vivid reminder that plants are both resilient and vulnerable. The silky stewartia is imperiled by habitat destruction, principally through logging or building development. On a previous scouting trip to Alabama in 2012, we bore witness to a new condominium development that destroyed a former thriving population. Somehow, this spectacular hillside of trees was spared the backhoe and bulldozer—for now. With the same luck that brought us to this unique population of trees, we hope to return and see them in bloom someday. Perhaps the flower size will also be larger, or some of the petals streaked ruby red, as variants in the wild are known to do?

We looked at our watches to check our time; not surprisingly, we would be late to our next destination. However, the place, the trees, and the experience were worth it. As we gathered up our gear to move onto our next location, we did so in a suspended state of stewartia euphoria. The remainder of the trip was both productive and satisfying, but nothing would compare to this remarkable discovery in the unlikeliest of places. 🌿





# *Rhododendron prunifolium*

Michael S. Dosmann

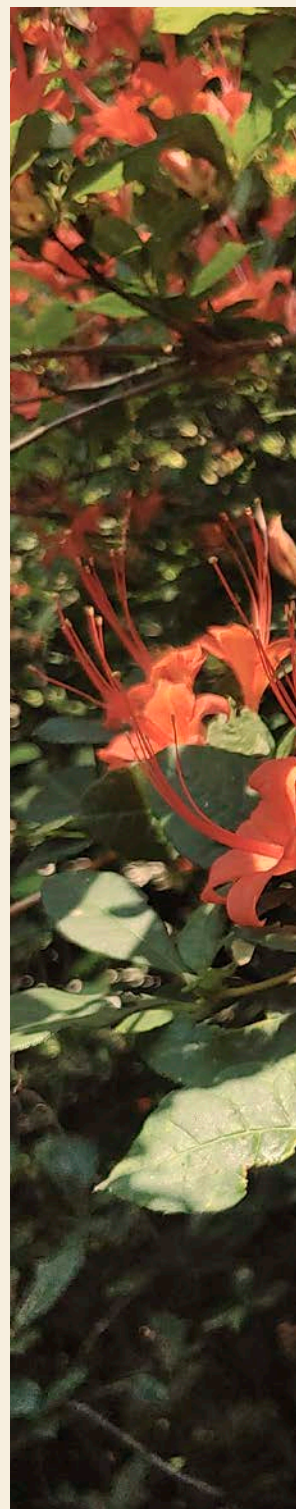
I have always been fond of Korean azalea (*Rhododendron mucronulatum*), that hardy shrub whose pink flowers crack open just as the snow recedes. At the other end of the season, and the last of our azaleas to flower, comes another personal favorite: *Rhododendron prunifolium* (plumleaf azalea).

Most of the Arboretum's plumleaf azaleas grow along Meadow Road, amassed below towering black locusts in the Wolcott Bed. They escape notice until the middle of July, when their floral buds swell and burst open, when few woody plants bloom and temperatures are irrepressibly hot. Although it's not comprehensively accurate (color ranges from deep red to nearly pinkish-orange), in this portrait, I'll say the flowers are safety orange, that alarming shade reserved for prison jumpsuits and cautionary traffic cones.

This color *should* be taken as a warning, because *Rhododendron prunifolium* is rare in nature, limited to just a few dozen populations in the Chattahoochee River Valley and straddling the border of southern Alabama and Georgia. Neither disease nor insect is to blame; climate change (to date at least) is also not the culprit. Instead, the species totters on the brink simply because its preferred habitat—mesic forests, stream sides, and ravines—is disappearing due to logging and other development. In this respect, plumleaf azalea is like most other woody plants threatened with extinction: their natural homes are vanishing.

Shortly after the founding of the Center for Plant Conservation in 1984 (then based at the Arnold Arboretum), we began to collect the species in earnest. At present we grow thirty-four plants, mostly from Georgia's Dade, Harris, and Stewart Counties. Preserving wild populations remains the highest priority, but it is important to have a back-up; while they grow here, their story is shared with others, and scholars from around the world come here to study them.

Let's not ignore the fact that *Rhododendron prunifolium* looks good in the garden. For endangered species, being charismatic and attracting attention is a gateway to its security (just look at the giant panda). This means we must equally care for species whose security is questionable simply because they are less charming, at least in appearance anyway. At the Arnold, we make room for these plants, too. 🌿



**Michael S. Dosmann** is the keeper of the living collections at the Arnold Arboretum.

Plumleaf azalea blossoming along Meadow Road. Photograph by Bob Mayer.









HISTORY OF LANDSCAPE

# Beatrix Farrand on Mount Desert Island

By Rodney Eason

I first visited the Abby Aldrich Rockefeller Garden, in Seal Harbor, Maine, on vacation with my then-fiancée, now-wife, Carrie, in 1997. We were both young landscape architects practicing at different firms in Raleigh, North Carolina. The garden visit had been arranged by Carrie's college classmate, Sarah Richardson, who lived on Mount Desert Island. After days spent hiking through Acadia National Park's coniferous forests, granite peaks, and scattered blueberries and junipers, the refined curation of color within the borders of the Abby Aldrich Rockefeller Garden was a beautiful and dramatic contrast.

The Rockefeller Garden nestled in the Acadian Landscape.  
*Photograph by Rodney Eason*



Sarah informed us that the Rockefeller Garden was designed by Beatrix Farrand (June 19, 1872–February 28, 1959), who also had designed Dumbarton Oaks in Washington, DC. One of Carrie’s classes at Penn State had made a trip to our nation’s capital, where she had been awestruck by the beauty of that garden. The only images I had seen of Dumbarton Oaks came from books and slide lectures, and it would be roughly 18 years before I would encounter Farrand’s work in depth, reading her biography by Judith Tankard, *Beatrix Farrand : Private Gardens, Public Landscapes* (2009).

Today, through a set of fortunate circumstances, I get to live all year round on Mount Desert Island and have served as CEO since 2015 of the Mount Desert Land & Garden Preserve, which is entrusted with the care of three Farrand-influenced gardens, including the Abby Aldrich Rockefeller Garden. In case you have never visited the coast of Maine, I should point out that the indigenous vegetation is not exactly floriferous. Coniferous forest predominates, largely composed of red spruce, black spruce, and white pine. There are some deciduous trees on the edges of the coniferous stands, including alders and moosewood maples. The dominant native ground-floor vegetation is largely composed of rhodoras, sweet ferns, huckleberries, blueberries, and northern bayberries. Underneath this typical plant community on Mount Desert Island are numerous ferns, mosses, lichens, and sedges. This plant community makes for a mix of greys and greens, all in contrast to the pink granite outcrops and glacial erratics that you would frequently encounter. Spectacular in its own right, this landscape inspired the formation of Acadia National Park in 1916.

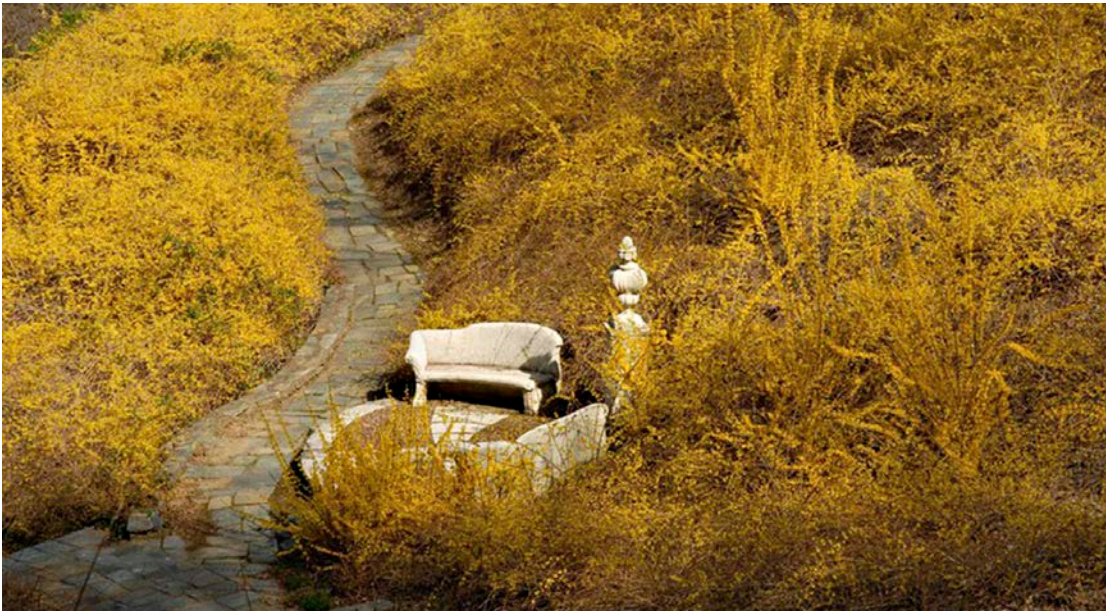
With English-style, mixed-herbaceous borders set off within this landscape, the Rockefeller Garden makes an evocative juxtaposition. Designed by Farrand for Abby Aldrich and John D. Rockefeller Jr. from 1926 through the early 1930s, the garden is a sublime mixture of sophisticated design and a complex palette of plants. I was smitten from the outset with the combination of bold floral colors, statuary sourced from Asia, and Beaux-Arts symmetry, provided most prominently by two parallel axes that run the length of the garden and orchestrate the flow for the visitor. The entry axis, called the Spirit Path, is flanked by carved-stone warriors and priests from eighteenth-century Korea. The second axis, parallel to the Spirit Path, provides the central aspect of the garden and its colorful flower borders with a distant

## She left an indelible mark within what is now called Acadia National Park.

view of a round opening called the “moon gate.” This gate frames the view of a eighteenth-century bronze Buddha in the Shakyamuni, or historical form, from China. As I studied Farrand’s designs in more detail, I would learn how the use of such central orienting axes became a hallmark of her designs.

Many years after visiting Mount Desert Island and the Rockefeller Garden for the first time, I was fortunate enough to visit Dumbarton Oaks. Like an unfolding, complex novel that you just cannot put down, the garden kept leading from one masterfully designed room to the next, with brilliantly placed plants and sublimely scaled spaces. I distinctly remember encountering the camouflage-print bark of a superb Chinese quince, *Pseudocyonia sinensis*, at the end of a pathway. Overwhelmed by the beauty of this gorgeous tree, I walked off the pathway and gave it a hug.

What is now the Land & Garden Preserve, was conceived in 1970 as a way for Peggy and David Rockefeller to perpetuate the beauty of the Abby Aldrich Rockefeller Garden. They co-inherited the garden with David’s older brother, Nelson, after David’s father, John D. Rockefeller Jr., passed away in 1960. Soon after Peggy and David formed the Preserve as a non-profit, then known as the “Island Foundation,” they were asked to manage the nearby Asticou Azalea Garden. Asticou, or the Azalea Garden as it is known



“Like an unfolding novel”: the forsythia dell in Farrand’s Dumbarton Oaks.

Photograph courtesy of Dumbarton Oaks Research Library

locally, had been built beginning in 1956 by Charles K. Savage, using mature plantings from Reef Point, Beatrix Farrand’s Bar Harbor estate.

Another local garden, Thuya, joined the Preserve in 2000, after its trustees decided that the future of the garden would be in good hands with the growing organization. Thuya’s origins date to 1912, when a Boston landscape architect and Northeast Harbor summer resident, Joseph Curtis, constructed his “rusticator” lodge in Northeast Harbor, naming it for a prominent stand of eastern white cedar, *Thuja occidentalis*, growing nearby. Charles K. Savage became the trustee of Thuya after Curtis’ death in 1929. In 1956, Savage began establishing gardens at both Thuya as well as Asticou, a story for which more detail will be provided below.

To celebrate his 100th birthday in 2015, David Rockefeller gifted the Preserve over 1,000 acres of land around Little Long Pond, including over 10 miles of carriage roads and 10 miles of hiking trails. This parcel, too, carried Farrand’s legacy: When John D. Rockefeller Jr. was constructing the carriage road system from 1913 until 1940 on what is now both the Preserve and Acadia National Park, Farrand had provided pro-bono consulting on road layout and planting designs. When David Rockefeller passed away in 2017, the Farrand-designed Abby Aldrich Rockefeller Garden joined his gift to the Preserve. Beyond

the beauty of the Rockefeller estate in Seal Harbor, Maine, she left an indelible mark within what is now Acadia National Park and the Preserve.

Her ties to the place were deep. When Farrand was 10 years old, in 1882, her parents bought an ocean-front property called Reef Point in Bar Harbor, facing Frenchman Bay. Her childhood at Reef Point fostered a love of plants and landscapes, and for amusement she dug and transplanted native vegetation from the surrounding forests and combined these with cultivated ornamentals. Farrand’s ethos of protecting the natural environment while cultivating intensive gardening spots of horticultural pleasure carries on today at the Preserve with over 1,200 acres of conserved, natural lands connecting our three ornamental gardens.

As her interest in landscape design and planting became more of a passion, she was introduced to Charles Sprague Sargent, the first director of the Arnold Arboretum. Sargent agreed to guide Farrand in her self-education in horticulture and garden design from 1893 to 1894, since at that time, no formal training in landscape architecture existed. While studying at the Arnold, she worked with plants at the Arboretum, as well as at the Sargent family’s estate, Holm Lea, in Brookline, Massachusetts. In addition to learning about the art and science of horticulture from Sargent, she learned to design landscapes to fit



From Sargent, she learned to design landscapes to fit a site rather than change a site to fit a design.



Farrand in the library at Reef Point. *Beatrix Farrand Collection, Environmental Design Archives, UC Berkeley*



Sketch elevation for the double wall in the Rockefeller Garden, and a 1934 photograph by Yosei Amemiya showing the mature project. Drawing, Beatrix Farrand Collection, Environmental Design Archives, UC Berkeley; photograph from the Preserve.





Textures of the Rockefeller Garden in Seal Harbor. Photograph by Jonathan K. DeCollo

a site rather than change a site to fit a design.

The lessons she learned from Sargent carried over as well through the trialing of new plants at Reef Point and elsewhere. From 1946 to 1956, Farrand chronicled the evolution of her Bar Harbor garden along with the noteworthy characteristics of many plants in the “Reef Point Gardens Bulletin.” Farrand found the climate of Mount Desert Island to be particularly hospitable to climbing vines and in the June 1954 bulletin, she describes some of her favorites. Among her descriptions of *Aristolochia* spp., *Ampelopsis brevipedunculata*, *Vitis* spp., and *Lonicera* spp., Farrand is particularly hopeful and enamored by a vine that “Professor Sargent had scornfully described as a “dud.” This Arnold Arboretum cast-off was *Tripterygium regelii*. I admittedly had never heard of this Celastraceae member until this mention in the *Reef Point Bulletin*.

What began as a joint venture with her husband, Max, Farrand continued to develop, seeking to make Reef Point a public teaching garden after his passing in 1945. Max had been the first director of the Huntington Library and Gardens in San Marino, California. The Farrands divided their time between San Marino and Bar Harbor, with a dream of eventually

making Reef Point a garden where aspiring horticulturists and garden designers could learn. In October 1947, two years after Max’s passing, a massive wild-fire burned almost a third of Mount Desert Island, including many grand, oceanside estates. These massive estates had provided the town with substantial tax revenues, now lost to fire. I mention this because Farrand had sought tax exemption of Reef Point as a public garden, and after these fires (which left Reef Point unscathed), the town had to increase tax assessments. With the burden required to keep her gardens afloat, Ms. Farrand ultimately decided to dissolve Reef Point as a lasting garden in 1955.

Beatrix Farrand’s article on “The Azalea Border” in the April 15, 1949 edition of *Arnoldia* described the addition of azaleas and other acid-loving plants along Meadow Road by the Arnold Arboretum. Some of the azaleas mentioned in the article included: *Rhododendron mucronulatum*, *R. dauricum*, *R. canadense*, *R. vaseyi*, *R. schlippenbachii*, *R. arborescens*, *R. viscosum*, *R. nudiflorum*, *R. roseum*, and *R. calendulaceum*. After reading this article from 1949, I began to wonder if Farrand’s interest in azaleas was in any way linked between her desire to see what would grow both in Jamaica Plain as well as at

her Bar Harbor estate. As I will describe later, many of her plants were subsequently moved from Reef Point to the Asticou Azalea Garden and Thuya Garden by Charles K. Savage. Asticou Azalea has a substantial collection of azaleas, many of them species grown in the Arnold's Azalea Border. Farrand, along with her plant recorder, Marion Ida Spaulding, kept an herbarium of the Reef Point plants. Once Farrand decided to no longer keep Reef Point Gardens going, she sent their plant vouchers to the University of California, Berkeley's herbarium, where I have found 51 vouchers attributed to Reef Point.

In 1956, Farrand sold Reef Point to a Maine colleague, Reef Point board member and architect, Robert Patterson, who sold most of the plant collection to Northeast Harbor hotelier and fellow Reef Point board member Charles K. Savage. Lacking the \$5,000 needed to purchase and move the collection, Savage was able to convince John D. Rockefeller Jr. to become a financial backer (that \$5,000 in 1956 would be worth over \$51,000 in 2022). Rockefeller and his wife, Abby, had worked with Farrand for over a decade on the design and construction of their Maine garden, what is now known as the Abby Aldrich Rockefeller Garden. Documents in the Rockefeller family archives show that many of the drawings for the garden and planting designs were by Farrand. After a trip to China in 1921, Abby Rockefeller became enamored with the pink stucco wall around the Forbidden City in what is now Beijing. It served as the inspiration for the wall that surrounds the Abby Garden in Maine.

Outside of her formal garden designs, Farrand often acted as a consultant to Rockefeller about aesthetic decisions regarding the carriage roads both during and after construction. In correspondence in the Rockefeller Archives Center in Pocantico, New York, Farrand commented that the engineers and tradesmen that Rockefeller had hired to landscape the carriage roads of Acadia National Park were lining trees up like soldiers. She urged Rockefeller toward a more natural arrangement, mixing conifers and deciduous trees of different species and sizes. Farrand understood that the natural character of the carriage roads through the park required a more relaxed style than was evident in her notable formal garden designs. In other writings and sketches to Rockefeller, Farrand suggested covering many of the stone bridges with vines such as *Parthenocissus quinquefolia* (Virginia creeper). In Acadia National Park today, you will find 16 stone bridges built by

Rockefeller, none of them covered with vines. Last year I was hiking along Stanley Brook on the southeastern side of Acadia National Park, and I stopped to admire the Stanley Brook Bridge. I noticed that at both ends of the bridge, equally spaced, was a pair of sugar maples. Growing four sugar maples so symmetrically, on both sides of the bridge, would have been a profound work of art for Mother Nature, so I am going to put this down to Farrand—at the very least, a reflection of her influence and love of symmetry.

Once Charles K. Savage, or “C. K.” as he was known locally, was able to secure the \$5,000 from John D. Rockefeller Jr. for moving the plants from Reef Point to Asticou Azalea and Thuya, he had to act quickly. Savage wrote a narrative to Rockefeller, describing the need for funding and urgency in the matter. The new owner of Reef Point, Robert Patterson, was now responsible for paying taxes on the property and wanted Savage to move the plants before the property would be sold again. The move was done quickly, and records for which and how many plants were relocated remain elusive. White & Franke Tree Service, of Brookline, Massachusetts, with the assistance of various local helpers including Savage's young daughter and son, moved as many plants as possible the 11 miles from Reef Point to Thuya in Northeast Harbor. The Preserve has several historical photos of these plant moves; we thus know that White & Franke assisted with the move, as their company name is on the door of the moving truck. These photographs show that the largest plants were hand-dug, balled and burlapped with drum-laced jute, and moved with what looked like a converted tow truck, the lift on the back of which acted like a small, mobile crane. The plants were healed in and surrounded by mulch at Thuya during the winter of 1956, while construction continued at Asticou with the hauling in of truckloads of soil and stones that would eventually form the framework for the garden. Construction continued at Asticou and plants were moved from their temporary locations at Thuya until the garden was completed in 1958. Savage had also selected plants from the Reef Point collection for Thuya, planted after the Asticou plantings were completed.

I hoped there was a document to be uncovered in someone's basement, outlining all the plants purchased, moved, and planted by Savage. During research for this article I learned that even Farrand was unsure of what existed at Reef Point. As she was building the collections, she noted her continuous desire to correctly identify the plants in the garden,





Plants on the move, with the help of the White & Franke truck, at Reef Point (top) and Thuya (middle and bottom). *Photographer unknown, possibly C. K. Savage*

# A quiet, distinguished vibe seems to emanate from the plants that came from Farrand.

even bringing William Judd, the Arnold Arboretum's chief propagator, to Maine for help with inventorying the collection. Whether due to the rapid movement of the plants, the transfer of records and herbarium vouchers from Reef Point to Berkeley per Farrand's request, or the inadequate identification of the plants by their owner, the Preserve has never had a consolidated record of what was moved from Reef Point to Asticou and Thuya.

The current manager of Asticou Azalea Garden, Mary Roper, has worked to identify the plants under her care for over three decades, including some of the plants moved from Reef Point in 1956. Mary began working at Asticou in 1989, some thirty years after the moves were completed. Over the years, Mary, like Farrand before her, has assessed the nuanced details of flowers, leaves, and stems of the plants under her care to develop a proper identification. Beginning in late 2022, Grace Brown, the Preserve's plant recorder and lead gardener at Asticou, will begin sharing some of these plant records via our new plant records database, accessible at [gardenpreserve.org](http://gardenpreserve.org).

Despite the remaining mysteries, the spirit of what Beatrix Farrand envisioned at Reef Point lives on today at the Preserve, within the gardens of Asticou, Thuya, and Abby Aldrich Rockefeller, as well as in the forests and meadows of our natural lands.

This is felt most powerfully at the Abby Garden, with its overall layout, plantings, and ornamentation preserved since the 1920s. Asticou and Thuya were designs of C.K. Savage, but it was the influence of Farrand's relocated plants that completed these garden arrangements. When I tell someone who has visited the Preserve that I work there, "I just love (insert either Asticou Azalea, Thuya, or Rockefeller Garden here)!" is usually one of the first things I hear in response. When I ask why they love their garden of choice, the responses often embrace the spirit of these places. I felt that special spirit when I first visited the Abby Garden in 1997, and I still sense this every time I visit. When I walk through Thuya, as I brush up against the old *Kalmia latifolia* that came from Reef Point, a quiet, distinguished vibe seems to emanate from the plants that came from Farrand. Asticou Azalea's design and plant masses are calm and subdued, much like I assume Farrand was during her life. Yet during the spring when the azaleas and cherries burst forth with an explosion of blooms, I can see Farrand's love of beauty in plants and the art of arranging a garden for others to enjoy. 🌿

RODNEY EASON is CEO of the Land & Garden Preserve, responsible for the care and preservation of the gardens discussed in this essay.



## Lamb's Ear

By Stephanie Burt

No more at home here  
 than the lambs, though no  
 less so  
 among the Banks Peninsula's steep,  
 grassy, and almost pathless  
 declivities, the paired-off stalks can grow  
 to the height of a house cat; they slouch,  
 almost as much at ease  
 as a cat would be, amid the taller foxglove blooms, whose butter-popcorn and flame-  
 orange bells emerge  
 so early in the Southern summer's game,  
 as if to ring in the new year.

Too soft to be called teeth,  
 too thick, except  
 in direct sunlight, to see through,  
 the diminutive lobes on their immature  
 aluminum-grey or Statue-of-Liberty-green  
 leaves' edge look faded even when brand-new.

Their paler fur will catch  
 a drop from a hiker's water bottle if it spatters,  
 if that hiker happens to slide  
 down the unexpectedly parabolic  
 curve of a given hillside.  
 Though dwarfed by nearby sheaves  
 of bladed flax, or harakeke, the woolly stems  
 can hold their ground like hooves;  
 the individual petioles try  
 to overtake one another, competing  
 harmlessly, like teams  
 in the fairest of sports.

Each puffed leaf-ridge seems to invite  
a child's finger and thumb.  
No thicker than the skin  
of a tuned kettledrum,  
they might have come  
here in search of a world without force,  
or at least without force of arms.

If they could speak  
they would not; they would wait  
for a durable peace,  
for people taking one another on faith  
across the continents,  
as well as in this not-quite-wilderness  
with its traced-in, bush-sheltered not-quite-farms,  
where no human being or sheep  
is likely to get entirely lost,  
given the tree-bark hash marks, dry plank  
shelters, twine-bordered stream-beds, and occasional hand-carved  
fenceposts with their hand-mounted  
scarlet or cherry-red fire alarms.

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# The Transatlantic Arboretum in the Nineteenth Century

By Paul Elliott

In the summer of 1850, Andrew Jackson Downing embarked on a trip to England, where he toured gardens and rural estates. Downing was then thirty-four years old and had already emerged as a leading American landscape designer and horticultural writer. On the trip, he made a special stop in the midland town of Derby to see a garden known as the Derby Arboretum. The eleven-acre arboretum had been established ten years before, on land given for that purpose by a wealthy local cotton manufacturer, Joseph Strutt. Each tree was clearly labelled, and the arboretum, for two days a week, was completely free and open.

“As a public garden—the gift of a single individual—it is certainly a most noble bequest,” Downing wrote. “I met numbers of young people strolling about and enjoying the promenade, plenty of nurses and children gathering health and strength in the fresh air, and, now and then, saw an amateur carefully reading the labels of the various trees and shrubs, and making notes in his memorandums-book.”

The Derby Arboretum was distinct for its commitment to the public—even providing access to books so that interested visitors could learn more about the plants growing in the landscape. This commitment, Downing was sure, meant that the Derby Arboretum “is, and will be, one of the most useful and instructive public gardens in the world.”<sup>1</sup>

Often considered the first public arboretum, it was designed by the Scottish landscape gardener John Claudius Loudon, who was most responsible for popularizing the term and concept of “arboretum” during the nineteenth century. Yet public tree collections like those at Derby, and the Arnold Arboretum in the decades to come, did not arise *de novo*. Rather, the development of these institutions in Britain and the United States during the “long” nineteenth century (encompassing the period from 1780 to 1919) is best understood as a global—and particularly transatlantic—phenomenon, arising at a time of large-scale



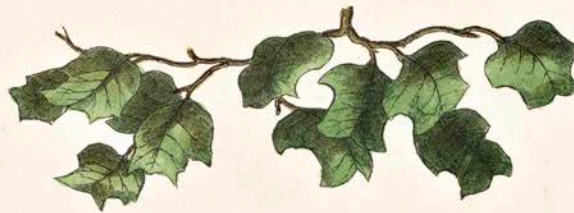
Title page, *Arboretum et Fruticetum Britannicum*, by J. C. Loudon. Image courtesy of the Library of the Arnold Arboretum

The presence of North American trees in Loudon’s *Arboretum* indicate the transatlantic cross-pollination of horticultural practice in the nineteenth century. Image courtesy of the Library of the Arnold Arboretum

*Liriodéndron Tulipifera.*  
The Tulip-bearing Liriodendron, or the Tulip tree.



Full-grown tree at Syon; 76 ft. high.  
[Scale 1 in. to 12 ft.]





immigration, industrialization, and botanical exploration. In that sense, public arboreta were products of changing relationships with the environment and, indeed, among people.

### Origins of Transatlantic Arboreta

The Atlantic world was fertile ground for the formation of tree collections in the parks and gardens of Europe and North America. The vast forests of North America, with their seemingly boundless numbers of trees (many new to European science), inspired the formation of tree collections in those places beginning in the eighteenth century. The biodiversity of the North American forests spanned from subtropical to boreal, from coastal to montane. This diversity across the vast extent of the continent persists to this day, as exemplified by the ninety-nine native species of conifers now believed to exist north of modern Mexico. By contrast, Britain and Ireland have only three native species of conifers—and, in general, far fewer native trees.<sup>2</sup>

Transatlantic arboreta arose from a combination of tree collecting for gardens and parks and systematic planting in physic (i.e. medicinal) and botanical gardens. American trees themselves played a large part in this process, and were often collected in places known as “American Gardens” between around 1700 and 1840. The enthusiasm for collecting American trees was encouraged by publications such as Mark Catesby’s *Hortus Britanno-Americanus*, published in 1763, which emphasized the value of these plants for timber, shade, fragranciness, and beauty, holding them superior to British trees.<sup>3</sup> Many American trees and plants were brought over to Britain and Ireland in the colonial period and early decades of the United States, especially through the botanist and explorer John Bartram, who, in the mid-eighteenth century, sent many examples to the English botanist and gardener Peter Collinson. Settlers in the New World also brought numerous trees from—and via—Europe with them, bringing these and trees from eastern North America with them as they moved westwards towards the Pacific during the nineteenth century.<sup>4</sup>

Plant collectors like Bartram were crucial to the creation of transatlantic arboreta, and came to be seen as heroic figures, making expeditions on behalf of wealthy collectors, nursery companies, governments, and scientific institutions. In his *Dendrologia Britannica*, published in 1825, the Hull merchant and botanist Peter William Watson praised the “bold and scientific travellers” traveling throughout North and

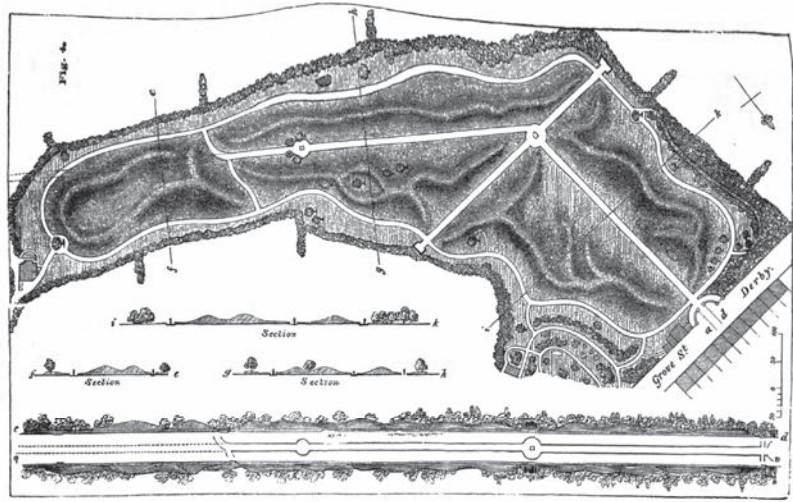
South America and other regions and identifying thousands of species.<sup>5</sup> One of the most famous plant hunters of the era was the Scotsman David Douglas, who trained at the Glasgow Botanic Garden and made three separate collecting expeditions to North America in the first half of the nineteenth century. His introductions into Britain from the West Coast included the Sitka spruce (*Picea sitchensis*), Douglas fir (*Pseudotsuga menziesii*), red alder (*Alnus rubra*), and many others.<sup>6</sup>

Nursery companies in America and Britain came to specialize in obtaining and selling American plants. The Loddiges company in Hackney, London, for example, had an American Garden, and featured many American trees in their collections and sales catalogues. Loudon used their collections for his research.<sup>7</sup> Wealthy British aristocratic collectors such as the Duke of Devonshire at Chatsworth—a landscape designed by Joseph Paxton, a noted English designer—spared no expense in obtaining “exotic” trees from America and across the globe for their parks and arboreta with the same eagerness that they acquired antiquities and works of art.<sup>8</sup>

Meanwhile, in North America, a series of private gardeners began to establish systematic tree collections, although they were not always designated as arboreta. For instance, William Hamilton, a neighbor of the Bartrams, developed his estate known as the Woodlands on the Schuylkill River, then outside of Philadelphia. In the decades following the Revolutionary War, he formed what was then one of the largest American tree collections, arranged in the style of an “English garden.” He toured gardens in Europe and obtained specimens from the Chelsea Physic Garden in London and other international sources.<sup>9</sup> Private collections like this would inspire public institutions to come.

### Living and Paper Arboreta

Other inspirations for Atlantic world arboreta were the publication of arboriculture books, which were, in effect, “paper arboreta.” The writing was informed by living tree collections. General studies of arboriculture grew from classic tree studies such as John Evelyn’s *Sylva, or a Discourse of Forest Trees*, from 1662. The popularity of works such as Erasmus Darwin’s epic poem *The Botanic Garden*, published in 1791, demonstrated how systematic plant collections were gateways to enchanting and exciting scientific worlds. The poem was initially inspired by a botanic garden Darwin established near Lichfield, England,



“A most noble bequest,” wrote Andrew Jackson Downing (top left) of the Derby Arboretum (above), designed by John Claudius Loudon (bottom left). Images courtesy of Harvard Library

which successfully united landscape beauty with Linnaean botany—and the book was much reprinted in British and American editions.<sup>10</sup>

Horticultural periodicals such as Loudon’s *Gardener’s Magazine* and Downing’s *The Horticulturist* (first issued in 1826 and 1846, respectively) helped build public enthusiasm for trees and landscapes. Both men advocated for the development of arboreta as part of suburban gardens. The collections could be associated with park development or collectively give the appearance of a country park through combination of private gardens, especially in the United States, where there were fewer walls and fences in between plots.<sup>11</sup> Though space for such collections was sometimes limited, especially in Britain, Loudon argued that arboreta were ideal for middle class gardens, even for small houses and gardens.<sup>12</sup>

Moreover, a series of books on regional and national arboriculture provided lists of hardy British and North American trees and shrubs, contributing to the acquisition and collection of trees. The plants delineated in these publications often came from all over the world, and they were only “British” or “American” to the extent that they had proven hardy enough to be grown outside in those places.

Watson’s *Dendrologia Britannica*, for example, provided 103 plates of North American trees imported to Britain, alongside others from Southern Europe and West Asia.

One of the most influential of these paper arboreta was Loudon’s eight-volume *Arboretum et Fruticetum Britannicum*, from 1838, which inspired the creation of many tree places, including the Derby Arboretum. It was, in many ways, a transatlantic work that drew on arboricultural literature and catalogues from across the Atlantic world to provide a detailed history of trees and shrubs from antiquity to the 1830s.<sup>13</sup> According to William Jackson Hooker, director of the Royal Botanical Gardens at Kew, Loudon’s study was a work of “vast importance” not just to Britain and Europe, but also to “the temperate parts of North America.”<sup>14</sup> Loudon made full use of a transatlantic network of botanists, gardeners, nurserymen, landowners, and plant collectors who provided him with information and drawings, specimens, seeds, and other tree parts.

The first volume of the *Arboretum Britannicum* included a chapter on American arboriculture informed by American contacts such as the printer Colonel Robert Carr, in Philadelphia, who, with his





An early twentieth-century postcard from the Derby Arboretum, all but indistinguishable in use from a public park.

wife Ann Bartram Carr, had taken over responsibility for maintaining Bartram's Garden.<sup>15</sup> Loudon believed that although American trees and shrubs had been available in British nurseries for decades, many remained under-appreciated, and he hoped the *Arboretum Britannicum* and the living arboreta it inspired would increase the number and popularity of more public tree places showing off "living specimens" and capturing imaginations in a way dried herbaria never could.<sup>16</sup>

### **Picturesque Naturalism, Tree Planting, and Arboreta**

Trees were also essential to transatlantic conceptions of landscape design, providing beauty, color, contrast, structure, variety, seasonal change, and much more. The dominant Atlantic-world landscape philosophy of the nineteenth century was known as "English" picturesque naturalism. This style idealized the English landscape, and was widely invoked in garden, park, and arboretum designs. Downing, for example, believed that the style developed in Britain by the English landscape gardener Humphry Repton, Loudon, and others should be applied across North America. According to Downing's pupil and friend

the Ohio landscape gardener Frank Jesup Scott, who published a popular book on suburban gardening in 1870, "compared with the English" the Americans were still "novices in the fine arts of gardening" and the "exquisite rural taste" even shared by "the poorer classes" of England.<sup>17</sup>

Picturesque naturalism encouraged the positioning of trees and shrubs to achieve effects of openness and simplicity, shelter, shade, and beauty, to obscure boundaries through screen plantings, and to offer the occasional pleasure and sublimity of distant views. The designs often emphasized varied sensory experiences: sloping and terraced ground, shifting light patterns, the sounds of leaves and water, and the changing colors and aromas of trees and floral displays. The movement of birds and wildlife added to this multivarious experience for visitors, especially to the extent that animals (like plants) had their own degree of controlled agency.

Further development of this transatlantic landscape gardening philosophy was encouraged by immigration and the movement of people across the Atlantic. British and Irish gardeners and landscape gardeners working in North America brought ideas and methods from home which they adapted to local

conditions and contexts. Notably, while Downing was on his British tour in 1850, he met the architect Calvert Vaux and persuaded him to immigrate to America, joining Downing's practice in Newburgh, New York. In the decade to come, Vaux, a Londoner, would employ picturesque naturalism when planning of New York's Central Park, which he codesigned with Frederick Law Olmsted.<sup>18</sup>

The careers of Vaux, Downing, and Olmsted, and their many other professional interconnections, illustrate how an international approach to designing with trees took root on both sides of the Atlantic. In the second half of the century, Olmsted became a leading practitioner of picturesque naturalism. Successful picturesque landscapes, according to Olmsted, worked by adapting and evoking nature to produce a "higher impression of grace than nature minus the agency of man would have produced," stimulating the "simplest, purest and most primeval" actions of the poetical side of "human nature," offering relief from the overly elaborate but stressful "sophisticated and artificial conditions of their ordinary civilised life."<sup>19</sup> In practice, of course, the features held to constitute this language or tradition underwent considerable variation, although it remained particularly important to many North American and British landscape gardeners to claim to be following this tradition. While there was some introduction of formalism and Italianate features from the 1850s and 1860s, the languages of picturesque naturalism remained highly influential throughout the century.<sup>19</sup>

### Arboreta as Public Institutions

The appearance of nineteenth-century public parks and arboreta was associated with the development of modern urbanization across the Atlantic world with its new institutions, suburbs, transport systems, built environment, and cultural experiences.<sup>20</sup> Travelers, books, and ideas crisscrossed the Atlantic, encouraged by more rapid and cheaper steam ship lines and technological improvements such as telegraphy and undersea cables. While immigration to North America brought immeasurable human resources, it also increased tensions, clashes of identity, and problems of health and sanitation in towns and cities.<sup>21</sup> As the pattern of immigration changed, bringing new peoples from across the globe, the question of how to adapt British and European landscape gardening ideas and practices to American contexts became more contentious. However, public parks

were promoted as rational recreational institutions which could help facilitate assimilation, intercourse between the classes, and American patriotism.<sup>22</sup>

In the United States, some of the earliest tree collections in designed public landscapes were associated with suburban garden cemeteries or "rural cemeteries." Mount Auburn Cemetery in Cambridge, Massachusetts, was established in 1831 and soon followed by others, including Laurel Hill Cemetery, in Philadelphia. The cemeteries represented the application of landscape gardening aesthetics and practices. In London, Abney Park opened in 1840 and included collections that were formally laid out, at least in part, as a labelled arboretum. The landscapes were portrayed as sacred places where family members and others could repose in quiet contemplation amidst appropriately somber planting, particularly yews (*Taxus*), Scots pine (*Pinus sylvestris*), and other evergreens and columnar trees associated with mourning.<sup>23</sup>

Encouraged by Loudon in particular, a series of public and semi-public arboreta were established in Britain from the 1830s, while many new public parks and botanical gardens also featured arboreta. Arboreta were opened at Derby (1840), Nottingham (1852), Ipswich (1853), Worcester (1859), Lincoln (1872), Walsall (1874), and other places, some by commercial companies such as the Walsall Arboretum and Lake Company but most increasingly by town councils. The picturesque arboretum in Nottingham was noteworthy for its integration within a larger parks system, which was made possible by a large-scale enclosure act in 1845, which freed up common land for housing and park development. The scheme included a network of tree-lined avenues and parks. However, the botanical aspirations of these institutions as systematic tree collections tended to decline as their role as public pleasure gardens increased.<sup>24</sup>

As one of Loudon's few realized park designs, much notice was taken of the Derby Arboretum. Downing, of course, had visited while on his tour in 1850. At the time, he was designing extensive public grounds in Washington, which incorporated a garden of American trees and a living "museum" of evergreens, and he was actively urging the creation of a large park in New York. His experience observing British and European parks undoubtedly informed his thinking about the role of planting systematic collections. Although it was not executed, his plans for a public park in Boston for the Massachusetts





Trees and the city: The Arnold Arboretum in 1974. *Photograph, by Alfred James Fordham, courtesy of Harvard Library*

Horticultural Society included a scientifically arranged arboretum.<sup>25</sup>

The public parks of Britain provided important inspiration for Olmsted as well. Like Downing, he embarked on a tour of Britain, Ireland, and other parts of Europe in 1850. While he did not visit the Derby Arboretum on that trip, he made an inspirational stop at a new public garden in Birkenhead, a suburb of Liverpool. Like the Derby Arboretum, the gates of Birkenhead Park were open to the public without a fee—but in this case for the whole week. It had been laid out by Joseph Paxton, who had designed other noteworthy landscapes including the arboretum and pinetum in the Chatsworth House gardens—Downing’s favorite. Olmsted described Birkenhead Park as the “People’s Garden.” He was delighted by the winding paths and avenues and clusters of trees, set within wide, rolling lawns.

“All this magnificent pleasure-ground is entirely, unreservedly, and for ever the people’s own,” Olmsted wrote of Birkenhead Park. “The poorest British peasant is as free to enjoy it in all its parts as the British queen.” The design and public function of Birkenhead Park would later serve as inspiration for Central Park. Olmsted revisited it as part of his investigation

on the development of Central Park for the New York commissioners in 1859. On the same trip, he also paid a visit to the Derby Arboretum.<sup>26</sup>

### **A Public Arboretum in North America**

Despite growing interest in arboreta on both sides of the Atlantic in the mid-nineteenth century, a public arboretum with intentionally designed, labelled collections had yet to be established in the United States. There were proposals to plant the National Mall in Washington as an arboretum associated with the Smithsonian Institution, focusing upon American natives of some two thousand trees, and about two hundred species and varieties and counterpart to indoor natural history museum. Downing surveyed the landscape and produced designs for this in 1850 and 1851, after returning from his tour of British and European parks and arboreta. Support for concept of a national botanical garden had grown during the 1840s, including from Asa Gray, the professor of botany at Harvard and the director of the Harvard Botanic Garden. He had called for a national arboretum in 1844, emphasizing the research on American trees that had already been conducted by Andre and Francois Michaux and others.

Downing's plan was for a public arboretum of labelled hardy trees and shrubs laid out in the natural style for educational and botanical purposes, and it included a pinetum. He also designed a picturesque garden surrounding the Smithsonian Institution formed with rare trees and shrubs. Although Downing's Washington plans were not implemented—and Downing died in a boat accident in 1852—the concept of a national arboretum was ultimately realized outside the capital with the establishment of the Arnold Arboretum in 1872.

The Arnold Arboretum was integrated within a broader park scheme developed in Boston by Olmsted and the landscape architect Charles Eliot from the 1880s. The system, now known as the Emerald Necklace, consisted of a series of public parks connected by tree-lined parkways. Olmsted had proposed a similar concept in his report to the Brooklyn park commissioners in 1868.<sup>27</sup> The integration of urban public parks using planted parkways hastened the development of urban forestry across the Atlantic world, and there was growing recognition that this was a distinctive endeavor which required special methods and expertise. There was also increasing emphasis upon the psychological and physical health benefits of trees in modern urban environments, although pollution, traffic, and buildings presented problems for planters.<sup>28</sup>

Part of Harvard University, the Arnold Arboretum would be free to the public—all day, every day of the year. It expanded in a remarkably short space of time into a leading global arboretum guided by a director, Charles Sprague Sargent, whose longevity was hardly to be paralleled. However, the success also arose from its combination of elements of arboreta established across the Atlantic world over the previous century and collective body of arboricultural wisdom and experience. It combined picturesque naturalism with systematic tree collection, offering a place of study, recreation, and changing seasonal beauty. It was this that informed Sargent and Olmsted's collaborative design for the Arnold Arboretum.

### Egalitarian Ideals

Although Loudon, Downing, and other arboretum promoters in the early and mid-nineteenth century argued that arboreta (like public parks generally) had recreational as well as scientific and horticultural functions, arboreta often remained associated with aristocratic and wealthy landowners and institutions with enough land, staff, and resources to

form comprehensive collections with exotic trees and shrubs from around the world, some rare and expensive. The Arnold Arboretum's position as a part of Harvard University is a case in point.

Given these realities, nineteenth-century arboreta, like botanical gardens and parks, were idealized and often rather controlled, artificial, and regulated places. However, Loudon was motivated to promote them assiduously because he believed in their egalitarian possibilities, as did Olmsted. Loudon's gardening and natural-history magazines were intended to be forums that could be used by all social classes, from landed elites to gardeners, nurserymen, and women, and he strongly believed that gardeners ought to have a much fuller scientific professional education and have greater social status. As part of national, regional, or urban civic culture, arboreta had the power to transcend social divisions such as those between different social and ethnic groups (for example immigrant communities in North America) and between town and countryside, metropolis and nation.

While nineteenth-century botanical gardens and arboreta were associated with trade, empire, and colonial exploitation, Loudon believed that this exchange of plant material would lead to global "equalisation" of tree species, to the benefit all nations. "If it is desirable for us that we should assemble in our country the trees and shrubs of every other similar climate," Loudon pointed out, "it must be equally desirable that the inhabitants of every other similar climate should possess all those species for which their climate is adapted."<sup>29</sup>

### Conclusion

In 1868, Josiah Hoopes, a nurseryman from West Chester, Pennsylvania, wrote that he believed his fellow American citizens were "vastly behind" their "transatlantic brethren" in the provision of tree collections—specifically collections of conifers.<sup>30</sup> Yet, with the onset of the First World War, the initial decades of the twentieth century presented significant challenges for arboreta and gardens in Britain. Many of the arboreta established on country parks and estates declined because of general problems faced by the wealthy landed classes and their country houses after the war. British public arboreta such as those at Derby, Nottingham, Lincoln, Ipswich, and Walsall effectively ceased to be maintained as systematic tree collections for educational and scientific purposes and became indistinguishable from other urban parks.<sup>31</sup>



# In today's world of looming environmental crisis, the arboriculture practiced at the Arnold has taken on a new urgency.

On the other hand, with the professional development of forestry, urban forestry, and municipal horticulture, new arboreta were developed by the mid-twentieth century on both sides of the Atlantic. The most resilient British arboreta were those that remained parts of wealthy landed estates or academic institutions. Other long-term successes were arboreta that were acquired or developed by organizations such as the Forestry Commission or National Trust, the leading English quasi-governmental heritage organization founded in 1895 to “preserve historical and natural places.”<sup>32</sup>

In 1925, more than half a century after the creation of the Arnold Arboretum, Ernest Henry Wilson, the British plant explorer who became the Arnold's first keeper of the living collections, wrote that the number of visitors who journeyed from around the world to the tree collections in Boston increased by the thousands each year. He described the institution as “America's Greatest Garden,” reasoning that because its *raison d'être* focused “solely” upon the “acclimatization, cultivation and study of hardy trees and shrubs,” the institution was entirely unique, even among European peers. Certainly, it had grown in a relatively short space of time into a peerless global

institution, guided by Sargent, with a clear mission and supportive organizational structure.

While Loudon's belief in the ideal of tree equalization across the continents is complicated in today's world of looming environmental crisis, the arboriculture practiced at the Arnold Arboretum from Sargent's day to the present has taken on a new urgency as the need to understand how trees respond to climate change becomes crucial. While Wilson's argument that the Arnold Arboretum brought “man ... nearer unto man” without “boundary of race and creed” remained an ideal rather than reality in an age of imperialism, oppression of Native American peoples, and continuing racial tensions, it is now beginning to be realized, aided by the collective desire to face the climate threat together as a global community, and to celebrate the symbolic value of public arboreta uniting trees from around the world for all to study and enjoy.<sup>33</sup> 🌿

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VISUAL ESSAY

# Drawn to the Edges

By Bobbi Angell



**L**iving in southern Vermont, I am surrounded by lush forests and verdant fields. There is so much to observe while trying to decide what to draw! Hobblebush (*Viburnum lantanoides*) has always been one of my favorite shrubs, with attractive winter buds, brilliant white flowers that light up the edge of woods in the early spring, and rich fruits in the fall, soon after eaten by birds. A single seedling, such as Pagoda dogwood (*Cornus alternifolia*) is far simpler to draw, but equally satisfying to find and turn into a copper etching.

I have been drawing plants professionally for over forty years, and have always been obsessed with the precise detail that can be achieved with pen and ink. Several years ago, master printmaker Brian Cohen introduced me to the intricate art of copper etching, and I was immediately smitten. Accustomed to working within a defined space for publication, I appreciate the sharp boundaries of a copper plate. And since an etched copper plate is printed as a mirror image onto the paper, I work on my designs in reverse, checking it out on tracing paper and lightbox.

The final sketch is transferred onto a waxy ground application on a copper plate, and then I “needle” it, scratching the wax with a sharp needle under my microscope, impressing fine lines and stipples, creating soft

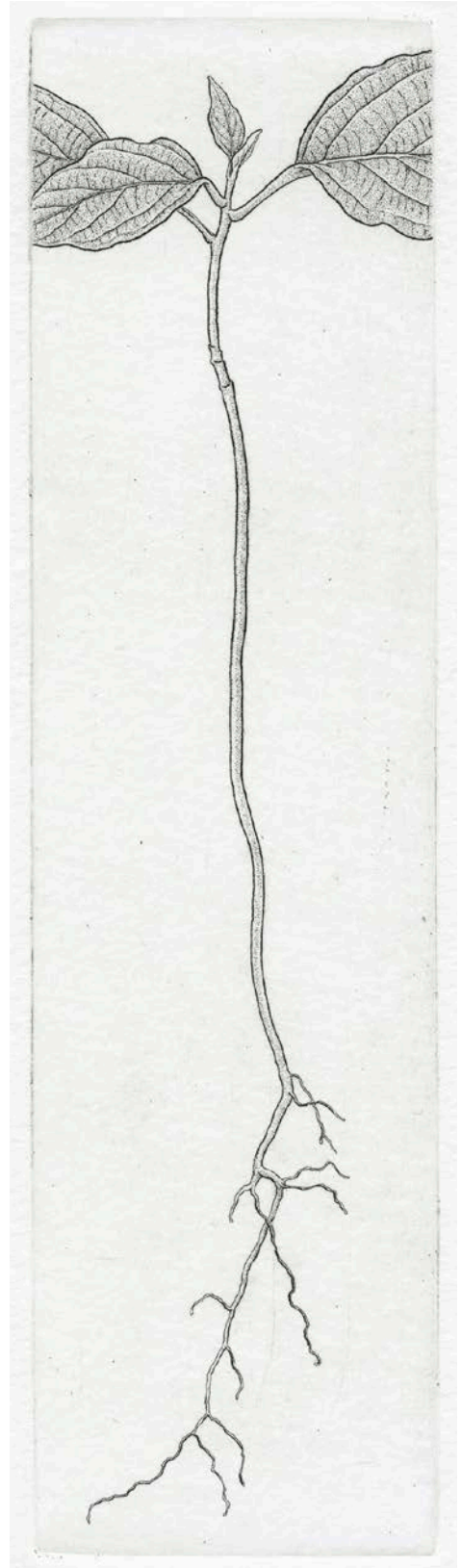
Above: Hobblebush (*Viburnum lantanoides*); opposite, Bobbi Angell wiping excess ink from the plate. Photograph by William Dixon; all etchings by Bobbi Angell



tones dot by dot. The plate is then etched with ferric chloric acid, printed as a test, and then reworked two, three, or more times to add more detail and depth. I use oil-based ink, rubbed onto the copper, cleaned first with fine cheesecloth-like fabric and then wiped with my hand. Each print is done, one by one, on water-soaked paper on my Ettan Press. I add watercolor to a select few of my editions. The editions are limited, usually 20 or 30 prints.

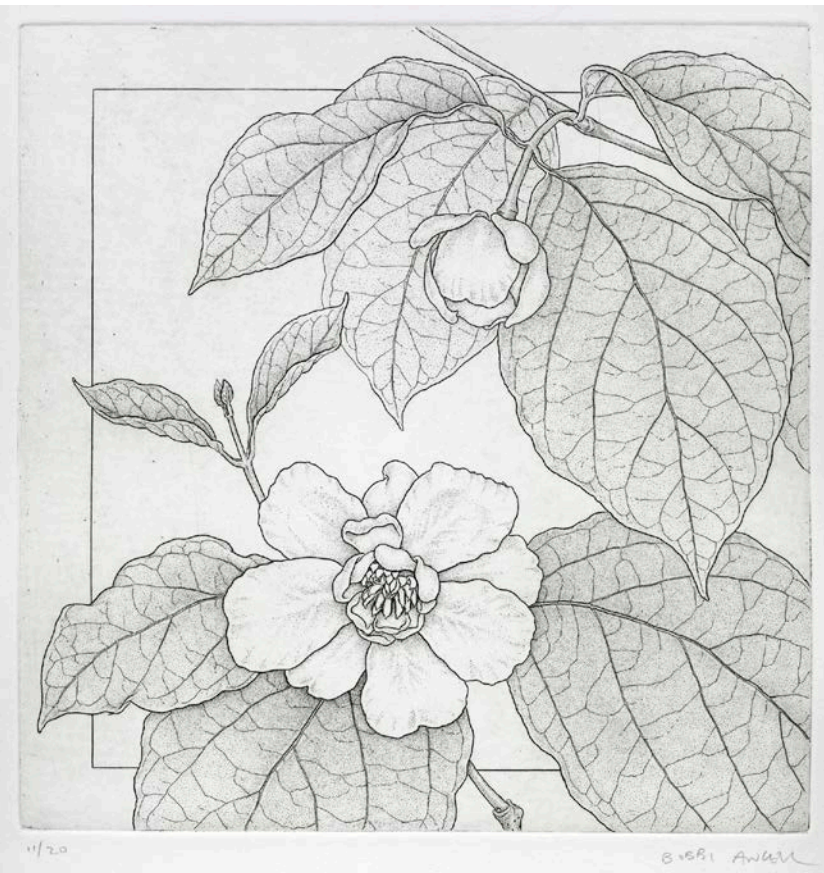
Primarily a scientific illustrator, I am attracted to unusual plants, reflecting my long history working with botanists and horticulturalists. I created a collection of such etchings for an exhibit with Beverly Duncan at The Arnold in 2018 (*Impressions of Woody Plants: Disjunction, Two Artists and the Arnold Arboretum*). As Beverly and I walked around the Arboretum with Michael Dosmann, planning the exhibit, I saw the gorgeous Chinese sweetbush (*Calycanthus chinensis*) in full bloom. Having learned it had been introduced into cultivation in the 1980s, I eagerly went out to purchase a shrub to grow, and draw, in my own garden. Also impressive is seven son flower (*Heptacodium miconoides*), the elegant, fall-blooming flowers and fruits of which I had seen at The New York Botanical Garden. Arnold Arboretum staff had collected seeds from a garden in China in 1980, raising plants for other institutions, including the NYBG. Within a few decades, seven son flower, too, had become commercially available, and so I was able to grow it and turn it into a copper etching. Tea viburnum (*Viburnum setigerum*), too, I first encountered at the NYBG, where I learned it had been introduced by the Arnold's E. H. Wilson in 1901. *Corylus fargesii* was commissioned for *Curtis's Botanical Magazine*, describing the introduction of a wonderful woody plant from China. The Arnold Arboretum has over a dozen plants in the collection. *Magnolia × loebneri* 'Merrill', one of the finest hybrids ever released by the Arnold Arboretum, and named in honor of director Elmer Drew Merrill, was in full bloom during an early-spring visit to Smith College, stunning flowers displayed before the foliage leafed out. I was quite pleased when the Arnold Arboretum chose to use the resulting illustration for a logo for Arnold Selects (see page 7), a newly created program to bring exceptional plants from the living collections to gardeners around the world. 🌿

BOBBI ANGELL illustrates florae, monographs, and new species articles at the New York Botanical Garden, Harvard University, the Smithsonian, and other institutions. Her copper etchings are represented in exhibits and several galleries.





Seven son flower  
(*Heptacodium  
miconoides*)



Chinese sweetbush  
(*Calycanthus chinensis*)

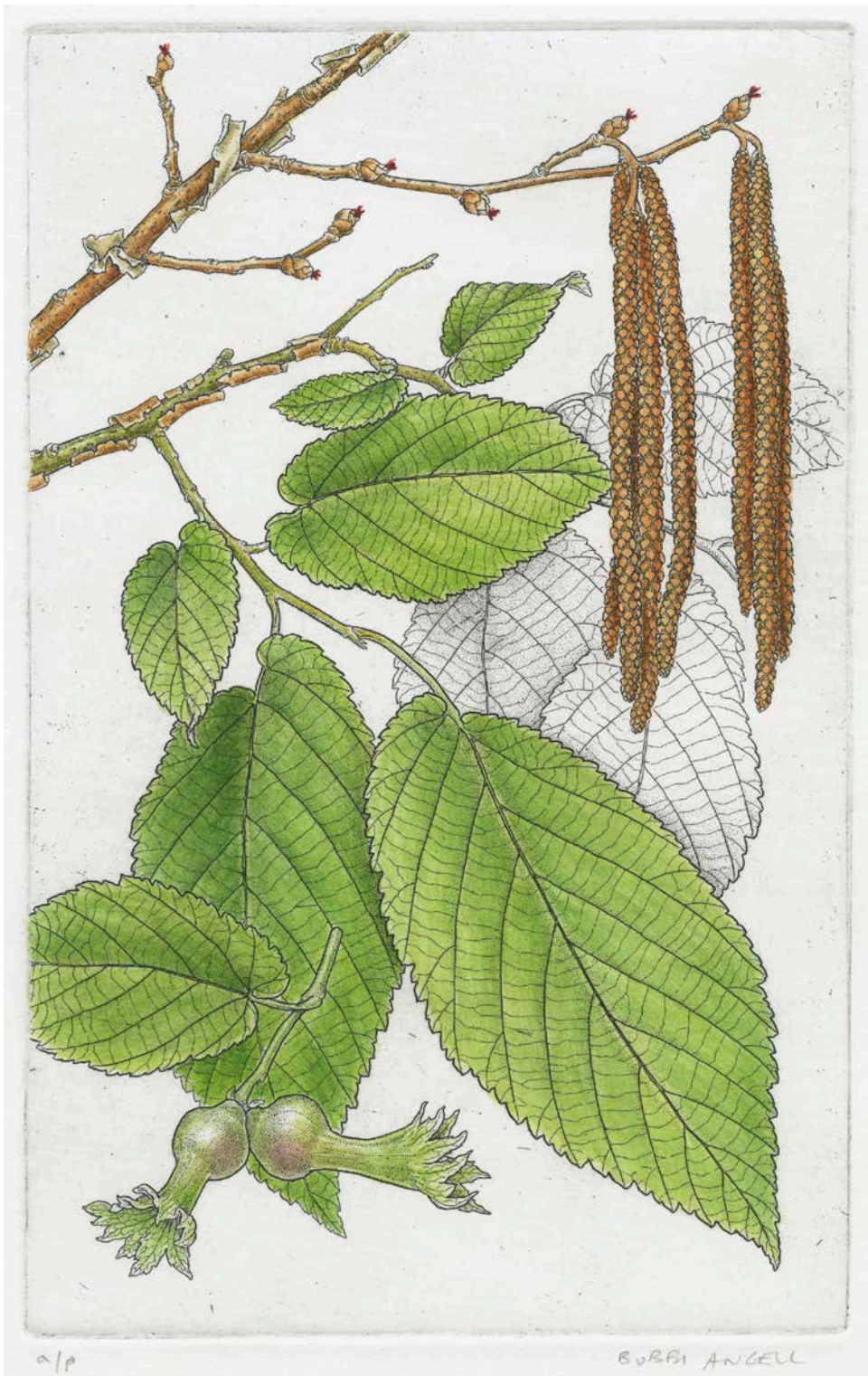
Opposite: dogwood  
(*Cornus*) seedling



Accustomed to working within a defined space for publication, I appreciate the sharp boundaries of a copper plate.



Tea Viburnum (*Viburnum setigerum*)



Farges filbert (*Corylus fargesii*)



# What in the World is a Species?

By Michael J. Donoghue

Many people are aware that species have formal names with two parts—a genus name combined with what’s called a specific epithet. *Homo sapiens* is a well-known example; for botanists, *Ginkgo biloba* will do. In their fullest form, they also include the name (or abbreviation) of the person or people who originally described the species. *Homo sapiens* was described by Carl Linnaeus in 1758, and in 1771 he named *Ginkgo biloba*, so you may see his initials after these names: *Homo sapiens* L., *Ginkgo biloba* L. There are very detailed (and ever-evolving) rules for how the description of a new species must be done for the name to be considered validly published. In botany, we refer to the *International Code of Nomenclature for Algae, Fungi, and Plants* for the exact procedures. It turns out that anyone—yourself included—can describe a new species if they follow these rules. You don’t have to be certified as an authority to do this. Once you’ve published your new species, it generally would have one of two fates. Your new species could stand the test of time, in the sense that knowledgeable botanists would adopt it when they conduct their studies. However, unless you really know what you are doing, in 2022, it’s likely you have named something that has previously been described. In this case, your proposed species name would be regarded as a synonym of the earlier one, and would henceforth be ignored.

A key point is that you can validly publish a species name only to have it rejected by other botanists on the grounds that they don’t consider it to be a “real” species. This implies that there are some criteria being applied by scientists to judge whether something is a real species or not. It seems reasonable to assume that long ago there would have been agreement on what a species is—on a species *concept*. This, however, is not the case. In fact, many different definitions of species have been published over the years, and to this day there are major

Scientists track biodiversity in plots at the Cedar Creek Ecosystem Science Reserve in Minnesota.  
*Photo by Jacob Miller*







camp of biologists who disagree (sometimes passionately) over which should be adopted as the universal standard.

The use of different species concepts by different scientists has a very important consequence: the various species that you are familiar with may not be equivalent to one another in ecological, evolutionary, or organismic terms. For the most part, however, we proceed as though they are. By “we,” I mean not just the general public, but also the scientific community, who, despite knowing full well that multiple concepts are in use, still treat species as being somehow equal to one another. In reality, the only equivalence you can count on when you see species names is that they have been named according to some agreed-upon rules, and that they haven’t been rejected by the scientific community. The potential non-comparability of species seems like a recipe for miscommunication. We proceed under the hope that species will somehow be “equal enough” for most purposes, and that the differences among species won’t interfere too much with scientific progress or public understanding.

The best-known definition, provided by ornithologist Ernst Mayr in 1942 and widely taught in introductory biology classes since the 1950s, is short and snappy: “species are groups of actually or potentially

interbreeding natural populations, which are reproductively isolated from other such groups.” This is the so-called “biological species concept,” which many biologists accept in theory, although information on which organisms can interbreed is almost always lacking in practice. So, one generally just assumes such gene flow based on similarities and differences in the visible characteristics of the organisms, hoping that actual interbreeding will be tested directly someday. It has long been pointed out, however, that interbreeding and reproductive isolation aren’t relevant criteria for organisms that reproduce through asexual reproduction. Such is the case with many bacteria, for instance, and with some plants as well. And there’s the associated question of whether any level of interbreeding could or should be tolerated. This has been a special concern for botanists, where hybridization is often possible between species that appear to be quite distantly related (consider all of the strange orchids that have been produced in this way).

Although the biological species concept is the most widely known, there are a variety of alternatives that feature different criteria. One such alternative focuses on species as occupying particular ecological niches that differ from related species. Another one focuses on shared common ancestry, delimiting species based on

## A Cryptic Species in the Tangled Bank

In eastern North America, botanists have long recognized *Viburnum nudum* L. and *Viburnum cassinoides* L. as separate species, though the two can be difficult to distinguish. In studying these species in more detail, we recently discovered the existence of a “cryptic species,” which, although most closely related to *V. cassinoides*, has long been lumped with *V. nudum* in the southeastern US (Spriggs et al., 2019b; see also Spriggs 2019). This species was validly named *V. nitidum* by Scottish botanist William Aiton in 1789. We hypothesize that *V. nitidum* is indeed a separately evolving species based on multiple lines of evidence, including genetic data, differences in several morphological characters and in their ecological niches, and the apparent absence of interbreeding between *V. nitidum* plants and members of the other species.



Beth Spriggs in 2016 with *Viburnum nudum* L. (left) and *V. nitidum* Aiton (right).  
Photograph by Michael Donoghue

evidence that certain organisms and populations share a common ancestor separate from related species.

One concept I find especially appealing is known as the “evolutionary species concept,” proposed by the paleontologist George Gaylord Simpson in 1951. Working with fossils of long-dead mammals, he wanted to take the emphasis off of interbreeding (which he certainly couldn’t test). Instead, he conceptualized species in terms of a full evolutionary life cycle, from inception to extinction. Simpson said a species is: “a *phyletic lineage (ancestral-descendant sequence of interbreeding populations) evolving independently of others, with its own separate and unitary evolutionary role and tendencies.*” Under this view, the populations that we study today are time slices through an extended lineage evolving independently of other lineages. This concept provides a nice image of species, though for many people, “role and tendencies” have seemed a bit squishy and difficult criteria to apply in practice.

One very nice “solution” to the species problem was proposed by herpetologist Kevin de Queiroz in 1998, and reinforced in his subsequent work (e.g., de Queiroz, 2005). He noted that all of these concepts focus on populations or lineages extended through time and evolving independently of one another. In his view, reproductive isolation, ecological differentiation, and

exclusive shared ancestry may arise in different temporal sequences as the process of speciation (the origin of independently-evolving lineages) proceeds. At any given point in the process, species might have some of these properties, and not others. For example, gene flow may be cut off early in the process, perhaps by the simple geographic separation of populations, as compared to, for example, ecological differentiation.

Under de Queiroz’s so-called “general lineage concept” of species, phenomena formally viewed as necessary and sufficient defining criteria for species-hood, are instead understood to bear on whether, in fact, two lineages are evolving *separately*. If we find, for example, that the organisms in two populations are unable to breed successfully with one another, this provides pretty good evidence that the populations are evolving separately. Likewise, the finding that populations are occupying different ecological niches provides evidence of independence, as do consistent differences in morphological characteristics. These things don’t *define* species, but instead help us to *discover* them.

The general lineage concept of species has been steadily gaining popularity among evolutionary biologists, but it is still far from universally accepted. Personally, I like it very much, but would stress a



*Viburnum cassinoides* 593-2008\*C at the Arnold Arboretum. Photograph by Suzanne Mrozak



*Viburnum nudum* 'Winterthur' 431-2002\*A at the Arnold Arboretum. Photograph by William (Ned) Friedman



# Species are best viewed as hypotheses to be tested with evidence coming from as many different angles as possible.

few additional points. First, I think that the delimitation of a species is best viewed as putting forward a hypothesis to be tested with evidence of lineage independence coming from as many different angles as possible. By this I mean to include not only information on breeding, but on geography, morphology, DNA sequences, ecology, and a host of other criteria. Second, I would like to preserve Simpson's reference to the future and predicting the likely fate of a lineage. It seems reasonable to add into the decision-making process whether it seems likely that two lineages will continue to evolve independently into the future. Evidence bearing on fate may also come in different forms. For example, consider the two species of tulip tree: the familiar eastern North American *Liriodendron tulipifera*, and the eastern Asian *Liriodendron chinense*. These can readily be hybridized, and the offspring plants (*L. tulipifera* × *chinense*) are fertile. Living proof of this can be found at the Arnold Arboretum, on the lawn in front of the Hunnewell Building. But, it seems reasonable to suppose, based on their very widely separated geographic ranges, that individuals of these two species will not naturally be exchanging genes any time in the foreseeable future. Finally, I also really like the reference to "tendencies," as this highlights the idea that a separately evolving lineage will often show a propensity to generate certain variants again and again as compared to another species. Mind you, I don't at all mean to

suggest that such tendencies should define species; rather, in keeping with the general lineage concept, they can potentially serve as evidence of independent evolution.

Allow me to end with a few observations about my own favorite plant group, *Viburnum*. When I was a graduate student at Harvard, in the late 1970s, I lived on the grounds of the Arnold Arboretum, at what used to be 383 South Street. Of course, I wandered the grounds often, and it was there that I became well acquainted with around 40 of the roughly 165 *Viburnum* species, many of them from eastern Asia, where *Viburnum* is the most diverse. You can learn a lot about species differences in an arboretum, but not nearly enough to critically assess their evolutionary independence from one another. For one thing, you don't see the species that can't be grown in the arboretum (e.g., *Viburnum* species from tropical forests in Borneo, or from high elevations in the Andes), or the many species that could potentially be grown but have never been brought into cultivation. And, you really need to study organisms in their natural surroundings to understand the range of variation that they exhibit, their ecological niches, and which species might encounter one another in the wild.

I did, however, manage to observe something about *Viburnum* species that has turned out to be more important than I ever imagined. I went out on a regular basis to record the times when plants of

different *Viburnum* species were flowering in the arboretum. I found that they were flowering each year in a consistent sequence, staggered through the spring and early summer. In fact, these observations were the basis of my very first publication, in 1980, which happened to be in *Arnoldia*, and was entitled “Flowering times in *Viburnum*.”

As we have learned since that time, related species of *Viburnum* living in the same geographic area very often flower at different times, which means that they are reproductively isolated from one another in this temporal way. For example, as shown recently by my former graduate student Elizabeth Spriggs, the species of the *Viburnum lentago* complex in eastern North America (nannyberry and its relatives) bloom at different times, and this minimizes hybridization between them where their geographic ranges overlap (Spriggs et al., 2019a; Spriggs, 2019). We know that individuals of these different species can breed together successfully. In fact, *Viburnum* × *jackii*, a hybrid between *V. lentago* and *V. prunifolium*, was described from a plant first noticed in 1908 at the Arnold Arboretum. However, in the wild these species rarely do hybridize, simply because they are flowering a week or so apart. Importantly, given the discussion above, I am not supporting the biological species concept with this observation. Instead, I am adopting the general lineage concept and using this flowering offset as one line of evidence that these are time-extended lineages evolving on their own.

I hope that these few reflections will heighten your appreciation of species when you see your next specimen label in the Arnold Arboretum—perhaps even a *Viburnum lentago* L. plant in the superb *Viburnum* collection near the Centre Street Gate! 🌿

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ACKNOWLEDGEMENTS: I'm eternally grateful to the Arnold Arboretum and its amazing staff for all they have done to support my research and my appreciation of plant diversity. I'm especially grateful to Michael Dosmann for inviting me to contribute this essay, and for his wise advice on the content.

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LUCK  
 COLLABORATION  
 SOIL TOIL  
 WEEDY  
 ADAPTATION  
 CONVERSATION  
 REGULATION  
 EDUCATION  
 CULTIVATION  
 TRIPLOIDY





# Propagations

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TREE TIME

## A New Way for the Norway Maple

by Ryan Contreras

The summers of my youth in Eastern North Carolina smelled of Chinese privet (*Ligustrum sinense*) and Japanese honeysuckle (*Lonicera japonica*). As a kid, I loved playing with the tiny “berries” of the privet and sucking the nectar from the honeysuckle flowers. Warm memories aside, these two species are landscape plants turned weeds, which escaped cultivation and invaded large areas across the Southeast. As someone who works with the nursery industry and specifically with this issue of weedy or invasive plants, it sometimes feels that folks believe *all* introduced plants are bad, and we should only grow natives to protect our ecosystems.

We should think, however, about what is it we are asking our landscape plants to do. In the city, we want them to survive stress, even to flourish. We want to punish them with drought, heat, pavement, and poor and compacted soils while still enjoying their shade, beautiful flowers, lovely scent, and fruit. Whether native or introduced, plants that thrive well enough to escape cultivation are doing *exactly* what we asked of them.

I often hear that we should only plant native plants because they are best adapted to a site or region. If that is the case, how do the non-native and introduced species outcompete them? There also are “native” plants that have become “invasive”: western juniper, for instance, now covers more than 2 million acres of grassland in Oregon, its spread aided by fire suppression. We need plants that do well in our cities. We should care less about their provenance and focus more on their behavior.

The problem isn't trees that flourish, but trees that won't stay where we put them.

Take the Amur and Norway maples, two resilient species commonly found in our cities. Easy for producers to grow, they thrive where other species may not survive. Amur maple is hardy to USDA Zone 2, fitting the bill for a small urban tree in regions short on options of plants from which to choose. Norway maple is hardy to USDA Zone 4, making it suitable as a medium to large tree in most of the US. Both are relatively free of major pest problems, and transplant well. Norway maple is also incredibly well-adapted to heavy clay and compacted soils, tolerates pollution, and holds up better to drought conditions than sugar maple. Unfortunately, both have done their job too well, and have escaped cultivation to invade native forests and cause real problems in several parts of the country. As an urban tree, however, they fit the bill incredibly well, helping to ameliorate the heat-island effect, manage stormwater, and beautify our paved metropolises. It is not surprising that such resilient trees can outcompete other species.

On Burnside Avenue in downtown Portland, Oregon, just down the street from Powell's City of Books, there is a planting of Norway maple that separates opposing lanes of traffic. The soil volume is tiny, and tall buildings loom on either side. Yet, these Norway maples are gorgeous; more than 35 feet tall and healthy, they cover most of the five-lane driving surface and cast shade on the sidewalks for pedestrians. Contrast this to urban instances of our native bigleaf maple, such as the large specimen near Valley Library here on the Corvallis Campus, or the majestic tree that greets you as you set out on the trail at Hoyt Arboretum in



Portland. These are “easy” sites for trees, with large soil volumes and little compaction. You will not find bigleaf maples adorning streets like Burnside Avenue, however.

We could alter conditions to suit bigleaf maple—redeveloping our cities for more soil volume, less concrete, and less pollution—but that does not seem likely. Alternatively, we could breed more resilient bigleaf maples—a path that is being explored, but likely will take a *very* long time.

My research program is making great progress pursuing a third option: breeding Amur and Norway maples that stay put where we plant them. We want to provide growers, land managers, and the public the utility of resilient trees that are good for cities, but also do not reproduce in sufficient numbers to displace our native flora.

Here, it’s worth mentioning ‘Bradford’ pear. Perhaps the most numerous of the many cultivars of *Pyrus calleryana*, it has become the poster child for invasive plants. Smelly, weedy, fragile in ice storms, it’s the tree people love to hate. ‘Bradford’ and other pears are self-incompatible, which means they need another genotype to fertilize their ovules and form seeds. Soon—as new cultivars were introduced—these genotypes started cross-pollinating and producing fruit, soon becoming the weed we know today. *Pyrus* ‘NCPX2’, the Chastity® pear developed by Tom Ranney of North Carolina State University, by contrast, was recently tested for fertility compared to wild-type, and is not merely self-incompatible. Chastity® is a triploid—that is, it has three sets of chromosomes. This odd ploidy (number of chromosome sets) disrupts normal formation of pollen and eggs, resulting in a plant that infrequently or never produces viable seeds. The most famous triploid out there is banana. If you have enjoyed a ‘Cavendish’ dessert banana, then you have enjoyed a delicious fruit rendered seedless through triploidy.

Though there are reported examples of Norway maple exhibiting reduced seed set or seed germination, in my experience these cultivars are perfectly fertile. It is unclear in what contexts the trees have

The problem isn’t trees that flourish, but trees that won’t stay where we put them.

set seed, but these cultivars are not sterile across environments—thus my reluctance to use the word “sterile” in context of seed set. As with most cases in nature, there is a gradient from perfectly fertile wild-type down to complete sterility. As such, I try to stick with “reduced fertility” as the descriptor for cultivars that reproduce at such a low level as to pose no ecological threat.

The first step in the process was to induce chromosome doubling of standard diploid plants (containing two sets of chromosomes) to develop tetraploids (plants with four sets of chromosomes). We planted our tetraploids alongside diploid cultivars at our field in Corvallis and allowed them to open pollinate. We collected seed from the tetraploids, grew seedlings, and tested their ploidy level. Fortunately, most of these seedlings were triploid—they received two sets of chromosomes from their tetraploid female parent and one set from their diploid male parent. Furthermore, these seedlings are not genetic composite (chimeras), but are triploid in all cell layers, and thus highly stable from one generation to the next.

Ten years after starting this project, I published the results of this work in 2020 in the journal *Horticulturae*. But the work in so many ways is just beginning. To

produce the seedless trees we desire, they must be propagated clonally. Traditionally, Norway maples (and Amur, too, in some nurseries) have been chip budded, grafting the cultivar of interest to seedling rootstocks. While this production system speeds up the production and quantities of triploid clones, we need a new tactic. This is because we must avoid at all costs grafting our sterile triploids onto fertile diploid rootstocks—rootstocks that can sometimes send up their own shoots and eventually produce seeds, which happened with callery pear. For Amur maple, this is not a major problem, as it readily roots from stem cuttings. For Norway maple, which does not, we have been working to optimize cutting propagation. We now have triploid genotypes of both species, which we are growing via micropropagation, using sterile culture *in vitro* to multiply plants in large numbers relatively quickly. This technique is used in many taxa that would otherwise be slow to increase using other methods, such as hazelnuts (*Corylus avellana*). It also is frequently used in red maple as a means to increase and distribute clean clonal material. Our triploid plants will be ready to come out of micropropagation and harden off to begin production trials during 2022.

Evidence of reduced fertility gives us much reason to hope. Amur maple triploids in our plots have flowered in the presence of pollinators and fertile pollen donors and have produced no viable seeds to date. While this inspires confidence, I am not ready to bet the farm—or rather, to have growers bet theirs. Our next step is to work with nurseries, universities, and public gardens around the country to install replicated tests of our trees to see how they perform in other environments. The stakes are too high not to verify.

Of course, my title is Ornamental Plant Breeder, so the trees resulting from this work should have some aesthetic appeal. To that end, we are working with J. Frank Schmidt and Son Nursery along with Tom Ranney to evaluate seedlings of Amur maple selected at JFS in Boring, NC State in Mills River,

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and Corvallis, OR. Ten genotypes from each location were propagated during 2021 under production conditions to identify superior forms. Furthermore, the trees from micropropagation will be included in a parallel study. The end goal is to develop and test trees according to the best scientific methods we have, while working with growers to ensure that we are meeting their needs for trees that work in production.

There is no doubt of the need. Industry partners report more than 90% reduction in Norway maple sales, with steep declines in Amur maple as well. Certainly, overplanting of maples has reduced demand, but the invasive issue has also had an impact, and the industry is ready for cultivars of these species that could be sold in longstanding markets such as the upper Midwest and New England.

Evidence indicates the trees I have developed (and those of my colleagues like Dr. Ranney) are “sterile,” or close enough that they present no threat of invasion. The biological side of the problem is largely solved. What remains is the political aspect, which in many ways is more difficult. The story of ‘Bradford,’ damaging in its lack of nuance, has spread effectively, and plants like Norway maple may prove difficult to reintroduce as a result. Already it is illegal to plant *A. platanoides* in Massachusetts, and many other states—a rule which leaves no room for reduced-fertility cultivar exemptions.

We need a national conversation on this topic in the Green Industry, to collectively establish the framework for reintroduction of sterile versions of weedy species. The specifics of individual plants are highly regional, and thresholds should be determined at a state level, but the issue is a national one. The shade of that tree you’re enjoying on the east coast may have gotten its start here in Oregon. As such, the rules enacted in Massachusetts have wide-ranging impact. The need for education, collaboration, and nuanced regulation will only grow, so long as cities remain, and climate change increases the demand for resilient trees. 🌿



# What Clings to the Roots

by Matthew Battles

The morning we moved out of my childhood home, the new owner pulled up with a small tractor to uproot the Forsythia hedge, my mother's pride. It was late April, I think, as the bushes were in bloom; sprays of yellow blossoms shivered as the backhoe groaned and clawed at the plantings. I was shocked by how easily they came up, ungainly roots whipsawing as they shook loose from earth. My mother sobbed as we drove away. And yet soil clings to the roots; an ecology shifts intact. To uproot is an ambivalent move, metaphorically: is it about the fragility of attachments, or their stubbornness to endure?

Salomé Jashi's *Taming the Garden* opens with a tree shimmering on the horizon, rooted in the liquid tumble of the sea. Lashed to the deck of a barge, its headway is barely perceptible against the lowering sky. The barge sails under the orders of Georgian oligarch Bidzina Ivanishvili, whose minions search farm and forest for the prodigious trees he has uprooted and moved to his "dendrological park" in Shekvetili, a resort town on Black Sea coast. We never see Ivanishvili; no agents or officials sit to offer apologies or explanations to the camera. The oligarch's name is only occasionally uttered by workmen and townspeople, and he remains a minor character, his motives a mystery to the people whose trees he takes. One man claims to have read that "it prolongs his life" to collect trees, if their age is greater than one hundred years. Some praise his enterprise, while others boggle at the cost of the operation. "No matter how much a villain he is," another exclaims, "at least he's doing something!"

Townspeople gawk at their trees on the move. Their faces register the dappled play of emotions, from grief to wonder, as workers cut, dig, and lever at giant trees—a towering tulip, goblet-shaped and elegant; a bounteous linden growing close by an old house; a chestnut with two splayed leaders that swing



like the arms of a drunken giant. Their slow severance from the earth is both clumsy and precise, a kind of terrestrial surgery, at once an amputation and a deliverance of tender care. Jashi allows the sensuous overwhelm of these labors to fill her frame: a trench dug round the tree, the earth wrapped with sheets and shored up with boards, and a framework of pipes bored through below, driven home with rust-streaked drilling augers. The scale of the work matters to Jashi: we see men chopping, sawing, dragging brush, dwarfed by walls and mounds of foliage. A backhoe swings into view, framing the shot like a great mechanized tree; from another angle, viewed downslope through a colonnade of what look like hemlocks, the same machine looks minuscule. During a break, the crew sit around a fire of brush and reminisce. They agree that the trees are very beautiful. "Life takes strange turns," says one.

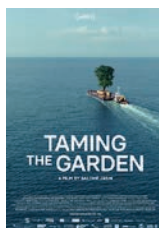
Jashi is a generous storyteller, and patient. Long takes invite us to ponder how a mature tree organizes its surrounding space: the way the earth bunches muscularly at the roots; how its shade selects and prunes the vegetation; above all, the way it pigments and concentrates the air in its branches. And then we watch the slow, uncanny spectacle of this composition deconstructed, as yet another great tree is carved out of the ground, jacked onto a



carriage, and towed off, leaving a crumbling pit of soil to fill up with new vegetation.

I think of those islands of earth cut and carried away, with their cryptic assemblages of fungi and invertebrates, to be installed in the oligarch's faraway estate, ferns and flowering plants bobbing in the shade of a tree transported over the sea. The trees' communities exceed grasses, forbs, and fungi, however, rooted as they are in the loam of family and village. Local people gather in the night to watch as a towed tree sways in spotlight gleam. "It's so beautiful in the night," one says. "Like a fairytale." "It won't survive," says another, "it's shrunk so much." An old woman confronts the cutters: "she planted this tree," her companion warns the foreman; "what we do in this world will be judged in the next." Elders embrace, young people shoot video on cellphones, the tree moving stately through pines as flashlights lance through the galleries of boughs, the lights of the trucks closing in, filling the frame, branches of roadside trees snapping as the tulip shoulders through. Jashi stays with these shots a long time, lingering in the strangeness of a tree swaying in the still of night.

What are we to make of Ivanishvili's uprootings? How do we weigh the ecological and social costs; how does his project compare to the collecting practices of public gardens and arboreta? Jashi eschews such



**Taming the Garden**  
Directed by  
Salomé Jashi  
2021

**Matthew Battles**  
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*Arnoldia*.

ready questions and contrasts, preferring to dwell patiently in the confusion of the more-than-human encounter. Resisting easy critique, her eye is anthropological, tracing the exertions of people and trees with equanimity and affection. Along with townspeople and workers, we're invited to boggle, mourn, and wonder. And the trees in the end are beautiful, settled in their new home amid sprinklers and curving paths.

In his lavish account of Kublai Khan's pleasure palace, Marco Polo describes a hill planted with mature evergreens collected throughout the empire and carried to the capital by elephants. Historically, Marco Polo arrives on the eve of modernity and the coming Anthropocene—before the forests of North America travelled upright over the seas in the form of ships' masts; before the forests of Asia and South America were felled for tea and palm and rape-seed. The ecological impact of Ivanishvili's Dendrological Park pales by comparison to such depredations. It's even beautiful in its way. Like the green hill of the Khan, the oligarch's park is lush, verdant, well tended. The birdsong there is fluting and evocative. And yet the trees are still rigged with the cables, bound fast like wild beasts. The oligarch wants his country to behave like a well-loved garden. And yet, as Salomé Jashi reminds us, the memory of living soil persists amid the roots. 🌿





GREEN CITIES

# Of Trees and the City

by Matthew Stephens

Anyone who has planted and cared for a new tree knows that few things in life are as rewarding as this simple act. Planting day is unquestionably a stand back and be proud moment, but those of you who have planted one tree, or many, know that the real work (and appreciation) is just beginning. The watering, weeding, pruning, and care that is needed is an investment that will pay back dividends in seeing a tree grow bigger and bigger with each passing season.

I happen to fall into a special category of tree planters: someone who can take credit for having played a significant role in planting over one million trees. This is becoming less of an incredible accomplishment given many places are now planting millions or billions of trees to combat climate change. However, there are few who can claim such a large bounty in an urban area, and specifically New York City. Prior to becoming the current President & CEO at Mount Auburn Cemetery, I helped to lead MillionTreesNYC, an effort to plant one million trees throughout all of New York City between 2007 and 2015. We planted trees along streets, in parks, and in cemeteries and botanical gardens—work that will continue indefinitely, just as occurs in nature.

One question I have been asked about my work is, “how do you plant a million trees in New York City?” The answer can be reduced to a simple instruction: one tree at a time! Further,

New York City should be applauded for its efforts to use MillionTreesNYC as a springboard to further investment in pruning, permitting enforcement, and staffing tied to managing the urban forest.

Having landed at Mount Auburn in September 2021 as its new President & CEO, I was immediately entranced by the awe-inspiring collection of oaks and beeches. Without question, Mount Auburn has one of the best collections of mature trees anywhere in the United States, with nearly 4,700 trees of varying ages and over 650 taxa on its 175 acres. During a ten-minute walk on the grounds, you are sure to see specimens of multiple species of trees that will be some of the best you'll ever see! Our trees, some over 200 years old, have seen the world reinvent itself many times over, yet continue to reach for the skies with each passing year. For nearly 200 years our trees have received remarkable care in the form of watering, pruning, and other conscientious landscape maintenance techniques which have allowed them to thrive. Further, trees at Mount Auburn don't have the same competition as most urban trees.

While tree planting traditionally gets the most fanfare and showy pictures, the years of effort and care leading up to a canopy-covered street tend to be overlooked. A few steps beyond our gates I am reminded of how tough it is to be an urban tree, especially a street tree. Between traffic, dogs, developers, climate change, and countless other variables, these trees face many stresses which shorten their lifespans. Struggling to keep up with necessary tree maintenance, cities worldwide have backed away from tree planting goals—while also minting goals for canopy coverage. Ultimately, it is every urban forester's hope to invest resources, create policies, and develop stewardship to increase the canopy percentage over time.

Trees happen to be quiet constituents. Rarely will an email, phone call, or press conference intervene when a community tree is suffering, unless an urban Lorax intervenes. Trees take time to grow; a future canopy doesn't develop on the schedule of

We need those who will speak for the trees, knowing they are a critical part of the urban infrastructure.

politics and budget cycles. A tree planted today will take decades to equal the annual ecosystem services generated by the biggest and most beloved trees. This is a tough reality for trees in all our communities. However, the data that have been collected over the last three decades enunciate with extreme clarity: mature trees, and especially large shade trees, are exponentially *much* more significant providers of the ecosystem services. The math is simple: the larger the tree and more leaf surface area, the larger the benefits. For example, a newly planted tree, just a few inches in diameter, may sequester six pounds of carbon, or currently valued at about thirty cents; a mature tree greater than thirty inches in diameter, by contrast, will sequester over 6,000 pounds of carbon, worth some four hundred dollars. A thousand-fold increase! With that, how can trees continue to be overlooked?

Beyond their value as carbon store, trees provide real and tangible benefits in the form of cleaner air, shade for buildings, or stormwater capture among many, many others. Many years ago I remember talking to Dr. David Novak with the US Forest Service who has dedicated his career to studying urban forests. Comparing the urban forest to other forms of infrastructure, he mentioned that we are just starting to fully realize the benefits of trees. Walk down the street where you live, and you will see some permutation of city infrastructure: fire hydrants to ensure buildings don't burn down, light poles to provide safety, or stop lights to allow traffic to be regulated, among others. Funded through local, state, or federal dollars, these investments improve the quality of life or safety of a given neighborhood. Compared to trees, however, light poles have lower dollar value in benefits—and unlike trees, they decrease in value over time.

Why, then, have trees gone so overlooked as critical parts of urban infrastructure? Simple: trees are rarely considered a capital investment. But, if they were, it would provide urban foresters access to new and necessary sources of funding. Additional funding and pragmatic, focused



local tree preservation legislation are long overdue. Trees should be funded, along with highly competent urban forestry managers to manage the urban forest—which, like all critical urban infrastructure, is key to the safety and well-being of residents. In addition, many cities have a mechanism in place to raise capital monies through the selling of municipal bonds—why couldn't trees be included along with other key infrastructure that elevates the quality of life of a locality?

Many cities are making great strides, but there is still much work to be done. During my time in New York City, I would travel the country helping other cities figure out how to attract more funding for trees. Some cities were incredibly creative, but a clear thread emerged: urban forestry managers must scratch and claw for every dollar they get. And trees get pennies on the dollar compared to other urban infrastructure. In many cities, public/private partnerships are aiming to fill the gaps. From Washington, DC, to San Francisco, to Portland, robust and sophisticated urban forestry nonprofits are filling the gaps left by public funding.

One irony of this struggle is that many cities or towns have left tree management/urban forestry to a roads and sidewalks or public works department—the areas of government that typically manage infrastructure. As a result, urban forestry programs have modest resources and/or no meaningful political support given they are buried in large public works departments, and must compete against potholes or sidewalks for attention and funding. The reality, however, is that a well-sited tree likely will outlive all its infrastructure counterparts, outlasting sidewalks, stoplights, and even many buildings.

Further, local tree legislation that protects trees on public and private property is also lagging. Every city desires some level of development; however, it has also been the experience of many urban foresters that the impacts trees encounter from new construction, sidewalk/driveway work, or other infrastructure projects lead to a significant

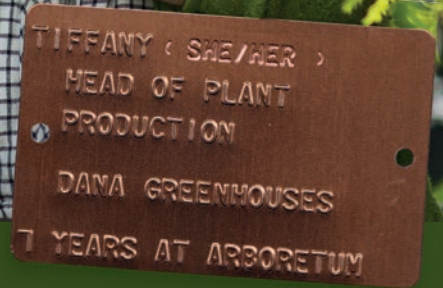
number of removals or tree mortality after construction is completed. While a tree may not die immediately from construction impacts, my time working in New York suggests trees must be monitored for several years post construction to fully assess development impacts. When I met with developers in New York, they were quick to point out that they will likely spend more on doorknobs or cabinet handles than they will on trees—even though the trees become part of infrastructure, and a community asset. When replacement is mandated by local legislation, it often merely requires a 1:1 planting ratio—such that an old mature oak tree in its prime, for example, might be replaced with a newly planted red maple. We know from the data, however, that a newly planted tree can't replace a fully-grown tree in the urban infrastructure. There are few cities like New York City who are using a basal-area replacement methodology, which is a more appropriate way of calculating the true cost of removing healthy trees. That calculation not only more adequately accounts for loss, but protects trees by ensuring that any developer thinks twice before removing a tree.

The time for policy change is now. We need those who will speak for the trees, knowing they are a critical part of the urban infrastructure. Find fellow Loraxes, and organize. Approach your local elected officials and let them know how important the trees are to you and your community. Work with them to move forward thoughtful and pragmatic legislation. It will take time, steadfastness, and collective action by like-minded citizens who can speak and act civilly and passionately to make change—change that will, that must, happen one tree at a time.

If you are in the Boston area, I encourage you to stop by Mount Auburn to check out our incredible canopy in a thriving metropolis. I guarantee you will leave feeling inspired by our one-of-a-kind landscape. Then, find a tree in your own neighborhood and start giving it some care. I am certain the time and energy you invest will be repaid in dividends. Enjoy your trees! 🌿

**Matthew Stephens** is President and CEO of Mount Auburn Cemetery in Cambridge, Massachusetts.

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## Deadheading Lilacs

By **Conor Guidarelli**, Arboretum Horticulturist

396

Approximate number of live lilacs in the Arnold collection.

70

Percentage of ethanol in the solution used to sterilize shears.

The Lilac Collection has been getting its very own special day of celebration, Lilac Sunday, every Mother's Day for the past 112 years. Flowering extends beyond this day, of course, running from the end of April to the beginning of June. Within 2 weeks of flower wilt, we begin preparation for next year's spectacle by deadheading the lilacs. This practice helps to ensure that the shrubs do not expend more energy in seed production, but rather use it to produce flower buds more prolifically.

Many hands make quick work of this time-sensitive task, as interns, seasonal gardeners, and horticulturists make their way through over one hundred plants. Some shrubs are so large that we need our six-foot extendable pruners to reach many of the spent flowers. Orchard ladders extend our reach even further, making it easy to maneuver in and around a shrub. Between plants, we spray sterilizing solution on our snips to prevent the spread of pathogens like phytoplasmas, often called Lilac Yellows. All the cuttings are collected and composted, to return to the collection as a soil amendment come the fall.

Nigel Popplewell, Raydaliz Cancel, and Conor Guidarelli deep in deadheading. *Photograph by Andrew Gapinski*







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