Plant propagation, as a subset of horticulture, is not especially prone to wild claims or effusive description. Techniques generally work or not, or successes get described as a percentage of rooted cuttings or germinated seeds. The propagator’s lot in life is steady progress, creating thousands of new plants one by one, leaving behind an uncredited legacy in other people’s gardens. So when a bit of “extreme propagation” takes place in our botanic garden, it is worth a note.

Propagation generally falls into two categories: sexual propagation, using seed or spores, which produces genetically diverse offspring, and asexual propagation, which is essentially cloning plants by means of cuttings, divisions, grafting, and other techniques. The latter is usually done to preserve a desired character or lineage. For example, the “Sheep’s Nose” apple, an heirloom variety, has been preserved for hundreds of years by a successive chain of grafts over the generations.

At the Smith Botanic Garden, a plant species can sometimes be easily replaced if lost. But when we have been growing a taxon for many decades, we sometimes preserve our specimens just because they trace back to earlier times. It is remarkable to us that returning alums, coming to their 50th reunion, may be seeing some of the same plants, propagated many times, that greeted them as first-years.

Sometimes, however, chance can force us to develop new techniques. One of our oldest and most prized specimens is a very large tree fern, *Dicksonia antarctica*, the woolly tree fern, native to Australia. Tree ferns are extremely ancient plants, some being found in the fossil record from at least 300 million years ago. They are found mostly in mild tropical areas such as the cloud forest biome and are probably one of the most poorly represented groups of plants in botanic gardens. Over 500 species are known but one is hard pressed to find more than a couple in cultivation. *Dicksonia*, as a genus, is native to Asia, Australia, New Zealand, and Central and South America, with *Dicksonia antarctica* being one of the hardier tree ferns as it can take a few degrees of frost.

Our specimen dates back to the “PA” era (pre-accession numbers), when record keeping at Smith was not as organized as today. The earliest note we have of its existence is from 1962 with a location of the Center Bed of Palm House. At some point it was planted inground in the small center bed under the Fern House dome. Over the ensuing decades it grew mightily and came to dominate the space so completely that it hit the roof. During the renovations of 2000 it was dug up, hand carried by seven men to the Cool Temperate House,
Tree Fern continued

and planted in a large specially built box. Once the construction frenzy halted, it was planted in ground in a new bed under the high ceiling of the Cool Temperate House. As it was top-heavy with a curved trunk, we cabled it to structural elements of the greenhouse and here it happily grew for ten years. As *Dicksonia* stems have active roots all along their length, our watering regimen was to douse the trunk multiple times per day. Good for roots, but over time, not so for steel cable. We came to work the morning of July 28, 2013, to find the cables had rusted through, and without support, our tree fern had toppled over and was broken at the base. The 12-foot stem, all bristly with roots and topped with a green shock of leaves, looked forlorn and wounded lying on the ground. The base of the stem was broken apart so there was no righting it. As we felt the sting of losing a specimen more than 50 years old, we decided to take some desperate measures. I had been told once by a visiting Kew botanist, David Cooke, that the stem could be cut and the top portion of the fern easily rooted as a cutting. Once I told him we reached a very non-English 100°F during New England summers, he tempered his opinion. But an internet search showed that nurseries in mild areas of New Zealand and Australia stack the trunks like cordwood, which customers buy and plunk in the ground.

So we proceeded to harvest the largest cutting we have ever tried at the Lyman Conservatory, a 4-foot-long, 1-foot-thick topmost section of the stem. We removed a section of benchtop from our misting bench, put a large plastic garbage can on the floor, dusted all the stem with rooting powder, then nestled it into a medium of perlite and sand. Here it sat for six months, the regular bursts of mist keeping it from desiccating while it set out additional roots. On December 20, 2013, we decided to take a look and try to plant it back in the Cool Temperate House. We brought the heavy “pot” to the greenhouse, cut open one side with a reciprocating saw, and were rewarded to see a mass of new roots. A sufficient hole was dug, the pot leaned just so, and in slid the returning specimen, minus 8 feet of stem but still with us.

Once we were able to get a good look at the top of the fern, we saw that it had actually branched, having more than one growing point. Tree ferns exhibit what is called monopodial growth, like most palm trees, with one main woody trunk topped by a single growing point. That ours has begun to branch is very rare, and it sets up an interesting prospect for the next 50 years, in that future greenhouse crews will have to cable four stems instead of one. Here’s hoping they check cables more regularly than we did.
Curricular Enhancement Program: The First Eight Years

Nancy Rich

The Botanic Garden’s Curricular Enhancement Program (CEP) was envisioned to expand the Botanic Garden’s educational role across the breadth of Smith’s liberal arts curriculum, and after eight years we can say with confidence that it has been a success.

All told, 23 CEP courses have been developed since 2007; counting repeats, a total of 39 courses have run, covering twelve different departments. Faculty in the arts, humanities, social sciences, engineering, and, of course, the sciences, have taken advantage of the program, which provides course development funds, supplemental funds for field trips and guest speakers, and access to Botanic Garden staff expertise either for course planning or for key sessions during the semester.

Intriguing new topics and approaches have marked CEP courses in biological sciences. Students in Judith Wopereis’s lab on microbial diversity collected samples from the “tanks” of pitcher plants, the Stove House pool, and other wet areas in the Lyman Conservatory. After cultivating and identifying the microbes (even finding some that were previously unknown to science!), they took exquisite photographs that were displayed in the Church Exhibition Gallery. One student found her eyes opened to new research possibilities:

I never really ventured into the Lyman Plant House too much, and being able to experience [its] resources as a scientist/researcher was very rewarding. I feel I have gained insight into the importance of the Botanic Garden as such a resource for science… Any opportunity I have to get involved again with research at the Botanic Garden I will take!

Students in Carolyn Wetzel’s plant biology laboratory learned the value of observing live plants and their natural variations to help decipher the “ideal” forms in textbook illustrations. One student found that firsthand experiences renewed her previous appreciation of plants, stating that the course “reminded me of how amazing plants are and how complex their interactions with other organisms can be.”

The range of courses has been impressive. Drew Guswa’s ecohydrology students got a firsthand look at plant adaptations to varying water availability as Conservatory Manager Rob Nicholson “unpotted” plants to show types of roots. Students used the olive tree in the Cool Temperate House to test their sap flux sensor and measure differences between day and night sap flows.

Many more classes in the arts, humanities, and social sciences are coming to the Botanic Garden than ever in the past century. Courses have focused on plants as aesthetic inspiration, as cultural “texts,” as literary symbols and drivers of history, and as subjects of social theory. After learning from Director Michael Marcotrigiano about thigmotropism, heliotropism, gravitropism, and other types of plant movement, students in Susan Waltner’s choreography class danced the spring bulb emergence in Capen Garden, as bulbs actually were emerging. The performance brought tears to my eyes.

In James Middlebrook’s architecture class, students designed pavilions based on plant forms they observed in the greenhouses. Their architectural models, exhibited in the gallery, gave countless visitors an unexpected perspective on plant form.

(Continued on page 4)
CEP courses have increased students’ interest in and knowledge of plant-related topics, an important aspect of the mission and function of the Botanic Garden. In end-of-semester reflections, many students say that they became more interested in plants and gardens and that they will carry on this interest by taking horticulture or botany courses, seeking internships and future careers in related fields, or gardening on their own. One student wrote, “I came from a family that has always cultivated a little garden and plants but I was never interested. … The class made me realize that I will continue this tradition.”

For many students the learning takes place at substantial intellectual depth, their perceptions of plants and gardens changing or becoming more complex:

I look at plants differently now: where do they come from and how did they get there? How have their uses changed over time?

This course has caused me to look at plants as historical texts describing the past; the greenhouse is a sort of museum, and unfortunately we don’t understand all the stories it holds (but are trying to!).

I discovered how plant biology directly informs literature. I will never look at plants the same way.

Academically, the program helps support key initiatives at Smith. Our collection of plants from around the world furthers the global curriculum. Because of the Mediterranean and tropical greenhouse collections, at least one third of the courses have been able to focus on those geographic areas, including plants in ancient Roman art; plants as Biblical symbols and metaphors; and politics, history, and/or literature of plants in Africa, Latin America, and Brazil. The outdoor collections, including both New England natives and temperate species from Asia, supported Sujane Wu’s Chinese poetry course and Reid Bertone-Johnson’s landscape studies course addressing Northeastern plants found at Smith’s MacLeish Field Station.

For many, the chance to connect closely with a few plants can lay a foundation for further goals of protecting the natural world, thus supporting such initiatives as the Environmental Science and Policy major; the Landscape Studies program; the Center for Environment, Ecological Design and Sustainability; the MacLeish Field Station; and the Community Garden. For others, the program serves as an entryway into science, which they might not otherwise have had:

I’ve learned not to just look at plants on the surface, but to think about their biological characteristics and growing habits for some fascinating new angles for [literary] analysis!

Another benefit that has emerged clearly is the value of high-quality interdisciplinary learning:

I have more confidence in my own ability to study/research in ways that are new/distinct/out of my comfort zone. I never imagined doing a project that included merging/blending science with social theory—and even just this merging has opened my mind to the multiplicity of ways to engage/learn from a subject.

Finally, CEP courses contribute to the intellectual life of the college and the local community. Public programs have included at least five exhibitions, numerous guest lectures, poetry readings and dance performances, bilingual portfolios about the collection, and online information dissemination.

We gratefully acknowledge the work of the faculty, staff, and students who have helped this program grow. We encourage all faculty to apply.

Curricular Enhancement Program details and course descriptions may be found at smith.edu/garden/Academics/curricularenhancement.html.
This summer, the Botanic Garden’s possession of a rare gymnosperm that was producing cones—a male *Welwitschia mirabilis*—allowed Smith College to contribute to research being done globally on the phylogenetics of the species, and allowed me to get my first taste of scientific collaboration.

This *welwitschia* plant was introduced to the Botanic Garden in March of 2005 as a seed we received from the Munich Botanical Garden. It was featured in *Botanic Garden News* that year (see page 7 of the Fall 2005 issue). Living individuals of this ancient gymnosperm lineage that are up to a thousand years old have been found in the wild. Native to the arid southwest African countries Namibia and Angola, *Welwitschia mirabilis* is a dioecious species, meaning there are separate male and female plants.

Researchers at the University of Victoria, British Columbia, Canada, including Biology Professor Patrick von Aderkas, reached out to botanic gardens all over the world, looking for male *welwitschia* plants that were producing cones. They wanted samples of the male cones’ pollination drops for chemical analysis, information they would share with a research team directed by Massimo Nepi at the University of Siena, Italy, studying *Welwitschia* and other primitive gymnosperms. Previously thought to be found only on female plants, pollination drops are released from the tips of the ovules in the cone and function as landing sites for pollen. Surprisingly, pollination drops are now known to form on male *welwitschia* cones as well (from an abortive ovule), and could possibly provide insight into the evolutionary history of this “living fossil.” The researchers are examining pollination drop constituents of gymnosperms, specifically amino acids (the building blocks of proteins) and sugars, as part of a larger study looking to unearth new information about the evolution of vascular plants, their phylogenetic relationships, their reproduction, and animal associates. They have been working their way through the gymnosperms, and were still needing material from male *welwitschia* cones.

The Botanic Garden has four individual plants, three from the 2005 seed batch and one from seed received in 2002 from the Berlin-Dahlem Botanical Garden. Two of the plants from the 2005 batch have coned, in 2010, again in 2013, and one of the two coned this summer in 2014. The other two plants have not yet coned, possibly because the plants are females, which take longer to mature. On the male plant that was producing cones this summer, the small pollination drops were barely visible to the human eye without using a microscope or magnifying glass. However, the technique required to collect the pollination drop sample was simple for someone used to collecting liquids in microliters (one millionth of a liter). As an incoming first-year and aspiring biology major at Smith College, I was prepared to pipette. But seeing the odd plant for the first time, I couldn’t help but feel as Dr. Friedrich Welwitsch, the plant’s namesake, did upon its discovery: afraid to go near it “lest a touch should prove it a figment of the imagination.”

After mentally preparing myself to penetrate the plant’s aura, my next visit had me pipetting pollination drops off of its delicate red cones. As if my nerves around the rare desert plant were not enough, this method of collection supplied an insufficient amount of the liquid for chemical analysis. I had to switch tactics. With no female cones currently available to the male plant, these cones were not going to pollinate any female plants successfully. Rob Nicholson (the conservatory manager) and I decided to sacrifice the male cones for their pollination drops. Each cone was carefully removed from the plant and pressed in a vise between two plates of slate until droplets formed at the base of the cone and each was depleted. Our vial of the liquid was finally of sufficient volume for the chemical analyses. Although this fluid includes more than just pollination drops, the researchers were still (Continued on page 6)
Larch Arch at Capen Garden

Gardens are never static. Every gardener knows that planting a garden is just the beginning of the process. The hedge and arbor made of hemlock, Tsuga canadensis, had been a longtime fixture at Capen Garden. Although we don’t have records showing when it was planted, the Smith College Archives has old photographs of Capen Garden showing the hemlock arbor. Since those photos were taken by Dorothy May Anderson, who was Smith’s landscape architect from 1935 to 1943, we know that the hemlock dates back to at least then.

When Capen Garden went through a major renovation in 2004, we kept the hemlock, although we knew it was not going to be for the very long term. Since then, the hemlock has been showing its age and became infested with hemlock woolly adelgid. We finally made the decision to take it down, along with some long-suffering mountain laurel, Kalmia latifolia, which is also visible in the Anderson photograph.

In its place you will now find a weeping larch, Larix decidua ‘Pendula.’ Michael Snape of Ultra Machine in Huntington, Massachusetts, made the metal archway that we are now training the larch to grow on. Since the larch is deciduous, we wanted an attractive support and Michael did a lovely job adding decorative leaves. (By the way, he was also responsible for fabricating the great hanging system we use in the Church Exhibition Gallery). The larch will be much easier to train, prune, and keep in check than the hemlock.

Madelaine Zadik

References
Managing a botanic garden and arboretum on a college campus poses many challenges, especially compared to a garden designed solely as a pleasure garden without other competing functions. The Campus Arboretum at Smith College serves as a landscape for residential, academic, and administrative buildings. There are sidewalks, roadways, and underground utilities. Year-round construction projects pose many threats to our plant collection, and the campus, especially with the expansion of summer programs, never shuts its gates to the public. Added to this are the pressures put on plants by a workforce that is required to maintain the campus for student use, for example, clearing snow and ice in the winter. We are also growing plants out of their natural habitat, surrounding trees with turfgrass and sidewalks. You can perhaps begin to see what an uphill battle it is for a tree at Smith.

One of our main concerns at the Botanic Garden is to provide an aesthetically pleasing yet safe environment for the college community. Every tree is subject to the forces of nature and has the potential to fail. In fact, trees have a limited life span, longer for some, shorter for others, even under ideal circumstances. As a certified arborist, one of my jobs is to evaluate the potential risk of our trees and mitigate the hazards that exist, to make our campus safe for everyone. Sometimes this might require the removal of a tree (usually to the chagrin of many), cabling limbs, or simply pruning in a way that will decrease the potential for a particular limb to break or fall.

Trees are complex living organisms. It takes considerable knowledge, experience, and understanding of tree physiology and architecture to be able to accurately evaluate their well-being. Tree assessment is a field of arboriculture study that is growing. New scientific discoveries and new technologies are enabling us to better understand what is going on within our trees, develop new ways of preventing problems, and treat issues before they become major problems. Yet, we cannot prevent damage from extreme weather systems, and there are always new threats on the horizon, such as the emerald ash borer. It is a delicate balancing act, minimizing risks from our trees while maintaining a beautiful pastoral landscape that serves as a great environment for learning.

Tree Risk Assessment

Jay Girard

Tree Risk Assessment is the toolbox that professional arborists use to evaluate the potential of a tree to fail. The toolbox consists of four areas of concern. For every individual tree, these questions need to be thoroughly researched and evaluated in order to determine the level of risk involved. The four categories, with some recommendations, are as follows:

**Tree characteristics:** Is the form structurally sound? Has the tree been pruned properly in the past? Does it have weak or narrow crotches or competing main stems (codominant leaders) that make the tree more prone to failure? Is it a species that is known to have weak wood or weak branch attachments? Planting appropriate species and pruning properly starting at an early age can help minimize these risks.

**Tree health:** Does the tree show appropriate shoot growth for the age and (Continued on page 8)
species of the tree? Does it have good leaf color or is it having nutrient issues? Is there “wound wood” (where the tree has been injured and callus tissue has grown over the wound) or fungus growth that needs further examination? Careful observation and constant monitoring can help catch problems early, when there may still be something that can be done to reverse the decline of the tree.

**Site conditions:** Have there been any disturbances to the soil: construction, grade changes, trenching, or soil compaction due to foot or vehicular traffic? Is the tree subject to prevailing winds? Are there any signs of fungal growth in the soil that would affect root stability, and what type of soil is prevalent on the site? How high is the level of the water table? Siting trees correctly is the best preventative measure, but we also have to be vigilant about protecting tree roots from harm by building contractors, digging projects, and vehicular traffic.

**Potential Target:** Is it a high use area for pedestrian or vehicular traffic, such that many people would be at risk if the tree were to fail? Are there buildings, parking lots, benches, or hardscape in the area? Is it an occasionally or frequently used area? Again, siting trees properly can avoid problems, but we also need to be conscious of changes of use in particular areas.

At Smith, we have, unfortunately, lost many aging trees on campus over the last several years. We have had to take down some as a result of damage from high winds, heavy snow loads, and instability as a result of wet soil conditions. Sometimes we see trees failing years after a construction project, as it often takes a while for the damage to tree roots to affect overall tree health. We lost our beloved cedar of Lebanon in 2010 to a lightning strike, and other trees have succumbed to disease problems. While we are lucky enough to have some stately old trees on campus, that number is unfortunately diminishing. We are doing our best to improve conditions for our oldest trees and plant new trees to ensure a beautiful campus for future generations.

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**The World in A Garden Goes to Ohio**

In 2007, to celebrate the retirement of biology professor John Burk, we worked with him to produce *The World in A Garden*, an exhibit that he had been thinking about for many years. The exhibit explores ways in which botanic gardens since the early Renaissance have represented our increasing awareness of and fascination with the plant life of other continents and climatic regions. John Burk selected images, many from the rich collection of botanical works in Smith’s Mortimer Rare Book Room, to showcase how botanists and botanical artists have sought to describe and illustrate the diversity of the known plant world in an age of constant exploration and discovery.

While the exhibit lives on in cyberspace (see smith.edu/garden/exhibits/worldingarden), it will be on display next year at Fellows Riverside Gardens in Youngstown, Ohio, starting in mid-June of 2015. So if you missed it at Smith in 2007, you have another opportunity to see the actual exhibit in its full glory.

Many of our exhibits have traveled to other gardens and museums around the country and around the world. With modern technology, reproducing our exhibits in other places has become much easier. We’d love to be able to bring our exhibits to you. If you would like to see one of our exhibits in a place near you, please have them contact us. More information about our exhibits is online at: www.smith.edu/garden/exhibits/exhibitions.html.
Doing the Math

Marisal Dobbins ’15

The syrupy sweet scent of one of our most floriferous plants, Dendrochilum magnum, known as the golden chain orchid or large dendrochilum, was wafting about the Stove House and Palm House of the Lyman Conservatory in September and October. The huge plant has quite an amazing presence. I counted over 134 gracefully arching inflorescences (flowering stalks) with 84 to 90 flowers each, and calculated that there were well over 11,000 individual flowers infusing the atmosphere with perfume! Many noted the smell as having hints of spice, citing cardamom, vanilla, and clove as components of this species’ fragrance.

With colors seemingly cut from the midsection of a rainbow, the 80 to 90 flowers on each inflorescence were mostly shades of orange, transitioning to yellow, then green. To complement the magnificence of color and smell proffered by our Dendrochilum magnum, bountiful colors of many surrounding orchid species also in bloom greeted visitors to the Botanic Garden in late summer to early autumn. Although initially labeled as Dendrochilum cobbianum, with a note indicating the species would have to be verified at bloom, we have since identified it correctly as Dendrochilum magnum.

Hailing from the forests of the Philippines, Dendrochilum magnum lives as an epiphyte in tree canopies at elevations between 5000 to 6500 feet above sea level. We received our plant on August 5, 1996, courtesy of Greg DeChirico from Brattleboro, Vermont. It has done so well that the steel rod supporting it is beginning to bend with the weight of 65 pounds. As such, the plant is scheduled for division in the upcoming months.

The blossoms of our plant were open for well over a month. On any day you might see a few more of the original ten thousand blooms fallen down to pepper the floor. Catching the perfect moment, I saw one drift down into the pond to accompany our aquatic plants. Even without the hundreds of inflorescences in bloom, the sheer quantity of leaf blades and the magnitude of this plant is something to behold. And, fortunately, Dendrochilum magnum, blooms annually in the autumn, meaning if you missed it this time, you can come back for it next year just before the Mum Show! ☮

Congrats to the Class of 2018!

Madeline Zadik

Since 1993, when Paula Deitz and Susan Cohen (co-founders of the Friends of the Botanic Garden) came up with the idea, the Botanic Garden has welcomed incoming students with an ivy plant. They must pick it up at the Lyman Conservatory, ensuring that all students know about the Botanic Garden. We hope that they will return for classes and make use of this great Smith resource.

Ivy was chosen to connect to Smith’s Ivy Day traditions. That first year, ivies were brought in from a commercial greenhouse, but after that we produced them here from cuttings from our collection. We estimate that over the past 22 years we have given out over 13,000 ivies!

This year, a record number of students came for their ivies. Including first-years, transfers, and Ada Constock Scholars, there were a total of 715 incoming students. At the end of September, we only had 79 ivies left, which is an 89% participation rate, the best ever.

In 2012 we captured students coming for their ivies on video. You can see it at: smith.edu/news/ivy-for-first-year-students. ☮
In the last issue of the Botanic Garden News, I interviewed ex-horticulture student Lindsey French, an artist who creates works centered on plant-to-plant and plant-to-people communication. She loaned me one of her favorite reads, What a Plant Knows: A Field Guide to the Senses, written by Daniel Chamovitz. Initially, I was hesitant to take the time to read it, as the title seemed to suggest it was some pseudo-scientific, anthropomorphic treatment of plants. However, I quickly changed my mind when I saw that it was published recently (in 2012) by Scientific American/Farrar, Straus and Giroux, New York. Scientific American is known for publishing credible scientific work.

As it turns out, the book is an extremely enjoyable compilation of some recent research on plants as they react to stimuli in their environment, written in terms understandable by nonscientists. Chapters are broken into “senses,” what a plant sees, what a plant smells, what a plant feels, etc., to organize explanations of what we currently know (and don’t!) about plant “sensations.”

As a backdrop, I must tell you that I have a rather long history with this topic. The first question I was asked during my dissertation defense decades ago was, “What is the main difference between higher plants and animals as they relate to their environment?” I did not expect such a general question, having done my research in the very specific area of plant development. But, with gentle nudging by one of the more compassionate committee members, I finally offered that almost all plants are stationary and this forces them to adapt to their local environment in ways different than animals. Birds can fly to water to drink, mammals can forage for food over rugged terrain, fish can dive deeper to escape predators — but plants must deal with what is handed to them once they take root.

This point is not minor because, as What a Plant Knows reveals, it is a general lack of mobility that has a great influence on driving plant evolution. Strategies to adapt are common in plants, and once a mechanism to adapt to a location had evolved, a plant could colonize that area. As with all organisms, “survival of the fittest” is key, and so we find remarkable plants such as those with tendrils that climb up other plants to steal their light; plants whose roots bend down, not up, to get to a deep water table; fruit that ripens simultaneously to attract the most seed disseminators; carnivory that allows plants to live in impoverished soils; and receptors to gaseous signals that allow parasitic plants to distinguish a host from a non-host species. The more Chamovitz explains, the more you are amazed.

While plants do not have a neurological system—nor specialized senses relying on eyes, eardrums, or taste buds—they have evolved mechanisms to take in signals and respond to them. Plants, for example, have more photoreceptor chemicals than do human eyes. Yet, we generally think of plants as passive objects that do not even know when we touch them and don’t react if we cast our shadow on them. But they do. Chamovitz’s book is the first to attempt to explain this complex biology to the nonscientist. With great storytelling and comparisons to human senses, he manages to explain some very complex biology that even for me, a trained botanist, made me think more about a plant’s “awareness” than I ever have. Chamovitz describes some remarkable new research: that some tendrils are more sensitive to touch than human skin; a form of “memory” exists that prevents Venus flytraps from closing prematurely; and that a leaf under attack sends signals to nearby leaves that then get their chemical defenses in order before they too are attacked. What Chamovitz gives us is a sense that plants, even though they have no emotions, “have feelings” and that their lives are influenced, not dictated, by their environment.

Chamovitz rightfully warns us that “If you’re looking for an argument that plants are just like us, you won’t find it here.” This is music to my ears (pun intended), as I am all too familiar with the poorly designed, amateurish experiments with plants and music, like those featured in the 1973 pseudoscience favorite The Secret Life of Plants, which the author makes a point of debunking. Whether it be as a result of sound waves, heat, or day length, all life on earth is subjected to the environment that this planet offers—gravity of a certain force, light of certain wavelengths, and an atmosphere with certain gases. Should we not expect that all organisms have evolved an awareness of where they are, and mechanisms to cope with the stresses they are subjected to?

The only criticism I will offer for the book is that the chapters seemed a bit uneven, with one or two much more difficult for an average reader to understand than the others. The author admits that he gave his editor “the daunting task of turning my academic wording into readable prose.” I think this was only partially achieved. Yet, I must say it’s been years since I read a book cover to cover in one day. If you love plants, this is a must read—your appreciation of them will be greatly enhanced once you understand how much more “aware” they are than you ever imagined.

In our next article in this newsletter, Rebecca Tishler, horticulture student and Botanic Garden intern who is entering the University of Cambridge for graduate school, discusses the problem of the English language as it relates to describing plant “awareness.” It may be a lack of proper vocabulary that makes the legitimate field of plant awareness get less respect than it deserves. 

To hear a conversation with Daniel Chamovitz go to: http://scientificamerican.com/podcast/episode/plants-know-stuff-12-06-29
The use of animal-specific descriptions of cognition, consciousness, and awareness to describe plant behavior, given our own reliance on plants to create meaning in language. We call a beautiful British woman “an English rose”; one extends their interests by “branching out”; someone slow to develop is a “late bloomer.” These are all metaphors, a literary device wherein two distinct things are compared to better understand the both.

David Chamovitz, author of Botanic Garden News, considers plant neurobiology and its associated terms as metaphors, which in turn “challenge people to reevaluate their understanding of biology in general, and plant biology specifically.” No one who uses these terms believes they accurately describe a plant’s anatomy, but rather they employ them to call into question our considerations of what it means to be an animal or a plant. This is the nature of the use of plant neurobiology and its associated terms as metaphors, which in turn “challenge people to reevaluate their understanding of biology in general, and plant biology specifically.”

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Rebecca Tishler graduated in May from Mount Holyoke College with a degree in English. She worked as a horticultural intern for the Botanic Garden this past summer, and is on her way to Cambridge University for a graduate degree in American Literature.

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Parks to People Field Trip to Mt. Tom

April 8, 2014, was a perfectly clear day to hike up to the observation tower at Mt. Tom’s Goat Peak to enjoy gorgeous 360 degree views. That was the plan for students in the Smith Landscape Studies Art and Ecology Studio and the Performance Citizenship Club consisting of sixth to eighth grade students from Holyoke’s William R. Peck School. This field trip was a small but important part of the “Parks to People” community art project led by Carolina Aragón, the 2014 artist-in-residence for the National Park Service’s New England National Scenic Trail (NET). The goal was to create art and inspire the public to visit the NET and local parks such as the Mt. Tom State Reservation. Local geologist Richard Little was also on hand to provide basics on how Mt. Tom was formed and has changed over time. I, representing the Botanic Garden, was there to encourage students to experience the local flora.

As we gathered in the parking lot, students were able to smell freshly snapped, aromatic twigs of dormant sweet birch and sassafras. Being early spring, there were fewer green distractions, so they were also introduced to lichens, mosses, hemlock, and mountain laurel. The students photographed anything and everything that inspired them. They later worked together at the Peck School on collages, watercolors, student-written postcards addressed “Dear Mt. Tom,” and maps that were eventually exhibited at the Holyoke Public Library. The largest work is now a giant mural on the side of a Pioneer Valley Transit Authority bus, featuring a collage of photographs forming the outline of the Mt. Tom range with a bilingual message inviting local residents to visit the New England Trail. Seeing these tangible results was impressive and I was grateful to be a small part of it.


Language continued

(Continued from page 11)

language: when confronted with new things, we grasp to make sense of them using terms we already know, which in turn reveals just how meaning is constructed in the first place.

I am personally convinced by the recent research suggesting plants are highly skilled readers of their environment and furthermore have developed responses and traits that are not directly comparable to those of animals. Those researchers leading the field of plant neurobiology support this latter claim, and as Italian plant physiologist Stefano Mancuso suggests, we should begin to focus “on the otherness of plants rather than on their likeness.”1 It is already clear that our language does not allow for the description of many of the findings and conclusions that plant neurobiology presents. How, for example, can we talk about a bean plant “seeing” a pole in the distance when it has no eyes? And, removed from an animal model, what would the descriptions of these striking examples of “sight” and “hearing” even sound like? The field of plant neurobiology has managed to outpace the English language, and given the speed and enthusiasm with which plant behavior and communication studies are developing, it will probably continue to do so. For plant and language lovers alike, it is fascinating to see

References

Perhaps more than any other place on the planet, Brazil tends to be identified with an intense abundance and diversity of plant life. What other country, after all, is named for a species of tree? *Pau brasil* or brazilwood, *Caesalpinia echinata*, was the first export commodity of the colonial period, valued in European markets for the deep red dye that could be extracted from its wood. Who, when reminded of South America’s largest and most populous nation, doesn’t almost immediately think of vast Amazonian forests and worry as to their future? Though many Brazilians are uneasy with cliché images and ideas of tropical exuberance that can overshadow their country’s geographic, socio-economic, and cultural diversity, an understanding of Brazil’s past and present must inevitably turn to the determinate and dynamic roles of plants.

Thanks to a grant from the Botanic Garden’s Curricular Enhancement Program and to the wonderful collections and human expertise of the Smith Botanic Garden, the Lyman Conservatory became the setting for an exploration of the place of plants in Brazilian culture and environmental history. Students in my Fall 2013 seminar in Portuguese and Brazilian Studies, “Brazil Profundo: Landscape and the Environmental Imaginary in Brazilian Culture,” engaged in a variety of forms with the Botanic Garden’s impressive collection of plants of significant importance in Brazil, including native species such as rubber, cacao, guarana, cassava, pineapple, and the *Mandacaru* cactus, as well as non-native transplants such as banana, mango, coffee, and sugarcane. Together we practiced close observation, botanical illustration, and written description of individual plants, and compared our attempts with those found in 16th and 17th-century colonial accounts. We planted different varieties of coffee, soybean, and açai palm seeds, tracking their germination and development over the semester (the soybeans and palms quickly thrived, but the coffee, alas, took its sweet time).

In addition to guiding students through the collection of Brazil-related plants, curricular outreach consultant Nancy Rich gave a talk to the group about the history and mission of botanic gardens, the Smith Botanic Garden specifically, and how one might “read” them as inscribed with particular cultural values. Students followed up this talk with research on Brazil’s oldest botanic garden, founded in 1808, interviewing via Skype Dr. Ana Rosa Oliveira, a specialist in arboriculture and head of the Research Institute of the Jardim Botânico do Rio de Janeiro. They asked her questions about her work there and the history, collections, and current initiatives of her institution. Another three guest lectures were hosted at the Plant House.

Rob Nicholson, the conservatory manager, reviewed Brazil’s major biomes and the history of botanical expeditions to the country. Dr. Zoraia Barros described efforts through UMass to connect local farmers to new markets through the cultivation of “ethnic” crops such as *Taioba* (*Xanthosoma sagittifolium*), which is popular among Massachusetts’s Brazilian immigrant community. Finally, Erotides Silva, a former agronomist, conversed with students about the mix of coffee, cotton, and subsistence food production on the small farm where she grew up in the southern Brazilian state of Paraná.

Throughout the semester, students’ experiences were combined with readings and discussions on a variety of environmental humanities topics, including figurations of landscape and nature in Brazilian visual, literary, and popular culture, from early postindependence romantic poetry and painting to contemporary “earth art” and environmental justice movements.

This was my first time teaching with the support of the Botanic Garden’s staff and resources, and it was thrilling to witness the students’ excitement and engagement as they moved back and forth between different textual representations of plants and their physical counterparts, fostering a truly cross-disciplinary and hands-on perspective. It is an experience I look forward to repeating in future versions of this course. As biologist Fábio Scarano notes, “Brasil has the greatest biodiversity on Earth, comprising fifty thousand plant species that represent approximately 20% of the documented flora known to us.”

Smith faculty and students of Portuguese and Brazilian Studies are certainly fortunate to have a substantial piece of that biotic legacy cared for and accessible for their contemplation on their campus.

Notes
**Order of Bloom Gains New Relevance**

**Data Tracking Capacity for Phenologic Study of Local Flora**

*Tara Stark ’15*

Since the early 1980s, the spring horticulture class has been following the return of flowers and leaves to plants on campus through an assignment called *Order of Bloom*. Observing a list of around 50 plants on campus, students make weekly observations of the emergence of buds and subsequent phenological (timing of natural life cycle events) developments through the end of the semester. The purpose of my research was to develop a better method for organizing and storing this data, and to make it accessible and useful to other institutions or organizations also interested in tracking phenological changes.

For my summer internship project, I collected primary sources of data in the form of paper copies of Order of Bloom assignments spanning over two decades, developing data sets for plants that had five or more years of records and that still are on campus. I recorded seven key phenological stages (bud burst, first leaf, all leaves, first flower, full flower, first fruit, and fruits mature). I was able to observe changes that occurred year to year and recognize patterns that emerged in the data sets.

The overwhelming majority of the data I analyzed indicated the potential for significant phenological changes year to year due to weather but no overwhelming gradual or consistent change in bloom time over the past 20+ years due to climate change. To make the data more useful to the scientific community, I contacted Dr. John O’Keefe, an ecologist at Harvard Forest, who has developed a long-term phenology data set of native woody species in the area. A meeting was arranged at Harvard Forest with him and Gaby Immerman, the Botanic Garden’s summer internship coordinator and horticulture lab instructor, as well as Emery Boose, a senior investigator at Harvard Forest. We discussed collaborating with Harvard Forest to enhance the research happening at both institutions, and build a more comprehensive data set for native woody species. Beginning in the spring of 2015, the horticulture class will complete a modified assignment that focuses specifically on distinct phenological changes so that more accurate dates can be recorded for the future. Hopefully an ongoing relationship will be formed between Smith and Harvard Forest to make the data more accessible and useful to the scientific community.

Tara Stark ’15 spent this past summer as a Botanic Garden intern, funded through the Smith Summer Research Fellows (SURF!) Program at the Clark Science Center. A sociology major, she took the horticulture courses in the fall and spring.

**Blast from the Past**

It’s always fun for us to hear from those who have a history with the Botanic Garden. At reunion, we often hear from alumnas who have stories of times spent in the Lyman Conservatory or in particular places on campus and the meaning that the Botanic Garden holds for them. Many local people also have a special relationship with the Botanic Garden, having many fond memories from their childhoods. We love hearing from them as well. Recently one of those kids who used to visit sent us a 40-year-old photo of her and her mother in the Stove House. She still lives in the area and now visits the garden regularly with her own young daughter.

Send us your old photos—we’d love to hear from you!

Pandora Judge Redwin and mom Wendy Judge in the Stove House in the 1970s
Summer of Power
Gaby Immerman

The Botanic Garden annually hosts over 3,000 children on field trips from area schools, often providing bus subsidies as well as customized tours and activities matched to curriculum and age group. In late July, 25 middle and high school students from Holyoke Public Schools’ ELL Summer of Power Academy (an intensive, accelerated, and engaging learning program for English language learners) came to Smith. The students had the opportunity to tour and photograph the gardens, learn about the medicinal properties of plants, work in a college lab, and get experience being on a college campus. The students came from Peck Full Service Community School and Holyoke High School. Summer of Power has a strong bridge-to-college component and encourages youth to graduate high school and pursue higher education.

In collaboration with Holyoke-based Enchanted Circle Theater (ECT), this year’s Summer of Power students staged productions of Shakespeare’s Romeo and Juliet and A Midsummer Night’s Dream—both replete with botanical imagery—to build English language fluency and self-presentation skills. Enchanted Circle Theater is an educational theater company whose mission is to engage, enhance, and inspire learning through the arts.

ECT Teaching Artist Melissa Redwin, who cofacilitated the field trip with me, described the experience this way: “It was much more than your typical college tour: there was in-depth lab work with a slew of ready interns, a dynamic (and even dramatic) garden tour, and the students’ experience enhanced their understanding of how plants can have both healing and toxic properties. The students were engaged on intellectual, artistic, and social levels, and got a taste of what it might be like to be a student at Smith College. Thank you!”
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We will be offering a three-day intensive training session on January 21, 22, and 23, 2015. Pre-registration and an application are required.

Please contact us (413-585-2742 or garden@smith.edu) if you are interested in volunteering. Information and applications are also online:

www.smith.edu/garden/volunteer-application.pdf
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