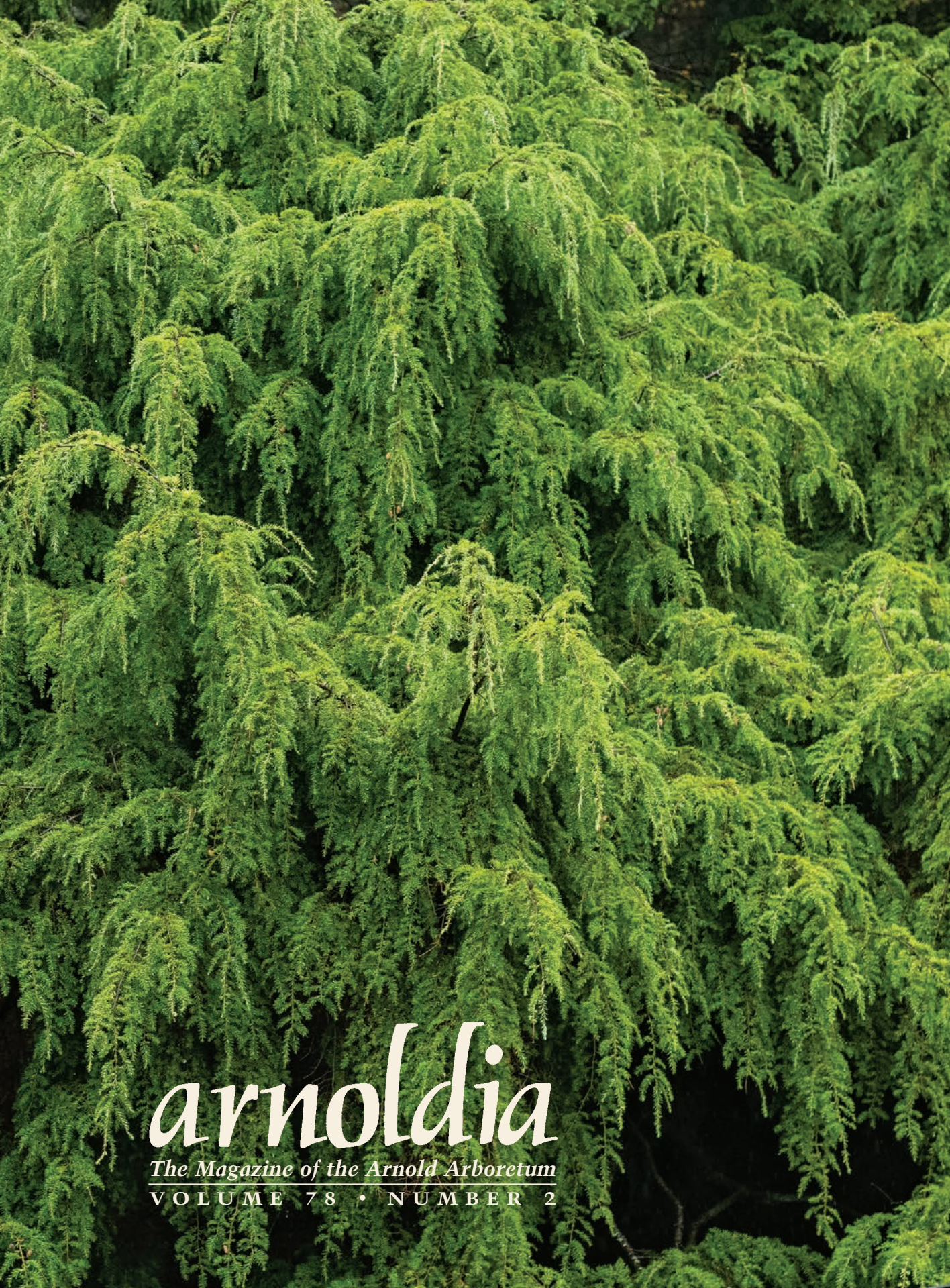

arnoldia

The Magazine of the Arnold Arboretum

VOLUME 78 • NUMBER 2

W. G. Terry (1828), it is chiefly a compilation
n Purton's work, with additions by the author, and
sents no features demanding special comment.
mes Britten, F.L.S.

THE WEEPING BEECH.

T is not too much to say that the Weeping Beech
gus sylvatica pendula) is one of the most strikingly
utiful of deciduous trees—its beauty being of the
tesque and picturesque rather than of the spruce
symmetrical order. It is so singularly erratic in
wth that no two trees take the same character, and
all alike possess a certain free and easy develop-
nt, as if bidding defiance to rule and order, com-
ing therewith a peculiar style of gracefulness in
weeping masses of pendent spray. Loudon does
o more than justice when he merely says (Arb. Brit.
1952), that "it forms a very singular and highly

FIG. 298.

utiful object, well deserving a place in collections
weeping trees," for its grand mountain-like masses
so striking in character and so eccentric in form—
e like a gentle slope, there like a craggy precipice—
t no amount of praise could overstate its merits as
ornamental tree.

The accompanying woodcut (fig. 298) will show that
are not exaggerating. For the opportunity of
roducing it in this place we have to thank Mr. A.
terer, of the Knap Hill Nursery, Woking. It
ns one of a series of beautiful illustrations to Mr.
terer's new catalogue, a list which conveys just the
t of information which is most useful to planters in
king their selections, and aids them still further
putting before them pictures of some of the fine
cimens for which this establishment is famed.
ese illustrations—our present figure amongst them,
e been copied from careful and excellent photo-
phs taken in the Knap Hill Nursery, by Messrs.
ts & Co., of Diary renown, and who have also
st charmingly rendered them in the engravings, as
present example will show.

The Weeping Beech is the most taking in the cata-

Pædia of Trees and Shrubs," is very different from this. He writes: "The Rev. M. J. Berkeley informs me, in a letter dated June 2, 1837, that in one of the plantations bordering Milton Park, the seat of Earl Fitzwilliam, in Northamptonshire, there is a beautiful accidental Weeping variety of the Beech. The branches are beautifully pendent, and even the last 6 feet of the top bend down. The height is 50 feet." The general habit of this tree must be much more erect than that of the variety we here represent. *T. M.*

TABLE PLANTS.

Reidia glaucescens.—This is one of the prettiest of all the plants I know for either stove, house, or table decoration. It is a woody stove shrub, with narrowish compound leaves, which at first sight gives it the appearance of belonging to the Pea family. These are about 6 inches long and about an inch broad, each placed close to a row of small pinkish white tassels, which are the flowers, about an inch in length, hanging all along from the midrib of the leaf, which gives the plant an elegance that is almost beyond conception. All those who are in search of rare and beautiful plants for decoration should try this. It is worthy of a place in every collection. I may say it was Mr. Woodbridge, now of Sion, that first called my attention to its merits.

Correa magnifica.—This is one of the prettiest and most showy of all the winter-flowering greenhouse plants, and it will do also for the table when it can be obtained in nice bushy plants through frequent pinchings during the growing season. It continues flowering for months together, and its colour, which in the main is of an attractive red, makes it have a very striking appearance. The flowers are not large, being tubular, and superficially not unlike a Pentstemon. It requires treatment similar to most other New Holland plants, that is, greenhouse temperature in winter, the natural climate of this country in summer, with a soil equally made up of turfy loam, peat, and some sand. This is a plant that is worthy of more general culture, and its flowers are also useful for bouquets

a foot in length, and an inch in breadth, which cu
outwards towards the top, giving the plant a ve
elegant appearance. It is not such a strong grow
as either N. exaltata or N. davallioides, and is m
useful for cutting from for mixing amongst cut flowe
or for adorning the front shelf of the Fern-house, wh
it is a general favourite. It can be easily increased,
numerous rhizomes spring up round the bottom.

Gesnera macrantha, with its beautiful green, ov
crenate, pubescent, opposite leaves, and velvety tul
lar red flowers, is very handsome indeed, in nice pla
for the table. Its flowers contrast beautifully w
its leaves, and altogether the plant is very charmi
Under a magnifying glass the flowers are of the rich
red velvet.

G. cinnabarina, *zebrina*, and *exoniensis*, remarkal
for their beautiful foliage as well as flowers, are wort
of the very highest praise for winter decoration in t
stove or house. Their flowers are mostly red, and

unlike miniature Foxgloves. The plants require st
temperature, with a soil composed to a good extent
peat, and they continue flowering the greater part
the winter months.

Sedum Sieboldii.—This common hardy prostr
plant, with roundish glaucous leaves and spread
branches, is very useful for house or table decoration
autumn. The plant has large heads of rosy p
flowers, and a habit slightly drooping, which gives
fine effect when slightly elevated. When its succul
leaves are well bronzed under the sun's influence,
gives it an additional effect at night.

Selaginella apoda.—This is very pretty for sm
dishes for table, or, from its dwarf, dense green hal
for furnishing the surfaces of other vases that are
over well clothed below. In a shady stove it can
grown in almost any quantity, not being particular
to soil. A few days ago I put a nice pan of it int
room, with a small, well-coloured plant of Mrs. Pollo
Pelargonium in the centre, and it had a very pleas
effect. *R. M.*

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The ARNOLD ARBORETUM of HARVARD UNIVERSITY

CONTENTS

Front and back cover: A Sargent's weeping hemlock (15820*B) creates wave upon wave of foliage at the Arnold Arboretum, where it is labeled as *Tsuga canadensis* forma *pendula.* In his article, Peter Del Tredici contends that this selection should be known as *T. canadensis* 'Sargentii'. Photo by Jonathan Damery.

Inside front cover: A woodcut illustration of a weeping beech (*Fagus sylvatica* 'Pendula') appeared in *The Gardeners' Chronicle and Agricultural Gazette* in 1870. The featured specimen was grown at Anthony Waterer's Knap Hill Nursery, in Woking, England. Illustration from Biodiversity Heritage Library.

Inside back cover: A venerable weeping beech (*Fagus sylvatica* 'Pendula', 22746*A) creates an enchanted cathedral at the Arnold Arboretum. Photo by Jonathan Damery.

PUBLICATION NOTE: Volume 78 will comprise six issues published on the current quarterly schedule. Volume 79 will begin with the first issue published in 2022 and will include four issues.

Pandemic Digitization

Anthony R. Brach

Listening to Vivaldi's *Four Seasons,* I began my day transcribing data from herbarium-specimen labels. The melodies and the early morning light mixed, and I entered the zone, my fingers typing rhythmically with the music. Staff at the Harvard University Herbaria transitioned to working from home due to the coronavirus pandemic on March 16. In the early weeks of this new routine, I was transcribing detailed data from specimens collected in Wyoming—locations like Devils Tower and Yellowstone—but instead of handling the physical specimens, I was working from images on my screen.

This current work has been very different from the normal day-to-day curatorial activities at the Herbaria. Researchers, who we would normally be assisting, have been unable to visit the collections. Our team, likewise, was initially unable to be on-site for routine activities like processing incoming and outgoing shipments of loans, gifts, and exchanges. We could not mount new specimens or file them into the collection; nor could we update specimens with new taxonomic determinations. We have even discouraged other institutions from sending materials given potential shipping and handling delays. Before this began, however, our team was busy with a long-term effort to share images and data from our collections online, and this meant we could use the same images to continue digitization projects remotely as well.

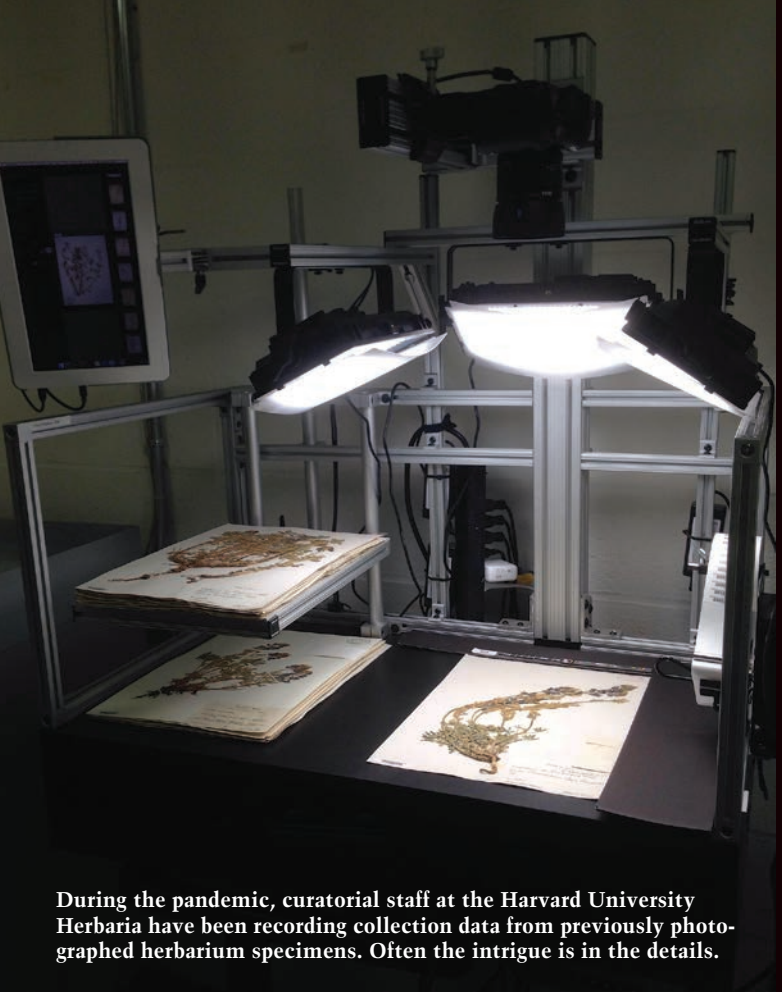
Over the past 170 years, the Herbaria have amassed more than five million specimens, making our collections one of the largest in the world. Given the scale, specimens have been digitized on a project-by-project basis. About one-quarter of our total holdings have been digitized to date. I like to think of imaging and transcription of specimen labels as "publishing" unfinished symphonies composed by botanists. Without digitization, their collections are often hidden in the Herbaria, requiring either in-person visits or potentially risky shipments of specimen loans. Among the Wyoming specimens, for instance, I enjoyed databasing those collected by Reed Rollins, a Harvard professor and longtime director of the Gray Herbarium. Many of his extensive collections of the mustard family (Brassicaceae) were redetermined by his student Ihsan Al-Shehbaz, who followed Rollins as the world's foremost taxonomist of this family. Now digitized, their collaborative work has become available for study by a new generation of researchers.

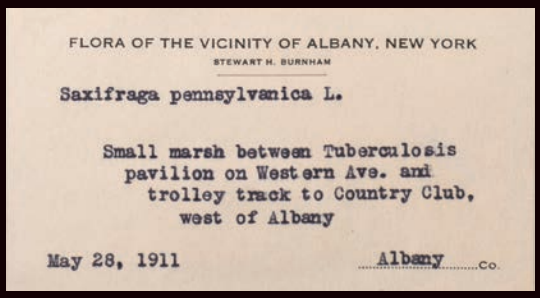
Before the pandemic, our curatorial team was in the middle of three collaborative digitization projects funded by the National Science Foundation and coordinated through the Thematic Collection Network. One focuses on the Southern Rockies. The second focuses on the vascular flora of the South Central United States, particularly Texas and Oklahoma. The third is called Endless Forms (or Plants on Edge) and focuses on fifteen families of rare and endangered plants with unique morphological adaptations, including orchids (Orchidaceae), cacti (Cactaceae), and sedums (Crassulaceae). Combined, these projects include about 470,000 specimens.

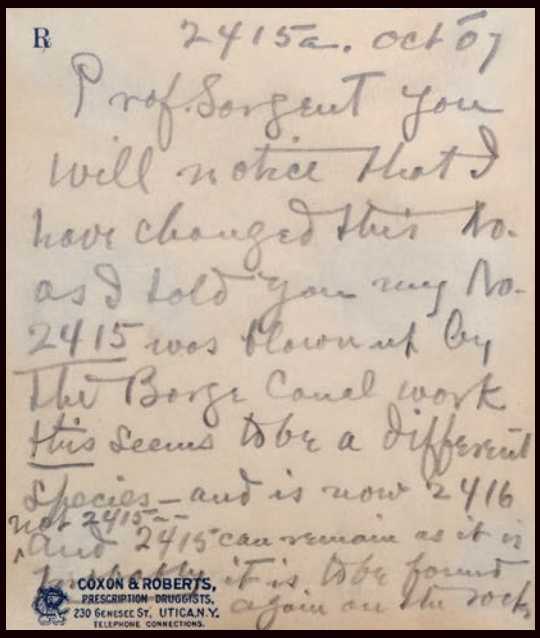
Our director of collections Michaela Schmull and the director of informatics Jonathan Kennedy have orchestrated our curatorial team's digitization efforts so that, rather than pulling collections piecemeal by individual states (states are filed alphabetically for each species), all vascular plants from the United States and Canada were added to the queue. This expansion (another 1.6 million specimens) is part of the Herbaria's effort to digitize the entire collection.

When the closures began, I had been photographing *Lupinus* in the legume family (Fabaceae), and recently, I had photographed specimens of a few other families with great diversity in the Rockies, including the mustards (Brassicaceae) and saxifrages (Saxifragaceae).

Now, working from our homes as a team, the thirteen of us curatorial assistants had the opportunity to loop back and record detailed







During the pandemic, curatorial staff at the Harvard University Herbaria have been recording collection data from previously photographed herbarium specimens. Often the intrigue is in the details.

data from specimens we had already photographed. This data entry allows the specimens to be searchable using details like the collector's name and collection date. Our team completed transcription from available images from project-related states (about 66,670 specimens) after the first couple of months of the pandemic. This could have taken three times longer if not for our work-from-home efforts. Next, we moved onto other states and provinces not part of the projects.

For this second phase, I selected New York. I was born in Rochester, and when I was just a kid, I carried *Peterson's Field Guide to Wildflowers of Northeastern and North-Central North America* on hikes with my dad, who was an avid, knowledgeable amateur botanist. He took my brothers and me to regional parks and to the Adirondack Mountains. In my college years, I explored the Hudson River Valley and Long Island Sound, and my graduate research on the ecology of forest-understory herbs and ferns brought me back to the Adirondacks. Transcribing specimen labels for this familiar flora allowed me, in some sense, to revisit these ecosystems.

Because many labels were from the nineteenth to early twentieth centuries, only a fraction were typed, while many were handwritten and of various degrees of legibility. Since the beginning of the pandemic, our team has been communicating via Slack, a chatting tool that we have used for asking questions and helping one another decipher illegible handwriting on labels. I was amused by two handwritten labels for collections from Irondequoit Bay (Rochester area) and Taughannock Falls (north of Ithaca). If not for my familiarity with these places, I do not know if I could have deciphered them. We also have a very large collection of specimens from New York that were collected by Asa Gray, the first director of the Gray Herbarium, whose handwriting has always been challenging to read.

I was fascinated to see specimens collected more than one hundred years ago near my hometown and from other familiar places. In 1889, collector John Dunbar told Charles

Sprague Sargent, the director of the Arnold Arboretum, about many hawthorns (*Crataegus*) near Rochester that did not match any described species. Dunbar and others—including his coworkers Calvin C. Laney, Henry T. Brown, and Berhard H. Slavin (all from the Rochester Parks Department)—collected hundreds of specimens for Sargent.

Beyond the familiar locations, some specimens included details that made these places come alive with activity. I came across a 1905 label, for instance, which noted that small boys filled their pockets with fruits from a scarlet hawthorn (*Crataegus pedicellata*). Others documented landscapes that were changing like the tempo of Grieg's "In the Hall of the Mountain King" (made popular in *Fantasia*). A dramatic 1907 label for another hawthorn (*C. brainerdii*), for instance, marked history: "Prof. Sargent you will notice that I have changed this No. as I told you my No. 2415 was *blown up* by the Barge Canal work," a physician-botanist named Joseph V. Haberer wrote. Strikingly, the label recorded an instance of the widening of the Erie Canal, between 1905 and 1918, for use by large barges.

When I encounter multiple specimens from the same collector, I often look up the person's backstory. Collections by botanists who happened to be medical doctors often catch my attention, especially since one of my sons serves as a doctor of osteopathic medicine and his brothers study pharmacy and medicine. In addition to Haberer (and Asa Gray, who trained as a physician), other medical doctors who collected specimens in New York included Henry P. Sartwell, George Thurber, Peter D. Knieskern, George G. Kennedy, and Edwin H. Eames. Their collections, too, have now been digitized for continued studies.

Starting on June 15, our team transitioned to a hybrid work model, which allowed for limited entries into the Herbaria for a set number of hours, one day per week. This required strict adherence to the university's guidelines, safety protocols, and weekly coronavirus testing. It was a relief to be back but strange returning to a near-empty place, devoid of researchers. With this on-site day each week, I aimed to take care of essential services for the collections, in coordination with others during their allotted times at the Herbaria. I processed incoming shipments (after freezing to prevent potential insect problems), checked insect traps (each of the curatorial staff has an area to monitor), and photographed specimens as requested by botanists for their remote studies. I attached barcodes to a new set of two hundred herbarium sheets of *Lupinus* and photographed them for digitization from home. I finally reached *Lupinus texensis,* the brightly colored, bluebonnet of Texas.

The university has encouraged staff to continue working from home, so transcription will continue to keep everyone busy. During our remote work so far, from mid-March until mid-September, our team has digitized 135,333 specimens, bringing the total number of digitized North American specimens in the Herbaria to nearly one million. These data and images can be found using the search interface on the Harvard University Herbaria website. Our team also learned how to use the Geo-Locate Project's collaborative georeferencing tool to add mapping coordinates whenever possible, starting with localities in the Southern Rockies.

Throughout the pandemic, as I've been working with these digital specimens, my wife, Ying, has also been working from home. She is a forest ecologist by training. In the early months, when we left the house for walks in our neighborhood and local conservation areas, we were encouraged by the sights and sounds of spring. Plants flowered and produced leaves as usual, and the seasons have continued to flow like Vivaldi's melodies. This ceaselessness is echoed in our preserved herbarium specimens, each of which documents a particular moment from seasons past. Seasons and generations accrue. When brought together—and shared with researchers and teachers—the long-hidden symphonies, at last, resound.

Anthony Brach is a senior curatorial assistant at the Harvard University Herbaria and a research associate of the Arnold Arboretum. Previously, between 1993 and 2012, he served as an editor of the *Flora of China,* while based at the Harvard University Herbaria as a Missouri Botanical Garden staff member, after completing his PhD in environmental and forest biology at the SUNY College of Environmental Science and Forestry.

Redefining "Remote Fieldwork"

Amy Hruska and Kimberly Komatsu

During the summer, the Smithsonian Environmental Research Center (SERC), in Edgewater, Maryland, is typically buzzing with activity. Scientific staff and volunteers arrive early in the morning to load gear into field vehicles and begin long days of research on land or at sea. Much of this fieldwork, near or in the Chesapeake Bay, deals with pressing and complex environmental threats, such as climate change and invasive species. Roughly two dozen visiting undergraduate researchers move into campus dormitories during the summer and join the research labs where they diligently work to complete independent projects in just ten weeks.

In SERC's Ecosystem Conservation lab, we investigate how ecosystems respond to global threats, such as nutrient runoff, land-use conversion, and invasive species. Our plan for the summer of 2020 was to revisit over a dozen forest fragments in the Chesapeake Bay watershed for the first time in more than forty years to assess how land-use change has affected plant and songbird populations. Undergraduate researchers were to be instrumental in resurvey efforts and would have the opportunity to design complementary field experiments or surveys that would broaden their experience. Over the winter, we assembled an all-star team: Skye Austin, a rising sophomore from Shenandoah University, enthusiastic about the environment and conservation and ready for her first research experience. Rachael Brenneman, a rising senior at Eastern Mennonite University, eager for the chance to design and implement her own field research after conducting class research projects. And Julia Smith, a recent graduate of the University of Chicago and a data modeler, excited to get outside and experience the nuances of ecological field research.

During any given field season, we anticipate that not everything will go as planned—an unexpected storm may shift the schedule or cause extensive damage to a site, or we might add measurements to account for new field observations. This year, however, the very idea of conducting fieldwork and mentoring students seemed to hang in the balance as the coronavirus pandemic led to nationwide shutdowns and internal policy changes. As stay-at-home orders went into place in March, it was unclear how field research programs would proceed—if at

HRUSKA, A. AND KOMATSU, K. 2020. REDEFINING "REMOTE FIELDWORK". *ARNOLDIA*, 78(2): 5–7

all. Overnight, SERC's research campus became an unrecognizable ghost town as most of the staff began to telework and only pre-approved, essential staff (including members of our lab) came in to maintain critical operations and experiments. Over time, it became clear that this would be the new normal, and as a result, the organizers of the undergraduate research program decided to take everything remote.

As our lab began planning a remote field season that did not involve a plane ride, we initially inventoried existing datasets related to plant mutualisms, biodiversity, and ecosystem function, and generated a list of possible questions that undergraduate students could address while living at home, turning a fun field-based research experience into ten weeks in front of a computer screen gathering data from the web or navigating the world of statistical analyses. While this type of experience would certainly be valuable for many students, the idea of a computer-based internship did not meet the goals of our three undergraduate researchers who were eager for the chance to design and conduct field experiments. Cue inspiration from none other than Charles Darwin. While most of us go through school associating Darwin with his voyage on the HMS *Beagle* and the theory of natural selection, many of his theory-testing experiments took place from the comforts of his own home (see *Darwin's Backyard: How Small Experiments Led to a Big Theory* by James Costa). We asked, would it be possible for our undergraduate students to conduct field experiments at their family homes?

Before the undergraduate researchers started in mid-June, we determined their locations in relation to SERC, their indoor and outdoor spatial constraints for an experiment, and compiled topics and resources that would help shape the type of questions they'd be able to ask. Coincidentally, everyone lived within three hours of SERC, so with extra steps to keep materials disinfected and acquire administrative approval, we could drive materials to their homes. Furthermore, everyone had outdoor space in their family yards to set up an experiment. Thus, a summer of backyard ecosystem-conservation research began.

Our undergraduate researchers hit the ground running. With minimal direction other than the compiled topics and resources related to our broad research themes and the agreed-upon spatial constraints, they worked together to develop an overarching research question and experimental design that they could each have in their yards. Over two weeks, they read the scientific literature and met daily to settle on one overarching question: how does nitrogen pollution from runoff affect plant and soil communities? To address this question, they would each set up sixty one-gallon pots in their yards, each pot containing two native plants. Plants within a pot could be one of three native species: Joe-Pye weed (*Eutrochium purpureum*), sensitive partridge pea (*Chamaecrista nictitans*), or Virginia wild-rye (*Elymus virginicus*). All possible combinations were represented, meaning that a pot could be planted with either two of the same species or two different species.

Next, the team identified measurements that would allow them to answer more specific questions based on their individual interests. Skye was interested in the capacity of these native plants to uptake added nitrogen under different diversity treatments. Rachael asked how added nitrogen and plant diversity treatments affect the soil microbial community. And Julia wanted to understand how nitrogen addition and diversity treatments affect plant competition. Everyone was responsible for collecting the data that would be needed to address each of these three questions. They would take plant growth measurements, collect soil and invertebrate samples, and harvest plants for analyses of biomass and nitrogen content.

After settling on the questions, experimental design, measurements, and materials, we spent a week purchasing and preparing all the required materials. We then made a ten-hour road trip to drop off the materials at each house. Traditionally, lab mates would help with project setup, but this year, the undergraduate researchers were left to handle those steps on their own.

Previous page: **Julia Smith, an undergraduate researcher at the Smithsonian Environmental Research Center, receives a delivery of remote research supplies.**

PHOTO BY AMY HRUSKA

To ensure each researcher made the same judgment calls during setup (such as how to orient the plants in the pot), they held a multi-hour video meeting to discuss the process. Later, long video discussions became a reoccurring theme as the team took each measurement for the first time and harvested their plants at the end of the experiment. But various household members (parents and friends) did help each student with the setup (and maintenance and harvest). In some cases, parents became just as invested in the success of the plants as the undergraduate researchers themselves, checking on the experiment periodically just to see how the plants were getting along.

In total, the experiment ran for a little over five weeks, with plants exposed to four weeks of fertilizer treatments in concentrations that matched those found in runoff from residential yards. After the last plant was harvested, we made a final road trip to collect their samples, as well as the equipment loaned for the summer. Back at SERC, we dried and stored samples that will be analyzed in the lab at a later date. For our undergraduate researchers, a final virtual presentation bookended their summer experience. Together, the researchers eloquently presented their fieldwork experience and discussed how they designed a single experiment to answer a host of meaningful questions related to ecosystem conservation.

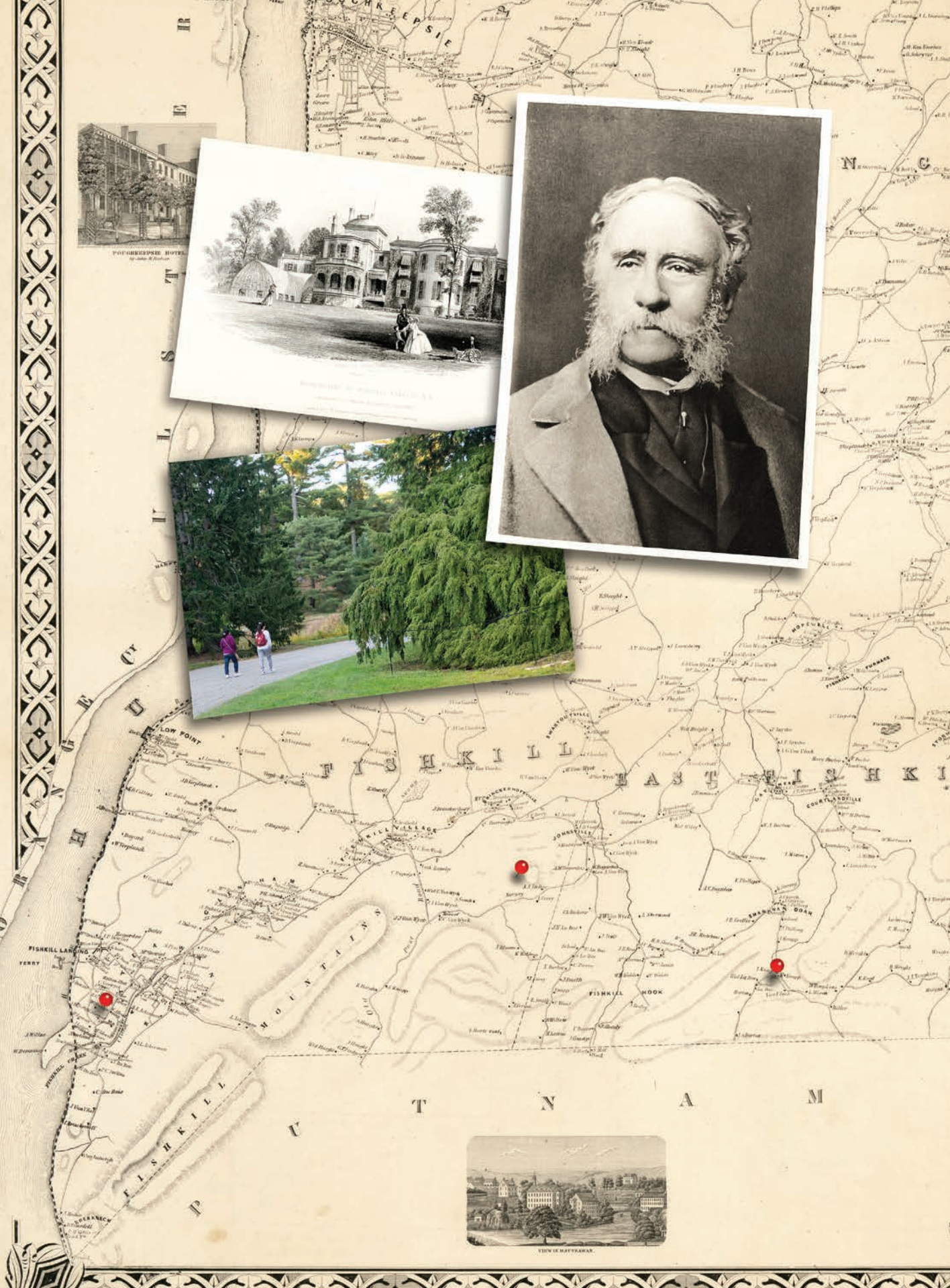
While this summer was a far departure from our initial plans, and a deviation from what is traditionally considered remote fieldwork, each undergraduate researcher experienced the hallmarks of conducting field research. Everyone coped with the heat and humidity of the DC, Maryland, and Virginia metropolitan area as they took their late-summer measurements. They anxiously sat and watched their pots from indoors as Hurricane Isaias brought heavy winds and rains to their yards. They all agreed to add herbivory observations to their data collection after each experiment had evidence of unintended interactions with residential wildlife. But, most importantly, everyone felt the ownership and satisfaction that can only come from developing and completing an experiment.

Data analysis for this project is ongoing and will continue through the fall and winter. Many of the samples still need to be processed in the lab to determine plant biomass, and leaf and soil nitrogen content. While Julia is currently starting her doctorate, Skye and Rachael have continued as fall interns in the Ecosystem Conservation lab, working to finish these analyses and lead the efforts to publish their results. The initial results are beginning to tell an exciting story as to how plant diversity may help combat nutrient pollution. The data suggest that some species can continue to grow just as well under high nitrogen conditions from runoff and in different diversity treatments.

A bonus of conducting remote research from home this summer was the realization that undergraduate researchers can, in some cases, continue to be supported once they return to school. As our lab continues to function over video conferencing, undergraduate researchers can be involved in lab meetings and SERC virtual events. And as SERC moves through the phases of its reopening plan as coronavirus cases drop in the region, the undergraduate researchers will finally be able to make it into the lab to process their samples.

The current pandemic has changed many aspects of our day-to-day lives and how we conduct science. At times, these changes are overwhelming and do not have clear resolutions. Yet, this pandemic has also demonstrated our ability to be resilient and adapt to the previously unimaginable. Our ability to pivot from an in-person field program to conducting remote science in our backyards is one of many examples of how field scientists have coped this summer. These examples, however, should not come as a surprise. As field scientists, we know that disruptions are inevitable, and we need to be flexible and open to new solutions. If anything, conducting science during an unprecedented time is what field research has been preparing us for all along.

Amy Hruska is a postdoctoral fellow in the Ecosystem Conservation lab at the Smithsonian Environmental Research Center (SERC). Kimberly Komatsu is the senior scientist and principal investigator of the Ecosystem Conservation lab at SERC.


POUGHKEEPSIE HOTEL
FISHKILL
FISHKILL LANDING
FERRY
FISHKILL HOOK
MOUNTAINS
VIEW OF MATTEAWAN.

Closing the Book on Sargent's Weeping Hemlock

Peter Del Tredici

Sargent's weeping hemlock (*Tsuga canadensis* 'Sargentii') is one of the world's greatest dwarf conifer cultivars in terms of its beauty, longevity, and stability. As opposed to the typical eastern hemlock with a tall straight trunk reaching upwards of a hundred feet, the weeping variety is a totally horizontal tree that can form a giant dome of foliage up to twenty feet high by forty feet across—"a vernal fountain of perpetual joy" is what one writer called it.[1]

The tree was discovered in the mid-nineteenth century in the Hudson Highlands,[2] about sixty miles northeast of New York City. This part of the world was a critical supply depot for the Continental Army during the American Revolution, and later its scenic vistas inspired both the Hudson River School of painting and the "picturesque" landscape movement championed by Andrew Jackson Downing. This region is one of the areas where modern American ornamental horticulture first took root, and many of its earliest practitioners built country estates in the area based on aesthetic principles that Downing laid out in his writings from the 1840s and 50s.

One such horticultural pioneer was Henry Winthrop Sargent, the man for whom the weeping hemlock was named. In 1841, he purchased a twenty-two-acre parcel of woodland overlooking the Hudson River at Fishkill Landing—also known as Fishkill-on-the-Hudson—where he developed a country estate called Wodenethe, which included sweeping vistas and an especially notable collection of conifers.[3] Sargent's younger cousin Charles Sprague Sargent, the first director of the Arnold Arboretum, would describe the conifer collection as "the most complete in the United States." H. W. Sargent made his place famous by describing the design and construction of its grounds in the supplement to the sixth edition of Downing's classic book, *A Treatise on the Theory and Practice of Landscape Gardening,* published in 1859.

In an update to the supplement, in 1875, Sargent produced a vivid description of the "gardenesque" landscape effects he sought to achieve through the use of exotic plants with extreme growth habits and foliage textures and tints. "There should be certain groups all color, other groups all form, and others again pendulous or drooping," Sargent wrote. "But these colors and forms must be harmoniously arranged by very careful blending. Sometimes in contrast (not so great as to shock), and sometimes by the delicate merging and intermingling of one color with another, the deeper and darker first, to disappear and melt away as it were into the lighter and fairy-like tones." For Sargent, landscape gardening was more about art than science, and the garden itself was a kind of living sculpture. The weeping hemlock that now bears his name fit so perfectly into Sargent's gardenesque landscape style that, as has been said, had he not introduced it, he would have invented it.[4]

My own interest in Sargent's weeping hemlock began in 1970. I had just moved to Boston from California and was teaching biology to children ages five through eighteen at an experimental school in Watertown, Massachusetts. Always on the lookout for interesting field trips, I visited the Arnold Arboretum for the first time in the fall of that year. In my aimless wandering, I came across a bizarre, low-growing tree with twisted, ribbon-shaped branches, the likes of which I had never seen before—it was Sargent's weeping hemlock. Why did it have its amazing shape? Where did it come from? How did it get here? Although I did not recognize it at the time, I had been seduced by the tree and the Arboretum where it was growing.

Facing page: **The story of Sargent's weeping hemlock often centers on the plant's namesake, Henry Winthrop Sargent, who grew the horticultural curio at his estate, Wodenethe, in the Hudson River Valley. But archival discoveries have introduced new characters to the story.**

SARGENT/ARNOLD ARBORETUM ARCHIVES; WODENETHE (DOWNING, 1859)/BIODIVERSITY HERITAGE LIBRARY; ARNOLD ARBORETUM SPECIMEN (15820*B)/JONATHAN DAMERY; DUTCHESS COUNTY, NY, MAP (1850)/ LIBRARY OF CONGRESS, GEOGRAPHY AND MAP DIVISION

When I finally began working at the Arnold some nine years later, in 1979, my interest in Sargent's weeping hemlock was rekindled when Augustus M. Kelley, publisher of Theophrastus Books in Little Compton, Rhode Island, wandered into the Dana Greenhouses where I was the assistant plant propagator and, without introducing himself, started talking to me about weeping hemlocks. At some point in the conversation, after I had expressed interest in the topic, I mentioned that I had a theory about why hemlocks weep. Gus said he'd like to hear it and, after listening carefully for about five minutes, asked if I would write it up. I told him I'd think about it, and a year later, I published my first-ever article for *Arnoldia,* the magazine of the Arnold Arboretum: "Sargent's Weeping Hemlock Reconsidered."

As soon as the article was published, however, I discovered several new references related to the origin of the tree, including one that pushed its first mention in print from 1875 to 1868. Gus suggested that this new information warranted an update of the weeping hemlock story and offered to publish a book about the tree if I would write it. To make a long story short, *A Giant Among the Dwarfs* came out in 1983, providing a new account of the tree's history. There were still gaps in the story, of course, but I did my best to fill them with well-reasoned speculation. Predictably, after the book came out, people wrote to me with new information about various specimens of Sargent's weeping hemlock, which I dutifully stashed away in a file folder, never really expecting to revisit the subject.

In the years since the publication of my book, the internet was invented, and the door that I had closed some thirty-six years ago cracked open with the unexpected discovery of a statement from H. W. Sargent himself, in 1880, about who actually discovered the tree that carried his name. One thing led to another, and the cold case of the true discoverer of Sargent's weeping hemlock suddenly got very hot. With the help of various websites—especially the Biodiversity Heritage Library—I was able to access a slew of old references that shed new light on the story of how this sublime conifer came into being. And so, it is with some trepidation that I make my third attempt at resolving the contradictions that have plagued Sargent's weeping hemlock since its discovery. Hopefully, this time will be the charm.

In the Beginning

Based on research that I completed for *A Giant Among the Dwarfs,* I concluded—correctly as it has turned out—that the first written reference to Sargent's weeping hemlock was from 1868. The critical passage appears in *The Book of Evergreens* by Josiah Hoopes, a well-known nurseryman and conifer specialist, in the midst of his description of H. W. Sargent's Wodenethe estate. "Near the mansion are two very handsome specimens of *Araucaria imbricata,* grown in boxes," Hoopes wrote, referring to the monkey puzzle tree (now *A. araucana*). "These had attained the height of 5 or 6 feet, and were perfect examples of this species in a young state. Near these we noticed a remarkable variety of the Hemlock Spruce, of dwarfish habit, with long drooping branchlets, and altogether quite unique in character. This plant was found growing on the mountains near by."

On the basis of the description alone, one could not say absolutely that Hoopes was talking about Sargent's weeping hemlock, but when the location of the discovery on a nearby mountain is added, the plant could be nothing else. Hoopes, nonetheless, omits the tree from the main body of the book where the "hemlock spruce" (listed as *Abies Canadensis*[5]) and two of its varieties are discussed, suggesting that the plant was relatively unknown in 1868.

I recently found a second reference to the plant at Wodenethe in an 1874 article about mutant conifers by one Thomas C. Maxwell, a nursery owner from Geneva, New York. "On Mt. Hounes, Fishkill-on-the-Hudson, is found a sport from our well known Hemlock," Maxwell reports. "The species we all know is remarkably graceful and beautiful, lofty and grand, but this sport grows down as persistently as the Kilmarnock Willow—a real deformity, and yet on Mr. Sargent's lawn it is one of the most interesting and ornamental plants in his entire collection—'a thing of beauty,' with which scarcely another tree or plant on these most beautiful grounds or in all the land can compare."

The author first encountered Sargent's weeping hemlock in 1970, at the Arnold Arboretum, and was instantly enamored with its unusual form.

ARNOLD ARBORETUM MAP (1969); ARNOLD ARBORETUM SPECIMEN IN 1970 (10712*A)/BOTH ARNOLD ARBORETUM ARCHIVES

It took me a while to figure out that "Mt. Hounes" was an alternate spelling for what is today known as Honness Mountain, a 906-foot "peak" near the present-day town of Fishkill—about five miles northeast of Wodenethe.[6] Maxwell's description of the tree is particularly noteworthy because he describes how the wild weeping hemlock that was discovered on Honness Mountain—"a real deformity"—was transformed into "a thing of beauty" after being cultivated at Wodenethe, as if the plant had somehow gone to finishing school.

Sandwiched between these two early references to H. W. Sargent's stunning new hemlock was a more complete description of the tree published by Frank Jessup Scott in his monumental work, *The Art of Beautifying Suburban Home Grounds of Small Extent.* Curiously, there are two different versions of this book with an 1870 publication date: One is 274 pages long and deals mainly with garden design issues. The other contains an additional 244-page section titled "Part II: Trees, Shrubs and Vines," which contains detailed descriptions of woody ornamental plants suitable for planting in home landscapes.

In the shorter of the two 1870 editions, Sargent's weeping hemlock is mentioned only in the fifteenth chapter, "Plans of Residences and Grounds." This section of the book presents written descriptions of twenty-nine hypothetical landscape layouts, along with detailed drawings showing the locations of recommended plants. In the seventh plan (as well as in seven others[7]), Scott uses the letter *H* to designate the position of a plant he identifies as "Sargent's hemlock, *Abies canadensis inverta*" and recommends that "its main stem to be kept tied to a stake until it has a firm growth six feet high." Remarkably, this first attempt at giving Sargent's weeping hemlock a proper scientific name is one of only two times that the epithet *inverta* appeared in print.

In the longer of the two 1870 editions of *Suburban Home Grounds,* which is identical in all respects to an 1873 edition (except for the date), Scott preserves the use of the name *Abies canadensis inverta* in the chapter "Plans of Residences and Grounds," but in the second part, under the entry on "Hemlock Fir," he introduces a new name for the tree, "Sargent's Hemlock: *Abies canadensis Sargenti.*" He

ARNOLD ARBORETUM ARCHIVES

Henry Winthrop Sargent's house at Wodenethe, photographed in 1886.

goes on to describe it as being "of an eccentric rambling nature, but well clothed in verdure," and he provides information about its cultivation: "Grown without training it will probably be a broad, irregular, flat-headed tree or great bush, with an over-laying of downward growing branches like that of the Scamston elm. By grafting it well up on other trees, or by tying its leader to a stick or stake we believe it will be one of the prettiest and most picturesque of evergreens. The best effect will be produced when grafted well up on an ordinary hemlock stem."

While Scott's use of two different names for Sargent's weeping hemlock in the longer of the two 1870 editions is confusing, the discrepancy suggests that there was a gap between the publication of the two editions. In fact, I found a review of the longer version of the book in the August 1871 issue of *The Horticulturist* by Henry T. Williams, which clearly suggests that the complete version of Scott's book did not come out until mid-1871. For whatever reason, this edition retained the 1870 publication date and constitutes the earliest publication of the name *Abies canadensis Sargenti.*

In the longer of the two 1870 editions of his book, Scott also states that the plant had been "brought into notice by H. W. Sargent, Esq., who found it growing wild on Fishkill mountain." I could find no reference for this specific mountain in the literature of the period, but given that the town of Fishkill lies at the base of Honness Mountain, which is shown as part of the "Fishkill Mountains" in period maps, it could well have been an alternative name for it. If so, then Scott is in agreement with Maxwell that Sargent's weeping hemlock was discovered on Honness Mountain. Scott and Maxwell also agree on the need to stake up Sargent's weeping hemlock in order to make it a proper "ornamental" plant and that without this treatment it would sprawl across the ground, eventually forming a strongly pendulous shrub.

One final detail in Scott's description of Sargent's weeping hemlock that should be noted appears in the appendix at the end of the second part where he lists "Sargent's Hemlock" as reaching ten feet tall by ten feet across under the column headed "Usual Size 12 Years from Seed" and thirty feet tall by forty feet across under the column "Usual Size at Maturity." When I first read these numbers in the early 1980s, I couldn't figure out how Scott managed to come up with them given that they were written just two years after Hoopes published the first written description of the tree, so I chalked it up to a lucky guess.

The Parsons Brothers of Flushing

Scott's description of Sargent's weeping hemlock and his prescient projections about its size clearly suggest that its propagation must have been well underway in the early 1870s. Samuel B. Parsons of S.B. Parsons & Sons, Kissena Nurseries in Flushing, New York, confirmed this supposition in a lecture that he presented on November 12, 1874, to the Rural Club of New York, with many prospective clients in attendance. "But the gem of all gems is the Weeping Hemlock," Parsons declared. "If left to itself, it will remain trailing upon the ground, but if the leader is tied to a firm stake it can be carried to any reasonable height, and each tier of branches will then droop in graceful curves toward the ground." A year later, in October 1875, Parsons sent a letter to the editor of *The Garden* introducing Sargent's weeping hemlock to British audiences, using the name *Abies canadensis* var. *pendula.* Parsons's promotion of the weeping hemlock to both national and international audiences clearly suggests that he was already selling or getting ready to sell the plant to the general public.

As far as I have been able to determine, however, it was the nursery owned by Parsons's brother, Robert, who first offered Sargent's weeping hemlock for sale in the fall of 1874. Some two years earlier, in the fall of 1872, the brothers had decided to split up Parsons & Sons Nursery, which they had inherited from their father and jointly operated since 1841. Samuel got half of the plant stock and established S.B. Parsons & Sons, Kissena Nurseries in a new location in Flushing while Robert took control of the other half of the stock and remained at the original nursery site but changed the name to R.B. Parsons & Co.[8]

In his fall 1874 catalogue, Robert Parsons listed Sargent's weeping hemlock under the heading "*Abies canadensis,* weeping." Ten one-foot-tall plants were available for the reasonable price of eight dollars, and ten larger plants (up to two feet tall) were selling for twelve dollars. Samuel's firm, S.B. Parsons & Sons, first offered the weeping hemlock in their autumn 1877 wholesale catalogue. Both brothers clearly had a financial stake in the success of the plant and cooperated in introducing it into cultivation.

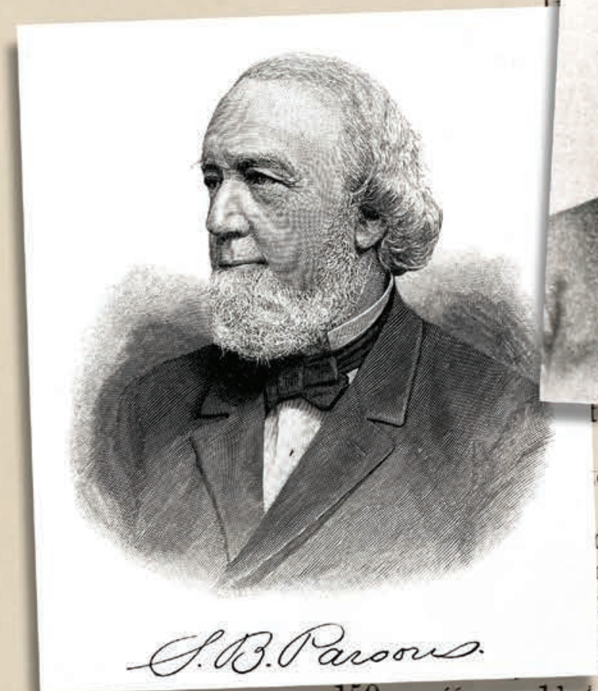
One of the curiosities of the weeping hemlock history is that up until 1875—after its production and sale was well underway—the supposed discoverer of the plant, H.W. Sargent, had said nothing about it. He finally broke his silence in the fourteen-page supplement he wrote for the ninth edition of Downing's *Treatise on the Theory and Practice of Landscape Gardening:* "*Abies Canadensis pendula,* or *Sargenti,* as sometimes called, is a very interesting and distinct variety of hemlock," Sargent wrote. "It is as pendulous as a Weeping Cherry, perfectly hardy, and admirably adapted for small places, though as yet very rare, Messrs. Parsons, of Flushing, alone having plants for sale. It is a sport of our native Hemlock, found in the Fishkill Mountains." This brief description occurs in the supplement to the 1875 edition of Downing's book but is not included in his 1859 supplement to the sixth edition where fifty-one pages are devoted to "The Newer Evergreen Ornamental Trees." This omission is significant because it suggests that Sargent did not learn about the tree until after 1859.

From Fishkill to Philadelphia

One of the long-standing questions surrounding the history of Sargent's weeping hemlock concerns the date when it was first propagated for commercial sale. In 1939, Arlow B. Stout of the New York Botanical Garden identified J.R Trumpy, the propagator for the Parsons & Sons Nursery, as the person who visited Fishkill and collected scions from H.W. Sargent's plant, but Stout didn't provide a date for the

EVERGREENS.

We seek, by frequent root pruning and transplanting, to secure well rooted plants.



			100.
Arbor Vitæ, American,			
Thuja occidentalis, . . .	9		5 00
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	3 feet,	3 50	
	5 "	6 00	
	6 "	8 00	
	12 "	1 50	10 00
	1½ "	2 00	12 00
150 "	1½ to 2 "	2 50	18 00
	2 to 2½ "	3 50	25 00
	2½ to 3 "	5 00	35 00
	3 to 3½ "	6 50	
Tom Thumb, ...	9 to 12 inches,	2 50	
Biota aurea, golden, ...	1 to 1½ feet,	4 00	
elegantissima, ...	9 to 12 inches,	4 00	
nepalensis, ...	2 to 2½ feet,	4 00	
	3 to 3½ "	6 00	
Buxus arborescens, ...	1½ to 2 "	4 00	
variegata, ...	. . .	4 00	
Cephalotaxus, ...	1½ to 2 feet,	5 00	40 00
Cunninghamia, ...	1 to 1½ "	4 00	
Cyprus, Lawson's, ...	. . .	5 00	
Hemlock,			
Abies canadensis, ...	1 to 1½ feet,	2 00	15 00
	1½ to 2 "	2 50	20 00
	2 to 2½ "	3 00	25 00
	2½ to 3 "	4 00	30 00
	3 to 4 "	5 00	35 00
	4 to 5 "	6 00	45 00
macrophylla, ...	1 to 1½ "	6 00	
	2 to 2½ "	10 00	
weeping, ...	1 foot,	8 00	
	1½ to 2 feet,	12 00	

trip. Trumpy was a Swiss-born horticulturist who immigrated to America in 1856 to work for the Parsons Nursery.[9] When the Parsons brothers split up the nursery in 1872, Trumpy went to work for Samuel's newly established S. B. Parsons & Sons (the name Kissena Nurseries was added later), and their very first *Descriptive Catalogue,* from 1873, listed him as propagator on the title page. Thanks to a recently discovered article in an 1877 issue of the *Moore's Rural New-Yorker*—written by the magazine's "conductor," Elbert S. Carmen—we now know what happened when Trumpy went to Fishkill in search of Sargent's weeping hemlock:

> Grace is not an adjective often serviceable in descriptions of Evergreens, but it is the first that comes to mind in any attempt at describing the Weeping variety of the Hemlock spruce [Abies Canadensis pendula]. The variety is comparatively new and its history interesting. The original tree was, as we learn, in the possession of an old gentleman named BURROW. Mr. J. R. TRUMPY, the well-known propagator of one of the Parsons of Flushing, heard about it, and visited BURROW for the purpose of purchasing the tree. But BURROW would not sell. Mr. TRUMPY, thus disappointed, and having a desire to possess so promising a novelty, which only those who have their hearts in the business can understand, set out for Mr. H. W. SARGENT'S (Fishkill, N. Y.), who, he had been informed, was possessed of a small specimen which, either from a layer or graft, was derived from the original tree of Mr. BURROW'S. Mr. SARGENT was gracious to the enthusiastic TRUMPY, who left him with a pocketful of cions [sic], and from this start the Weeping Hemlock was propagated and disseminated.

This stunning description of J. R. Trumpy's trip to Fishkill came as a complete shock to me and upended the traditional story of Sargent's weeping hemlock by asserting that the mysterious Mr. Burrow was in possession of the "original tree" and that Sargent's tree had been propagated from Burrow's plant. In light of the publicity that the tree had received prior to 1877, it's surprising that none of the earlier writers—or any of those that came after—mentioned Burrow, a sign that naming him as discoverer must have been somewhat controversial. The other remarkable thing about Carmen's article is that it is accompanied by the first known illustration of Sargent's weeping hemlock, which shows a healthy young specimen grafted about five feet up on the understock.

Curiously, the lingering question of when Trumpy actually visited Fishkill does not get answered until eleven years later when Carmen published a second article about Sargent's weeping hemlock, in an 1888 issue of the *Rural New-Yorker,* that repeated (and embellished) his earlier story about Trumpy's trip to Fishkill and described how best to use the tree in the garden.[10] Carmen ended his article with "A Note from S. B. Parsons," which offhandedly revealed when Trumpy's fateful visit had occurred. "I do not know the precise age of my Weeping Hemlock, but conjecture it is 25 years old, as it was one of the first we grew when we discovered it in the grounds of Mr. H. W. Sargent in 1861," Parsons stated. "My specimen is 11 feet in height and 13 feet in diameter of foliage. Its height has been obtained by training up a leader, and there is no reason why it cannot be carried 20 feet high." In light of this 1861 date, Scott's 1870 prediction that a mature weeping hemlock would be thirty feet high by forty feet across no longer seemed so outlandish.

In addition to introducing Burrow into the weeping hemlock story and identifying Sargent's "small specimen" of the weeping hemlock as the source of Parsons's first propagation material, both of Carmen's articles present a negative assessment of the attempts to make the tree more ornamental by grafting it "upon high stocks." His 1877 article is particularly blunt: "But the great expectations of securing an evergreen tree-form of unique and incomparable grace, thus reasonably entertained, have not been fulfilled." To support this assessment, Carmen quotes Samuel Parsons as saying, "We graft it readily upon high stock in the nursery, but it does not thrive as well—the naked stem cracks and suffers and the massive foliage, like most evergreens perched on high stems, is too

Facing page: **Jean R. Trumpy (right) propagated Sargent's weeping hemlock on behalf of the nurserymen Samuel and Robert Parsons. Samuel (left) began promoting the plant in 1874, the same year that his brother, Robert, offered it in the fall catalogue for R. B. Parsons & Co.**

PARSONS (T. MEEHAN, 1887)/ARNOLD ARBORETUM ARCHIVES; TRUMPY (*AMERICAN FLORIST,* 1913) AND CATALOGUE (PARSONS, R. B. & CO., 1874)/BOTH BIODIVERSITY HERITAGE LIBRARY

The first three illustrations of Sargent's weeping hemlock depicted specimens that had been grafted high: The first (bottom) appeared in *The Rural New Yorker* in 1877. The second (left) appeared in the *American Agriculturist* that same year. The third illustration ran in *The Garden* in 1887 and depicted a specimen, grafted in 1862, that was eleven feet tall by thirteen feet across.

heavy for grace and proportion, and is beaten and tossed by the winds." In November of 1877, just four months after Carmen's first article came out, the botanist George Thurber published an article in the magazine he edited, *American Agriculturist,* which echoed Carmen's negativity about high-grafting weeping hemlocks and published the second known illustration of Sargent's weeping hemlock.

The intensity of the debate about whether to graft the weeping hemlock high or low on the understock dates back to 1870 when Scott advocated grafting "well up on an ordinary hemlock stem" in his initial description of the tree. In 1874, Samuel Parsons implicitly supported the practice of high-grafting when he stated that such weeping hemlocks were "more like an evergreen fountain than any tree known." In Carmen's 1877 article, however, Parsons came out against high-grafting, and he repeated his opinion ten years later in *The Garden,* an English publication edited by William Robinson. Curiously, Parsons chose to illustrate this article with an image of an extremely beautiful, twenty-five-year-old specimen growing on the grounds of his nursery that had clearly been high-grafted and trained to a stake.

The fact that three prominent horticulturists expressed strong negative opinions about high-grafted weeping hemlocks suggests there must have been serious survival issues with specimens propagated this way. In addition, Parsons com-

mented that such plants were "too heavy for grace and proportion," subtly expressing his preference for the low-growing specimens that, in 1874, he had disparaged as "trailing upon the ground."

The first commercial sales of Sargent's weeping hemlock took place in 1874 and 1875 and were followed by the tree's first public showing at the famous 1876 Centennial Exposition in Fairmount Park, Philadelphia. In what must have been a remarkable display, 105 exhibits in the "Ornamental Trees and Shrubs" division were arranged in the landscape surrounding Horticultural Hall.[11] In his 1878 report on the Centennial Exposition, the chairman of the Awards Committee, William Saunders, published a detailed description of eight of these exhibits, only one of which was reported to contain specimens of the weeping hemlock—the Hoopes Brother & Thomas Nurseries of West Chester, Pennsylvania. Amazingly, their display featured three separate varieties of weeping hemlock: *Abies Canadensis inverta, pendula,* and *Sargentii.* Contrary to my expectations, Saunders's descriptions of both the S. B. Parsons and R. B. Parsons exhibits noted that varieties of *Abies Canadensis* were present but did not specifically mention any weeping types.

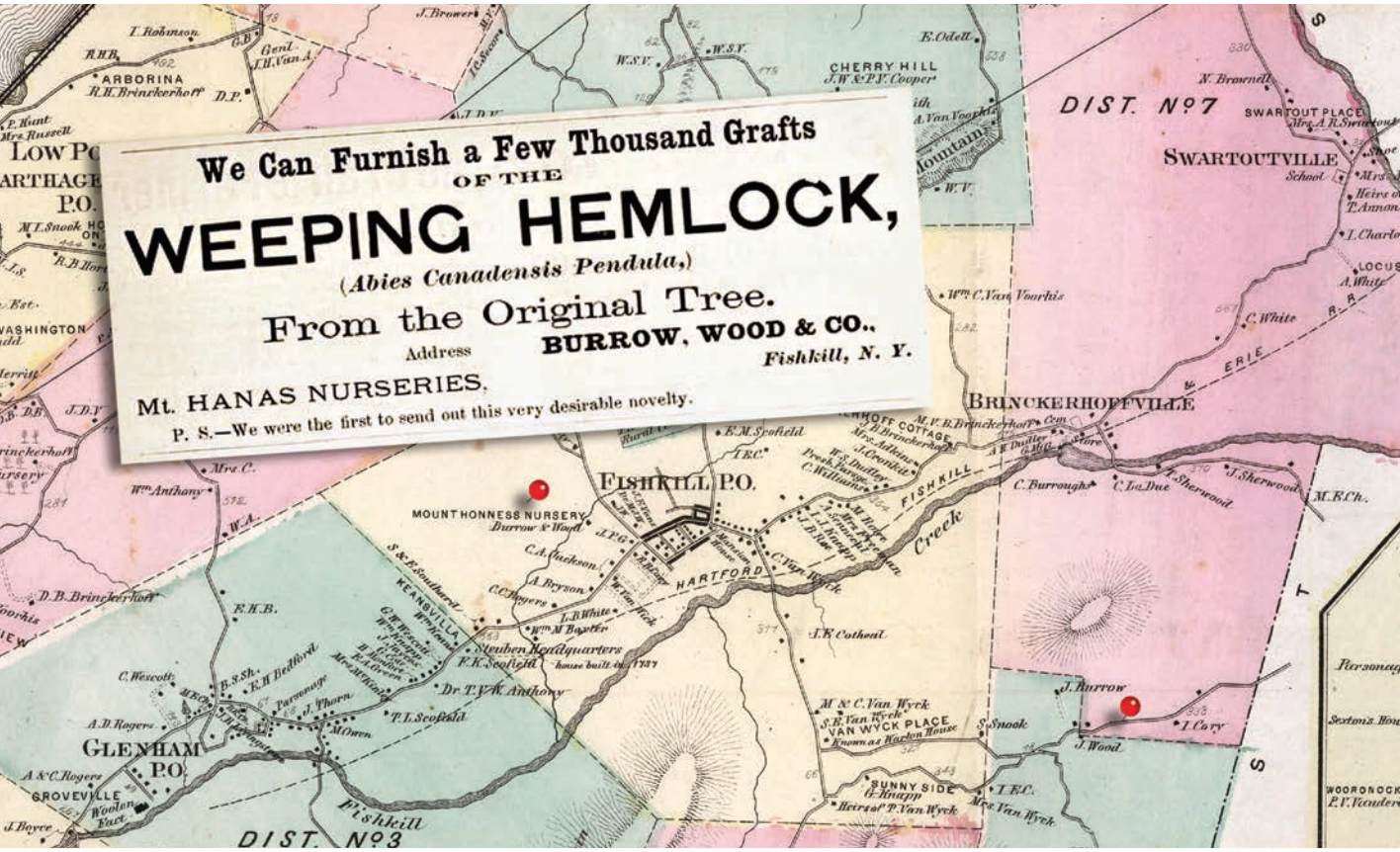
After the exposition ended in November, the commissioners of Fairmount Park arranged to purchase the plants used in the nursery exhibits for planting in the park. According to a December 15, 1876, report by Eli K. Price, chairman of the Committee on Trees and Nurseries for the Fairmount Park Commissioners, many of the nurseries that displayed plants at Horticultural Hall—including Hoopes Brother & Thomas, R. B. Parsons & Co., and S. B. Parson & Sons Co.—"were actuated by a liberal desire that their collections should remain in the Park, and offered them at prices which they esteemed little over half the cost to them. It was an object to the Commissioners to secure these permanently for our Park, to be transplanted as thinning out shall be required for their healthy growth, and they have been secured by purchase." Later records indicate that at least four weeping hemlocks were planted near Horticultural Hall, on a site that had formerly been occupied by the Women's Pavilion.[12]

Who Deserves Credit?

The fact that Scott initially referred to the weeping hemlock as *inverta* in 1870 but quickly changed it to *Sargenti* suggests that there might have been an issue deciding who deserved credit for introducing the plant. This idea is supported by the story of the weeping hemlock that Carmen published in 1877, which credited the mysterious "BURROW" with discovering the tree. In his second article, from 1888, Carmen made a bold proposal to formalize Burrow's role over that of Sargent's: "Now this Weeping Hemlock is catalogued as Abies Canadensis Sargentii pendula. Ought not the varietal name to be Burrowii pendula, in justice to the originator? Otherwise we should say that Mr. Trumpy's name should be given, since it was due to him rather than to Mr. Sargent that the tree was introduced."

It took a while, but I eventually figured out who Burrow was thanks to a pair of advertisements I came across in the January and February 1875 issues of *The Horticulturist and Journal of Rural Art and Taste.* The advertisements—for Burrow, Wood & Co., Mt. Hanas Nurseries—offered "a few thousand grafts" of the weeping hemlock from the "Original Tree." This not only confirmed Carmen's assertion that someone named Burrow played a central role in the weeping hemlock story but also identified him as a nurseryman living in the town of Fishkill. A quick check of the 1880 census records for the town of Fishkill indicated that John G. Burrow was born in 1839 and lists his occupation as "Hybridizer & Originator of New Variety of grapes." He had two partners, the brothers Isaac C. and Joseph J. Wood, both listed in the 1880 census as "nurseryman."[13]

The Burrow, Wood & Co. advertisements raise the intriguing question of why Sargent insisted in late 1875 that the Parsons brothers were the only ones selling the weeping hemlock when he certainly must have known that Burrow, Wood & Co.—located just five miles from his home in Fishkill Landing—had started selling the plant earlier that year. Could it be that Sargent was annoyed that Burrow claimed to have discovered the weeping hemlock before he did and therefore chose to ignore him? This



An 1875 advertisement for Burrow, Wood & Co. confirmed the role of an enigmatic character in the weeping hemlock story: John G. Burrow, a nurseryman who lived at the base of Honness Mountain.

ADVERTISEMENT (BURROW, WOOD & CO., 1875)/BIODIVERSITY HERITAGE LIBRARY, DUTCHESS COUNTY, NY, MAP (1867)/DAVID RUMSEY MAP COLLECTION, DAVID RUMSEY MAP CENTER, STANFORD LIBRARIES

idea is supported by two items in the advertisement: first, an unusual postscript at the end of the advertisement, "P.S.— We were the first to send out this very desirable novelty," indicates that Burrow, Wood & Co. was directly challenging the Parsonses' claim to have introduced the tree into commerce; and second, by using the name *pendula*[14] to describe the weeping hemlock—as opposed to *Sargenti*—they were rejecting proposals to attach Sargent's name to the plant. Clearly, the issue of priority had caused bad blood between Burrow and Sargent, especially in light of Carmen's 1877 statement that Burrow had provided Sargent with his first weeping hemlock.

One final detail in the Burrow, Wood & Co. advertisement that should be noted is that the name of their nursery, "Mt. Hanas," is an alternate spelling for what is now called Honness Mountain—the same location where both Maxwell and Scott said the weeping hemlock had been discovered. An 1867 map of Dutchess County by Frederick W. Beers clearly shows "Mount Honness Nursery, Burrow & Wood" located about a half-mile west of the center of Fishkill. The map also shows the home of "J. Burrow" nestled into the south slope of Honness Mountain. I suspect that this coincidence is best explained by the fact that both Maxwell and Scott were referring to the specimen of the tree—"The Original Tree"—that Burrow had growing on his property rather than to one he had found growing in the wild.

An Evolving Myth

Following its commercial debut in the mid-1870s, Sargent's weeping hemlock became something of a horticultural sensation. In 1897, fifteen years after Sargent's death, his cousin Charles Sprague Sargent, director of the Arnold Arboretum in Boston, attempted to formalize the tree's origin story in a *Garden and Forest*

ARNOLD ARBORETUM ARCHIVES

Taxonomist Alfred Rehder photographed the Sargent's weeping hemlock at Holm Lea, in Brookline, in 1900.

article. He noted that the plant had been found "about forty years ago on the Fishkill Mountains, in New York, and was first cultivated and made known by Mr. H. W. Sargent … Several of these plants were originally found together and transplanted and the largest of them which I have seen is on the Howland estate, in Matteawan, New York, and is now about twenty five feet across. This variety has been propagated by grafting the branches on the ordinary Hemlock, but in a few years, the grafted plants form an erect stem and lose the dense low habit which is the charm of the original seedlings."

Keeping in mind that Sargent's statement was written some forty years after the events described, it puts the date of the discovery at "about" 1857. For the first time, the article also reports that "several plants were found together and transplanted," but it does not say by whom. Indeed, Sargent carefully counters Scott's 1870 suggestion that H. W. Sargent was the discoverer of the "seedlings" by noting that he was the one who "first cultivated and made known" the tree. Sargent followed his cousin's lead by not mentioning John Burrow or Honness Mountain, but he does weigh in on the high-grafting debate by expressing his preference for the low-branched "seedlings."

Sargent's article is also noteworthy because it mentions that one of the original plants was growing at the Howland estate in the village of Matteawan (now Beacon), New York. This marks the first time that General Joseph Howland is mentioned in connection with the weeping hemlock, but Sargent does not credit him with its discovery. This attribution came fifteen years later, in 1912, in an unsigned article in the Arnold Arboretum's *Bulletin of Popular Information* written by Sargent's colleague Ernest H. Wilson:[15]

> Many years ago, four or five plants of this form [*Tsuga canadensis* var. *pendula*] were found by

> the late Joseph Howland of Mattapan [sic], New York, on one of the mountains back of Fishkill Landing on the Hudson River and were named by him Sargent's Hemlock for his friend and neighbor Henry Winthrop Sargent. One or perhaps two of these wild plants are now living, although the variety has been much propagated by nurserymen by grafting its branches on the common Hemlock … The plant in the Arboretum on Hemlock Hill Road is a grafted plant, but at Holm Lea in Brookline there is one of General Howland's original plants.

In Wilson's retelling of the weeping hemlock story, he makes several mistakes: first, he confuses Howland's hometown of Matteawan with a Boston suburb, Mattapan, and then he goes on to identify Howland as the discoverer of Sargent's weeping hemlock when no one else mentioned him in this role. The saving grace of Wilson's article is that he mentions, for the first time, that one of the original weeping hemlocks was growing at C. S. Sargent's private estate, Holm Lea.

In 1923, the British horticulturist Murray Hornibrook put the finishing touches on this widely cited but factually challenged version of the weeping hemlock story in *Dwarf and Slow-Growing Conifers:* "Professor Sargent informs me that the nurseryman's stock has all been produced from grafts from the four original plants found near the summit of Fishkill Mountain (near Beacon City, on the Hudson River) by General Joseph Howland about 1870. The finder grew one in his own garden at Matteawan, N.Y., gave the second to Mr. Henry Winthrop Sargent of Fishkill; the third to Mr. H. H. Hunnewell[16] of Wellesley, Mass., and the fourth to Professor C. S. Sargent of Brookline, Mass. The second and third are dead, but the first and fourth have made very fine specimens."

The Horton Hemlock

Hornibrook's Sargent-approved version of the weeping hemlock story from 1923 received its first serious challenge in 1939, when Arlow B. Stout of the New York Botanical Garden announced to the world that "the largest and presumably the oldest specimen of this type (*Tsuga canadensis* var. *pendula*) is a tree that stands in stately splendor in its original wild location on the mountainside overlooking the hamlet of Hortontown," about eight and a half miles as the crow flies from H. W. Sargent's home in Fishkill Landing. According to Stout, "My first knowledge of this tree was during 1937 when it came into view as I passed by auto along the newly constructed Eastern State Parkway [now the Taconic State Parkway]." The tree was sixteen feet tall and had a single trunk—eighteen inches in diameter—that was unbranched for its first five feet. Stout interviewed the owner of the tree, Joseph Horton, who told him that he had known the tree "since sixty-five years [1874] and that it was then at least one half as large as it is now."

In February 1980, when I first visited the Horton hemlock, it was owned by Jacob Veldhuis, who was using the tree—which was over eighteen feet tall and thirty-one feet across—as a kind of storage shed, a use to which it was admirably, if ignobly, suited. The pendant branches concealed no less than half a cord of wood, a hundred-gallon oil tank, a ladder, a wheelbarrow, several packages of shingles, and innumerable other artifacts of country life. The branches that formed the tree's canopy grew out from the trunk at about eight feet, and within the canopy, considerable self-grafting occurred where the branches touched one another.

In his 1939 article, Stout noted that the Horton hemlock was growing "close to a dwelling," but I was surprised to see that it was only about twenty feet away from the corner of the house—a fact that cast some doubt in my mind on Stout's "original wild location" hypothesis, as did the tree's single, unbranched trunk. This doubt was reinforced by the fact that I had been told that the so-called "Knapp house" where the tree was growing predated the American Revolution. At the same time, however, I chose to ignore the fact that the tree was growing at the edge of a relatively steep, rocky slope where it was unlikely to have been planted.

Having seen the Horton hemlock in the flesh, I felt the need to learn more about it, so

Facing page: **Eva Scofield, photographed in 1938 (bottom), stands with the Horton weeping hemlock. The tree grew outside of a family home that first appeared on maps as "E. Horton, Grocery" in 1876. The author first visited and photographed the plant in 1980.**

SCOFIELD/HAMILTON, ARNOLD ARBORETUM ARCHIVES; HORTON HEMLOCK IN 1980/PETER DEL TREDICI; PUTNAM COUNTY, NY, 1876/PUTNAM COUNTY HISTORIAN'S OFFICE DIGITAL COLLECTION

DIST. Nº12
J.M.Horton
J. Knapp
J. Knapp
J. Horton
E. Horton
Grocery
J. Shaw
W. Ladue
C. Russell
J. Brewer
Mrs. Dean
J. A. Lee
J. Lee
I. L. Wright
G. Booth
G.B. Dean
J.A. Miller
J.W. Russell
Mrs Wright
J.G. Horton
J.W. Tompkins
E. Knapp
Mrs Bennett
DIST. Nº3
Brook
D. Hubbard
M. Gilbert
Miss
Mc Donald
B.H. Brevoort
Black
Pond
E.&C.H.
G. Mead
Meads Corners
J. Halstead
Sheep Mt
Cem
White
N. L. Barrett
G. Bar
Mrs. Parker
J. Hulse
School
DIST. No. 1
S. Russell
K
School
A. Light
C. Smalley
Bailey
DIST. Nº8
J.E. Austin
J.S. Adams
W. Tost
J. Tost
H. Odell
Mrs. Satterly
Saw Mill
A. Tompkins
O. Barrell
Mrs Hunt
BARRETT POND

I persuaded Jack Karnig, chief forester at the nearby (and now disbanded) Harvard Black Rock Forest in Cornwall, New York, to take core samples from the lowest branches on the tree—at heights of five and six feet—in order to calculate its age. The cores that Jack sent me in March of 1980 came with the following note: "Your hemlock was a son of a b----. Twice I bored and got nothing. Finally got a reserve borer (smaller one) and managed to pull two cores." Under the dissecting microscope at the Arboretum, I counted 119 rings in the lower of the two cores—with an average width of 0.5 millimeters—which meant that the tree was *at least* five feet tall in 1860. In other words, the Horton hemlock was already a substantial tree when Burrow and Sargent first learned about it!

While I was surprised by the 1860 date, I was still skeptical that the tree was growing in its original wild location given its single-trunk form and its proximity to the house. My suspicions were confirmed a year later when I unexpectedly discovered two photographs of the Horton hemlock in the Arnold Arboretum Archives. They were taken in May 1938 by Ormond Hamilton, a noted conifer enthusiast from Conway, Massachusetts, and the handwritten caption on the back of one of them stated that the tree was "growing on place of Miss Eva Horton, Horton Town, Hopewell Junction, N.Y. This is not far from Beacon, N.Y. It was transplanted from mountain back of Beacon to its present site by Miss Horton's grandfather."

I was stunned by this discovery, and in 1983, when I published my book on Sargent's weeping hemlock, I rejected Stout's theory that the Horton hemlock was the original tree in its original location and postulated instead that "grandfather Horton discovered at least five weeping hemlock seedlings on the mountains between Hortontown and Beacon, New York. Sometime after 1859 but before 1865, he collected one plant for himself (and staked it) and sold the rest to H.W. Sargent." At the time, I naively thought I had finally solved the mystery of Sargent's weeping hemlock.

Inspired by my book, Dennis Murphy of Warwick, New York, wrote me a letter on July 17, 1986, describing how he had visited the Horton hemlock in the company of a local dairy farmer, Vern Jackson, who told him that the house adjacent to the tree had been used as a store for many years. Murphy also spoke with Smith Townsend, one of the oldest residents in the area, who told him that Eva Horton's grandfather Alvah never lived in the house and that her father, Joseph, did not move there until "after the death of Enoch Horton [in 1913] who was the last proprietor of the store." According to Townsend, Enoch, Alvah, and Joseph Horton were all buried in the cemetery located behind the old Calvary Methodist Church on Hortontown Road, and indeed, when Murphy visited the cemetery, he located the tombstones for both Alvah and Enoch.

When I received Murphy's letter, I had no idea what to think given that it upended my published version of the origin of Sargent's weeping hemlock. I thanked Dennis for his letter and filed it away. And that's where things sat until 2015, when, by chance, I came across a statement by H.W. Sargent, from 1880, about who really discovered the weeping hemlock. This unexpected discovery got me thinking about the tree again and prompted me to pull out my old files where I rediscovered the letter from Dennis Murphy and the questions it had raised. One thing led to another and, with the help of the internet and several local historians, I was able to piece together the history of the Horton family farm.

It turns out that the house where the tree was located—now listed as 339 Hortontown Road, Hopewell Junction—was not pre-Revolutionary at all but had been constructed by Enoch Horton in 1874, on an acre of land he acquired from his father, Jefferson Horton, for the price of one dollar.[17] A local map from 1876 shows 339 Hortontown Road as "E. Horton Grocery" just as Vern Jackson had remembered. The same map, as well as one from 1854, shows Jefferson Horton's house just down the road apiece. According to Smith Townsend (as reported by Dennis Murphy), Alvah Horton lived about a half mile away from Jefferson Horton on Long Hill Road, and Alvah's son, Joseph, moved into the house on Hortontown Road after Enoch Horton's death in 1913.

In 1939, Joseph Horton told Stout that he had "known" the weeping hemlock since 1874—when he was thirteen years old—which coin-

cidentally was the date that Enoch Horton acquired land from his father and would have begun clearing the land around the weeping hemlock in order to build his house. In 1938, Joseph Horton's daughter, Eva Scofield, told Ormond Hamilton that her grandfather had transplanted the tree "to its present site," but this is highly unlikely since her grandfather Alvah never lived in the house where the tree was located. Given that the Horton hemlock was at least five feet tall in 1860, the most plausible explanation for why it was growing where it was is that it had always been there.

The Internet to the Rescue

As stated above, my research on Sargent's weeping hemlock remained dormant until 2015, when in the course of doing internet research on the history of the introduction of Japanese plants into North America,[18] I came across an article from 1880 by Samuel Parsons Jr., the son of nurseryman Samuel B. Parsons and an eminent landscape architect and horticulturist in his own right. The article was a transcript of a "prize lecture" Parsons delivered in Boston before a meeting of the Massachusetts Horticultural Society on January 17, 1880. In his talk, Parsons described in detail—and at length—how best to use the flood of new woody plants that were coming into the market, especially Japanese species recently introduced by his father's company, Kissena Nurseries.

Three-quarters of the way into his presentation, Parsons mentioned Sargent's weeping hemlock. "If the broad-leaved hemlock [*Abies Canadensis macrophylla*] is somewhat stern and masculine in its outline," Parsons began, "the weeping hemlock [*Abies Canadensis pendula Sargentii*] is essentially feminine in its graceful curves and fountain-like sprays of green." Parsons went on to credit H. W. Sargent for discovering the tree "about twenty years ago [1860], near his place, at Fishkill on the Hudson, and moved by his enthusiasm and appreciation of choice ornamental trees, entrusted it for propagation to the distinguished expert, J. R. Trumpy."

As I reached the end of Parsons's article, a paragraph appended to the conclusion of his lecture caught my attention. In it, the chairman of the Saturday morning meeting, the nurseryman William C. Strong of Brighton, Massachusetts, thanked Parsons for his lecture and then said that he was going to cut the discussion short so that the attendees could hear from "a gentleman well known to be thoroughly versed in the subject before the meeting, and the editor of the new edition of Downing's Landscape Gardening—Henry Winthrop Sargent, of Fishkill, N.Y., of whose presence he desired the Society to have the advantage." Strong went on to report that "Mr. Sargent spoke first of the weeping hemlock, which was first introduced by him, and which he said was a very good 'find' by an old farmer on the mountains back of his (Mr. Sargent's) house. He has the largest tree of it, which is eight feet high, and spreads from fifteen to twenty feet. He has assisted the leader by tying it up to a stake. It is difficult of propagation."

This brief quote—a proverbial smoking gun—struck with the force of a thunderbolt. Shockingly, Sargent contradicted Parsons who, just a few minutes earlier, had claimed that Sargent had discovered the weeping hemlock. No, says Sargent, the tree was found by an "old farmer" who had a large specimen of it at his home. The fact that Sargent specifically says, "He has assisted the leader by tying it up to a stake" is undoubtedly a reference to the single-stemmed Horton hemlock. In addition, Sargent's use of the present tense indicates that the "old farmer" who found the weeping hemlock was still alive as of 1880. Assuming a discovery date in the late 1850s, Enoch Horton, born in 1846, would have been too young to qualify as Sargent's "old farmer." But his father, Jefferson Horton (1804–1888), was still living at the time of the lecture and would have fit the bill—especially given that the 1860 census lists his occupation as "farmer." Taken together, all the evidence indicates that Jefferson Horton discovered Sargent's weeping hemlock growing wild on his own property.

The size of the Horton hemlock in 1880—eight feet high by fifteen to twenty feet across—coupled with my tree ring data showing that the tree was at least five feet tall in 1860, strongly suggests that Frank Scott had seen the tree and used it as the basis for his prediction that Sargent's weeping hemlock would reach a mature size of thirty by forty feet. It also seems possible

ARNOLD ARBORETUM ARCHIVES

The size and age of the Horton weeping hemlock, photographed here in 1938, suggests that it was the original tree—staked in the location where Jefferson Horton found it. The photographer, Ormond Hamilton, reported that the trunk measured twenty-two inches in diameter at three feet off the ground.

that John Burrow knew about the Horton weeping hemlock and that it was the "Original Tree" he referred to in his advertisement from which he had produced "a few thousand grafts."

Hemlock Layering

Around the time that I discovered H. W. Sargent's bombshell statement in 2015, I was also working on an article documenting the layering behavior of hemlocks growing wild on Wachusett Mountain, in central Massachusetts.[19] My research showed that the low-hanging branches of stunted hemlocks growing on exposed, rocky sites can form adventitious roots where they come in contact with the soil and, over time, readjust their orientation from horizontal to vertical. In a moment of clarity, it dawned to me that the layering behavior of hemlocks that I had observed on Wachusett Mountain might be relevant to Jefferson Horton's discovery of the weeping hemlock.

Could it be that the low-growing "seedlings" that C. S. Sargent first mentioned in 1897 were actually rooted branch layers dug up from the periphery of the wild weeping tree that Horton discovered? To my mind, finding a lone weeping hemlock with attached branch layers is much more plausible than finding five virtually identical mutant seedlings growing in one place. If there was just one original weeping tree sprawling across the ground, then it was probably growing on a sunny, exposed site with thin soil—similar to the examples that I observed on Wachusett Mountain—and its strongly pendulous lower branches would have been retained long enough to develop into layers.

If this layering theory is applied to Sargent's weeping hemlock, it seems likely that when

Jefferson Horton discovered the weeping hemlock on a steep, rocky slope on his own property, it would have been growing prostrate along the ground. Assuming the tree behaved like the ones I saw on Wachusett Mountain, he might well have dug up a couple of the layered branches and sold them to Burrow and Sargent. He then tied a branch on the remaining plant to a stake to create a single trunk. It also seems possible that he might have induced his tree to form the additional layers by pinning its pendulous branches to the ground.

Evidence for the layering of Sargent's weeping hemlock comes from multiple sources: First, many of the mature, multistemmed specimens of the tree display layered lower branches. In fact, Al Fordham, a former propagator at the Arnold Arboretum, successfully removed one such layer, in 1966, from the weeping hemlock that C. S. Sargent had planted at his Brookline estate, Holm Lea. Second, when the nurseryman Jacob C. van Heiningen[20] spoke to Stout about the origins of Sargent's weeping hemlock, in 1939, he reported that he had stopped grafting the hemlock because of their poor survival rate and that he had propagated several hundred plants by "the old fashioned way of layering which is naturally perfect, as they are on their own roots."[21] Third, H. W. Sargent himself never used the word *seedling,* but instead called the plant "a sport of our native Hemlock."

Sport is an old-fashioned horticultural term that describes a mutant plant that obviously deviates from the normal type. In his 1874 article "Evergreens, Novelties and Dwarfs," Maxwell also uses the term "Sports of Nature" to describe various mutant conifers and points to the weeping hemlock sport found on "Mt. Hounes" as an example of "a real deformity" that became a "thing of beauty" after receiving proper horticultural treatment (high-grafting and staking).

Perhaps the most convincing bits of evidence for the theory that Sargent's weeping hemlock was derived from a single plant comes from the Burrow, Wood & Co. advertisement that referred to an "Original Tree" and from Carmen's 1877 statement that Sargent's tree at Wodenethe, "either from a layer or graft, was derived from the original tree of Mr. BURROW'S." Taken together, all of these early references clearly suggest that Jefferson Horton's original discovery consisted of a single tree that he propagated by layering—the "single sport theory"— rather than the "multiple seedlings theory" proposed by C. S. Sargent some forty years after Horton's initial discovery. Indeed, Sargent's statement that "the dense low habit which is the charm of the original seedlings" implies a level of uniformity that is more characteristic of vegetatively propagated layers than a group of genetically distinct seedlings.[22]

As I reported in *A Giant Among the Dwarfs,* there is considerable variation in the size and form of the oldest specimens of Sargent's weeping hemlock as well as considerable debate as to whether these differences are genetic or the result of horticultural practices.[23] The surprisingly heated debate about the merits of high-grafting among the horticulturists of the day make it clear that the different appearances of the original specimens are a reflection of their mode of propagation—layering versus grafting—and whether or not they were staked.[24]

The Final Story

Putting all this information together, I can now present the most likely—and hopefully final—version of the Sargent's weeping hemlock story: Sometime in the 1850s, "an old farmer," Jefferson Horton, discovered a wild weeping hemlock growing on his property in Hortontown (Hopewell Junction), New York. The tree, which was rediscovered by A. B. Stout in 1937, was growing in its original wild location about twenty feet from the house and grocery store that Jefferson Horton's son Enoch had built in 1874. Sometime prior to 1861, John Burrow learned about Horton's weeping hemlock and obtained a layer, which he planted on his own property on Honness Mountain in Fishkill. Around the same time, Henry Winthrop Sargent also learned about the weeping hemlock and obtained a layer of it from either John Burrow or Jefferson Horton. The specimens that both men were growing were relatively small when J. R. Trumpy of Parsons & Sons Nursery visited Fishkill in 1861 looking for propagation material. After Burrow refused to sell him his tree, Trumpy visited Sargent who gave him some

scions, and he grafted these when he returned to Flushing. At some point, Sargent obtained at least three additional weeping hemlock layers from either his own tree or from Horton's tree. He planted one of them at General Joseph Howland's estate, Tioronda, in Matteawan, New York; gave a second to his cousin C. S. Sargent, who planted it on his estate, Holm Lea, in Brookline, Massachusetts, in 1871; and gave the third to his kinsman Horatio Hollis Hunnewell of Wellesley, Massachusetts.

Josiah Hoopes published the first description of the weeping hemlock in 1868. Frank J. Scott gave the tree its first Latin name, *Abies canadensis inverta,* in 1870, and later that year published the first proper description of Sargent's weeping hemlock under the name *Abies canadensis Sargenti.* Robert B. Parsons & Co. of Flushing, New York, was the first nursery to offer the tree for sale in the fall of 1874, and his brother, Samuel, started writing about it in horticultural magazines around the same time. Burrow, Wood & Co., Mt. Hanas Nursery of Fishkill, began offering grafts of the "Original Tree"—Jefferson Horton's tree—in January 1875 under the name *Abies canadensis Pendula,* the first time this name was applied to the plant.

At least four specimens of Sargent's weeping hemlock were put on public display at the Centennial Exposition in Philadelphia in 1876 and were later planted out on the grounds of Fairmount Park. Elbert Carmen published the first illustration of Sargent's weeping hemlock in 1877, followed a few months later by a second one from George Thurber, and a third from S. B. Parsons in 1887. In 1937, Arlow B. Stout rediscovered Jefferson Horton's specimen of Sargent's weeping hemlock in Hortontown, about four miles southeast of Fishkill and eight miles from Beacon.

The convoluted story of Sargent's weeping hemlock—which should by rights be called Horton's weeping hemlock—is a cautionary tale about the confusion and infighting that often surrounds the issue of who gets credit for the discovery and introduction of a new plant as well as the myth-making that sets in once the facts have been clouded by the passage of time.[25]

Nomenclature

In 1983, I accepted Alfred Rehder's 1949 determination that the correct scientific name for Sargent's weeping hemlock was *Tsuga canadensis* forma *pendula.* I did this because of C. S. Sargent's assertion that the original discovery consisted of "several seedlings" found in the wild fit the technical requirements of a botanical *forma.*[26] Because I now know that the original specimens of Sargent's weeping hemlock were actually layers from a single plant, the tree should be reclassified as a horticultural cultivar.[27]

In the light of this new information, the relevant question becomes what the "correct" cultivar name for Sargent's weeping hemlock should be rather than what rank it should be. According to Article 29.2 of the *International Code of Nomenclature of Cultivated Plants,*[28] "When there are two or more names in use for the same cultivar … the name that best preserves existing use is to be chosen as the accepted name by the appropriate International Registration Authority without regard to any rank in which those epithets might have been established or to the principle of priority." Scott's first epithet, *inverta,* from 1870 is clearly out of the running given that it lacked a proper description and it last appeared in print in 1876. Scott's second 1870 proposal, *Sargenti,* was properly described and is in wide use today as 'Sargentii'.[29] *Pendula* came late to the party, first appearing in 1875, and seems to be used more commonly today than *Sargentii.* In 1983, I chose to use the name *pendula* because I thought that the tree was a botanical *forma* and the German botanist Beissner, in 1887, was the first author to describe Sargent's weeping hemlock as a *forma* with the name *pendula.* Now that I know Sargent's weeping hemlock is actually a cultivar, I prefer using the name 'Sargentii' because it helps clarify the distinction between the two categories. I also like the name 'Sargentii' because it has temporal priority and reflects the plant's common name, but it's up to the International Registrar to make the final determination.

Current Status of Notable Sargent's Weeping Hemlocks

HORTONTOWN: Based on branch core data, the single-trunked Horton hemlock was at least 5 feet tall in 1860, making this the oldest known specimen of Sargent's weeping hemlock. In 1880, H. W. Sargent said the tree was 8 feet tall by 15 to 20 feet across. In 1980, it was 18.3 feet tall by 31 feet across with a trunk diameter of 24.5 inches. When I visited the tree in December 2018, it was completely dead but still standing with a trunk diameter of 28.3 inches. A picture of the tree on the internet from spring 2015—when the house at 339 Hortontown Road, Hopewell Junction, New York, was put up for sale—shows it to be in poor condition. In a Google Earth image of the site on April 16, 2016, the tree appears dead.

WODENETHE: Henry Winthrop Sargent purchased the twenty-two-acre parcel of land that became Wodenethe in 1841 and described the evolution of its landscape in the supplement to the sixth edition of Andrew Jackson Downing's *Theory and Practice of Landscape Gardening,* published in 1859. Sargent died in 1882, but the property remained in the family until 1921, when the house and grounds were sold and incorporated it into the Craig House Sanatorium. In 1955, Wodenethe was sold to a developer. The house was burned down as part of a fire-training session by the Beacon Engine Company in order to prepare the land for subdivision and housing construction. The first reference to a weeping hemlock at Wodenethe came in 1868 from Hoopes, and the last came from Maxwell, in 1874, who called it "one of the most interesting and ornamental plants in his entire collection." As for the question of when Sargent's tree might have died, it is worth noting that Charles Sprague Sargent made no mention of a weeping hemlock in the article he wrote about Wodenethe in 1897.

ALL "CURRENT STATUS" PHOTOS BY THE AUTHOR UNLESS NOTED

The Hortontown weeping hemlock 1981 (above) and standing dead in 2018. Note the Taconic Parkway in the background.

TIORONDA: In 1859, Joseph Howland purchased sixty-five acres of land as a site for his country estate, Tioronda, in the village of Matteawan, on the other side of Fishkill Creek from the home of H. W. Sargent. Construction of the house was completed in 1861 while Howland was off fighting the Civil War. He returned home with the rank of brigadier general. Sargent oversaw the laying out of the grounds for Howland, and at some point, he planted a layer from the original weeping hemlock near the entrance. Howland died in 1886, and his widow sold the estate in 1911. In 1915, the property was converted into America's first privately run psychiatric center and renamed

Craig House.[30] The facility closed its doors in 1999.[31] The tree was heavily pruned in the late 1990s or early 2000s and treated for hemlock woolly adelgid (*Adelges tsugae*). In December 2018, the Tioronda specimen was 16 feet tall and 40 feet by 34 feet across and had four major trunks with basal diameters ranging from 16 to 29 inches.

HOLM LEA: H. W. Sargent also provided a weeping hemlock to his cousin Charles Sprague Sargent, who planted the specimen at Holm Lea, in Brookline, Massachusetts. According to the caption on the back of a May 1923 photo, located in the Arnold Arboretum archives, the tree was planted in 1871. When I measured it in 1980, it was 7.5 feet tall and 32.5 feet across with multiple trunks emerging from the ground. On February 23, 1984, the tree was destroyed by a fire of suspicious origin, perhaps set by some teenagers who were reported in the vicinity of the tree that night. Indeed, the tree had long been an attraction for neighborhood children who called it "The Fort" and often played beneath its pendant branches. The Arnold Arboretum collected a layer off of the Holm Lea tree in 1966, and the resulting plant (accession 655-66*A) is currently 7.6 feet tall and 17.3 by 15.5 feet across with a basal trunk diameter of 16 inches.

HUNNEWELL: H. W. Sargent described the making of Horatio Hollis Hunnewell's estate in Wellesley, Massachusetts, in his 1859 supplement to the sixth edition of Downing's book, in the same chapter that described the creation of Wodenethe. Hunnewell was married to Isabella Wells, H. W. Sargent's first cousin, and through this connection was also related to C. S. Sargent. Some people have suggested that a large weeping hemlock in the Hun-

The Tioronda weeping hemlock in 1980 and December 2018 (top two). The Holm Lea weeping hemlock in 1980 and in 1984, with Gus Kelley, after the fire.

H. G. MAYER, ARNOLD ARBORETUM ARCHIVES

A. B. STOUT, ARNOLD ARBORETUM ARCHIVES

newell Pinetum might have been one of H. W. Sargent's original plants because of its multistemmed form, but it does not appear on an 1895 map of the collection. In 1923, Murray Hornibrook—on C. S. Sargent's authority—announced that one of the original seedlings went to Hunnewell but that it had died. In 2012, the estate's longtime horticulturist, David Dusenbury, uncovered a reference from the late 1920s among the unpublished writings of Theophilus D. Hatfield, who worked at the Hunnewell estate from 1887 until 1929: "The original plant [of Sargent's weeping hemlock] I believe is still on the late professor Sargent's estate in Brookline. Our plant, of course, is a graft, and indeed a very handsome specimen, admired by all visitors." As of 2019, the tree measured 22 feet tall and 47.5 feet by 42.2 feet across; it has four large trunks with breast-height diameters ranging from 13 to 27 inches.

FAIRMOUNT PARK: Following the end of the 1876 Centennial Exposition in Philadelphia, at least four weeping hemlocks were sold to the Fairmount Park Commission and planted near Horticultural Hall, on a site that had formerly been occupied by the Women's Pavilion. In 1896, Joseph Meehan reported that the four trees were "a source of much interest to the numerous visitors to the park. Having been grown for twenty years, they excel [sic] probably any other specimens in these parts. They are about six feet high and eight feet in width." In 1939, they ranged in size from 12 to 14 feet tall. When I visited the park in 1994, all four trees were still alive, and the largest specimen measured between 34.5 feet tall and 40 by 50 feet across with a basal trunk diameter of 31 inches. In November 2018, only this tree and one other were still alive.

The Hunnewell weeping hemlock in 1930 and 2010 (top two). The Fairmount Park weeping hemlocks in 1938 and one in November 2018.

J. F. ROCK, ARNOLD ARBORETUM ARCHIVES

ARNOLD ARBORETUM: A single-stemmed, grafted specimen (accession 1514-2*A) was propagated in 1881 from scions taken from a grafted plant received from S. B. Parsons & Sons, Kissena Nurseries in 1880. In 1980, a large branch with sixty-six growth rings was removed from the tree 6 feet up the stem, indicating that it was at least this tall in 1913. As of December 2018, the tree was 16 feet tall by 25 feet across with a trunk diameter at breast height of 19.4 inches; its trunk had a pronounced lean to it and structural roots near the base were protruding out from the ground.

LOVE LANE: Claiming to have found the largest anything is always a risky proposition, but with that caveat, the largest weeping hemlock I have seen is growing in a lawn on a private estate in Weston, Massachusetts. It was planted in the early 1900s on property owned by John G. Freeman and his wife, Caroline Case, the sister of Marian Case, who established Hillcrest Farms at the Case Estates.[32] In 1980, this giant, multistemmed specimen of Sargent's weeping hemlock was 19 feet tall and 47 feet by 43 feet wide. In 2018, it was 22 feet tall and 79 feet by 70 feet across with eight huge, ribbon-shaped stems with diameters ranging between 20 and 32 inches. It's a truly magnificent tree, but the main trunk was starting to split apart and one of its upper limbs had broken, leaving a large hole in the once closed canopy.

The Arnold Arboretum's oldest weeping hemlock (1514-2*A) in September 1945 and June 2019 (top two). The Sargent's weeping hemlock on Love Lane in 2019 and, showing the branching structure, in 2016.

DEDICATION

This article is dedicated to the memory of Gus Kelley of Little Compton, Rhode Island, who first inspired me to take up the study of Sargent's weeping hemlock.

Endnotes

[1] Jenkins, 1946

[2] According to *A Book of the United States,* edited by G. Mellen and published in 1838: "The Highlands of the Hudson, or Fishkill Mountains, which first appear about forty miles from New York, are marked for their sublimity and grandeur, and interesting from their connection with many great events of the revolution. This chain is sixteen miles in width, and extends twenty miles along both sides of the Hudson."

[3] Smith (1856) paints a vivid picture of Wodenethe in all its glory, and Spingarn (1937) documents the significant role that Sargent played in the history of American horticulture not only as a writer and plant collector but also a horticultural innovator. He was one of the first Americans to use a lawn mower and marveled, in 1855, at how it could do in eight hours what "formerly occupied two men and a boy the better part of nine days to do, and infinitely better too."

[4] Sargent's ideas about gardening were heavily influenced by the writings of the British horticulturist J.C. Loudon. According to Spingarn (1937), "Loudon's 'gardenesque style' became Sargent's ideal, as it became that of the Arnold Arboretum—in other words, an arboretum landscaped like a park-like English estate."

[5] The earliest scientific name for the eastern hemlock, also known as the hemlock fir or hemlock spruce, was *Pinus canadensis,* bestowed by Linnaeus in 1763. André Michaux changed it to *Abies canadensis* in 1796, and in 1855, the French botanist L. Carrière created the genus *Tsuga* to encompass all hemlocks and assigned the name *Tsuga canadensis* to the eastern hemlock, a change that was accepted slowly.

[6] Apparently Honness Mountain is a corruption of the Dutch term *hondenneus,* meaning "dog's nose."

[7] Plans VIII, IX, XIII, XIV, XV, XVI, and XVII also feature "Sargent's hemlock, *Abies canadensis inverta.*"

[8] Williams, 1872; Hoopes, 1875

[9] Jean Rudolph Trumpy was born in Glarus, Switzerland, in 1830 and died on May 21, 1913; he worked in the gardens of the King of Bavaria before coming to America in 1856 (A.F.F., 1913).

[10] The illustration that Carmen used with his article is of a specimen at Parsons's Nursery and first appeared in an article that S.B. Parsons wrote for *The Garden* in 1887; it also appeared in an unsigned 1887 article in the *Horticultural Art Journal,* volume 2, page 72.

[11] T. Meehan, 1876

[12] Rothrock, 1880; Jenkins, 1933

[13] See also the 1910 obituary of Isaac C. Wood, published in *Horticulture,* 12(5): 156.

[14] This advertisement constitutes the first use of the epithet *Pendula* to describe Sargent's weeping hemlock.

[15] The article can be ascribed to Wilson due to the fact that he reprinted much the same information—including the mistakes and much of the same phrasing—in an article he wrote for *The Garden Magazine* in 1920.

[16] Horatio Hollis Hunnewell was married to Isabella Wells, H.W. Sargent's first cousin (Sutton, 1970).

[17] Sallie Sypher, deputy historian for Putnam County, located the Horton Claim Deed (executed on June 10, 1874) in *Liber 67,* pp. 21–22 at the Putnam County Clerk's Office.

[18] Del Tredici, 2017

[19] Del Tredici and Orwig, 2017

[20] Van Heiningen established South Wilton Nurseries in Wilton, Connecticut, in the early 1900s.

[21] See Hoopes (1868) and Wells (1955) for a description of layering in nursery practice.

[22] It is tempting to speculate that the tendency of Sargent's weeping hemlock to "come true" from seed (first observed in 1906) provides evidence for Sargent's seedling theory (Jenkins, 1935; Stout, 1939; Del Tredici, 1983). The parsimony principle (Occam's Razor), however, suggests that propagating six layers off one parent tree is more likely than finding six identical seedlings growing in a single location.

[23] Bean, 1914; Stout, 1939; Swartley, 1984

[24] My own research at the Arnold Arboretum demonstrated that, after four years, grafted plants of two dwarf hemlock clones, 'Nana' and 'Cole's Prostrate', were significantly larger and broader than cutting-grown plants on their own roots (Del Tredici, 1985). Presumably these differences were due to the fact that a grafted plant is "bi-genomic," with a normal root system and a dwarf top, while both the roots and the shoots of a cutting-grown plant are derived from the same dwarf genome. As regards staking, the early propagators knew that tying the leader to a stake dramatically increases both a plant's height and the speed of its growth.

[25] In *St. George and the Pygmies* (1984), I describe the tangled story of *Tsuga canadensis* 'Minuta', which bears remarkable similarities to the story of Sargent's weeping hemlock.

[26] According to Davis and Haywood (1965), the rank of *forma* (abbreviated *f.*) is the lowest unit of botanical classification and describes a single-character variation with a random distribution within a natural plant population. While horticultural taxonomy still uses the *forma* designation, it has fallen out of favor in botanical taxonomy.

[27] In 1953, the horticultural concept of the *cultivar* was introduced as the preferred way to describe plants that have undergone some degree of human selection. Over time, the cultivar name in single quotes has largely

supplanted the use of the botanical concept of *forma* to describe horticultural selections. With woody plants, the cultivar name is typically, but not always, used to describe asexually propagated clones.

[28] Brickell et al., 2016

[29] According to the rules of nomenclature, when a plant name is derived from a person's name that ends in a consonant, the letters *ii* are added to it.

[30] Craig House hosted many famous "guests," including F. Scott Fitzgerald's wife, Zelda; Frances Seymour, the wife of Henry Fonda and mother of Jane Fonda; Rosemary Kennedy, after her catastrophic lobotomy; and the actors Jackie Gleason and Marilyn Monroe.

[31] In 1933, Jenkins describes meeting Clarence Slocum, who initially managed Craig House. I met with his son Jonathan on several occasions in the 1980s, and on my last visit, he gave me the remains of H. W. Sargent's library as a donation to the Arnold Arboretum Archives.

[32] According to the "Love Lane Historical Narrative" on the Town of Weston website, the landscape plan for the Freeman/Paine house at 55 Love Lane was drawn up in 1901. Retrieved from https://www.weston.org/687/Love-Lane-Area-Historical-Narrative

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Bonnets

Each Year in the Forest: Autumn

Andrew L. Hipp
Illustrated by Rachel D. Davis

I

September is the attenuated tail of summer. The last flowers of great blue lobelia bloom in meadow openings or in partially shaded forest edges where they can find a little extra soil moisture. Tangles of calico aster spill into the trails, branching and short-leaved, strewn with flowers. White rattlesnakeroot flowers hang like trombone bells at the ready. Jack-in-the-pulpit berries turn gradually from green to red, the masses of fruits on some plants as variable as kernels of multicolored flint corn. False Solomon's seal berries ripen from salmon to bright red and become thin-skinned and heavy with juice. Blue cohosh seeds ripen on the plant, toxic but delicious looking, a rich blue that will hold its own through winter, when you may still find an occasional seed abandoned by a gray squirrel on top of a fallen log, beside a scattering of scratched red oak acorn shells.

HIPP, A.L. AND DAVIS, R.D. 2020. EACH YEAR IN THE FOREST: AUTUMN. *ARNOLDIA*, 78(2): 34–43

Acorn production peaks in northern Illinois around the first of the month. Nuts pile up along the trails. Many are immediately split open by squirrels or eaten by deer. Others are not eaten by mammals but are preyed upon by weevils that devour the starchy cotyledons and fill the shells with frass, exposing the baby plants to fungi and desiccation. In some cases, the only violence weevils do the seedling is to deprive it of some of the nutrients left by the mother tree in its cotyledons. Perhaps this will be enough to kill the seedling over time, leaving it too weak to hold on for a few years in the understory until there is a blowdown or an old tree falls, taking a few others with it, letting in enough light for the baby oak to photosynthesize on its own and possibly win the race to the canopy. If it fails to do so, the oak will never produce offspring of its own.

The seeds falling from the tips of the tree of life in the weeks flanking the equinox are the ones we will find growing next spring. They were sparked into life in an instant of unlikely pollination. They were provisioned with food all through development. Now, we find them dispersed on feathers or fur, in the stomach of a bird, in mud lodged between toes or talons or claws. Some are dropped unceremoniously at the base of the tree to roll downhill, in a move that might appear clumsy, but what are appearances? Each species has gambled successfully over tens of thousands of generations, if not more, on that drop to the ground or that risky flight on wind, or on the passage of squirrels or jays or extinct passenger pigeons or mammoths whose interests were never identical to those of the trees. The dice drop; then the plant prepares for winter. Perhaps their seeds will germinate before they can be eaten by a vole or squirrel. If so, these notes of fall will echo for hundreds of years.

II

Near the end of September, the white fungal bodies of aborted entoloma sprout from the leaf litter like manna. These knots of mycelia push leaves out of the way overnight to sit on the surface of the forest floor. Over a few days, they grow into misshapen white loaves as large as an infant's fist. They are caused by a pathogenic fungus (*Entoloma abortivum*)[1] infecting one of the honey mushrooms (*Armillaria gallica*).[2] The latter are known best from their black, cord-like rhizomorphs that scout the soil's surface for trees to infect and then ascend the trunks beneath the bark, where they remain long after the tree is dead. Near these masses of intertwined *Armillaria* and *Entoloma* mycelia, the yellowish-brown fruiting caps of *Armillaria* can often be found, and sometimes the whitish caps of *Entoloma* as well. By night, when the rains have been just right, glowing *Armillaria* marks the edges of the trails, ghosts of the cambium devoured by the fungal mycelia. Rings of light mark the ends of severed boles, squeezing through passages where sunlight formerly passed from the leaves down to the roots as fixed sugars.

Blue Cohosh

Stump puffballs (*Apioperdon pyriforme*) sprout from downed logs or form colonies in the wood chips. Then their insides turn to spores. The precocious ones desiccate and become brown inside while their peers are still white and fleshy or just turning granular inside the taut skin. Chicken of the woods (*Laetiporus sulphureus*) sprouts from standing dead ashes, fallen oaks, and rotting trees of several species, forming scalloped orange shelves of delicious flesh. Months hence, its bleached carcasses will mark where the fungal bodies clung bright as lanterns to the dead trunks. Chanterelles (*Cantharellus* sp.), bonnets (*Mycena* sp.), oyster mushrooms (*Pleurotus* sp.), and giant puffballs (*Calvatia* sp.) emerge and then dry or decompose over the course of a few autumn weeks.

As these decomposers crowd the woods, the flowering plants become increasingly tattered. Jewelweed spanned the entire growing season, beginning as forests of nickel-sized cotyledons crowded under the leaf litter in late March and then rising into rolling hills of adult plants that dominate the landscape well into September.[3] Now, it begins to yellow and wilt, thinning and breaking over. Wild ginger leaves glow with golden margins as they senesce, like autumn leaves of *Ginkgo biloba.* False Solomon's seal becomes variegated and stringy, the vessels running the length of its leaves draped with torn and yellowing epidermis. Sheaths surrounding the glistening black wild leek seeds split open. The seeds stare out at the coming winter for a few days before they drop to the ground. Hop sedge and Gray's sedge become decrepit, and the swollen skins of their perigynia disintegrate. Straight-stigma and curly-stigma wood sedges shatter, scattering their last achenes onto the bare soil.

The white oak acorns that have made it this far lie half embedded in the soil. They split at one end, opposite the cap, cracked open by the emerging root that swells in the autumn rains. They are feeling their way blindfolded,

trying to get a toehold while there is still time. Their impulse to grow is strong: collect a bagful of acorns, toss it into the refrigerator next to the carrots, and keep it cool and moist and dark; even there, some will start to germinate, senselessly looking for soil. The katydids have become quiet, and the morning-time crickets purr. They and the acorns are *pacing the autumn to and fro,*[4] getting a little work done in advance of spring.

III

Rain falls and temperatures fluctuate in early October. Fog pools in the prairies beneath the power lines and drapes between the spruces. The trails become sodden. Stump puffballs ripen on fallen logs or stumps, syrupy brown. Earth stars (*Geastrum* sp.) crank their wings out and grip the soil. Young stinkhorns (*Phallus* sp.) erupt, crowded together like brussels sprouts, crawling with stink bugs. Over the course of several days, they grow obscenely to several inches in height and swarm with gnats. A few days later, they become flaccid and rot.

One morning last year, our woods at the Morton Arboretum were overrun by spring peepers. I started hearing their squeaks, trills, and whistles on my walk into work, their sounds shifted upslope from the wetlands where they had been calling six months earlier. There wasn't anything they could be except for spring peepers. I did not expect them, however, and I consequently could not convince myself at first that I was hearing correctly. Songbirds were migrating, and I told myself the calls I heard were those of some itinerant bird I didn't recognize. I waded into the sunflowers and towering wild lettuce to flush out any birds that might be there, but the calls stopped, as frog calls always do when you go hunting their source. They picked up again after I was safely back on the trail. After about ten minutes of this, it was clear I was hearing frogs. Peeps punctuated the woods west of Big Rock Visitor Station and all the way down to the service road that runs north through the meadow. I walked into work surrounded by them.

The peepers were with us for at least a few days. Colleagues found them in leaf traps and reported hearing their songs throughout the woods at all times of the day. Chorus frogs had also rediscovered their voices and were trilling in the warm afternoons. On a cool morning midweek, I made a quick stop to listen for the spring peepers again. The forest was silent. Gnats buzzed around the stinkhorns. Then, from a hollow tucked between the shortcut trail to Big Rock and the trail that runs west along the ridge of the moraine, a single peeper called. I walked down into the hollow and poked around for five or ten minutes, but there were no other calls.

In early October, sugar maple leaves are turning yellow and starting to fall. Lower branches of the American black elderberry corymbs are broken, and ray flowers fall from wingstem in the floodplains. Zig-zag goldenrod heads are pale with feathery achenes. Wood nettle leaves are chewed to lace but still have plenty of sting left. Bedraggled pale jewelweed provisions its late-season capsules, galls blistering along its leaf midveins and darkening

White Rattlesnakeroot

Calico Aster

Elm-Leaved Goldenrod

Gray's Sedge

Wild Leek

along one side. Wild leek has dropped about a third of its seeds. Fowl mannagrass culms are reclining. Enchanter's nightshade leaves have almost all fallen, leaving the stalks bristling with fruits. But false rue anemone, one of our iconic spring ephemerals, often begins sending up fresh shoots. The species is known to be a fall germinator,[5] a rarity in our forests. Yet many people miss it in the fall,[6] myself included for my first twenty-five years as a naturalist.

By mid-October, white-throated sparrows pass through town on their way southward and fill the fields with "tssts" and whistles, marauding the shrubs for berries and insects. Near sunrise, a single bird may belt out its spring song, the bold three-toned "Old-Sam-Peabody-Peabody-Peabody" or the two-toned "Oh-Canada-Canada-Canada."[7] The territorial song sparrows join in as they are skipping town, possibly defending their territory on the way south,[8] as they did on the way to their breeding grounds in the north.

These discordant echoes of spring reverberate through the months of fall: frog calls, spring wildflowers emerging under the year's falling leaves, sparrows guarding territory as though it were breeding season. Signs of the changing season are deeply inscribed, paid for with the lives of individuals whose instincts weren't as well tuned. Time your emergence right, and you'll make it through winter. Time it wrong, and you may not. A million hard-earned habits comprise this business of laying up treasure on earth, where the moth and dust corrupt. These are the forest's strategies for getting through winter. Beauty is a byproduct.

IV

Chlorophyll molecules become unhooked from the proteins that bind them as the days shorten and the nights become colder. They become phototoxic to the leaves in which they reside. Each leaf then begins the process of autumn housekeeping, breaking the chlorophyll into harmless components that can be recycled.[9] It reabsorbs nitrogen, nutrients, and basic elements that are costlier to assimilate than to recycle. As the engines of photosynthesis are disassembled and reabsorbed, carotenoids are exposed, producing the brilliant yellows of fall. Anthocyanin production picks up, producing reds and oranges that may protect the leaf from sun or insects for a few weeks.[10] It is a short period of intense color, shaped by the balance of daytime and nighttime temperatures, the shortening hours of daylight, the timing of precipitation, and the internal coordination of chlorophyll degradation, redistribution of resources in the tree, and the production of new pigments. Activity at the molecular level scales up to cells, to leaves, to canopies, finally to hillsides in color.

Last year, an early snow fell on Halloween, weighing tree branches down and tearing leaves off prematurely. The next morning, an hour after sunrise, yellow sugar maple leaves chirped almost inaudibly as they hit the fresh snow and glowed like lanterns on its surface. The skeletons of jewelweed were knocked to the ground. The wood nettle leaves, frozen, hung like

White Oak Acorns Germinating

rags. A woodcock stopped over on its way south, skating past a twelve-inch diameter red oak that had been hauled down by the snow. Fall can be over in a moment.

In most years, though, autumn funnels down to winter. Conduits between tree leaves and their branches are squeezed by a scar forming at the base of the petiole, and the trees rain resources. Leaves falling to the soil return calcium, nitrogen, and other nutrients that were shuttled upward all through the summer. Maples, basswoods, ashes, tulip trees, sassafras, and black cherries shed nutrient-rich leaves that are thin and tasty. These decompose rapidly, forming an ephemeral and semitranslucent sheet over the soil's surface. Oaks, American beeches, and shagbark hickories drop leaves that decompose more slowly, remaining on the forest floor where they insulate and provide the raw material for rodent and insect activity and the matrix for ground fires.[11] The chemical composition of these leaves, particularly their calcium content, shapes the sounds we will hear the next year in the quiet evenings, as Eurasian earthworms drag whole leaves into their burrows, selecting the calcium-rich species first[12] and shushing along under the leaf litter. When I stamp my foot next summer, shaking the ground, the earthworms will all slurp down into their burrows and go silent for a moment before they begin again: shh, shh, shh.

June beetle grubs go dormant. Cicada children, patient by nature, gradually cease their subterranean feeding. Forest understory herbs move their resources back into their corms or bulbs or rhizomes or bequeath them to the forest floor. Bald-faced hornet queens crawl into rotting logs and prepare for winter, quiet and still. Rotten black walnut husks disintegrate in puddles at the bases of hills. Needle ice appears again in the wet soil.

V

By the end of November, the days are cool and overcast. White oak and red oak and sugar maple leaves interbed. A few seedlings continue twisting over soggy earthworm castings that erode to granules beneath the litter. The crickets and birds are quiet, and colors become subdued. People are mostly gone from the woods. Orion begins to show up in the evening sky, gliding upward from the eastern horizon just about the time we are settling into bed.

The musclewood, ironwood, beeches, and oaks rattle with marcescent leaves: the branches either mistimed or willfully ignored the last freeze of the year, and in so doing, they failed to produce the scars that would have severed these leaves from the tree.[13] The squirrels have mostly gleaned the acorns and walnuts they need. Their messy nests are exposed in the treetops. Bark on many of the slender ashes and sugar maples throughout the woods is shredded where bucks have rubbed, scraping the velvet from their antlers. Jewelweed skeletons are broken over and knocked to the ground. Zig-zag and elm-leaved goldenrods are sparsely fuzzed with achenes, while white snakeroot has fully dispersed its fruits, and the few remaining bracts that once subtended the flowerheads are recoiled and twisted like starfish arms. Sandhill cranes fly southward in flocks of a hundred or more, their backs scraping the clouds.

Snow comes and goes, piling up on turkeytail fungus (*Trametes versicolor*) and secluding itself in the bark fissures of fallen logs. Juncos and chickadees glean and then spread the persistent berries of honeysuckle and gray dogwood. They are setting next year's seedlings into motion. White avens, spinulose wood fern, hepatica, white bear sedge, and a handful of other common species photosynthesize beneath the falling snow. The rhizomes of spring wildflowers are suspended for a moment, appear to rest for winter, but extend by a hair's breadth each time the soil thaws, bending around a buried stone. The future slowly unrolls with each cell division, shaping the forest we'll walk through two and three springs hence.

Leaves abscise at intervals. They gyre downward. They touch the ground. Then, there is the shush of leaves against leaves. Everything that falls accumulates and shapes the forest floor. Here, a falling tree hides the entrance to a mouse's home and crushes a mass of puffballs, and spores are dispersed. Over there, the leaves pile deeply, and then a windstorm blows them away so that the next year's fires will not burn through: as a consequence, a handful of sugar maple seedlings survives one more year in the understory. These are the endings that form the forest's beginning.

Endnotes

1 Czederpiltz, D. L. L., Volk, T. J., and Burdsall, Jr., H. H. 2001. Field observations and inoculation experiments to determine the nature of the carpophoroids associated with *Entoloma abortivum* and *Armillaria. Mycologia,* 93: 841–851. And for a readable summary: Volk, T. J. 2006. *Entoloma abortivum,* the aborting *Entoloma,* a.k.a. hunter's heart, totlcoxcatl, or "ground prunes." University of Wisconsin Plant Teaching Collection. Retrieved from: http://botit.botany.wisc.edu/toms_fungi/sep2006.html.

2 For a great article on the story of *Armillaria* taxonomy: Volk, T. J. 2002. The humongous fungus—Ten years later. University of Wisconsin Plant Teaching Collection. Retrieved from: http://botit.botany.wisc.edu/toms_fungi/apr2002.html.

3 The renowned forest ecologist John T. Curtis wrote of jewelweed, "One interesting response to light is frequently seen in mesic forests in which selective logging has been practiced so that large openings have been made in the canopy. The yellow jewelweed (*Impatiens pallida*) regularly forms an almost pure stand under such openings. This succulent and tender annual is very sensitive to light and is markedly reduced in height at diminished intensities. The colonies thus take on the characteristics of an integrating light meter, with the tallest plants in the center of the colony and shorter and shorter

Chicken of the Woods

plants toward the edges. They produce contoured mounds which reflect the chance peculiarities in shape of the canopy opening with surprising accuracy." Curtis, J. T. 1959. *The Vegetation of Wisconsin: An Ordination of Plant Communities* (pp. 122–123). Madison: University of Wisconsin Press.

4 "Listen to the rain, more rain, treadling earth to the sodden cold wet spun heads of this room, pacing the winter to and fro." Borodale, S. 2012. 3rd December: Notes. *Bee Journal.* London: Jonathan Cape.

5 Baskin, J. M., and Baskin, C. C. 1986. Germination ecophysiology of the mesic deciduous forest herb *Isopyrum biternatum. Botanical Gazette,* 147: 152–155.

6 I have only dipped my toe into the woodland phenology literature, but an unpublished report by Max Partch is an interesting example. Partch took pains to observe all plant phases across numerous species well into October and still included no observations of new growth in the fall. Partch M. 1999. Plant phenology in central Minnesota. *Biology Faculty Publications,* 1. Retrieved from https://repository.stcloudstate.edu/biol_facpubs/1

7 If you sense that the white-throated sparrow song has changed over the past decade or so, you may not be imagining it. Since 2000, the two-noted song has spread across the breeding ground in Canada to largely supplant the three-noted song, perhaps due to tutoring in the wintering grounds. Otter, K. A., Mckenna, A., LaZerte, S. E., and Ramsay, S. M. 2020. Continent-wide shifts in song dialects of white-throated sparrows. *Current Biology,* 30: 3231–3235.e3

8 Wingfield, J. C., and Soma, K. K. 2002. Spring and autumn territoriality in song sparrows: Same behavior, different mechanisms? *Integrative and Comparative Biology,* 42: 11–20.

9 Christ, B., and Hörtensteiner, S. 2014. Mechanism and significance of chlorophyll breakdown. *Journal of Plant Growth Regulation,* 33: 4–20.

10 The potential adaptive role of leaf coloration is an area of active study. For an informative review, see: Archetti, M., Döring, T. F., Hagen, S. B., Hughes, N. M., Leather, S. R., Lee, D. W., Lev-Yadun, S., Manetas, Y., Ougham, H. J., and Schaberg, P. G., et al. 2009. Unravelling the evolution of autumn colours: An interdisciplinary approach. *Trends in Ecology & Evolution,* 24: 166–173. For a recent evaluation of competing hypotheses: Pena-Novas, I., Archetti, M. 2020. Biogeography and evidence for adaptive explanations of autumn colors. *New Phytologist,* 228(3): 809–813.

11 Among the species I have included here, those dominated by arbuscular mycorrhizae (e.g., the maples) tend to decompose more quickly than those by ectomycorrhizal fungi (e.g., the oaks). Phillips, R. P., Brzostek, E., and Midgley, M. G. 2013. The mycorrhizal-associated nutrient economy: A new framework for predicting carbon–nutrient couplings in temperate forests. *New Phytologist,* 199: 41–51.

12 Holdsworth, A. R., Frelich, L. E., and Reich, P. B. 2012. Leaf litter disappearance in earthworm-invaded northern hardwood forests: Role of tree species and the chemistry and diversity of litter. *Ecosystems,* 15: 913–926.

13 My understanding of this phenomenon comes primarily from an unpublished University of Wisconsin–Madison botany thesis on the anatomy of marcescent leaves in black oaks. As far as I know, the only published report on the thesis is a brief article I wrote in 1996 for *NewsLeaf,* the newsletter of the University of Wisconsin–Madison Arboretum, then updated in 2005 as "When Oak Leaves Fail to Fall," *Plant Health Care Report,* 2005.03: 11–12; reprinted in 2007 in the Taltree Arboretum's newsletter, *Tag Along,* 6: 6–7.

PLANTS REFERENCED

Acer saccharum – sugar maple
Ageratina altissima – white snakeroot
Allium tricoccum – wild leek; *A. burdickii* is sometimes recognized as a distinct species, and my account also applies to that species
Arisaema triphyllum – Jack-in-the-pulpit
Asarum canadense – wild ginger
Carex albursina – white bear sedge
Carex grayi – Gray's sedge
Carex lupulina – hop sedge
Carex radiata – straight-stigma wood sedge (I made up this common name, because the sometimes-applied "straight-styled wood sedge" is a misnomer; the stigmas separate this species from *C. rosea,* not the styles)
Carex rosea – curly-stigma wood sedge
Carpinus caroliniana – musclewood
Carya ovata – shagbark hickory
Caulophyllum thalictroides – blue cohosh
Circaea canadensis – enchanters' nightshade
Cornus racemosa – gray dogwood
Dryopteris carthusiana – spinulose wood fern
Enemion biternatum – false rue anemone
Fagus grandifolia – American beech
Fraxinus sp. – ash
Geum canadense – white avens
Glyceria striata – fowl mannagrass
Helianthus sp. – sunflowers; here the common woodland species are *H. strumosus* and *H. decapetalus*
Hepatica sp. – hepatica
Impatiens pallida – pale jewelweed; the description in the first half of this essay also applies to *I. capensis,* though *I. pallida* is the more common in the woods I frequent
Juglans nigra – black walnut
Lactuca sp. – wild lettuces
Laportea canadensis – wood nettle
Liriodendron tulipifera – tulip tree
Lobelia siphilitica – great blue lobelia
Lonicera sp. – honeysuckle
Maianthemum racemosum – false Solomon's seal
Nabalus albus – white rattlesnakeroot
Ostrya virginiana – ironwood
Prunus serotina – black cherry
Quercus alba – white oak
Quercus rubra – red oak
Sambucus canadensis – American black elderberry
Sassafras albidum – sassafras
Solidago flexicaulis – zig-zag goldenrod
Solidago ulmifolia – elm-leaved goldenrod
Symphyotrichum lateriflorum – calico aster
Tilia americana – basswood
Verbesina alternifolia – wingstem

Andrew Hipp is the senior scientist in plant systematics and herbarium director at the Morton Arboretum in Lisle, Illinois. He conducts research on the origins and implications of plant diversity, with a focus on oaks, sedges, phylogenetic ecology, and trait evolution. You can read about his research at http://systematics.mortonarb.org and follow his natural history blog at https://botanistsfieldnotes.com.

Rachel Davis is an independent visual artist in the Chicago area. She works at the interface of natural science, abstract painting, printmaking, and textiles, integrating the formal and empirical elements of the natural world in her work. You can see more of her work at https://artbumble.com and follow her on Instagram: @art_bumble.

BOOK REVIEW

How Trees Were Urbanized

Phyllis Andersen

Sonja Dümpelmann. *Seeing Trees: A History of Street Trees in New York City and Berlin.* New Haven: Yale University Press, 2019.

The Roman engineer Vitruvius, writing in the first century BCE, suggests that trees were the original model for columns. The classical colonnade became the precursor to the tree-lined street. The repetition of identical elements evokes a kind of control, an organizing principle for settings otherwise subject to continual change. The tree metaphor persisted into the Renaissance with the architect Leon Battista Alberti, in the fifteenth century, pointing out the similarity between the increased diameter of the bottom of columns and the root flare of the planted tree. An association of trees and streets evolved. By the late nineteenth century, tree-lined streets were part of every urban planner's tool kit. Sonja Dümpelmann examines two approaches to street tree planting in her recent book, *Seeing Trees: A History of Street Trees in New York City and Berlin.* In the narrowest sense, her book is a case study of two cities and their approach to trees, but in the broader context, she weaves together the overlapping perspectives of urban design, tree management, and engineering and seamlessly integrates them with shifting political and social values. Her book is not only a contribution to the history of street tree planting but an original contribution to urban history.

The nature-versus-culture divide applies here as it does to much of urban landscape history. "Cities were naturalized," Dümpelmann writes, "and trees were urbanized." In American cities, street planting was part of the Romantic "urban pastoral" movement of the late nineteenth century. Advocates proselytized about bringing elements of the countryside into the city, arguing that this would offer respite from the tension inherent in city life. In New York City, trees were part of the urban sanitizing movement that created Central Park. Tree care itself still depends on the health metaphor originating in that period. Trees are evaluated in terms of health and disease. Terms like *immune systems, resilience,* and *injury* are part of tree care. Until recently arborists were called *tree surgeons.* Conversely, contemporary urban tree-planting practices embrace sophisticated technology to create manipulated growing conditions—an honest, transparent recognition of the unique conditions of the urban landscape. Tree species are hybridized to create selections that can withstand urban conditions. Soil mixes are created with the specificity of prescription drugs. Planting pits are engineered. It is now clear that what happens underground is as essential (if not more) to tree survival as what happens above.

In American cities, grand street-tree-planting projects are still part of political campaigns—a bread-and-circus approach to garner votes in upcoming elections with no provision for aftercare. Despite lessons learned about urban planting as an ongoing process that involves nurturing young plants, providing water, and protecting trees from damage and from insects and disease, municipal governments often leave trees on their own to survive with little intervention. Advocates promote trees in terms of ecosystem services, pointing out that trees moderate local weather conditions, filter pollution, and reduce global warming. Trees symbolize civic pride and the regeneration of neighborhoods. Altogether this is a heavy burden to place on young plants. Every city has tree haters as well as tree lovers. If, on one hand, trees clean the air, on the other, they are dirty: They drop leaves and fruit on sidewalks and cars. They attract bugs. Trees block signs and

Facing page: **Philibert de L'Orme described trees as the original inspiration for columns in his *Le Premier Tome de l'Architecture,* published in 1568.**

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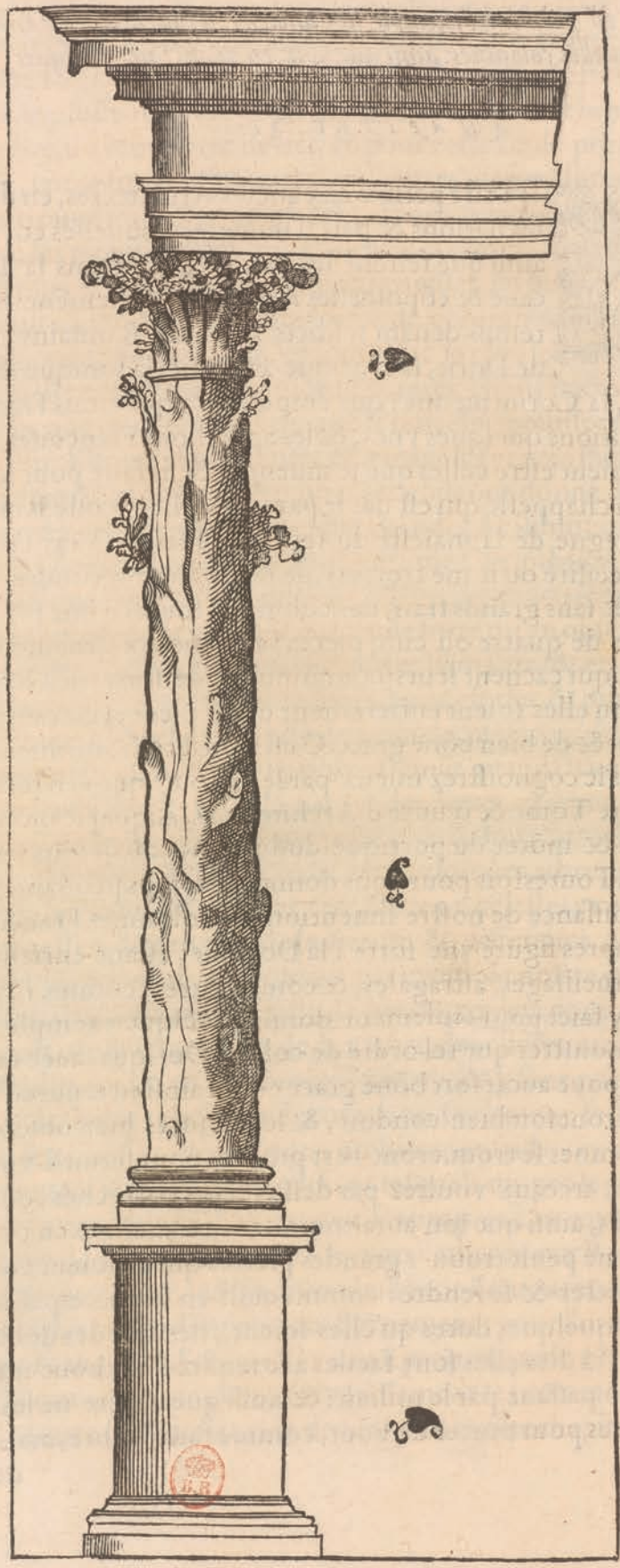

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The Tree Planting Association highlighted plantings on New York City's West Sixty-Eighth and West Sixty-Ninth Streets as examples of "model tenements" in a 1903 report.

storefronts. Although a seemingly benign activity, tree planting still attracts controversy.

Tree species selected for urban streets have been transformed by research and hybridization. But the selection of tree species is still vulnerable to fads. Dümpelmann quotes landscape gardener Andrew Jackson Downing in 1847: "There is a fashion in trees that sometimes has a sway no less rigorous than that of a Parisian *modiste.*" The tree of heaven (*Ailanthus altissima*), once recommended as a street tree, was quickly rejected because of its overwhelming odor. Norway maples (*Acer platanoides*), widely planted because of their ability to thrive in stressful conditions, are now banned in some communities because of their propensity to self-seed. American elms (*Ulmus americana*) are lost to disease. Dümpelmann reveals how the selection of tree species is vulnerable to xenophobic reactions both in Germany and the United States. Trees are caught in the debate between native-plants-only advocates and those who champion botanical cosmopolitanism.

The strength of Dümpelmann's treatment of street tree planting in New York is her ability to point out the differences between the work of municipal government, high-minded philanthropic groups, and community-based initiatives that recognize the needs of specific neighborhoods. Top-down versus bottom-up. New York's tree-planting schemes are still controlled by the New York City Commissioner's 1811 plan that overlaid a grid from Houston Street to 155th Street, ignoring the island's rolling topography. The architectural historian Hilary Ballon calls New York City's grid plan "a living framework." It is the tension between the rigidity of the grid and the looseness of the crowns of trees that defines the classic New York City street. While the practical benefits of street tree planting drove municipal efforts, philanthropic groups were also aware that tree-lined streets gave the rapidly growing city a veneer of a refined environment. One of the first to join the movement was Gifford Pinchot, head of the United States Forest Service. As residents of the city, Pinchot and his wife, Cornelia, were active members of the Tree Planting Association, founded in 1897. In addition to his interest in scientific forestry, Pinchot believed that trees were "the only form through which the residents of the city can come in daily contact with nature as we know it in the woods and fields."

By the early twentieth century, the New York landscape had become a gendered space dominated by male professionals. Dümpelmann describes how women gained entrée to tree-planting projects by virtue of their social position and influence. Women were valued for their roles as caregivers, child protectors, and municipal housekeepers. Tree-planting efforts

were a natural fit. Cartoonists had a field day. Later in the twentieth century, women were important leaders in groups like the Neighborhood Trees Corps and the Magnolia Tree Earth Center, which began to work in neighborhoods left behind in earlier planting efforts. African American groups, especially those in Bedford-Stuyvesant, organized local tree-planting projects to regenerate their neighborhood where the street was park space. Community groups came to resist top-down government initiatives and well-meaning but naïve philanthropic efforts.

Both New York and Berlin began street planting to build a healthy environment for residents. In contrast to New York City's efforts, street tree planting in Berlin is inextricably associated with destruction and loss. Berlin's important achievements in urban planning in the nineteenth and early twentieth century—broad tree-lined avenues and gracious parks—were destroyed by war. Trees were lost in massive numbers during World War II. Many were lost to bombing; those that remained were cut down for firewood and building materials. Dümpelmann's treatment of Berlin's rebuilding includes many small, poignant stories, from the struggle to plant trees on rubble to the protection of the city's mountain ash (*Sorbus aucuparia*) street trees because of the nutritional value of their fruits. The partition of the city into East and West sectors after World War II removed any possibility of comprehensive urban reforestation. It was only after reunification that renewed planting efforts could build on Germany's earlier research in scientific forestry, expanding on their admired analytic methods and fieldwork. The goal of nineteenth-century German forestry research was to increase yield, yet the basic methods of scientific analysis used for research were intriguing to tree specialists well beyond the field of forestry. German plant scientists experimented with vegetative propagation and hybridization techniques to create "the perfect tree." They warned of the dangers of monoculture. Charles Sprague Sargent, the Arnold Arboretum's first director, assembled a valuable collection of German forestry manuals.

Information exchange in the twentieth century between American street tree specialists and their German counterparts resulted in more sophisticated and experimental planting techniques. Ideas on tree management spanned from the individual plant to the greater tree population of a city. The American landscape architect Elbert Peets, a long-time advocate of street tree planting as an essential component of city design, collaborated with the German urban planner Werner Hegemann on *American Vitruvius: An Architect's Handbook of Civic Art,* published in 1922. This book provided a compendium of examples of urban forms, including the integration of trees into streets and boulevards. William Solotaroff, the New Jersey-based city forester and author of the widely distributed *Shade-Trees in Towns and Cities* (from 1911), often referred to German models for street planting.

Dümpelmann uses the complicated story of loss and rebirth of Unter den Linden, Berlin's famous tree-lined boulevard, to mirror Berlin's fractured history. It was created in the late seventeenth century and connects the pleasure ground of the Berlin Palace to the Brandenburg Gate. Long admired as one of the great promenades of Europe, the design was referenced in Frederick Law Olmsted's 1868 proposal for the parkways of Brooklyn. Unter den Linden is now freed from the isolation of East Berlin and is being restored with its long allée of lindens as part of the greater unification of the city.

For some, there is a certain cynicism about planting street trees in cities. As Dümpelmann reflects, street trees have an "inbuilt a priori obsolescence." They die. In both New York and Berlin, we see that the ability of trees to thrive is contingent on human intervention. But even given that responsibility, we no longer question that they are an essential part of urban infrastructure. We have enough confidence in urban life to no longer reference *rus in urbe,* the country in the city. Trees on city streets are health-enhancing; they have a strong sensory presence. But in the end, it is the power of the eye, the visual value of trees on streets that sustains their place in the city.

Phyllis Andersen is a landscape historian and former director of the Institute for Cultural Landscape Studies of the Arnold Arboretum

A Writer's World: *Fagus sylvatica* 'Pendula'

Sheryl L. White

An afternoon in July found me in the Arnold Arboretum landscape, on a writer's quest, looking for inspiration for new poems. I was back for the first time since mid-March, when the impact of the coronavirus became unmistakable. Masked in the brilliant summer sun, I revisited the copse of white pines atop Bussey Hill, and on my way back down the hill, I cut across the dry, dusty grass where the mansion of Benjamin and Judith Bussey (the hill's namesakes) once stood. There, I found what I had been looking for—an entrance into a new world, one created by an old weeping beech (*Fagus sylvatica* 'Pendula', accession 22746*A).

Composing in my mind, I parted the emerald curtain of branches. Inside was a space of light and awe. Sequins of sun edged through a jangle of leafy streamers. At my feet, swollen roots appeared to be burnished like antique pewter. The tree forms a living memoir, written in the layering of branches that produce younger trunks. Those offspring encircle the mother trunk and echo its smooth gray. This was truly a tree to write about, with an allure both glorious and otherworldly.

For me, all beeches have an aura of magic, but this tree, with its resplendent sanctuary, is my delight. It draws me in, hinting of a mythical forested world. Artists paint beeches; writers write about them—and also on them. Their wide boles of smooth silver have beckoned lovers and poets through the centuries. In Shakespeare's *As You Like It,* Orlando hangs his love notes upon the trees, amorously declaring, "O Rosalind, these trees shall be my books." This weeping beech is a well-annotated tree, incised with the names, initials, words of those who hoped to leave some mark, proclaim passion, or silently (!) voice an observation.

My own words would never find a "voice" on a tree. Still, I am curious about the *R*'s and *E*'s, hearts, and watchful eyes on this trunk—and I wonder about the impassioned sentiments that have already elongated and faded into its skin. When the tree was first mentioned in the Arboretum records, in 1942, it was described as "an old tree," presumably part of the nineteenth-century landscaping. The Bussey mansion was transferred to Harvard from the family in 1896, after the death of Thomas Motley, the husband of the Busseys' granddaughter, Maria. From that time until ours, how many must have marveled beneath this canopy?

Weeping beeches have long inspired writers to mold that marvel into words. Garden and catalogue writers of the nineteenth and early twentieth century featured the weeping beech frequently, embellishing its description with curious and sometimes contradictory adjectives. Consider Albany Nurseries' 1915 description: "quite ungainly in appearance … of wonderful grace and beauty." One wonders that they sold. Frank J. Scott, in *The Art of Beautifying Suburban Home Grounds of Small Extent,* published in 1873, resolved the contradictions into an enlightened use of prose: "It is the very embodiment of all the odd freaks of growth that make trees picturesque, and the vigorous healthfulness of foliage that makes them beautiful."

An etching in *The Gardeners' Chronicle,* from 1870, catches my own writing imagination—the tree leans and agitates, even in the stillness of an illustration. Its branches, from the very top to the thick undulating midsection, appear to swoop and splay about the ground in a hoary tapestry of leaf and limb. The tree's form and aspect appear as a landscape upon a landscape—so yes, as the accompanying article proclaims, "both grotesque and picturesque."

Our tree stands steeple-like on the hill, catching a mosaic of sun. This specimen is surely, to echo a description from *The Horticulturist* in August 1872, "like a cathedral built by one of the old masters of architecture." I consider the wonder of its life. It reassures me, even in our present world, that we, with this beech, remain, survive, hold to our roots. *Fagus sylvatica* 'Pendula' is evidence of nature's endurance and humanity's desire to be remembered. It is a witness. Though it does weep, I believe it is with a wondrous joy where it touches the earth.

Sheryl L. White is coordinator of visitor engagement and exhibitions at the Arnold Arboretum. Her poetry chapbook, *Sky gone,* was published by Finishing Line Press this fall.

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