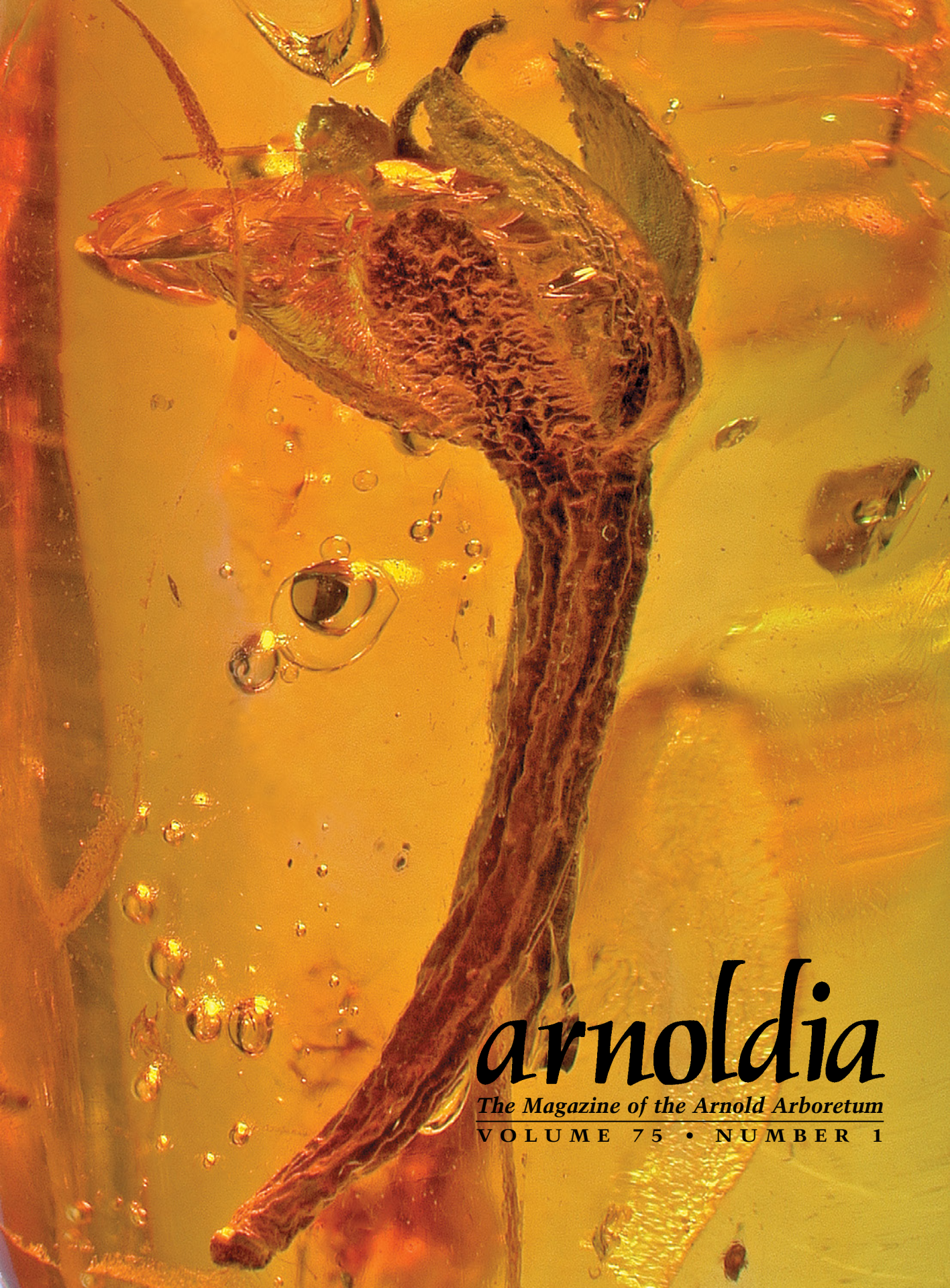

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Front cover: Plant parts, such as this flower, and animals trapped in amber can provide important scientific insights to the distant past. Photo courtesy of Patrick R. Craig.

Inside front cover: Many public parks, including Boston's Public Garden, seen here, still create extensive annual bedding out displays, a practice first popularized in the Victorian era. Photo by Norman Eggert/Alamy Stock Photo.

Inside back cover: Whether you call it striped maple, snakebark maple, or moosewood, *Acer pensylvanicum* is an admirable native tree. Photo of Arnold Arboretum accession 137-2003-F by Jon Hetman.

Back cover: A carpet of non-native lesser celandine (*Ranunculus ficaria*) blooms amid old stems of *Helianthus.* Photo by Peter Del Tredici.

Plant Exudates and Amber: Their Origin and Uses

Jorge A. Santiago-Blay and Joseph B. Lambert

Plants produce and export many different molecules out of their cellular and organismal confines. Some of those chemicals become so abundant that we can see or smell them. The most visible materials oozed by many plants are called "exudates."

What are plant exudates? Generally, exudates are carbon-rich materials that many plants produce and release externally. When exudates are produced, they are often sticky to human touch. Such plant chemicals can be the visible expression of attack by bacteria, fungi, herbivores, or some other plant pathology. In other instances, such as in typical underground roots, exudate production appears to be part of the typical metabolism of healthy plants that helps stabilize the soil and foster interactions with other organisms around the roots.

Different plant tissue types and organs can produce exudates. We have collected resins and gums from the above ground portions of plants, or shoots, as well as from the generally below ground portion of plants, or roots. Root exudation has been known for decades and is respon-

Prolific white, resinous exudation is seen on a tumor-like growth on the trunk of a white pine (*Pinus strobus*) at the Arnold Arboretum.

Resinous exudates on a conifer.

Blobs of white resin on a relatively young shoot of a Japanese black pine (*Pinus thunbergii,* AA accession 11371-O).

A slab of Great Basin bristlecone pine (*Pinus longaeva*) right out of the microwave oven showing extruded (and very hot!) resinous exudates. Microwave heating experiments were performed at the Laboratory of Tree-Ring Research, University of Arizona, Tucson.

sible for many of the fascinating relationships in the interface of plant roots and soil microorganisms known as the rhizosphere.

Collecting and Analyzing Plant Exudates

After receiving collecting permission (if needed), we spend days walking the grounds of botanical gardens and arboreta, or do field work elsewhere. Exudates are easily collected directly from the trees with no harm to the plant and leaving no doubt about their botanical identity. Occasionally we use more forceful methods, such as carefully microwaving wood slabs to extract the exudates, then letting them resolidify. Once the material is collected, we place it in a small plastic zip-top bag. An additional, external bag is used to hold a paper label containing the collection data. If needed, we let the exudate dry slowly in an oven and, once dried, the materials are ready for subsequent analyses. In other instances, generous collaborators send us materials for chemical analyses.

Carbon-13 solid state Nuclear Magnetic Resonance spectroscopy (ssNMR) is a state-of-the-art research tool that generates spectra (or chemical signatures) of materials, including plant exudates and amber or greatly fossilized plant resin. The analyses, which use a tiny amount (as little as 50 to 100 milligrams, approximately the volume of a new eraser on a school pencil) of the exudate, are non-destructive. They are performed at Northwestern University (in Evanston, Illinois), one of a few research laboratories in the world with carbon-13 ssNMR capabilities. At times, we observe plants that evidently have produced exudates but the amounts are insufficient for our analyses.

Solid exudates are pulverized manually and undergo two sets of carbon-13 ssNMR analyses: normal decoupling, which gathers signals for all carbon atoms, and interrupted decoupling, which, among others, obtains signals from carbons lacking the attached hydrogens. Just like in spectra used in the health-allied sciences, different regions of the spectra provide valuable information (see Figure 1 on page 4). In the case of NMR, the peaks represent different atoms and reflect their molecular environment. The height of the peaks largely represents rela-

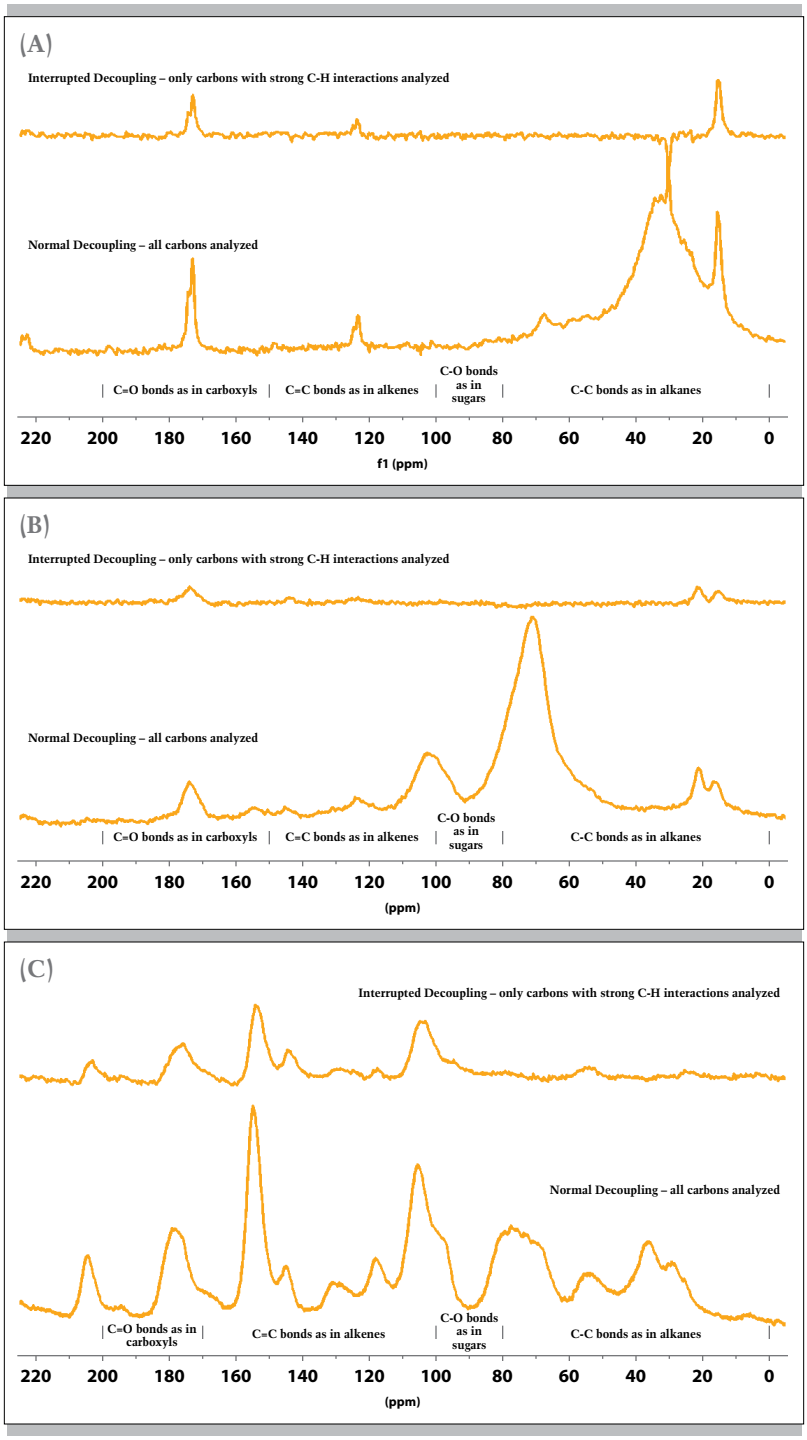

Figure 1. Chemical identity of peaks on a C-13 ssNMR spectra. Panel (A) is a resin, panel (B) is a gum, and panel (C) is a kino (a type of phenolic, often found in *Eucalyptus*). In all panels, the upper result uses interrupted decoupling, which eliminates peaks representing C-H single bonds. The lower result uses normal decoupling in which all carbon-to-atom bonds are represented.

tive abundance of those atoms. The position of the peak along the horizontal axis (parts per million [ppm]) is the resonance frequency characteristic of the atom and its molecular neighborhood. This position is an indication of the chemical identity of the peak as compared to an external molecular reference. In carbon-13 ssNMR, peaks in the 0–80 ppm region are singly bonded carbon atoms (-C-C-), or alkanes; signals within the 80–100 ppm region are single bonded carbon atoms with electron-withdrawing neighbors, in particular, oxygen (C-O), as found in carbohydrates, such as sugars. Currently, we have analyzed over 1,800 exudates of all types, including amber, representing most of the major plant groups worldwide. However, a lot more samples still need to be acquired and analyzed.

Types of Plant Exudates

Using NMR, we have determined that there are three major types of plant exudates: resins, gums, and phenolics. Resins are made from terpene molecules. The basic molecular unit of terpenes is a five-carbon molecule, known as isoprene (see Figure 2 on page 6).

When freshly produced, many resins are sticky and smell like Christmas trees or incense. Resins are insoluble in water and thus do not dissolve during rains. As time passes and the resins begin to "mature," many of their original chemical constituents evaporate. The materials remaining behind in the resin blob form chemical bonds, a process known as polymerization, and the blob begins to harden. With the passage of millennia, the resinous material becomes greatly polymerized and

Not On the Collection List

Not everything that looks like an exudate is an exudate. Some living organisms, particularly fungi, can resemble the kinds of plant exudates we collect. In other instances, the watery—and often foul smelling—material that decomposing portions of plants produce can also resemble exudates. As you may guess, we do not collect those!

JOSEPH O'BRIEN, USDA FOREST SERVICE, BUGWOOD. ORG

Clockwise: Some exudate mimics include a cedar-apple rust (*Gymnosporangium juniperi-virginianae*) fungal fruiting body on *Juniperus virginiana;* an unidentified fungus growing on a *Pinus hwangshanensis* (AA accession 68-76-F)—note its superficial similarity to the yellowish color of some resins; a *Polyporus* fungus on *Quercus palustris* (AA accession 805-87-A); an exudate-resembling, foul smelling material resulting from decomposition by fungi and bacteria on a cut *Cornus kousa* (AA accession 524-49-D) branch.

CHIP CLARK, NATIONAL MUSEUM OF NATURAL HISTORY, SMITHSONIAN INSTITUTION

Close-up of resinous flow on the trunk of a pine (*Pinus*).

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Latex exudate emanating from a *Euphorbia tirucalli* stem.

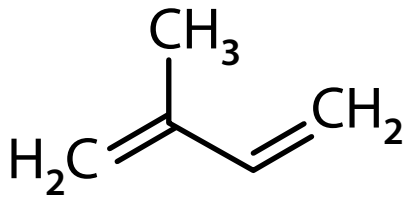

Figure 2. An isoprene molecule, the building block of resins.

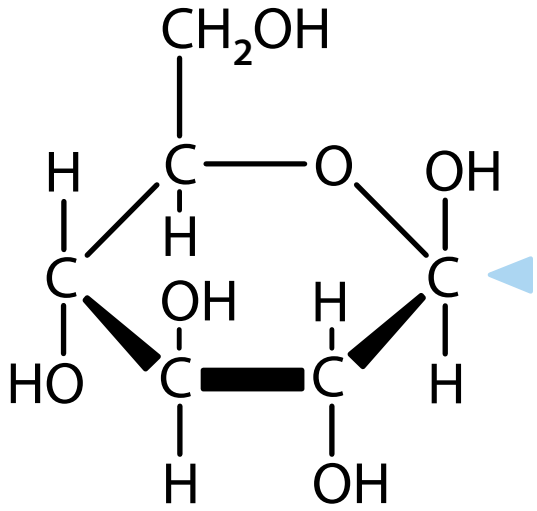

Figure 3. Model of a glucose, an example of a simple sugar molecule. Chemically linked sugar molecules make up carbohydrates. The carbon bound by two oxygen atoms (arrow) is known as anomeric carbon and is characteristic of sugars. Exudated carbohydrates are known as gums.

evolves into the robust gemstone called amber, produced only by specific plant species. Conifers such as pines (*Pinus*), firs (*Abies*), spruces (*Picea*), larches (*Larix*), and some other familiar cone-bearing trees in northern latitudes tend to produce resinous exudates. Many angiosperms (flowering plants) also produce resins.

The term "latex" refers to milky-looking exudates produced by numerous flowering plants, including those in the euphorbia or spurge family (Euphorbiaceae). Latexes can be dangerous to touch, causing dermatitis or other damage, especially to the eyes. Interestingly, all latexes we have examined thus far are resins in suspension.

A second type of exudates is known as gums. Gums are large carbohydrates consisting of myriad sugar molecules linked together chemically (see Figure 3 above). Gums do not

Gum produced by a Yoshino cherry (*Prunus* × *yedoensis*) growing near the Tidal Basin in Washington, D.C.

Reddish phenolic exudates are visible on the trunk of this *Eucalyptus sideroxylon*.

tend to smell because of their low volatility stemming from their high molecular weight. When freshly produced, many gums are spongy to touch because of their high water content. Thus, freshly produced gums dissolve easily during rains. If somehow gums manage to survive and dry out, they can then be very hard to dissolve. However, as far as we are aware, gums are not known to survive millions of years as amber does. Gum exudates tend to be produced by flowering plants; fruit trees in the genus *Prunus,* including cherries, plums, peaches, and almonds, commonly produce gums.

The third major type of exudates is known as phenolics. Phenolics are chemically related to terpenes but form unsaturated ring compounds known as aromatics because of their often-pleasant odor. When freshly produced, phenolics tend to be watery and reddish brown, and lack the strong smell of resins. If they survive dissolution, phenolics tend to form brittle solids. As with gums, we are not aware of phenolics that have survived deep time. Phenolics tend to be common in *Eucalyptus* and related plants. Combinations of these major types of exudates, such as gum resins, as well as several other minor kinds of exudates are also known.

Uses of Plant Exudates

In addition to their generally beautiful colors, pleasant aroma, and light weight, resins are water insoluble. These properties make resins, including amber, coveted natural products. Some uses of resins, including amber, include: ceremonial and artistic, as construction materials, ingestive, and, of course, as objects of science because they provide windows into past worlds.

Ceremonial and artistic uses

Amber, that is, greatly polymerized resin, has been used for ceremonial purposes as well as for objects of trade, jewelry, sculptures, and many other items. Although highly valued in the market, amber varies greatly in color and translucency, from white to black and from translucent

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An assortment of typical yellowish amber specimens showing the wide range in color and translucency.

PATRICK R. CRAIG

A group of typical Baltic amber specimens shows varying color.

PATRICK R. CRAIG

Specimens of rare Dominican blue amber from the personal collection of Patrick R. Craig.

PATRICK R. CRAIG

Earrings made from Columbian copal were treated in an autoclave, which applies heat and pressure, resulting in a color change from yellow to green.

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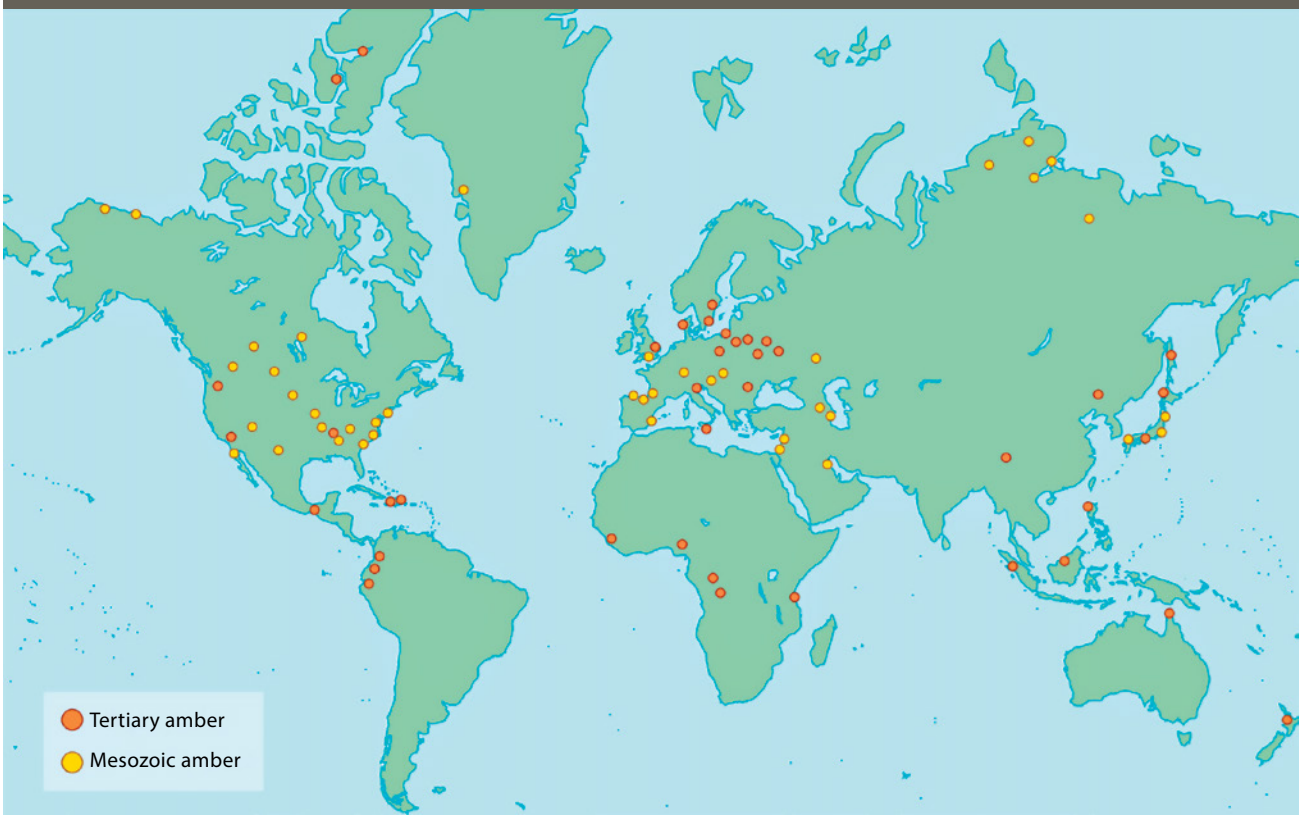
Retsina is a Greek wine traditionally flavored with pine resin.

to opaque. Because of this variability, color and translucency on their own are generally not good diagnostic traits for identifying amber.

On the other hand, copal (less polymerized resin) and modern resins are still used in some areas of Mexico and Central America for artistic and ceremonial purposes, prized because they smell of incense. Next time you encounter a pine, fir, or spruce tree, look carefully at its bark and you may be able to see some exudate blobs or "teardrops." Pick one of them up and smell it! Pine resin has been used in the preparation of rosin, which is applied to the hairs of bows used to play string instruments such



Is It Amber or Copal?

Amber is greatly fossilized resin. This resinous fossilized material has been found in numerous localities worldwide. The oldest amber has been dated as early as the Carboniferous period, over 300 million years ago. Often, forests whose trees produced resins that eventually became amber tended to be located close to sea level at the time of production.

Partially polymerized resin is known as copal, a Nahuatl or Aztec word that means incense. At times, we have seen the term "semi-amber" used instead of copal. We recommend avoiding the term "semi-amber" because it suggests the material is older than it really is. Although it can be difficult to distinguish copal from resin, a straightforward preliminary way to distinguish between the two is by using a drop of organic chemical such as 95% ethanol or acetone (the solvent used in most nail polish removers). Take a drop of the chemical and place it in a portion of the test sample that has little or no value to the owner. Then touch the wetted portion with the finger. If it feels sticky, the test sample likely is copal; if it does not feel sticky, likely it is amber. We have examined a number of alleged amber samples that turned out to be copal, some of which were in the collections of respectable museums. When finding "amber" specimens of potential scientific value, we recommend testing them by physicochemical means, such as nuclear magnetic resonance spectroscopy (NMR) or others, to gain more confidence on the specimen's true nature.

as the violin (rosin makes the hairs just sticky enough to grip the strings and create sound).

Construction materials

The metallic transatlantic cable that connected the Old and New Worlds telegraphically during the second half of the nineteenth century was insulated by gutta percha, the resinous exudate of *Palaquium gutta,* a tropical Southeast Asian tree. The modern aviation and aerospace industry uses human-made, lightweight and strong, synthetic resins and phenolics in building airplanes.

Ingestive

An old and interesting use of resins is in the preparation of retsina, a Greek wine that is flavored with a little bit of pine resin (typically from Aleppo pine, *Pinus halapensis*). Gums are also sometimes eaten; in places where the leguminous *Acacia* trees produce copious quantities of gums, these exudates are used as survival foods when other food is scarce. Although it has been alleged that amber has healing and other medicinal properties, we are not aware of scientific studies using a double-blind protocol that demonstrate any medicinal properties of amber.

Science

For reasons that are not known, some forests in the past appear to have produced copious amounts of resins. Although these exudates may have attracted some organisms and repelled others, once small organisms such as insects landed on the sticky material it was difficult to detach from it. When subsequent resin flows covered the specimen it was protected from the action of decomposing organisms and the environment, allowing it to be preserved for a longer time. Subsequent polymerization of the resin preserved a fraction of the resin-entombed organisms, which, when found, now have great value to scientists. Amber encased plant and animal specimens have contributed insights in a number of scientific fields.

Amber specimens that contain larger, rarely found organisms (e.g., scorpions, amphibians, lizards, birds) are of great interest and may command great sums of money. How-

Collecting Competition

Interestingly, sometimes birds, such as the types of woodpeckers commonly called sapsuckers (genus *Sphyrapicus*), compete with us as they also feed on exudates and leave characteristic holes on the surface of some trees. Other birds and some insects are known to use exudates for nest construction.

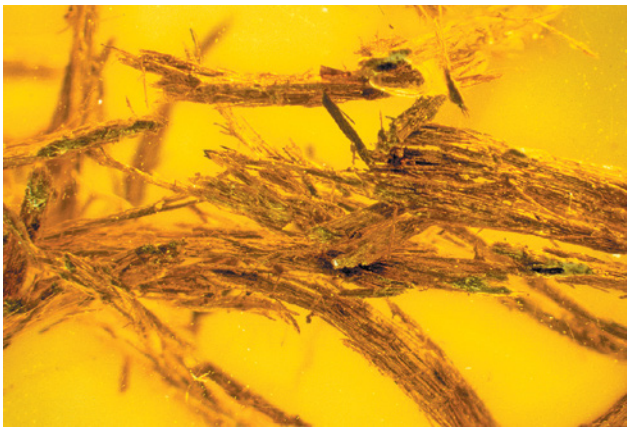
ROBERT MAYER

A yellow-bellied sapsucker (*Sphyrapicus varius*) perches on a conifer branch that displays the typical holes created by this and other sapsucker species.

PATRICK R. CRAIG

A drosophilid fly trapped in amber.

PATRICK R. CRAIG



Wood fibers encased in amber.

ever, buyer beware, as there are unscrupulous sellers willing to make money from objects that are not genuine amber.

Ongoing Research Goals

Ultimately, we seek answers to questions because we are curious about nature. Sometimes, our results can help answer a question. For example, along with several other colleagues, including Dr. Lisa Niziolek from the Field Museum of Natural History in Chicago, we answered the question: In what plant family was the tree that produced the blocks of resin found in a thirteenth century shipwreck excavated from the Java Sea? Our studies of many plant exudates have generated a large database of their NMR profiles. When we study a sample of unknown botanical provenance, that database allows us to compare the samples of unknown botanical origin, like the resin from the Java Sea wreck, with those in our database. With that information, we were able to suggest that the plant whose resins were harvested back in the thirteenth century was from the botanical family Dipterocarpaceae, and perhaps specifically the genus *Shorea*. Having an idea of the botanical provenance of archeological artifacts enriches our knowledge of how our predecessors used plants. In this case, research tells us that aromatic resins were an important commodity at the time and were often imported into China for use in Buddhist rituals as well as medicines, lacquers, and perfumes. We will continue to collect and analyze plant exudates from around the world, including amber and copal, as well as materials associated with anthropological artifacts, adding knowledge for future researchers to use.

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SUZANNE C. SHAFFER

SUZANNE C. SHAFFER

On the lookout even during vacation, author Jorge A. Santiago-Blay (left) noticed resinous exudates on several lodgepole pines (*Pinus contorta*) in Yellowstone National Park, including one partially debarked, possibly by American bison (*Bison bison*) (right). Note the copious exudate production (yellowish color) on the debarked portion of the trunk.

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Dedication

Author Jorge A. Santiago-Blay dedicates this paper to his mother, Ángeles Blay Sálomons, who in the early 1980s suggested to him that he pursue the study of *"las resinitas"* (the little resins) as she used to call exudates. Her memory always lives with him.

Jorge A. Santiago-Blay is a Resident Research Associate in the Department of Paleobiology at the Smithsonian Institution's National Museum of Natural History in Washington, D.C. (blayj@si.edu). Joseph B. Lambert is Research Professor of Chemistry at Trinity University in San Antonio, Texas , and Clare Hamilton Hall Professor of Chemistry Emeritus, Northwestern University, Evanston, Illinois (jlambert@northwestern.edu).

Other Order: Sound Walk for an Urban Wild

Peter Del Tredici and Teri Rueb

In urban areas, vegetation that is not planted or maintained by people—including both native and non-native species—typically dominates many different habitats including river and stream banks, highway verges, vacant building lots, infrastructure edges, chain-link fence lines, and random pavement cracks. For most cities, the amount of spontaneous vegetation they support varies inversely with their economic prosperity; cities that have lost the most population and jobs show the highest levels of land abandonment and volunteer plant growth (Del Tredici 2010a, b; Burkholder 2012).

How city dwellers respond to the presence of spontaneous vegetation in their midst is influenced by personal preferences as well as by cultural norms. In many European cities, residents' feelings about spontaneous vegetation is divided—some welcome it as a manifestation of unrestrained urban nature while others see it as an indicator of dereliction that should be removed. Such responses have led to the categorization of urban residents as either "nature lovers" (a.k.a. wilderness enthusiasts) or "neat freaks" (a.k.a. urban devotees). Interestingly, the percentages of people in these categories can vary dramatically from one city to the next in the same country (Keil 2005; Rink 2005; Weber et al. 2014).

In an effort to promote a wider appreciation and acceptance of "urban wilds," urban ecologists have recently been attempting to calculate the value of the ecosystem services provided by spontaneous vegetation, especially in cities where the population is shrinking and the amount of vacant land is expanding (Pataki et al. 2011; Burkholder 2012; Robinson and Lundholm 2012). On the positive side, this vegetation contributes to increasing the ecological functionality of the city in terms of storm water management, temperature reduction, carbon sequestration, soil development, and total biodiversity (Kowarik and Körner 2005; Carroll 2011). Harder to quantify, but nevertheless important, are the opportunities for social, cultural, educational, and nature experiences that spontaneous vegetation provides across the wide array of cultural contexts and sites that characterize most cities (Pfeiffer and Voeks 2008; Daniel et al. 2012; Jorgensen and Keenan 2012).

The aesthetics of spontaneous vegetation are usually considered negative given that much of it is perceived as ugly or messy (i.e., lacking ornamental characteristics or possessing an unkempt appearance), and its presence in the landscape is justifiably viewed as projecting an image of neglect (Nassauer and Raskin 2014). In the arena of public health, many people see spontaneous vegetation as providing habitat for animals that are vectors for a number of human pathogens and infectious diseases such as rats, mosquitoes, and ticks (Garvin et al. 2012; Gulachensik et al. 2016). Similarly, the large size that spontaneous urban vegetation can reach in the absence of maintenance is viewed as providing cover for potential criminal activity and thus a threat to public safety. To the extent that urban landscapes dominated by spontaneous urban vegetation are perceived as threatening, they fit within a concept of a "wilderness" that is defined as land that exists outside the bounds of human control (Hofmeister 2010; Jorgensen and Keenan 2012; Desimini 2015).

In this article we will explore the history of the "urban wilds" construct as it developed in Boston, Massachusetts, from its introduction in the mid-1970s through today, and present a case study of one such site, Bussey Brook Meadow at the Arnold Arboretum, to illustrate how multi-faceted urban wilds can be creatively interpreted for the general public utilizing GPS (global positioning system)-based cell phone technology.

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Urban vegetation takes hold in cracks in a neglected swath of asphalt pavement.

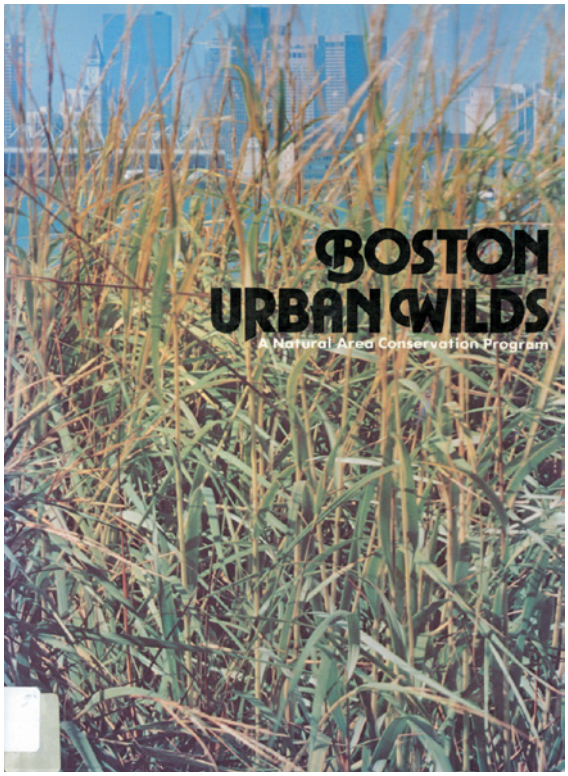
Pretty wildflowers or invasive weeds? Chicory (*Cichorium intybus*), yellow sweet clover (*Melilotus officinalis*), and spotted knapweed (*Centaurea stoebe* subsp. *micranthos*) bloom along a city street.

Weedy trees take over an abandoned lot in Detroit.

Urban Wilds in Boston

In the United States, the idea that unmanaged "open space" in cities could perform valuable ecological services was foreshadowed by a movement in the 1970s that categorized such sites as "urban wilds" (Tanner 1975; Desimini 2015). In 1976, the Boston Redevelopment Authority (BRA), a city planning agency, officially adopted the term when it issued an inventory of Boston's unimproved and unprotected natural areas under the title *Boston Urban Wilds*. The report—which was partially funded by a grant from the National Endowment for the Arts—was spearheaded by BRA landscape architect Elliot Rhodeside. It identified 143 parcels of land (2,000 total acres) of diverse sizes and ownerships that contained significant "natural resource value" but were threatened by on-going development pressure (BRA 1976). Most of the sites had histories of industrial, institutional, or residential use, some dating back to the nineteenth century. Rhodeside left the BRA shortly after the report was published and the work of advocacy, fundraising, and protection for the Boston Urban Wilds project passed to a non-profit organization, the Boston Natural Areas Fund (BNAF), founded in 1977 by Eugenie Beal (the head of the then newly formed Boston Conservation Commission) along with her future husband, John Blackwell.

In its early days, BNAF was focused on trying to preserve and protect properties listed in the Urban Wilds report, but over time the emphasis of the organization shifted away from land acquisition to maintenance of already protected properties and coalition building with other non-profit organizations around issues of public advocacy. In 1988, the Boston



***Boston Urban Wilds*, a 1976 report from the Boston Redevelopment Authority, identified 143 land parcels in Boston with potential value as preserved natural areas. This copy of the report is in the Arnold Arboretum library.**

Parks Department officially took over management of the Urban Wilds program which, as of 2014, listed 39 properties in its inventory. The Parks Department currently provides maintenance and logistical support for those properties that are controlled by the city; other properties on the list receive varying levels of maintenance depending on the resources allocated by the organization that controls it (Bird 2014).

The original 1976 BRA report described 143 sites that contained some significant "natural resource value," including geological features (68 sites), coastal or fresh water wetlands (20 sites), shorelines (27 sites), or important vegetation (28 sites). It was clearly a simpler time when the meaning of the words nature and natural were not contested and the dichotomy between native and exotic species had yet to emerge as the divisive issue it is today. In the 1970s, urban wilds, regardless of their biological content or cultural history, were viewed as valuable antidotes to blighted, barren cityscapes. By the late-1990s, the original concept of an urban wild became subsumed under the rubric of ecological restoration. This reconceptualization of urban nature—essentially attempting to affix a "native" label on it—represented a dramatic reversal of fortune for the non-native organisms that found themselves reclassified as invasive species. Older, less value-driven terms to describe these plants, including weed, pest, naturalized species, garden escapee, volunteer, etc., fell by the wayside and with them an appreciation of their historic connection with the past land use of the site (Del Tredici 2010b).

This privileging of native over non-native species has created problems for today's advocates of urban wilds because many of the sites they're striving to protect can no longer be "restored" to anything resembling their original ecological condition (Del Tredici 2010a, b; Carroll 2011). Similarly, the ways that some people use minimally maintained urban wilds, including drinking, doing drugs, having sex, painting graffiti, and camping out, has also caused problems for advocates because of complaints from abutting residents and other users. Like it or not, urban wilds are places where human behavior, like the plants and animals that occupy them, can sometimes be out of control (Keil 2005; Thompson 2012).

Bussey Brook Meadow

Bussey Brook Meadow of the Arnold Arboretum of Harvard University was listed as an urban wild in the 1976 BRA report. This 25-acre wetland has a documented history of land use going back 350 years when, in 1662, one of the first roads leading southwest out of the city of Boston was constructed along its western edge. This road opened the land up to farmers who drained portions of the property and moved the stream, Bussey Brook, that ran through the middle of it to the periphery. A hundred and forty years later, in 1802, another road was built along its eastern edge, which eventually developed into a railroad line that is still in operation today. Once a stable earthen berm was constructed for the rail line in 1873, Bussey

Willows and cattails are among the moisture loving plants that thrive in Bussey Brook Meadow.

Brook was effectively isolated from the larger, adjacent Stony Brook watershed that drains into the Charles River. Following this, the processes of fragmentation and filling of Bussey Brook Meadow accelerated dramatically, most notably with the installation in 1900 of a 9-foot-diameter, 3,600-foot-long high-level sewer line across the western edge of the property and the construction of an expanded Forest Hills train station to the north in 1909 (Arnold Arboretum).

The Arnold Arboretum, through a land purchase from its Harvard University parent, acquired roughly half of the Bussey Brook Meadow parcel in 1919 and constructed Muddy Pond in the middle of the site, a wagon road following the track of the high-level sewer line, and a tree nursery on the site of former agricultural land. All of these activities over a period of seven years resulted in more wetland filling and disruption of surface drainage. In the 1950s, a privately owned esker on the site, composed mainly of sand and gravel, was excavated for construction purposes and replaced between 1955 and 1965 with a 5-acre landfill consisting of construction debris from the demolition of several Boston public schools. In 1971, after an unfortunate incident in which two neighborhood children from a nearby public housing project drowned, Muddy Pond in the center of the Arboretum's portion of the wetland was filled in (Arnold Arboretum).

In 1982, the northern end of Bussey Brook Meadow underwent a major transformation when an expansion of the Forest Hills train station was initiated in order to make room for the new Orange Line subway station. As part of this project, a pathway was built along the base of the landfill that linked the new subway station to the South Street gate of the Arboretum. In 1996, through the determined efforts of

Eugenie Beal and John Blackwell and the two non-profit organizations they co-founded (the Boston Natural Areas Fund and the Arboretum Park Conservancy), the deeds to the variously owned parcels of Bussey Brook Meadow were bundled together and added to the Arnold Arboretum's 1882 indenture, thereby achieving permanent protection for the entire 25-acre site. At the same time, grants from federal, state, and city agencies, together with funds generated by the Arboretum Park Conservancy, were used to construct granite entrance gates and upgrade the surface of the main pathway, now christened Blackwell Path.

In 2011, the Arboretum, in keeping with its scientific research mission, approved a plan that called for turning Bussey Brook Meadow into a site for long-term environmental monitoring and research on urban ecology. While this meant that most of the land in Bussey Brook Meadow would be left alone to follow its own ecological trajectory, the Arboretum made a commitment to manage portions of the site that were heavily used by visitors, including mowing the edges of Blackwell Path regularly, removing hazard trees that threatened public safety, and mowing several meadow areas annually to keep woody vegetation from taking over (Arnold Arboretum).

Creating the *Other Order* Sound Walk

Having developed a long-term strategy for the site, the Arboretum still had to contend with issues raised by discordant visitor perceptions of the land. Some saw Bussey Brook Meadow as a "natural" counterpoint to the well-maintained landscape of the Arnold Arboretum proper, while others saw it as a haven for invasive species that undermined the Arboretum's moral authority on matters of ecology. It was into this

JAY CONNOR

Bussey Brook Meadow with Blackwell Path running through it.

The 9-foot-diameter sewer line being installed in Bussey Brook Meadow in August 1900.

Blackwell Path in Bussey Brook Meadow in summer.

A tree-of-heaven (*Ailanthus altissima*) grove on the slopes of the landfill in Bussey Brook Meadow. Ring counts of downed trees indicated that they established themselves on the site in 1965 or 1966, shortly after dumping stopped.

breech that the authors of this article stepped in 2012 with a proposal to interpret Bussey Brook Meadow for the general public using a GPS-based sound walk designed for use with a cell phone. The purpose of the proposed app was to illuminate the complex cultural history of Bussey Brook Meadow, to reveal the complex ecological interactions that are currently taking place on the site, and to show some of the ways the site was being used by the general public. The ultimate goal of the project was to try and change how people thought and felt about the site—to help them see that it was not just a chaotic collection of weeds but a dynamic, organized ecological system that reflected cultural values, past land-use history, and future ecological trajectories (Rueb and Del Tredici 2014).

The *Other Order* app took two years to complete and involved a close collaboration between Del Tredici, who provided extensive verbal interpretation of the site *in situ*, and Rueb, who recorded this material and combined it with field recordings to create a soundscape designed for delivery via a downloadable mobile app. The app uses GPS to track visitors' movements and play the sounds at specific locations in Bussey Brook Meadow as they pass through them. In addition to Del Tredici's monologues on "cosmopolitan" vegetation, recordings included dozens of on-site conversations with

Non-native wetland plants growing in Bussey Brook Meadow: common reed (*Phragmites australis*) in the background, yellow flag iris (*Iris pseudacorus*) in the middle, and reed canarygrass (*Phalaris arundinacea*) in the foreground. These species have sorted themselves out across a moisture gradient to form a functional urban wetland.

various experts, stakeholders, Arboretum staff, and park visitors including urban ecologists, park advocacy groups, multi-generation urban farmers, landscape architects, dog walkers, commuters, and transient residents.

Over twenty hours of ambient field recordings of the environment were also incorporated and used as inspiration for sound compositions evoking, for example, the material layers of the landfill, the interior sounds of the high level sewer pipeline, the leisure activity of past visitors mingled with those of the present, and the wildlife of the meadow. In some places one might find unexpected sounds such as light snoring tucked under a tree-of-heaven grove (*Ailanthus altissima*) near a concrete overhang, a flute mingling with sounds of laughter in a clearing in the center of the old Arboretum nursery, cows lowing and chickens clucking near the site of the former Bussey farmstead, and the sound of underwater gurgling as captured with hydrophones dropped into Bussey Brook. All of these sounds reference actual and imagined ways in which the meadow has been inhabited over time and the various materials and organisms that make up the complex social, biological, and physical matrix that is Bussey Brook Meadow.

Sound regions are arranged throughout the meadow in a manner that allows for a complete experience should visitors constrain their movements solely to Blackwell Path, which takes about twenty minutes to traverse at a leisurely pace. However, additional sound regions

A wetland in Bussey Brook Meadow consisting of common reed (*Phragmites australis*), yellow flag iris (*Iris pseudacorus*), and reed canarygrass (*Phalaris arundinacea*).

are spread throughout the meadow, rewarding the more adventurous and patient with sounds that may be accessed only by leaving the trail behind and following informal footpaths, trails, and tunnels through the dense vegetation.

Blackwell Path is an egalitarian corridor that connects the elegant environs of the formal Arboretum with the urban hubbub of the Forest Hills subway station and surrounding neighborhoods. Intervening into this path system represents a critique of conventional parks as much as an invitation to go off the beaten track and explore the wilds held within this "urban wild." Bussey Brook Meadow is a particularly complex social site as it sits somewhere between a managed botanical garden on the one hand, and an interstitial zone where commuters, neighborhood residents, and tourists from all over the world mix with transient populations who are often staying for extended periods of time or returning each year with the milder seasons to regular encampments.

A central concern of the work is to communicate a variety of perspectives on place as a means of critically engaging contested meanings, uses, and inhabitations of public sites. Voices in the work range from those of experts who tell us what to look for, what to hear, and what to value in this richly vegetated environment, to those that offer meandering impressions, personal histories, random thoughts, and idiosyncratic perceptions of a place. Animals, wind, weather, and water are equal voices in this mix. Through this blending of voices, the work draws upon the cosmopolitan botany of the site as a central metaphor and a means for

JON HETMAN

Peter Del Tredici and Teri Rueb recording conversations in Bussey Brook Meadow.

asking probing questions about ownership, access, interpretation, and use of public parks and green spaces.

Among the discoveries that stood out for the authors in developing the work and seeing its reception across various audiences was an awareness of the intensity of the experience as visitors were often torn between giving themselves over to immersion in the layered sounds emanating from their headphones and relating them to the complex sights, sounds, and social activities of the site itself. Frequently groups of people would walk together, taking their headphones off at regular intervals to exchange impressions and ask each other if they heard the same thing, and if it was "in the headphones" or "real." A surprising number of people seemed willing to bushwhack through the Japanese knotweed and stinging nettles to find a sound buried deep in the meadow or high on top of an embankment.

A challenge of sorts, *Other Order* could be approached as a kind of game where one tries to cover as much territory as possible, to visit each sound in its unique niche, or identify each of the plants and landmarks referenced in the sound composition and included in the project index. Related apps, including "Alpine Garden Misguide" by Jill Didur (2015), have successfully used the game structure of an exotic plant hunt to engage critical perspectives on the colonial histories of botanical gardens and specimen collecting. As an educational and informative piece, the authors were happy to discover that *Other Order* was equally appealing to adults and children, though it is less accessible to audiences with physical disabilities that would limit their movement or ability to listen through headphones. Finally, we found that visitors' appreciation of the botany of urban wilds was enhanced through the experience, but especially in the context of understanding plants in relation to their social entanglements with humans.

At its core, the *Other Order* sound walk is an effort to combine scientific and cultural perspectives on urban ecology in a format that can reach broader publics in non-traditional settings. Bussey Brook Meadow is often mistaken for a derelict parcel of public land—a park of sorts, but with an uneasy appearance when compared to the manicured landscape of the Arboretum grounds or with sections of the Olmsted-designed Emerald Necklace of Boston parks that bear the stamp of formal landscape design. As a public artwork, *Other Order* is aimed at drawing visitors into the site through a sonic overlay that reveals another kind of beauty—and another perspective on ecological environments that blend the biological, technological, cultural, and social elements. The contrasting aesthetics of urban wilds and more formal parks is brought into focus, revealing a historical moment when each has undergone dramatic shifts in purpose, perception, and public use.

A map of Bussey Brook Meadow showing the locations of the fifty-five sound regions that make up *Other Order*.

TERI RUEB

Herb Nolan, a longtime Arboretum supporter, listening to *Other Order*.

***Other Order* is available for free download from the App Store and Google Play Store. Visitors are encouraged to download the app in advance of their visit and wear headphones in order to appreciate the stereo, binaural recordings as they blend with the actual environmental sounds of the meadow. The combination of stereo, binaural recordings with the ambient sounds that surround visitors as they move through the meadow creates an uncanny sense of being simultaneously "here and now" and "there and then" in the site, further emphasizing the complex temporalities of the meadow, and complicating the emplacement of visitors as situated actors within its operations.**

NANCY ROSE

Urban vegetation provides autumn color along Blackwell Path in Bussey Brook Meadow.

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The final work included over two and a half hours of edited sound recordings that were broken into roughly thirty-six different sound regions spread throughout the 25-acre site. Spoken elements included excerpts from conversations with the following Arnold Arboretum staff members: Ned Friedman, Maggie Redfern, Jim Papargiris, Nima Samimi, Susan Hardy Brown, Ailene Ettinger, and Bob Mayer (Arboretum volunteer). From outside the Arboretum the following people were recorded: John Lee, Eugenie Beal, Nina Brown, Lucy Hutyra, Steve Decina, Matthew Battles, Kyle Parry, Anya Yermakova, and Richard, a longtime resident of Bussey Brook Meadow. And finally, thanks to Ernst Karel for help with sound recording. Funding for the development of *Other Order* was provided by a generous donation from Janine Luke in memory of Melvin Seiden.

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Peter Del Tredici is the former Director of Living Collections at the Arnold Arboretum and now a Retired Senior Research Scientist. Teri Rueb is a Professor in the Department of Media Study at the University at Buffalo — State University of New York.

Floral Clocks, Carpet Beds, and the Ornamentation of Public Parks

Phyllis Andersen

COURTESY OF THE AUTHOR

The geometric patterns and colorful flower and foliage plants typical of bedding out are seen in this postcard depicting part of Forest Park in Springfield, Massachusetts.

Municipal parks are the last territory of the decorative gardening tradition of bedding out: the practice of using brightly colored, low-growing flowering and foliage plants in ornamental patterns in beds, mounds, pyramids, floral clocks, commemorative plaques, and three-dimensional figures. Arranging plants to create decorative patterns is a convention of garden design from the eighteenth century, found from the *parterres de broderie* of Versailles to the boxwood *fleur de lis* of George Washington's Mount Vernon garden. But in the nineteenth century, perhaps as a reaction to the long reign of the picturesque model, which favored naturalistic design, bedding out jumped the walls of the aristocratic garden and found a home in public parks on both sides of the Atlantic. The bedding out practice elicited the admiration of the public and the sustained scorn of many landscape critics.

A variety of names have been assigned to this practice: carpet bedding, mosaiculture, pattern gardening, "gardenesque." It is also called Victorian gardening, an homage to its popularity in nineteenth century Great Britain, where advances in greenhouse technology and the introduction of tropical and subtropical species created a new way of displaying flowering plants. Bedding out, now the shorthand term, occupies a territory between art and craft. It is part of the history of ornamentation as well as the history of gardening. Both embrace the power of serial imagery and the creator's virtuosity in creating original forms. Bedding out evoked heated discussion on the definition of taste: what is it, who has it, and who doesn't. Bedding out of brightly colored flowers in artificial situations became part of the larger discussion in which popular taste was defined as bad taste, the highbrow/lowbrow remnants of that discussion still being argued in gardening circles today. Bedding out was the territory of gardeners rather than landscape designers, anonymous individuals whose skills were admired but whose names are unknown. The great bedding out schemes in public parks in American cities were associated with civic pride, with a populist enthusiasm for both the intricate floral displays and the intensive labor that was needed to both create and maintain them. Horticulture, as well as city beautification, is inherently competitive. Supported by park commissioners and local officials, municipal gardeners were encouraged to expand their floral displays to accommodate the tastes of the people—"to show you care."

Bedding out is temporary and labor intensive—a sink-hole of energy consumption. It is profoundly artificial, appealing most directly to

A color plate in Robert Thompson's *The Gardener's Assistant* (1878 edition) shows carpet bedding patterns complete with lists of plants to be used.

NANCY ROSE

Brightly colored flowers and foliage along with exotic tropical plants are still a common feature in city parks, such as this streetside planting in Victoria, British Columbia.

the senses rather than to the power of reflection or solitary contemplation. It is not a simulacrum of nature. It is antithetical to a prevailing notion of public parks based on a pastoral model, famously invoked in Frederick Law Olmsted and Calvin Vaux's design for Central Park in New York. It did not claim to bring the country into the city. The practice of bedding out produced no theoretical treatises, no literary or painterly allusions. It tapped into the public's love of spectacle and novelty, its appreciation of skilled labor well executed. Bedding out captured the lure of the exotic by using newly discovered plants from South America and Africa, tropical and subtropical natives brought into a temperate climate. It had the repetitive power of a military parade, an analogy not lost on the British garden writer William Robinson, who observed "Gardeners were not so much plant stewards as drill sergeants."

Critics of this type of floral display reached new heights of rhetorical disdain. William Robinson went on to call bedding out "pastry-making." The popular and widely published British writer Shirley Hibberd called ribbon beds (long meandering beds with alternating bands of floral color) "eels in misery." Landscape architect Frederick Law Olmsted's antipathy to floral display is well known. Writing in 1892 to his associates in Brookline, Massachusetts, about detached floral beds in London parks, he observed "I have hardly seen anything yet of that kind that did not seem to me childish, vulgar, flaunting, or impertinent, out of place and discordant with good general effect." In an article in a 1908 issue of *Ladies Home Journal,* the writer blamed municipal gardeners for creating "veritable pimples on the face of Nature."

The Roots of Bedding Out

The evolutionary process that advanced the nineteenth century version of bedding out is traced to the writings of landscape designer and writer John Claudius Loudon (1783–1843) who, in the 1830s, introduced the word "gardenesque" to the vocabulary of landscape. He encouraged his readers to think beyond the picturesque to what he defined as "scientific," collecting plants from all over the world to test their adaptability to different climates and growing conditions (a close definition of arboreta and botanical gardens). The goal was not to imitate nature. While Loudon valued artifice and offered bedding designs in many of his publications, he did warn against the extremes of bedding out, the distorted beds and clashing colors.

Loudon also recognized the limited educational opportunities for gardeners whose only option was a long apprenticeship that isolated them from new plant introductions and planting techniques. Loudon published *Self Instruction for Gardeners* in 1815, the first of several publications in the nineteenth century that attempted to codify best practices for both estate gardening and later municipal park management. With printing costs dropping, a number of magazines were founded that addressed professional gardeners, giving them access to information on new bedding plants and propagation techniques. They came to serve as pattern books for floral designs—fashion magazines for

With their bright colors and exotic, pouchlike flowers, South American calceolarias fit perfectly in the bedding out trend. Illustration of *Calceolaria pisacomensis* from *Curtis's Botanical Magazine* (Volume 93, plate 5677), 1867.

Illustration by D. Bois of zonal pelargonium (*Pelargonium zonale*) and several hybrid selections (note the hybrids' larger petals and denser flower heads) in Edward Step's *Favourite flowers of garden and greenhouse* (Volume 1, Plate 54), 1896–1897.

aspiring enthusiasts. *Florists' Journal, Gardeners' Chronicle,* and *Gardener's Magazine* were available in Great Britain, and *Magazine of Horticulture, Gardener's Monthly, Genesee Farmer* and *Gardener's Journal* informed gardeners in the United States.

If principles of romanticism and aesthetic theory provided a structure for the pastoral park, advances in science and technology stimulated the expansion and complexity of bedding out. To underscore the artificiality of the bedding out system, the plant species used were often imports from South America, Africa, and the Mediterranean region. The botanical bounty collected by plant explorers, perhaps more appropriately called flower hunters, was given to botanic gardens and to commercial nurseries where species were hybridized to create showy selections with features such as compact growth, larger flowers, more brilliant colors, and variegated foliage. Plants were as much a product of the nursery trade as they were of plant collecting. Many global imports—begonias, calceolaria, echeveria, caladiums, cannas, coleus, and more—were commonly used in bedding out configurations. Sedums, sempervivums, and other succulents also had a brief period of popularity. Palms, yuccas, crotons, monkey puzzle trees, and banana plants, all valued for their exotic forms, were brought in to serve as backdrops for theatrical staging and to punctuate the flatness of planting beds.

Floral Clocks

The association of plants with the passing of time has a very long history. Carl Linnaeus developed an idea for a flower clock in his 1751 treatise *Philosophia Botanica*. Based on his field observations, he proposed a Horologium Florae, a clock using forty-six flowers which opened and closed as the day progressed. But this more literal interpretation of flowers and time evolved into decorative objects: flower plantings with an imbedded clock mechanism. In the early twentieth century the floral clock was reinvented as a decorative object for parks, tourist sites, and international expositions.

COURTESY OF THE AUTHOR

First created in 1903, the floral clock in Edinburgh, Scotland, is still a popular attraction (postcard from the early twentieth century).

COURTESY OF NIAGARA PARKS

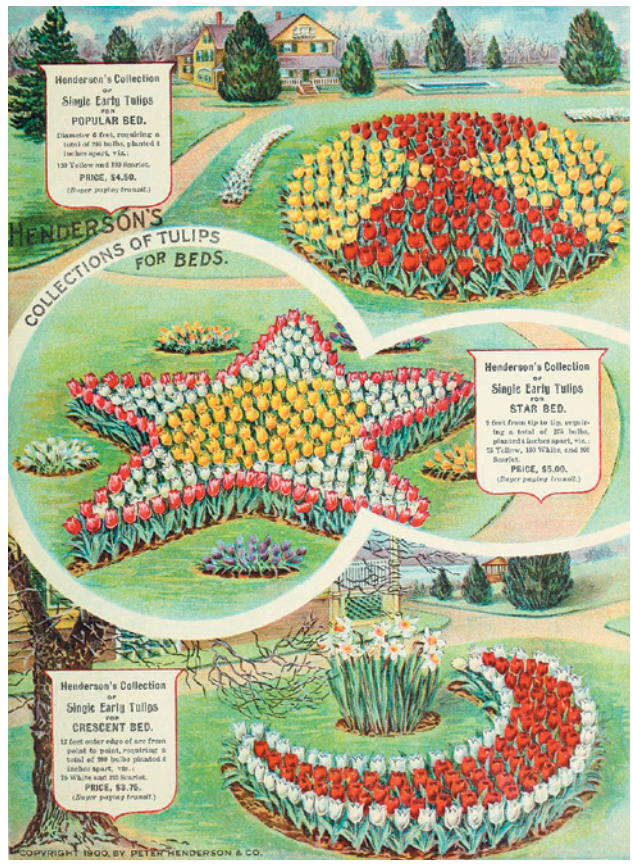
The design for the 40-foot-wide floral clock in Ontario's Niagara Parks is changed yearly and requires 15,000 to 20,000 bedding plants.

No plant group was more subject to manipulation than the pelargoniums (*Pelargonium*), which are often called (erroneously, British gardeners would say) geraniums in the United States. Native to South Africa, pelargoniums are still ubiquitous garden plants: drought resistant, blooming throughout the summer, a plant that has become a symbol of cheerful welcome in window boxes and entry planters. Zonal pelargoniums, introduced in the late eighteenth century, are characterized by alternating bands of dark and light green on their leaves and large, brilliantly colored flower heads. Continual experimentation with hybridizing various *Pelargonium* species resulted in hundreds of upright, prostrate, variegated, and ivy-leafed cultivars. Instantly recognizable by the general public, the pelargonium is still among the most popular bedding plants in municipal parks.

Growing and Designing With Bedding Plants

By the mid-nineteenth century, glass houses, once a luxury of estate gardens, became accessible to municipalities and commercial nurseries. In Great Britain, the repeal of the glass tax in 1845 dropped the cost of the material and fueled experiments with mass production. In both the United States and Great Britain advances in cast and wrought iron construction developed for the glass pavilions of the Crystal Palaces in London, Syndenham, and New York City were adapted to smaller glass structures. Magazines for gardeners offered advice on ventilation, humidity control, and heating alternatives. Commercial nurseries created acres of glass houses for the mass production of bedding plants. Nurseryman and author Peter Henderson (1822–1890) started with a small shop in New York City selling seeds. By the 1850s, his business skills and ability to predict the horticultural market allowed him to build extensive greenhouses near Jersey City, New Jersey. By his books, aimed at both the professional gardener and the amateur, and by his color catalogs, he developed a market for bedding plants, including his own introductions, most notably zinnias from Mexico and his hybrid 'Giant Butterfly' pansy. Henderson visited England in 1885 and noted that the carpet style beds "were interesting to the people in a way that no mixed border could ever be." He also noted the conspicuous lack of ornament in Central Park and Prospect Park, an omission he attributed to "a lack of taste in the management of our public parks."

Color theory, the investigation of human color perception, guided gardeners in the design of beds and created the distinctive intense impact of color combinations, either gaudy or brilliant according to your taste. One of the first explorations of color perception was a 1743 treatise by the French naturalist, Georges-Louis Buffon, followed by Johann Wolfgang von Goethe's *Theory of Colours* published in English in 1840. But it was the work of Michel Eugene Chevreul (1786–1889), a French chemist employed by the Gobelins Tapestry Works whose work on color, first directed to the textile industry but also to horticulturists, gardeners, and artists, that proved the most influential.



The 1900 autumn catalog from Peter Henderson and Company offered tulip bulbs for bedding out patterns.

BIBLIOTHÈQUE NATIONALE DE FRANCE

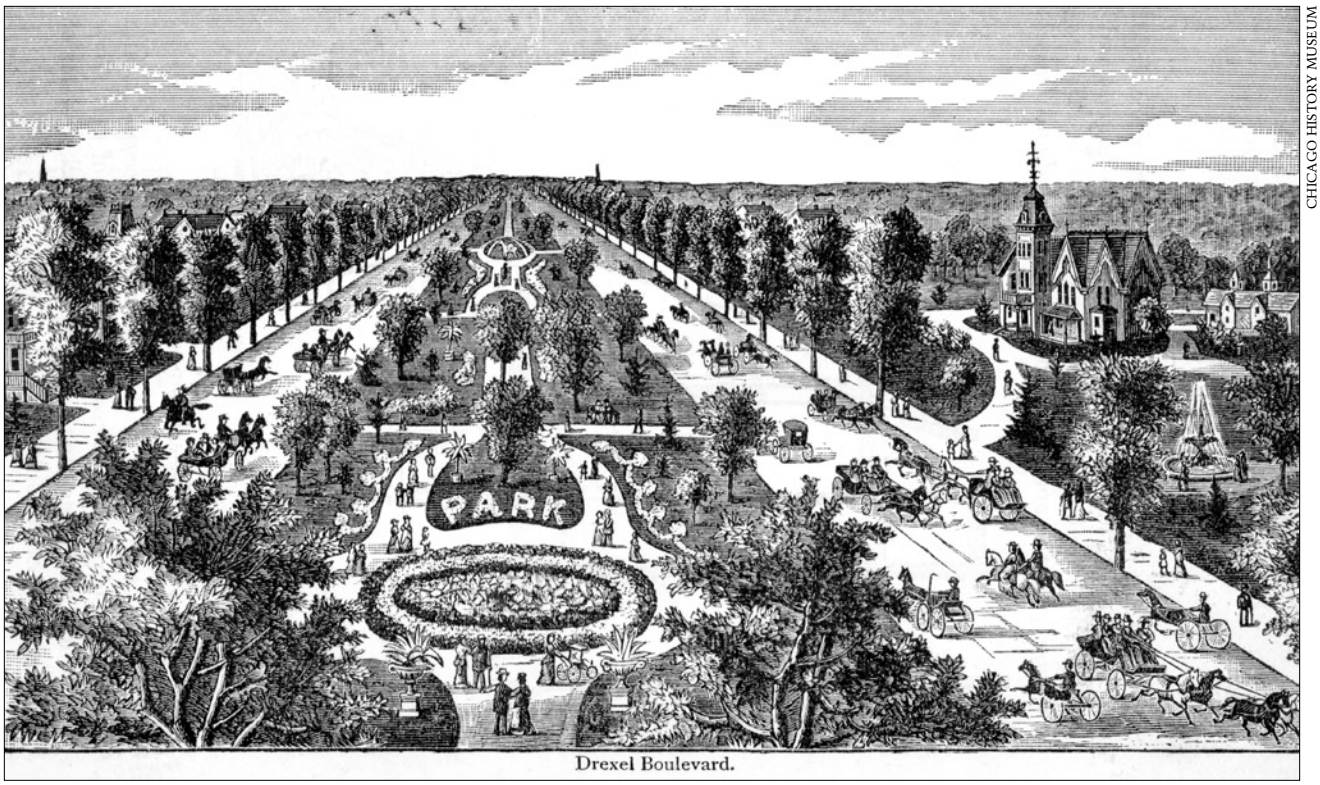
Michel Eugene Chevreul's color circle was used by horticulturists and garden designers when creating bedding out displays.

His book, *The Principles of Harmony and Contrast of Colours and Their Applications to the Arts,* published in English in 1854, enhanced the gardener's understanding of how colors are modified when placed next to each other, in contrast to how the color is perceived when observed alone. Chevreul's *Color Circle,* a circular chart organizing complimentary colors opposite each other, was a reference guide for gardeners well into the twentieth century.

Bedding Out in City Parks

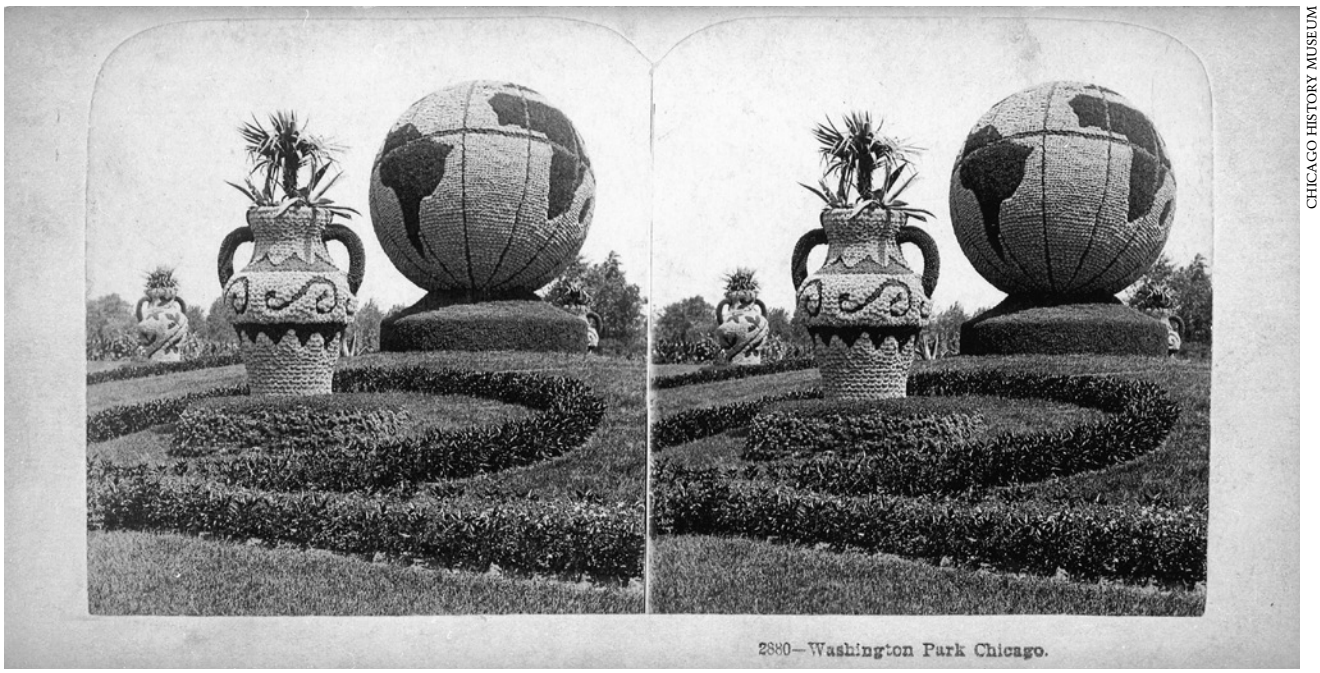
The city of Chicago engaged some of the best landscape architects in the country to transform the flat terrain of the city into a sophisticated park system to rival those of Eastern cities. Frederick Law Olmsted and Calvert Vaux, H. W. S. Cleveland, and later Jens Jensen, with his passionate commitment to the prairie landscape, all left their imprint on the city. But parallel to their planning work, the city encouraged ornamental planting in the form of elaborate bedding out schemes. In the 1890s Chicago built a large glass conservatory in Lincoln Park for the display of tropical plants, with extensive plant propagation areas for bedding plants. Earlier Chicago's South Park Commissioners supported ornamental plant attractions in Washington Park that included a twenty-foot-diameter globe, a sundial of echeverias, and wire structures covered in flowering plants depicting President Grant and Uncle Sam—what one writer called "floral masterpieces." In 1872 a Board of Botanical Directors was formed under the direction of H. H. Babcock, a prominent botanist and member of the Chicago Academy of Science. In a move antithetical to Olmsted, Cleveland, and Jensen's native plant perspective, the Board sent requests to botanical gardens and noted horticulturists all over the world and received seeds and bulbs from the United States, Europe, India, and Australia. Many were eventually planted out in the Chicago parks. In 1891, the journalist Charles Pullen wrote extensively on the development of Chicago's park and parkway system, especially of Olmsted's plans. He carefully threaded his way through the controversies of natural and artificial but commented that "it is hoped that with the gradual evolution of the grander and simpler elements of the park landscape these features of curiosity will be given to more appropriate places, less antagonistic to the pleasures obtained from natural scenery."

Boston's Public Garden, still admired for its commitment to the bedding out tradition, rests on a set of artificial conditions that eliminated any call for a rural landscape model. The Garden was created out of brackish tidal flats as part of the landfill project that created Boston's Back Bay. The supporters of the Public Garden were men with strong horticultural interests as well as a dedication to civic improvement. William Doogue, the Irish-born horticulturist hired to bring architect George Meacham's original 1859 plan for the Public Garden to life, developed flower adornments for the Garden of great public appeal. He maintained a municipal greenhouse that produced thousands of plants for the extensive beds he created throughout the



CHICAGO HISTORY MUSEUM

A park with bedding out displays along Drexel Boulevard in Chicago.



CHICAGO HISTORY MUSEUM

A stereo view card with images of large floral sculptures in Chicago's Washington Park.

COURTESY OF THE AUTHOR

Early twentieth century postcard shows bedding out in Boston Public Garden.

COURTESY OF THE AUTHOR

A Boston Public Garden floral carpet bed depicting the seal of the American Legion in 1930.

Garden. A newspaper article in 1888 described the summer scene: acanthus, pyrethrum, beds of silverleaf geraniums and pansies, edged with lobelias and alternanthera. In the midst of this blaze of color, Doogue created a cactus bed, an exotic sight to Garden visitors. In one of the more memorable horticultural disputes of the nineteenth century, played out in the pages of *Garden and Forest* magazine in the 1880s, Mr. Doogue's plantings and their accompanying popularity with the public were condemned by both signed and unsigned articles in the publication. Doogue and the supporters of his distinctive floral displays were pitted against an impenetrable fortress of opposition from the likes of landscape writer and architectural critic Mariana Griswold Van Rensselaer, Arnold Arboretum director Charles Sprague Sargent, and Frederick Law Olmsted. Doogue scoffed at their limited views, their isolated lives, and, most importantly, their lack of empathy for the taste of the general public.

The bedding out tradition is seen as a historical remnant of the Victorian era, outside the canon of landscape design history: at best, charming and whimsical, at worst an affront to good taste and the sanctity of a natural landscape. It is seen as a vernacular tradition perpetuated by gardeners rather than professional landscape designers or landscape architects. In a postscript to the bedding out tradition, the Philadelphia Museum of Art sponsored an art installation in 2012 by the minimalist artist Sol LeWitt (1928–2007). The work was based on a proposal LeWitt made to the Fairmount Park Art Association in 1981. The resurrected *Lines in Four Directions in Flowers* was created from LeWitt's initial instructions: "To plant flowers of four different colors (white, yellow, red, and blue) in four equal rectangular areas, in rows of four directions (vertical, horizontal, diagonal right and left) framed by evergreen hedges of about 2-foot height … The type of plant, height, distance apart, and planting details would be under the direction of a botanist and the maintenance by a gardener." It was a short term work, installed in 2012 and dismantled in 2015. It, perhaps unintentionally, reiterated the original power of bedding out: the appeal of geometric forms, the intervention of blocks of color in a green field, the fascination with observable change.

Today, we still identify public parks with the core of civic life. The binary of ornamental versus pastoral is still rightfully argued, but,

COURTESY OF THE PHILADEPHIA MUSEUM OF ART

Artist Sol LeWitt's work, *Lines in Four Directions in Flowers,* was installed in front of the Philadelphia Museum of Art from 2012 to 2015.

more challenging, is the question: How do you translate planting techniques of mass appeal with contemporary values of sustainability and the still unspoken ideas of taste? In 1856, horticulturist and landscape designer Andrew Jackson Downing argued that the public park could modify artificial barriers of class, wealth, and fashion—a notion that is still valid and still contentious. Sophisticated observers may still feel a degree of discomfort at the use of bedding plants to spell out town names, patriotic emblems, comic characters—the definition of kitsch being "the adaptation of one medium to another." But in the words of the art historian Tomas Kulka, "If works of art were judged democratically—that is, according to how many people like them—kitsch would easily defeat all of its competitors."

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

Uncommon By Any Name: *Acer pensylvanicum*

Jon Hetman

One thing I found challenging when I first started working at the Arboretum was learning (and using) scientific names for plants instead of their common names. While perhaps easier to use than those tongue-twisting Latin binomials, common names prove problematic for identification because they can refer to generic groupings (think of honeysuckle or rose) and can vary in usage from place to place (in the United States, a *Tilia* is called a linden; in the United Kingdom, a lime). Nevertheless, common names can offer intriguing clues about plants and their formal, natural, and historical associations. Consider the diversity of references suggested by the many common names for *Acer pensylvanicum*—from striped maple to whistlewood—and you begin to appreciate how one plant can inspire many appellations.

Native to North America from Nova Scotia to Wisconsin and south through the Appalachians to northern Georgia, *A. pensylvanicum* is called striped maple or snakebark maple because its smooth, olive-green bark bears bright green and white vertical striations. It shares this trait with more than a dozen other maples in Section Macrantha, though all the rest (including *A. davidii, A. maximowiczii,* and *A. rufinerve*) originate from Asia, making the snakebark maples a great example of the eastern Asia/eastern North America disjunct pattern of biogeography. The considerable ornamental interest provided by its bark makes *A. pensylvanicum* a real stand out, particularly in the winter landscape.

In spring, the leaves of *A. pensylvanicum* unfold tinged with pink and mature to bright green. It bears large, serrately margined leaves that measure up to seven inches (18 centimeters) across. Long-stalked and typically with three sharp-tipped lobes, the leaf shape suggests a third common name for the tree, goose-foot maple. In autumn, leaves turns a clear yellow. A primarily dioecious plant with male and female flowers on different plants, the tree bears long, pendent racemes of delicate, pale yellow-green flowers in early spring, which give way to graceful chains of pinkish samaras (winged seeds) that are extremely showy by summer's end.

Not overly abundant in the wild, striped maples grow to only 30 to 40 feet (9 to 12 meters) in height and spread, and are often multi-trunked because of wildlife browsing. In addition to feeding on the tree's soft shoots and young foliage, deer and moose also rub the velvet on their antlers against the smooth trunks of *A. pensylvanicum* as they approach the rutting season, suggesting two additional common names—moose maple and moosewood. When cultivated in the landscape with good soil, adequate moisture, and at least partial shade, moosewood can thrive as a striking specimen of intermediate size. While the species is not prone to any significant insect pest or disease problems, gardeners should protect its soft trunk from lawnmower injuries and other mishaps. The ease of its wood to yield to the knife once made it a popular choice for making whistles, and some still call it whistlewood.

The Arboretum has cultivated *A. pensylvanicum* since 1874. Today, you may observe 14 individuals of the species representing nine accessions, including two specimens of the cultivar 'Erythrocladum', selected for the coral pink to red color of its young winter twigs. Holdings of the species include individuals wild-collected by Senior Research Scientist Emeritus Peter Del Tredici in 1979 (in West Cornwall, Connecticut), Keeper of the Living Collections Michael Dosmann in 2008 (in Franklin County, New York and Mt. Wachusett, Massachusetts), and Manager of Plant Records Kyle Port in 2013 (in Orland, Maine). Most grow on the east side of Meadow Road in the Azalea Border and along the edge of the Maple Collection, and on the west side of Meadow Road in the North Woods. Visit any time of year to appreciate this truly remarkable native, no matter what name you call it.

Jon Hetman is Director of External Relations and Communications at the Arnold Arboretum.

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