Our Oldest Tree Is No More

Michael Marcotrigiano

In January of 1987 a vigil was held after the President’s Elm was removed because most of its canopy was diseased, the victim of Dutch elm disease. Richard Munson, director of the Smith College Botanic Garden at the time, counted 227 rings on that American elm, the most massive elm on campus. Smith president, Mary Maples Dunn and fifty candle-bearing mourners read poems about trees and said farewell to the huge plant.

Almost 20 years later, the saddest event during my tenure as director has happened. In the wee hours of the morning on August the third, I received a call from the Botanic Garden’s arborist, John Berryhill. Following a summer storm, the oldest tree on campus had lost two major limbs. Ironically, I was on vacation in California visiting 2,000-year-old trees in Sequoia National Park (see article on page 15). Smith’s giant tree, a northern red oak (Quercus rubra) was now sporting two “broken arms” and required closer inspection.

Standing between Tyler Annex and the College Club, the tree was a key feature in the landscape. Its location, size, and prior history of minor limb decay had led to the installation of a series of cables to support the crown when it swayed in the wind. Cables are not intended, however, to support the full weight of the limbs nor hold up broken limbs, and in this case they did not.

One of the fallen limbs had a rotten cavity making it weak. Our thoughts immediately went to the condition of the remaining limbs. How can we determine if the entire tree is compromised? Should we trim off the stubs that remained from the fallen limbs and try to salvage the tree using additional cables and braces? These were difficult questions. After Smith College arborist John Berryhill and two independent arborists examined the tree, many other problems were noted, the worst of which was a crack in the crotch where the two main leaders of the tree diverge.

Not wanting to cut down such an important tree, we called in an arborist armed with a resistograph to try to determine the weakness of other limbs. The resistograph drills into a limb with a thin bit and records on chart paper any areas where the drill meets little to no resistance. Those areas are likely hollow or (Continued on page 4)
A New Face at Lyman

Madelaine Zadik

After moving to Massachusetts from Oregon, Meeyoung Lepore joined the Botanic Garden staff in April as Assistant Volunteer and Tour Coordinator, funded by the Friends of the Botanic Garden. Her title is misleading as she is doing so much more.

Meeyoung started with the Botanic Garden in January of this year first as a volunteer. Having recently moved to the Northeast, she was looking for ways to get involved with her new community. She graduated from Portland State University in 2003 with a bachelor of science, studying ecology, geology, plant science, as well as business. She is especially interested in native plants, medicinal uses of plants, and learning about invasive species. Moving east made her realize that there are a lot of new plants she needs to learn!

From Meeyoung’s first day, we were delighted to have her here. During the Bulb Show and Spring Break she put in many extra volunteer hours. By mid-March Meeyoung had already completed 40 hours of service, had begun leading tours for school groups, and was making herself indispensable. We knew that we were in dire need of additional staff at our reception desk, but with Meeyoung here we suddenly realized how much better things could work with one person in charge of that area. Fortunately for us the timing was right, since Meeyoung was looking for part-time work. The rest, as they say, is history.

Working here, Meeyoung says, is a natural fit as it brings together many of her diverse interests, allows her to use her past experience, and offers her the opportunity to continue learning. She enjoys interacting with the public and has been busy working on improving our visitor touch screen, which enables the public to easily learn more about our gardens and find plants on campus. We’ve also been taking advantage of her photography skills to help us document our collections and gardens. Growing up, Meeyoung dreamed of working as a photographer for National Geographic. She loves taking pictures and even has experience as a picture framer, having worked for a photographic art gallery called Images of Nature. Additionally, Meeyoung is a great organizer. She planned events as Community Director for the March of Dimes and for the Korean adoptee community. She’s currently president of Boston Korean Adoptees, Inc. Our first summer volunteer potluck was her idea, and it was a resounding success!

Next time you visit, say hello. Along with answering any questions, Meeyoung will be happy to show you how to use the visitor touch screen, tell you what is particularly exciting to see at the moment, help you buy a Botanic Garden T-shirt, orient you to the Lyman Conservatory, and perhaps suggest you go on our audio tour. All with a smile and a twinkle in her eye.
The Value of Plant Records

Elaine Chittenden

Living plants certainly provide a tranquil and beautiful environment. L. Clarke Seelye, the College’s first president, expressed the hope that the entire campus could be developed as a botanic garden so that it might be of “scientific as well as aesthetic” value. As a botanic garden we take our role seriously and work to inform and inspire people about the importance of plants on our planet. Our plant collections serve as a resource for art and science education as well as for botanical research. Botanic gardens worldwide are addressing issues ranging from maintaining plant biodiversity to studying plant growth rates and climate change to reducing the harmful effects of imported diseases, insect pests, and invasive plants.

The integrity and usefulness of any collection reside in its documentation and the accuracy of its records. Unlike an art museum’s inanimate objects, the plants in our collection change over time: they grow, may suffer storm damage, get propagated, are moved to new locations, become reclassified by scientists, or die. All this information is recorded. It is this recordkeeping that distinguishes us as a botanic garden from a park or any other display of plants. Although the aesthetic value of today’s collections is readily apparent, the scientific value lies below the surface.

Range or nativity is one piece of information that we track in our plant records database. That information enables us to generate lists of plants in our collection that are native to particular regions. In the recent reorganization of the Cool Temperate House in Lyman Conservatory into sections representing four continents, the data on nativity was essential. Another example of information we track is habit or life form—we use 21 categories, from arborescent herb (banana, for example) to woody vine. Thus, it is easy to produce a list of Japanese trees or American aquatics in the collection. (If you have questions along these lines, please do not hesitate to ask.)

Anyone with access to the web can search Smith’s plant records to see the number of plants in any particular group. On the collections page on our web site click on “search the plants in the living collection” and type in a family, genus, species, or common name. Searching for “rose” will give you 100 matches consisting of all plants in the collection with rose as part of their common name or scientific name. If you search using the genus Rosa, 107 matches come back. Not all of the matches are true roses, e.g., the Chinese hibiscus (Hibiscus rosa-sinensis) comes up because it has rosa as part of its specific epithet or species name. To search for members of the cucumber family, enter Cucurbitaceae, which brings up four plants in the collection belonging to this family. Entering cucumber produces two matches, each with cucumber in the common name: the cucumber magnolia tree (Magnolia acuminata) and Indian cucumber root (Medeola virginiana), a herbaceous perennial of the lily family. Be aware, however, that common names do not appear in the results, even though the system is searching common names in the database.

When querying our plant records you’ll also discover that we record whether accessions* come from the wild or from plants in cultivation. Wild-collected material arrives with collection locality information, which we call provenance. Knowing the provenance is essential for many kinds of research, including studying plant hardiness, population and conservation genetics, or habitat ecology and restoration. Plants of cultivated origin may include hybrids of unknown parentage or mixed seed batches. In any case, the provenance of cultivated plants is not recorded and may be unknowable. Cultivated plants are important for horticultural research, such as developing new varieties and studying landscape utility.

Our plant records are part of a web site maintained by the Royal Botanic Garden, Edinburgh (RBGE), Scotland, where simultaneous searches of plant collections at 24 institutions in the United States and Europe are possible. You can search that site at: http://rbg-web2.rbge.org.uk/multisite/multisite3.php. A German researcher discovered Smith has 42 plants in the Buddhist pine family (Podocarpaceae), a group of primitive gymnosperms. He requested and received material from us to aid in his scientific research. He plans to share his findings in a future issue of Botanic Garden News.

The Botanic Garden utilizes database software (BGBase) specifically designed for gardens to maintain plant records, and our mapping program (BGMap) pulls information from BGBase. All the institutions on the RBGE site use BGBase, making the sharing of data technologically easy. Over 170 botanical institutions across 29 countries currently use this software.

We are striving to make information about our collection easily available to the public. Our new visitor touch screen at the reception desk enables visitors to access our database and use it to locate plants in the collection (as well as memorial trees or benches) and print maps to help find them. You can also create a customized tour of plants on campus and print that map. Searches are done by common or botanical name or the name of the memorialized person. Recently a researcher studying dawn redwoods (Metasequoia glyptostroboides) printed a map so he could find our specimens on campus. Nontechnical descriptions of plants are also available. Of course, entering these descriptions is a work in progress, as is keeping our records up to date. Tracking new accessions, moved or dying plants, and maintaining the accuracy of all the information are more than a full-time job!

*A database of images of our herbaceous perennials, trees and shrubs, and Conservatory collection is now accessible and searchable online at www.smith.edu/garden/plant-images
contain rotted wood. Two graphs (at right) show a sound and healthy limb (top) and one limb with a hollow rotten interior (bottom). The resistograph also indicated that two other limbs were greatly compromised. A visual inspection using a bucket truck revealed that one of the metal cables, normally installed to allow movement, was stretched taut. The limb, which was nearly horizontal in orientation, was pulling down and stretching the cable, a very dangerous situation.

Given all of these indicators, it was concluded that the tree was a high hazard, especially on College Lane near two buildings, a busy road, and sidewalks. With sadness we decided to remove the tree, not as a cost-saving measure but out of concerns for safety. Oak wood is extremely heavy and a large limb drop could be catastrophic. If this tree had been growing in a field, it might have lived for decades, limbs thundering to the ground now and then until the entire tree rotted away. But this declining tree was not in an isolated field where limb drop would have no consequence to humans. It was sharing a vibrant campus where faculty, staff, and students are ever present.

Loss of the oak, however, allowed us to clarify the actual age of the tree. A Daily Hampshire Gazette article on April 29th, 1989, entitled “College’s red oak has lasted 203 years,” followed the Smith College announcement that the tree in question was a bicentennial oak—growing when the U.S. Constitution was signed. The removal of a tree of this importance would be quite unpopular. But was it really that old?

There are a few ways to estimate a tree’s age. The best, of course, is to have accurate records of the planting date. This oak, however, sprouted up on its own before Smith College existed and long before the Botanic Garden began keeping records.

Trees in temperate zones put on new growth starting each spring, creating a new ring for each growing season (see page 5). Therefore, counting tree rings is a fairly accurate way of determining tree age. Without cutting a tree down, there is only one reasonable method to get an estimate of its age. An increment borer drills into the tree and gets a thin sample core across the tree so that rings can be counted. The sample is about as thick as a drinking straw. Although increment boring will not kill a tree, we would be reluctant to use any invasive method on a routine basis. In fact, the accuracy of the method is dependent on several factors so one should never say for certainty a tree is x years old based on a coring. Lack of accuracy in estimating age can cause decision making problems. For example, we might consider using expensive bracing and keeping a tree that is weakened if we were sure it were historic, a state champion, or predated the Olmsted plan.

Once a tree is cut down, counting rings is fairly easy, although rotten cavities and chain saw marks make absolute certainty difficult. After the red oak was cut to a stump, the annual rings were counted, only to reveal the tree was not anywhere near the 220 years it should have been if the coring in 1989 had been accurate. Our count was 140 ± 5, making the year of seed germination around 1866, not 1786. We have no explanation as to why the increment boring performed by a local arborist in the late 1980s was so far off the mark. The tree was not a bicentennial oak. The tree was not over 200 years old. Nevertheless, it was our oldest living tree on campus and a true giant with great importance to the landscape.

Most of the wood from the felled tree had some core rot, cables or bolts, and tar or cement fill (old practices, now abandoned) making it undesirable by sawmills. We saved some of the wood and many acorns. We hope some will sprout and we can plant the oak’s progeny on campus to continue life’s chain.

This tree reminds us that evaluating a tree’s condition on a regular basis is important. We evaluate our trees the best we can given our resources. Now we must take special care to check the older oaks since they are very good at concealing problems. Oaks are very strong trees and leafy limbs with significant interior rot often stay on the tree for years. On September 8, 2001, another red oak that looked absolutely fine plunged into Paradise Pond, making a thunderous sound that could be heard at the President’s Residence (see “Loss of an Old Giant,” Botanic Garden News, Fall 2001 page 9). Rot inside
the lower trunk at the soil line caused the tree to collapse like a building that suddenly lost its foundation. A similar incident happened to a smaller red oak that fell during this year’s Bulb Show and just missed the Boat House. No one was hurt in either incident.

The stresses to which our old trees have been subjected are not often documented, making it difficult to determine all the reasons for premature death of a tree. City and campus landscapes are stressful environments for trees. We should let this giant oak remind us that we need to do all that is possible to reduce the stress our trees are exposed to, including soil compaction from vehicles and building supplies, construction injury, raising the grade of soil, excavation near roots, excessive foot traffic, and lack of irrigation. Root damage is most definitely the largest stress to landscape trees, and we continue to emphasize this to students and staff. The campus benefits in so many ways from its trees. With care and good decision making, the future could see a campus graced by the shade of 200 year old trees.

(Continued from page 4)

Asian Gardens of the 1920s:
The Travels of Elizabeth K. Roys

October 1, 2006 – February 15, 2007
Church Exhibition Gallery, Lyman Plant House
Hours: 8:30 am – 4:00 pm

This unique exhibition connects two Smith College alumnae who graduated 76 years apart and brings to life a truly amazing expedition. As a botany student, Elizabeth Roys (Smith College class of 1928) toured Asia with her mother in 1926–27, exploring gardens in China, Japan, Korea, Siam (now Thailand), and India. She compiled detailed records and observations in five notebooks, which she kept all her life. Although Roys died in 1991, her notebooks remained hidden away until her husband died ten years later and the notebooks were discovered and donated to the Botanic Garden of Smith College. Now, eighty years since Elizabeth Roys embarked on her remarkable Asian journey, these well-kept treasures are coming into public view through the efforts of another Smith College student, Betsy Anderson (class of 2004).

Betsy Anderson cataloged the notebooks while a student at Smith and stewarded this extraordinary exhibit over the past two years. Stunning photographs transport the visitor to the gardens Elizabeth Roys chronicled, and many of these gardens exist today only in Roys’ photographs. Visitors are able to relive Elizabeth Roys’ fascinating garden tour. The exhibition highlights temple, palace, private, working-class, and ruined gardens in all five countries and explores the differing cultural conceptions of the garden.

Public lecture and slide show of the work of Elizabeth K. Roys
Presented by curator Betsy Anderson
Smith Class of 2004 and Garden Historian at The Mount
November 10, 2006, 7:00 pm
Weinstein Auditorium, Wright Hall
Followed by a reception in the Exhibition Gallery at the Lyman Plant House and with the Fall Chrysanthemum Show on view in the illuminated Conservatory

Big Oak continued

Read more about campus trees in the current issue of NewsSmith
available online at www.smith.edu/newssmith

Annual Rings

Why do temperate zone trees have annual rings?
The girth of a tree trunk increases in diameter due to the formation and subsequent growth of new water-conducting cells each year. The cell size is influenced by the availability of water. In spring when soil water is abundant cell diameters are large. As the season progresses and soil moisture declines newly formed cells are smaller. The alternation of wider and narrower cells results in the appearance of rings. By counting the rings we closely approximate the number of years a tree has lived.
As I stepped out of the train station at Kew village on a mild January morning, I was welcomed by the familiar neighborhood that I had called home the summer of 2005 during my Kew Internship sponsored by the Botanic Garden. I walked over the train tracks and down past the flower shop, Tesco’s grocery, Newell’s, which serves excellent pastries and tea, and on toward Kew. It almost felt like I had never left.

My summer at Kew had a profound impact on my life. I learned new techniques, gained lab experience, discovered a passion for research, and met an incredible group of friends. Most importantly, however, my experience at Kew helped me to choose the next step in my path. During the 10 weeks that summer, I did research on *Nicotiana* species (including ornament tobaccos) working to strengthen the phylogenetic relationships between the *Alatae* clade, using plastid DNA sequences. Plastids are a group of organelles, including chloroplasts, that have their own small genome. In gathering plastid DNA sequences from the species of the *Alatae* clade and comparing them using special software programs, the variation in the sequences can be used to determine the divergence pattern of the species. There was enough variation in the sequences I obtained to construct a more informative phylogeny of the *Alatae* clade, and I will be a coauthor on the paper that has been accepted for publication.

I fell in love with Kew, both the research and the accepting environment of the Jodrell Laboratory. On my return to the United States and Smith, I started to try to find a way back to Kew. I looked into fellowships and applied for both the Marshall and Fulbright scholarships. The Marshall involves two years at any university in the United Kingdom, which led me to Professor Andrew Leitch at Queen Mary, University of London, who also works on the *Nicotiana* project in collaboration with Kew. I had met him a few times that summer, and he agreed to take me as a postgraduate student.

During my trip to the United Kingdom in January, I not only visited many of the friends I had made in the summer, but I also visited Queen Mary, and of course, Kew. Having never been to Queen Mary before, I embarked with a friend’s *A to Z London Guide* and found my way to the Biological and Chemical Sciences building at Queen Mary with surprising ease. Andrew gave me a tour of his lab and part of the campus, and I got to see a friend from the summer who was working with Andrew on the first year of his Ph.D. In true English fashion, we had several cups of tea during my visit and a pint at the pub when the day was over. The next day I visited Kew and it was lovely to catch up with people and see how research was progressing. I also enjoyed seeing the gardens in a different season. Every winter, a rink is set up in front of the Temperate House, so I got to go ice skating in the midst of the beauty that is Kew.

Once back at Smith, I received word that I had not been accepted for either the Marshall or Fulbright Fellowship. I was disappointed, but I knew how competitive these programs were, and I was determined to get back to London another way. I applied to Queen Mary, and I received the Overseas Research Student Award Scheme (ORSAS), which will reduce my tuition fee from international tuition to British tuition for the full three years of my Ph.D. program. Although I have to take out loans to cover the cost of tuition and living in London, I am excited to fulfill my goal to return to London, and I am currently looking to secure other funding for the remaining years. I will be doing research both at Queen Mary and at Kew, working on a project that I started at Kew last summer, researching the evolution of the *Waxy* gene in the genus *Nicotiana*, using polyploid species that originated at different times in the history of the genus.

It is very hard to leave Smith where I have had an amazing four years, but the prospect of doing a Ph.D. in London keeps me excited about the future. I feel that Smith has prepared me for anything life may offer, and I am eternally grateful to the Botanical Garden at Smith and the Pokross family for developing the Kew summer internship, which has shaped my love of plant molecular biology and given my path direction.

To find out more about the Kew Internship see http://www.smith.edu/garden/Academics/KewInternship.html
**Opening Lecture and Reception**
Friday, November 3, 2006, 7:00 pm, Seelye Hall 106

*Captivating Gardens in Our Continental Backyard: Visual Memoirs of an Addicted Photographer*

By Robert E. Lyons

Director of the Longwood Graduate Program in Public Horticulture and Professor of Landscape Horticulture at the University of Delaware, former Director of the JC Raulston Arboretum, and award-winning photographer.

Gardening is an art form that can be appreciated at any level of sophistication. Gardeners take their inspiration not only from the plants themselves, but from observations and visitations to other gardens, both public and private. For the vicarious gardener and those who simply take respite in the work of others, touring gardens can be enormously fulfilling. Robert Lyons will showcase garden treasures found within the continental United States and Canada. While our own garden history is relatively young, it is nonetheless outstanding and often just around the corner...or at least just a short trip away!

*Followed by a Reception in the Lyman Plant House and a Preview of the Mum Show in the Illuminated Lyman Conservatory.*

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**Chrysanthemum Show**

November 4 – November 19
10:00 am – 4:00 pm     Lyman Conservatory

A popular college and community tradition since the early 1900s, Smith’s annual Fall Chrysanthemum Show features a variety of multicolor blossoms, including the hybrids made by the previous year’s horticulture class. Highlighting the floral display are the cascades — chrysanthemums grown in the Japanese manner on a flat surface and hanging several feet, forming a wall of color. Additionally the show displays extraordinary chrysanthemum standards — oversized blooms growing atop plants as tall as seven feet. This year’s show presents a special sculpture installation as well.

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**Mum Poetry**

By Campus School Second Graders

*Bee in the Mum*
By Lihuan
Pollin back
Hiding
In spider-like petal legs
Waiting....
Waiting....
Waiting for something to eat
Something is coming
Swaying....
Swaying
On a tall stick
It sways

*Chrysanthemum*
By Celeste
spidery
cascading
petals like daddy longlegs
cascading

*Chrysanthemums*
By Aurora
Long petals
cause honey bees
to press
their lips
their lips
there

*Beautiful Umbrella*
By Kira
Chrysanthemum
Little balls
At the end
Like a
Beautiful umbrella

*Written at the 2005 Fall Mum Show*
Campus Internship Off to a Rousing Start

If you noticed some new faces and new energy in the Botanic Garden summer, you weren’t alone. The Botanic Garden interns made a huge impact on campus that was impossible to miss. Six talented and hard-working women in barn-red shirts inaugurated the internship program to universal acclaim, garnering the praise of garden staff, college administrators, and the campus community.

The interns, five Smith College students and one from UMass Amherst, spent twelve weeks performing core maintenance at the Botanic Garden — weeding, edging, and mulching their way across campus. This work experience provides a window to the realities of keeping a large, dynamic landscape both beautiful and functional. Breaking up the labors of garden maintenance, each intern also participated in a rotation schedule, working intensively with Botanic Garden staff. One- or two-week sessions with the Chief Arborist, the Collections Manager, in the Conservatory, and in the Systematics and Rock Gardens offered a glimpse at the broad range of skills and duties associated with maintaining and developing a botanic garden. One of the most enjoyable and productive aspects of the internship was the independent project, in which each intern tackled a specific Botanic Garden challenge or opportunity in depth.

Funded by a Summer Science Center Fellowship, Rachael Cain ’08 identified and mapped invasive species on campus, and made significant headway toward their eradication (see her article on page 11). Another Summer Science Fellow, Mo Speller ’07, developed a tree health survey and conducted an evaluative inventory of the Botanic Garden’s arboreal assets. Intern Sophie Argetsinger ’07 took on the challenge of restoring the health and aesthetics of Lyman Pond, the small water feature next to the Conservatory, which has experienced a severe decline in the aftermath of the Lyman renovations in 2000–2001. Jamie Duncan AC ’07, a Landscape Studies minor, used her independent project to examine the Landscape Master Plan of 1996, to see what steps have been taken to preserve and protect the priceless resource of our campus botanic garden, and develop recommendations to submit to ongoing collegewide strategic planning efforts. Stephanie Jones AC worked with Collections Manager Elaine Chittenden to organize and upgrade the Botanic Garden’s Index Seminum. Stephanie contributed significantly to the computerization of the records of the seed exchange program, and she participated in seed collection, processing, and dissemination.

The summer was filled with many other learning opportunities for the students as they worked side by side with our professional gardeners. Over 1,000 herbaceous groundcovers, including Hosta, Pachysandra, Plumbago, and Liriope, were planted in various locations throughout the campus. The interns helped Assistant Curator and Gardener Jeff Rankin, who maintains the Systematics and Rock Gardens, prepare the site for a new hardy cactus planting alongside Lyman Conservatory. The interns took a field trip to The Mount, Edith Wharton’s historic estate in Lenox, Massachusetts, where they were treated to a private tour of the house and grounds and participated in a garden restoration project with Garden Historian, Betsy Anderson ’04.

By any measure, the interns had an overwhelmingly positive impact. Everywhere they worked, faculty and staff would literally leave their offices to express their appreciation of the beautiful work being done to maintain and upgrade the landscape. Building on such a strong pilot program, we at the Botanic Garden hope that this new program will be expanded next year, and ultimately become a permanent feature of the Smith College landscape.

“...We at the Music Office in Sage Hall learned today about the internship program that is helping to restore our campus to beautiful condition. So many people who work in Sage notice and take pride in having neat and lovely green spaces ... things are looking better already as a result of the student interns you have employed this summer. We hope that the internship program continues and grows. Thank you for your great work. It really makes a difference to us.”

Linda L. Shaughnessy, Music Department

Read more about the internship in the current issue of NewsSmith available online at www.smith.edu/newssmith
Attending the American Public Gardens Association annual conference in San Francisco this past summer, I looked forward to visiting some new (to me) gardens on the West Coast. One tour that caught my eye was “Country Place Landscapes of the Peninsula.” The tour offered the chance to see private gardens not open to the public, which is always a treat, as well as the “remarkable Arizona Garden at Stanford University.” I was intrigued; I hadn’t heard of this public garden and a quick Google search revealed that it dated back to the same time period the Botanic Garden at Smith was established. When I first tried to sign up, I was disappointed to discover the tour was already sold out, but fortunately someone canceled at the last minute and I was able to go. How glad I am not to have missed this opportunity!

Julie Cain, Operations Manager at the Engineering Library at Stanford, gave us some of the historical background of the Arizona Garden as she guided us. Hidden away from the main academic areas of the Stanford University campus, this unexpected treasure is a remnant of the original grounds of Leland Stanford’s proposed residence. The term Arizona Garden describes a particular style of garden of the late nineteenth century created by noted landscape designer Rudolph Ulrich. His Arizona Gardens were laid out very formally in a Victorian bedding style and were composed of a great variety of both desert and subtropical plants. Ulrich produced another Arizona Garden as part of the 126-acre landscape for the Hotel del Monte in Monterey (now the site of the Naval Postgraduate School). Leland and Jane Stanford were part owners of the hotel and they also hired Ulrich to work on their 8,900-acre estate at their Palo Alto farm. Stanford provided railroad cars for Ulrich’s collecting trips to the Sonoran Desert, which enabled him to easily ship back many different large and unusual specimens.

Planted sometime between 1881 and 1883, the Arizona Garden was intended to be part of a larger landscape and arboretum surrounding the Stanfords’ mansion. Ulrich planted approximately 12,000 trees in the Arboretum and the Arizona Garden was situated in what would have been the backyard of the house. But the house was never built. When the Stanfords’ only son died in 1884, they abandoned their plans in favor of building a university in his memory, and they hired Frederick Law Olmsted to develop the campus landscape. A few plants, including thirty palms, were dug up from the Arizona Garden and planted on the main part of campus, but the Arizona Garden remained. A directive from Jane Stanford after Leland’s death stipulated that no buildings were ever to be erected in the original Arboretum and that it should be “sacredly preserved from mutilation.” Although located in an outlying area, the Garden was part of the campus landscape when the university opened in 1891, and is rumored to have been a favorite student courting spot in those early days of the university.

The garden was regularly maintained until the 1920s but then seemed to disappear from the University’s radar, although there is evidence that it was still a popular student getaway in the 1930s and 40s. After World War II the Garden fell into disrepair. The serpentine rocks outlining the 58 beds of the 30,000 square foot garden became buried under a foot or more of soil, covered with decades of oak leaf litter, brush, and debris. Over time an encroaching woodland shaded much of the Garden and many of the original sun-loving plants died. It was no longer recognizable as a garden.

Fortunately, in the 1990s some people started paying attention to the Garden again. Its restoration was part of larger efforts to rehabilitate significant historical areas of the Arboretum. When Julie Cain first got involved in the restoration, she had been working at Stanford for over 20 years but had never before heard of the Arizona Garden! With a passion for garden history and horticulture, Cain dug around in the Stanford archives, researching the history of the neglected garden, and for a while worked part-time coordinating the restoration project. Yet, the restoration of the Arizona Garden was not a funding priority for the University and it only moved forward due to the efforts of a group of volunteers, many from the San Francisco Succulent and Cactus Society. Dedicated to resurrecting the Garden, they donated plants, expertise, and labor, excavating the rocks edging the beds as well as replanting hundreds of cacti and succulents.

(Continued on page 10)
Arizona Garden

Some of the original plants still found in the garden today:

1. *Agave salmiana* var. *ferox* – century plant
2. *Aloe maculata* – soap aloe
3. *Cupressus sempervirens* – Italian cypress
4. *Kniphofia uvaria* – red hot poker
5. *Nolina microcarpa* – bear grass
6. *Opuntia ficus-indica* – Indian fig
7. *Quercus agrifolia* – coast live oak
8. *Trachycarpus fortunei* – windmill palm
9. *Washingtonia filifera* – California fan palm
10. *Yucca faxoniana* – Spanish bayonet
11. *Yucca filifera* – tree yucca
12. *Yucca recurvifolia* – pendulous yucca
13. *Yucca schidigera* – Mohave yucca
14. *Yucca schottii* – mountain yucca

One thing missing from the garden today is the quintessential plant of the Arizona desert. Historic photos show that the saguaro, *Carnegia gigantea*, had been a chief element of the original design. It is estimated that Ulrich used specimens that were 50–75 years old when he planted them in the garden, but not a single one remains. What happened to them is a mystery.

The restoration preserved the garden’s original symmetrical design with a central walkway lined with columns of cacti and cypress trees, and curved paths around irregularly shaped beds. A map of the original bed design as well as some historic photographs of the Garden helped guide the restoration. Original plantings now comprise only about 10–15% of the garden.

If you are ever in the Stanford area, it is definitely worth taking a detour off the beaten path to see this unusual garden.

(Continued from page 9)

To learn more about the Stanford Arizona Garden:


Standford University: http://grounds.stanford.edu/points/gardens/arizonagarden.html

Many thanks to Christy Smith, Arizona Garden Coordinator, for providing the garden plan and securing the archival photo for us. For more information contact her at 650-723-7459 or christy.smith@stanford.edu.
Evaluating Nonnative Plants at Smith

Rachel Cain '08

As part of my summer internship with the Botanic Garden, I worked on an independent project, formulated and executed with the help of the garden’s director, Michael Marcotrigiano, and Internship Coordinator Gaby Immerman. My project addressed the issue of nonnative invasive species on the Smith campus, including both plants that are accessioned (formally incorporated into the Garden’s permanent collection) as well as volunteers (self-seeded). In an effort to contain the spread of nonnative invasive plants as well as to provide an example for the academic and local communities, I identified, located, researched, and evaluated invasive species on campus.

Invasive species, as defined by the Massachusetts Invasive Plant Advisory Group (MIPAG) in *The Evaluation of Non-Native Plant Species for Invasiveness in Massachusetts*, are “non-native species that have spread into native or minimally managed plant systems in Massachusetts, causing economic or environmental harm by developing self-sustaining populations and becoming dominant and/or disruptive to those systems.” For example, *Berberis thunbergii*, or Japanese barberry, was introduced to the United States as an ornamental in 1875. It produces a high number of seeds and expands vegetatively, forming dense stands that disrupt natural habitats by displacing native plants, reducing wildlife habitat, and in some cases raising the soil pH. Curbing the growth of *B. thunbergii*, and the other 66 species designated invasive by MIPAG, assists in preserving Massachusetts’ ecosystems. It should be noted, however, that not all rapidly spreading garden plants are considered invasive species. It is only when they displace native flora in the local ecosystem that they are called invasive.

The project began with identifying accessioned invasives using the Botanic Garden’s computerized plant database, BGBase (see the article on page 3 about plant records), and noting all species listed as invasive by MIPAG as such in our records. The result was a list of eighty individual plants in the collection. The next step was to conduct on-site evaluations of each plant including documenting them with photographs. The possibility and extent of spread were evaluated, considering the plant’s natural propagation methods, size and growth rate, and the environmental characteristics of the site. Specifically, I looked for evidence that the plant was overwhelming surrounding species or spreading to other areas by seed or rhizomes, considering that any plant’s tendency to spread can increase if the surrounding landscape is only minimally managed. Also considered was the visual impact on the surrounding landscape.

Specimens that did not pose a direct biological threat to the greater community, but still had symbolic and political status as invasive species were identified. For example, even if Smith removed all on-campus *Acer platanoides* (Norway maple) it would have only symbolic value in keeping with our vision of removing invasive species as *A. platanoides* would still be present in large numbers in the rest of Northampton. By comparison, the *Iris pseudacorus* planted around Lyman pond has spread to Paradise Pond and possibly beyond. Because of its tendency to spread by rhizomes and seed in wetland areas, Smith might easily be a source for further spread both on campus and off campus, and thus these plants should be removed.

My final report listed each of the eighty plants with accession number, location, campus grid map number, status, and recommendations for future action. Twenty-one of the accessioned individuals could not be located and were determined to have been removed prior to 2006, which I duly recorded in our records. Eleven others were removed immediately due to the high potential for spread (and this was also noted in our plant records). For example, *Lythrum salicaria* (purple loosestrife), introduced from Eurasia, produces large numbers of seed and has no natural enemies. It has overtaken many landscapes in the Northeast, and Smith’s four accessioned plants had already spread within Lyman pond with the potential to spread further off campus. I dug up the accessioned populations before they set seed and covered the areas with mulch to discourage any germination of seed present in the soil from previous seasons.

Twenty accessions were evaluated as having significant aesthetic value in the landscape or very low potential for spread, and the recommendation was that they be maintained within the collection. For example, the mature *Phellodendron amurense* (amur cork-tree) in front of
Students and visitors to the Botanic Garden’s outdoor gardens and arboretum as well as the Lyman Conservatory quickly recognize and appreciate the educational qualities of the living collections. A quick check of an accession tag to learn the identity of a plant becomes such a habit that horticulture students can be easily identified off campus by their habit of circling trees looking in vain for an identifying label. While the living collections are easily appreciated, they are not the only collections used as teaching aids and research tools in plant-related classes at Smith. The dried and mounted plant specimens in the herbarium are not as accessible to the casual visitor, but they are an important component of Smith’s collection. Students of the plant systematics class regularly study herbarium specimens, and in the middle of winter the specimens are especially valuable in learning the life-forms and characteristics of outdoor species that do not appear until months later. Herbarium specimens are also useful in providing evidence of when and where certain species grow, and it is in this capability that I used them in my own research project while a student at Smith.

I began working with the Smith Herbarium under the direction of Professor C. John Burk. He had acquired an historically important herbarium collection shortly before I met with him to discuss research opportunities. The majority of the approximately 1400 specimens were collected in the region around Northampton in the 1860s by Henry Griswold Jesup (1826–1903). H.G. Jesup abandoned his career as a Congregationalist minister in 1862 and moved to Amherst in 1863, where he spent the next thirteen years collecting plants and becoming an expert on local flora. In 1876, Jesup was appointed the first instructor of botany at the newly formed Smith College, but he taught for only one semester before accepting a teaching position at Dartmouth College, taking his herbarium with him. It was from Dartmouth that Professor Burk acquired the specimens, which I began to catalogue in 2003.

The specimens are fascinating for the insights they provide into Jesup and his time. Attached to some specimens are letters from other botanists, consulting on identification, collections, and in one case, the best way to guarantee a response from another expert (the author of the letter notes rather sarcastically that including return postage will make a response more likely), demonstrating that Jesup was part of a larger botanical community. There are some specimens from the “Mount Holyoke Seminary,” which lack collection dates or locations and were probably used as teaching tools.

The celebrity specimen is a sedge collected by Henry David Thoreau in Concord; how it ended up with Jesup’s specimens is a mystery.

The specimens of the most interest to me as an aspiring plant ecologist are those that reveal the impact of humans within the landscape. There are a number of species that Jesup noted were “troublesome weed[s].” There is a sedge specimen with two plants attached, one collected near a spring and another near the railroad tracks in Amherst, and the visible difference between the two specimens, especially the sooty dust covering the leaves and roots of the second plant, are a reminder that ecosystems felt the impact of human activities before the modern age. There is even a specimen of the species Lysimachia vulgaris, today considered invasive in the region, which Jesup noted on his collected specimen was “a garden escape but for many years growing by the road.”

After constructing a database of Jesup’s herbarium, I compared his collections to a list of plants growing in the region compiled by one of his colleagues, Edward Tuckerman of Amherst College. The area around Northampton has been home to industrious botanists since at least the early nineteenth century, so I had access to records of plants growing in the region from several time periods. To make a centuries-long story short, there were approximately 1000 plant species growing in the area before 1633, when the first European settlers arrived in the area. Today, there are approximately 1700 plant species growing wild and uncultivated. I became interested in documenting the historical presence of these newly arrived species.

First, a few words on the difference between introduced and invasive plant species. Introduced plants are those which grow uncultivated in a place outside of their geographic range. That one third of the total species currently growing around Northampton have been introduced is fairly representative of the percentage of introduced species present in most states, although the phenomenon is by no means limited to the United States.

Invasive species are a small subset of introduced species, and are slightly harder to define. There is kudzu, the vine that ate the South, which grows in a blanket capable of covering and killing mature trees. Citizens of the

(Continued on page 13)
twenty-eight individuals were determined to be direct biological threats with potential for on and off-campus spread, and these were ranked as high priority removals for the Smith grounds crew to carry out. Others, with lower threat levels, were ranked as medium and low priority for eradication. Where removal was recommended, I suggested replacement plantings of noninvasive species.

Additionally, populations of volunteer (unaccessioned) nonnative invasives were located, mapped, and evaluated. I was able to track these down during the course of my work on the intern crew, through word of mouth from other Botanic Garden employees, and by walking systematically through the campus. My second report listed the individual volunteers, their campus grid map number, recommended action, and comments. Out of thirty-nine invasive plants, I removed twelve and recommended the maintenance of two. Those remaining were prioritized for removal.

I worked with the staff to formulate a Botanic Garden policy that does not allow future plantings of species designated invasive by MIPAG and stating Smith’s commitment to gradually eradicate all on-campus invasives except for sterile cultivars and aesthetically or historically valuable individuals that pose no significant threat.

Some of the remaining

I searched the surrounding area and found no evidence of seed spread from this individual. Using these standards, sterile cultivars of invasive species may remain in the collection since they would offer no potential for spread.

Private gardeners in Massachusetts can utilize the same criteria for addressing invasives and examining their competition with native flora. A full list of species designated invasive in Massachusetts is available at http://www.massnrc.org/MIPAG. Home gardeners should evaluate potentially invasive plants in their own gardens, their potential for spread, and whether they are serving as a source for spread to surrounding areas. Removal of undesirable invasives can have a positive impact on our environment and promote good stewardship of natural ecology within the community.

Southwest may be familiar with several of the invasive grasses that are both flammable and the first plants to grow back after burning; these species are blamed for intensifying wildfires. Each region has its own set of invasive plant species, but what these species have in common is their ability to overpower and restructure the plant communities in which they grow. For all the dramatic impact these invaders demonstrate, they are diverse enough to make predicting the scale and scope of invasions, even the assessment of which plants will become invasive, extremely tricky. (For more information on invasive plants, see the article by Rachel Cain on page 11.)

I used the herbarium specimens and historical records to evaluate the invasive plant species present in the Northampton area. The invasive species present in Franklin, Hampshire, and Hampden counties reflect the human history of the area. The majority of the invaders present today that were established by 1875 are European herbaceous species, plants which probably thrived in the pastures and farm fields of the earliest European colonists. Invaders established by the early twentieth century include a wider variety of life forms (trees and aquatic plants, for example) and hail from Asia as well as from Europe, reflecting the increase in trade and the popularity of gardening among the Victorians. About half of the modern invasive plants in the region first appeared between 1920 and the present; the increased ease of travel and trade is again partly responsible for the increased rate of invasion, although the experimental plantings of new species at Arcadia Wildlife Sanctuary in the 1940s and 1950s certainly contributed. I had expected at the outset of my project to see biological patterns (certain life-forms or perhaps limited geographic ranges of origin) in the invasive species present in the region. Instead I was surprised to find how much human history was reflected in the invasive species present in western Massachusetts. Visitors to the Botanic Garden can walk along the river and see knotweed growing thickly along the bank and garlic mustard spreading through the forest understory. These invaders were not planted here, but they are as much a sign of human presence in the area as are the carefully labeled plants in the gardens.
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A bout 250 miles southeast of San Francisco, in the southern Sierra Nevada, is Sequoia National Park. In it grow the most massive trees on Earth, the giant sequoia (*Sequoiadendron giganteum*), the only member of its genus. This species is often confused with the coastal redwood (*Sequoia sempervirens*) which exists along the coasts of southern Oregon and northern California. Coastal redwoods have much narrower trunks as they grow into the tallest trees on Earth. However, giant sequoias are by far the more massive of the two.

On an early August trip to California, my wife and I spent a few days in the company of the big trees. Beginning at a bed and breakfast in Three Rivers, a small town on the southern edge of the park, we took a 50 minute drive up the steep and curved mountain roads. The early part of the ride gave us no idea of what to expect. The scenery consisted of valley oaks, dry soil, jagged rocks, and scrub. At about 4,000 feet in elevation we made a turn onto the west side of the mountain and my life will never be the same. It was as if we were entering a fantasy land or video game. Everything suddenly changed in scale as we saw the first giant. My foot hit the brake at the same time my jaw dropped. The trunk, resembling a furrowed wall of reddish orange paper, rose several hundred feet into the sky without tapering. We were now tiny specks in the landscape. As I stepped out of the car and walked among the giants I began to feel humbled. No picture can describe the scene; no text can stir up the feelings of seeing a cluster of trees that began their lives before the birth of Cleopatra.

The emotions these trees evoked were much different in the late 1800s. Although few people had seen the trees, stories about them were common. In an era where commercial logging was getting into full gear there were many who couldn’t care less about a tree’s age. As hard as it is to believe, one of the larger trees on Earth was cut down so that a section of the base could be displayed at the Chicago World Columbian Exposition in 1893. It is said that most visitors considered the display a hoax since they could not believe a tree could attain such size. Giant sequoia wood is so resistant to rot that the stump of this tree remains in place today. An exhibit that displays a reconstructed section of this tree is currently located at the Niagra Falls Museum in Canada (see niagaramuseum.com).

Other giants were cut down for trivial reasons, e.g., for wood for cigar boxes or for use as dance floors (at left). A depressing but historic patch of land near the entrance to Kings Canyon National Park (adjacent to Sequoia National Park) is where you find the Big Stump Basin trail, a one mile road of stumps that is testimony to the environmental callousness of the time. Logging was ego and power. The Mark Twain Stump is the remains of a 26 foot wide, 1,700 year old tree that took two loggers 13 days to cut down. Interestingly, sequoia wood is brittle and it can break across grain, a trait that makes it of little use in the timber industry. Despite this trait over one-third of the giants were cut down. Even today not all of the giants are protected. Of the 75 existing groves, two-thirds are not in national parks but rather are in the Sequoia National Forest in areas where logging may be permitted depending on the whims of our government. Some are on private land. Environmental groups continue to lobby for further protection, but to date most of the mature members of this species are unprotected.

Fossil records indicate that the giant sequoia was once widespread in California, but following millennia of climate change they now occur only in the Sierra Nevada of central California. There would be none had it not been for the conservation efforts of John Muir (1838–1914), who emigrated from Scotland to Wisconsin in 1849. Amazed by the mountains in California, he began an effort to publicize their value so that federal conservation policies would become a reality. By 1876 he was successful, having influenced both Grover Cleveland and Theodore Roosevelt. Muir had a way with words and had friends to publish them: “God has cared for these trees, saved them from drought, disease, avalanches, and a thousand tempests and floods. But he cannot save them from fools.”

Muir is credited with pushing forward the movements that led to the establishment of Sequoia and Yosemite National Parks. Since 1890, giant sequoias have been protected in Yosemite, Kings Canyon, and Sequoia National Parks, as well as in smaller individual groves outside these parks. Later, Muir became the chief founder and first president of the Sierra Club. In his honor the Muir Woods National Monument was established in Marin County, California, in 1908.

Sequoiadendron giganteum

*(Continued on page 16)*
Any fool can destroy trees. They cannot run away; and if they could, they would still be destroyed — chased and hunted down as long as fun or a dollar could be got out of their bark hides. Branching horns, or magnificent bole backbones. Few that fell trees plant them; nor would planting avail much towards getting back anything like the noble primeval forests. It took more than three thousand years to make some of the trees in these Western woods — trees that are still standing in perfect strength and beauty, waving and singing in the mighty forests of the Sierra. Through all the wonderful, eventful centuries God has cared for these trees, saved them from drought, disease, avalanches, and a thousand straining, leveling tempests and floods; but he cannot save them from fools — only Uncle Sam can do that.

John Muir

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