The winter of 2003–04 brought us some of the coldest temperatures we’ve ever experienced, cold enough to kill two twenty-five-foot tulip poplars on Burton lawn and over 250 plants in the Systematics Garden and Rock Garden. This winter has been kinder, and while temperatures have been up and down, we are hoping for no great losses in the Campus Arboretum or in our specialty gardens.

I am most pleased that several of our long-term projects are now coming to fruition.

Progress with the Capen Garden renovations has been good. All of the stone seat walls surrounding the new fountain are installed. The new fountain was paid for with Friends of the Botanic Garden donations, and it will be referred to as the Friends Fountain at Capen Garden. This summer we will have a plaque or engraved patio stone placed near the fountain thanking the Friends for their generosity. The garden has some new woody additions including a grove of paperbark maples, *Acer griseum*, a ‘Red Sunset’ swamp maple, *Acer rubrum*, and a hybrid elm, *Ulmus* ‘Accolade.’ We also planted a large specimen of *Franklinia alatamaha*, the Franklin tree, and are hoping the winter did not damage this marginally hardy rare gem. This summer we hope to build a new custom rustic gazebo on the east end of Capen Garden. Several renovated “rooms” at Capen have been designed by Tracey A.P. Culver, Chief Gardener (see page 7). These areas will be planted this spring and summer.

One complication in completing the Capen Garden project is that we may need temporarily to use some of the space designed for iris, peony, and daylily, collections to store young trees for the campus. Our small tree nursery behind Talbot House will be eliminated to allow for the construction of a multi-unit housing project for students in Smith’s Ada Comstock Scholars program. The campus continues to be “filled in.” Construction is scheduled to begin in October. As I write this, I am negotiating with the College for a replacement site that is as useful and convenient as was the Talbot nursery.

Other accomplishments this year include the completion of our audio tour of the Conservatory (see page 3) and the reopening of the Cool Temperate House with its dazzling waterfalls and new pathways that demarcate collections from different continents. We are already seeing increased visitation to Cool Temperate.

The Botanic Garden is taking an active role in the national botanical garden community. In July at the annual meeting of the American Association of Botanical Gardens and Arboreta (AABGA) in Chicago, I will be hosting a session entitled “Connecting Academics to Botanic Gardens.” The Botanic Garden will also be hosting the AABGA northeast regional meeting in late September. We have not hosted this meeting since 1987. Our theme for the meeting is Technology and the Garden. Shavaun Towers ’71 will be

(Continued on page 2)
the keynote speaker. Conference sessions will focus on topics such as using technology to manage plant collections, exploring new frontiers in interpretation, balancing history and technology, and finding the right technology for a particular garden. The conference will offer participants a day of touring Naumkeag in Stockbridge and Nasami Farm in Whately, now the New England Wild Flower Society’s Native Plant Nursery and Education Center. At the end of the conference we are offering an optional workshop on mapping and Global Positioning System (GPS) technologies to be co-taught by Tracy Omar, our Collections Manager, and Jon Caris of Smith’s Spatial Analysis Lab.

Despite cuts in personnel and budget over the past few years, we continue to offer a diverse array of educational venues—exhibits, audio tours, new garden designs, renovated greenhouse collections, and more web pages. While I am still very concerned about the reductions in staff responsible for the outdoor gardens, building landscapes, and trees, I am optimistic that the College will reevaluate the importance of the landscape for admissions, student life, and alumnae relations, and redistribute positions in the College to assure that the grounds and gardens remain attractive, healthy, and educational.

Horticulture students at Smith have been learning chrysanthemum hybridization techniques since the early 1900s, producing new hybrids bearing the names of their creators. It is a long-standing Smith tradition that these hybrids are exhibited at the following year’s Fall Chrysanthemum Show, and that exhibition-goers vote for their favorite hybrid.

Magdalena Zopf ’06, a student in the fall 2003 Horticulture class and one of the students selected for the Kew Internship this year (see page 9), produced the hybrid that received the most votes from visitors to the fall 2004 Mum Show. We’ll be adding it to our Chrysanthemum Hall of Fame, which you can see online at www.smith.edu/garden.

Magdalena Zopf’s winning hybrid is an anemone mum with a yellow-bronze center and pink ray florets.
O
nce the Conservatory renovation projects were completed, we began putting our thoughts and energies toward examining and improving the Botanic Garden visitor experience. The new gallery has enabled us to present some very interesting exhibitions and to introduce our visitors to other dimensions of the plant world. Yet our visitors don’t always understand why we grow particular plants, how the collections are organized in the greenhouses, or why the plants are important. We have been working toward remedying this situation by expanding the educational technology in use at the Lyman Plant House. We are delighted to announce the latest addition to our methods—audio tours of the glasshouses. This is a new and exciting way for the Botanic Garden to empower our visitors to explore our collections on their own and in the process develop a deeper understanding of what the Botanic Garden is all about.

Today’s visitors are accustomed to a multimedia environment, in which entertainment and the educational message are mixed together. Nearly everyone who has visited a museum, historic site, zoo, or science center has some experience with an audio guide. As the environmental controls in the greenhouses have been updated to utilize the latest technologies, so now our educational efforts also include more modern technology.

Since the renovations, the Church Gallery and the newly refurbished building have been attracting more and more visitors. This past year our volunteers worked to capacity, touring large numbers of groups through the greenhouses. Over 1100 schoolchildren and adults received personal guided tours last year, and an additional 65 groups visited but did not have the benefit of guides. The actual number of visiting groups is probably higher as our statistics only document those groups that schedule with us in advance. Many other groups arrive unannounced. We will now be able to provide these visitors with narrated tours through the greenhouses even when a live guide is not available.

The system employs technology that allows visitors to use the audio wands to randomly access information while touring the facilities at their own pace, following their own route, and without disturbing other visitors. We have developed a special children’s track to reach younger audiences as well. The way the wands work is pretty simple. You walk through the Conservatory on your own and locate the audio stops in each house—there are numbered signs throughout the greenhouses, silver for the adult stops and yellow for the kid stops. You just punch the three-digit number into the wand, hold it to your ear, and listen. All the wands have adjustable volume controls.

Audio Tours of the Conservatory

Madelaine Zadik

Every greenhouse has an introductory stop to familiarize you with that particular house, and then there are more specific stops that focus on particular plants, habitats, or groups of plants. Some of the stops explain some of the inner workings of the greenhouses.

Of course, we are not replacing the docent-led guided tours with the audio tours. There certainly is a need for both. We are hoping to reach out to larger numbers of visitors, beyond the scope of our current guided tours. We are aiming to use every possible means to enhance our visitors’ experience when they come to the Botanic Garden, including signage, guided tours, printed brochures, exhibitions, our web site, and now audio tours. In the future we also hope to produce an audio guide to the campus arboretum and outdoor gardens. We guarantee that if you take the audio tour you will learn something about the Botanic Garden that you did not know before. Check it out!

Audio tours will be available starting April 6, 2005. The fee for the audio tour is $1 per person. It is free for Friends of the Botanic Garden (bring your membership card) and members of the Smith community (with a Smith ID). All children using the audio wands must be accompanied by an adult.
**Plant Adaptation Up Close: A Biological and Artistic Interpretation**

Madelaine Zadik

What can you learn from a leaf hair that is magnified 2000 times? How can beautiful microscopic images of plant surfaces become educational tools? These are some of questions we wrestled with when Northampton artist Joan Wiener first approached us a year and a half ago. She had been exploring leaf surfaces and presented us with her beautiful colorized scanning electron micrographs (SEMs), hoping that we might want to display them in the new Church Exhibition Gallery.

When the architects were planning the renovation of our offices and the old head house/potting room, they imagined transforming them into a beautiful new exhibition gallery. It was up to the Botanic Garden, however, to figure out how to best fill the space and use it to fulfill our educational mission. The donors (the family of Eleanor Bradford Church, Smith Class of 1932) were also concerned about what would be shown in the gallery. The Botanic Garden developed guidelines for the use of the gallery space that clearly specify that all exhibitions or other events hosted in the space, such as lectures or presentations, must be of a botanical and educational nature. This is certainly in keeping with President Seelye’s original vision for the Botanic Garden to be of “scientific as well as aesthetic” value.

As we started contemplating the transformation of the SEMs into an exhibition, it was thus important to us that we not just create a display of “pretty pictures.” Additionally, we wanted to work toward breaking down some of the barriers between art and science, oftentimes an unnatural division. For many people, artistic images serve as an entryway into another realm of knowledge, and many scientists might also find a new way of looking at and appreciating their research subjects. The exhibit would be an entryway into the world of art as well. While our first exhibition in the gallery, *Plant Spirals: Beauty You Can Count On*, relied on beautiful images—of pine cones, sunflowers, and cacti, to name a few—in presenting the fascinating mathematical world of spiral patterns in plants, this new exhibition would be using art as the starting point. The four collaborators on *Plant Adaptation Up Close*—Michael Marcotrigiano and Madelaine Zadik of the Botanic Garden, Judith Wopereis, Manager of Smith’s Microscopy Facility, and artist Joan Wiener—began exploring how to combine Joan’s wonderful images with the Botanic Garden’s educational mission to create a synergistic effect.

After much discussion, we decided on a theme of plant adaptations to environmental conditions. Since the earth’s diverse environments often create challenges for plant survival, over time plants have evolved with a variety of special adaptations that allow them to thrive under what would otherwise be hostile conditions. Our goal was to explore diverse adaptations, bringing to life the resourcefulness and beauty of the plant kingdom and opening up a microscopic realm unseen by the naked eye. The number of plants exhibiting environmental adaptations is huge. It made sense, as an educational arm of the Botanic Garden, to focus the exhibition on plants in our collection, giving our visitors greater insight into plants they see here. In the end, Joan decided which species were the most photogenic.

We settled on seven adaptations. For each we feature a piece of Joan’s artwork that brings the viewer to the microscopic structures, in all their splendor. The seven adaptations—named *Meat Eaters, Guzzlers, Social Climbers, Squatters, Vegetarians, Sunbathers*, and *Drifters*—each have an explanatory panel mounted next to the artwork. The panels introduce the visitor to the adaptation in general, give more specifics about the plant that is the subject of Joan’s artistic exploration, and provide two additional examples of other species with the same adaptation. But don’t worry, we limited the amount of text and allowed the pictures to speak their thousand words.

You can have a seat and learn more about magnification, while watching a slide presentation that showcases another adaptation, that of plants hosting nitrogen-fixing bacteria in their roots. The display case in the gallery has an explanation of how scanning electron microscopy works and how plant material must first be prepared.

Perhaps the most fun part of the exhibit are the two large three dimensional images—a pitcher plant and bladderwort, both carnivorous plants. We provide the 3-D glasses that truly enable you to get “up close” to these amazing plant adaptations.  

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*Electron photomicrograph of Venus flytrap*
Tell Us More

Michael Marcotrigiano

Our latest exhibit, Plant Adaptation Up Close: A Biological and Artistic Interpretation (see article on page 4), consists of a series of panels addressing strategies that plants have developed to thrive in the specific environments in which they live. By necessity the exhibit is brief but, as we had hoped, it is proving to be intellectually provocative.

While the exhibit was planned for a wide audience, I took the opportunity to focus my Horticulture class on the exhibit’s relevance to horticulture and botany. The class of about 30 students was given the assignment to read the new exhibit. They were then asked to come up with a question that was not answered by the exhibit—a question that they would not have had before visiting the exhibit. By using the library and other resources they were to write a short paper trying to answer their question.

Below is a sampling of students’ questions and an abstract of the information they presented in their short papers.

How do mangroves desalinate water?
Mangroves live in or near saltwater, conditions fatal to many plants. Most mangrove species exclude salt uptake by regulating osmotic pressure in the roots. Some species, when presented with extremely salty water, use salt glands to excrete salt from openings on the leaf surface. It is speculated that salt glands evolved from nectar glands.

How do bacteria in legume root nodules convert nitrogen for the plant’s use?
Nitrogen is an essential element for plant growth. But atmospheric nitrogen remains unavailable to most plants. Legumes develop a special symbiotic relationship with Rhizobium bacteria. These bacteria, living in special root structures, convert atmospheric nitrogen into ammonium, a form that plants can take up and use to make protein.

How does the resurrection plant survive in a dry state?
The resurrection plant grows in arid regions and appears to be brought back from the dead after drying out. As it dries out, it curls inward. It is now known that curling inward is necessary because it reduces irradiance, protecting the chlorophyll from damage when there is insufficient water.

What causes a Venus flytrap to close?
When insects enter the Venus flytrap it rapidly closes and digests the insect. The closure is initiated when special trigger hairs located inside the trap are touched by the insect. The speed at which it closes is possible because the stimulation of the trigger hairs causes water to be rapidly pumped from cells on the outer layer of the trap while inner ones remain the same. This unstable pressure builds up quickly and causes a rapid buckling of the trap, closing it on the insect.

How does Rafflesia, the parasitic stinking corpse lily, live without stems, leaves, or roots?
The highly endangered plant parasite, Rafflesia, depends on its host plant, the Tetrastigma vine, in its native habitat, the rainforest of Southeast Asia. Living inside its host, it has no chlorophyll and extracts food from its host. Its life cycle is unusual. It is not known for certain how it enters its host but it is speculated that rodents carry Rafflesia seed into the crevices in Tetrastigma stems. The seed germinates and penetrates the host. Once inside it lives as a filamentous plant, eventually flowering. The flower erupts from the host plant, smelling like a dead animal, which attracts its pollinator, carrion flies.

(Continued on page 6)
Tell Us More continued

Why are flower sizes so different even in the same species?
We often associate a specific flower size with a particular plant. However, some plants have adapted flower size to assist in pollination.

Polemonium viscosum grows at various elevations along the Rocky Mountains and is pollinated by bumblebees. At low elevations certain ant species destroy flowers by damaging the styles (part of the female reproductive system) when entering the flower. It appears that over time populations with small flowers evolved, and while bees are still able to pollinate them, the ants can’t fit inside. At upper elevations, where these ants do not exist, the Polemonium populations have larger flowers.

How does Spanish moss reproduce?
Spanish moss, Tillandsia usneoides, is an epiphyte that hangs from trees in Central and South America and in the southeastern United States. It propagates itself primarily by seed or through fragmentation. Tiny flowers in the leaf axils produce small fruit that release seed, which are spread by wind or with the assistance of birds. Fragmentation is accomplished when heavy winds tear off sections, which then land on other branches. Birds also assist with vegetative propagation when they harvest Spanish moss to use as nesting material. Being epiphytic and rootless, it survives this ordeal, hanging on in its new location and continuing to grow.

How are aquatic plants adapted to allow for gas exchange?
Floating aquatic plants have a very limited amount of tissue that gets exposed to air. Many adaptations have evolved to resolve this issue. Some develop a tissue called aerenchyma that contains large gas-filled chambers. Others respond to the stress hormone ethylene, which triggers the leaf petioles to grow rapidly, making even young leaves surface quickly. Possibly the most elaborate adaptation is one involving a complex system of osmosis and gas flow that involves a combination of heat differentials and gradient differences (caused by differences in pore sizes of young and mature leaves). This creates a pressurized pumping system that moves gases more effectively than other methods of gas diffusion.

Why are Venus flytraps native to such a small area?
Venus flytrap is a carnivorous species found only in a small area in the coastal North Carolina/South Carolina region. It is considered an endangered species in the wild. Once common in 21 counties it is now found in only 11. Venus flytrap thrives in nitrogen-poor bogs, using its ability to catch insects to make up for the poor soil. Its natural habitat is being altered by herbicide use, road construction, and urban expansion. With changing soil conditions the plants are threatened by the invasion of other species that shade them. In addition, poaching remains a problem. North Carolina has passed laws to protect the ecosystems in hope that the species will not become extinct in the wild.

How do carnivorous sundews attract and digest insects? – Rachel Cain ‘08
Sundews live in nutrient-poor soils and depend on digesting insects to obtain protein. The plants use a variety of strategies to lure insects. Some species have leaves that reflect ultraviolet radiation in patterns attractive to insects able to see UV light. The leaves also secrete nectars and enzymes from glands. The digestive glands on the tips of leaf epidermal hairs release a mucilaginous, odorous liquid that contains sugars to attract insects, and enzymes to digest an insect once it is stuck on the leaf. Digestion can take up to a week.

As you can see, the addition of the Church Exhibition Gallery to the Lyman Plant House has expanded the type of teaching we can do. If the above questions and answers sound interesting to you, we hope you can visit the exhibit in person and come up with a few questions yourself. The exhibit will be up until April 24 and reinstalled for an encore appearance from September 28 to October 9, 2005.
Remember the color wheel that you were introduced to in the first or second grade? A simple construct, yes? Well, yes and no. The wheel itself is fairly simple. However, the wheel is based upon color theory, a complex and mysterious array of concepts discussed and debated throughout history by the likes of Sir Isaac Newton, Johann Wolfgang von Goethe, philosopher Arthur Schopenhauer, Josef Albers, and Johannes Itten. Color theory involves the aesthetic, associative, symbolic, psychological, and physiological aspects of color (Vodvarka, p.1) and its perception by the human eye and mind. Physicists, biologists, artists, writers, psychologists, philosophers, horticulturists, and others have studied the various aspects of color and come to their individual conclusions concerning color, its use, and its impact on the viewer.

As an avid gardener for the last thirty years, I have seen my own use and perception of color change over time and have also noticed a distinct trend as fellow gardeners evolve away from the safety of the Gertrude Jekyll-inspired pastel flower borders to include color combinations that would have been taboo for the “tasteful” garden just a few years ago: orange and purple, purple and yellow, chartreuse foliage with red flowers, magenta and orange flowers combined with black-foliaged plants. Like the pistachio-crusted breast of free-range canary on a bed of pomegranate coulis, some of these risky combinations just don’t work, but some are very interesting and novel for the gardener-in-a-rut. Why we find such combinations either pleasant or disconcerting can be explained through color theory and the relationships imposed by the color wheel itself.

When the director of the Botanic Garden, Michael Marcotrigiano, approached me to design a “color garden” for one of the new areas at Capen Garden, I was intrigued. Michael envisioned a garden of “warm” colors (red, orange, yellow, etc.) and another garden of “cool” colors (green, blue, purple, etc.) Another, adjacent area could be a ‘white garden.’ As I started thinking about design in this rectangular area, I decided that it would be most instructive if the warm and cool gardens could be arranged as the color wheel itself is ordered. I began compiling “color pages” of plants: annuals, perennials, and some woody plants whose flowers or foliage were all of the same basic color. I began with red, then red-orange, orange, orange-yellow, yellow, yellow-green, green, blue-green, blue, blue-violet, purple, and finally red-violet leading into red.

Almost immediately, I ran into some problems. As a gardener, I have favorite plants, of course. I had used some of them in the various pages, including “warm pinks” and “cool pinks.” The former include flowers in which some orange is found in the pinks, the latter in which some blue occurs. These two pages looked hideous near each other, even when separated by red. Now I realized why that peony ‘Coral Charm’ looked so out of place next to peony ‘Kansas.’ Out went those two color pages. One of my favorite pages was of black/bronze-flowered or foliaged plants. But where did that belong in the color wheel? After reading that these plants or flowers contain violet or dark blue pigment, rather than literal “black,” I tried to fit it in next to purple, but that didn’t work. Black is not a color, it’s the absence of color, or more precisely, the absence of visible wavelengths. It doesn’t fit in the color wheel. Out went that page. Gray, too, was discarded along with more favorite plants with gray leaves. No single wavelength is dominant in the color grey, so it, too, is homeless. This made me grumpy.

Deb Klein, one of our work-study students, had a great idea—why not design a black/white/gray garden instead of a white garden? Next to the color wheel garden, I thought, it would look almost like a photographic negative. Now I was happy and excited. I realized (finally) that to make the color wheel garden work, I had to stick to clear, strong colors—no pinks (either warm or cool).

Although many perennials are included, I also added in a lot of annuals which have a much longer bloom season. Paths into the garden echo the divisions on the color wheel that separate cool colors from warm. I’m quite pleased with the outcome and look forward to planting the garden this spring. Hopefully, it will look as good in real life as it does on paper (a rarity). I am most avidly excited about the black/white/gray garden. The gray-leaved plants are arranged in a
Coloring continued

(Continued from page 7)

square block, around three sides of which is the white border, itself framed by the black/bronze plants. The whole garden is approximately twelve by twenty feet. For the most impact, I used only truly white-flowered plants, avoiding any with flowers containing a hint of cream or ivory, and again including many annuals for bloom longevity. Choosing the dark-foliaged/flowered plants was serious fun. They include *Perilla frutescens* var. *crispa*, *Wiegela* ‘Wine and Roses,’ bronze fennel (*Foeniculum vulgare* ‘Smokey’), coleus (*Solenostemon* cultivars), *Alternanthera dentata* ‘Purple Knight,’ *Canna* ‘Australia,’ and many others. The gray plants were easy: *Plectranthus argentatus*, *Artemesia*, *Helichrysum*, etc. And, of course, I want a big, imposing cardoon (*Cynara cardunculus*) right in the middle!

I’m adding a list of books I found valuable for using color in the garden. [Oh, if only I’d read Sydney Eddison ‘54 first—she went through the same thing with cool pinks/reds and warm pinks/reds as I did. Talk about reinventing the (color) wheel!] I’m also including some interesting reading on color theory for those of you with real stamina.

We would like to thank one of our avid supporters, Anne A. Hubbard ‘55, for her generous donation of 300 bulbs of a new tulip, which will be gracing the Botanic Garden this year. Growers and importers of Dutch bulbs selected and named *Tulipa* ‘Mrs. Thomas Hubbard’ in her honor. Growing these tulips is a special treat for us since this tulip is not yet readily available in the trade, and since Anne Hubbard has been such a devotee of the Garden.

‘Mrs. Thomas Hubbard’ is an early-flowering 16” tall Triumph tulip, with pure white petals. It was blooming in the spring Bulb Show and you can see the tulip showing itself outdoors at Capen Garden and in front of the gates at the College entrance on College Lane.

References


Tulip Donation

‘Mrs. Thomas Hubbard’

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Capen Garden is in need of some new benches and some new trees. The Meditation Garden at Capen needs two curved teak benches to complete its seating area. In addition, we want to build a new rustic gazebo near the rose arbors. Near the Friends Fountain (see page 1) there are two trees that can be memorialized, an ‘Accolade’ elm, *Ulmus* ‘Accolade,’ and a ‘Red Sunset’ maple, *Acer rubrum* ‘Red Sunset.’

In addition, seven flowering pears, *Pyrus calleryana* ‘Trinity,’ will be planted along the Campus Center next to Haven House, and none of these trees have been sponsored to date. If you have a favorite tree on campus that is not memorialized, you can “adopt” the tree and get recognition in the form of a plaque. Some choices for trees that need adoption are listed at our web site, which also lists costs and policies regarding memorial and honorial gifts.

We hope that you take the opportunity to remember a loved one with a special gift that will beautify the Smith campus.

Visit our web site: [http://www.smith.edu/garden/Giving/donations.html](http://www.smith.edu/garden/Giving/donations.html) or give us a call.

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Giving Opportunities

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On a weekend in May of 2004, we arrived in London, settling in at Mrs. Stuart’s house, in a quiet Chiswick neighborhood. The following Monday we walked on the Chiswick Bridge across the Thames River for our first day at the Jodrell Laboratory at the Royal Botanic Gardens, Kew. Our first few weeks were spent learning lab techniques and wandering around Kew Gardens at lunchtime. Despite London’s reputation as a rainy city, our first weeks were full of clear skies and warm weather. In this respect, as in so many other ways, our summer at Kew totally surpassed all our expectations.

Working in the Jodrell Laboratory is unquestionably a unique experience. The lab represents an international scientific community, and it certainly feels like one. Researchers from far and wide are coming and going, working on a variety of projects, all in the same small space. We were given a lab bench tucked away amongst the Molecular Systematics and Conservation Genetics Sections. Our supervisor, Dr. Michael Fay, initially put us under the direction of two undergraduate students working in the lab, Jenny Greensmith and Stacey Harris. Jenny and Stacey, along with the lab manager, Dolores Lledó, taught us where everything was and how to use the equipment.

Emmi: After our initial two weeks, we began to work more independently, although my project had me constantly asking other people in the lab for help. I continued the work of last year’s Smith interns, researching familial relationships between species of the genus Conostylis, a group that grows only in southern areas of Western Australia. There was a fairly complete family tree for Conostylis, but there were still a few species which had not been included, since the necessary polymerase chain reactions (PCR) had failed for these species. I spent six weeks running different reactions and trying every trick anyone in the lab could think of, but without success. I then switched to a project involving Dactylorhiza, a genus of European orchids. Working on that project, I learned how to extract DNA from plant specimens (a fancy name for a process that involves a lot of work with mortar and pestle) and how to recognize and use the products of a successful PCR.

Ana: In the meantime, I also worked on a project with Dactylorhiza orchids. I used degenerate primers (primers that bind to multiple bases) to find microsatellite regions in DNA of various species of Dactylorhiza. Microsatellites are regions in the genome that contain large sets of base repeats and can help to identify the parental species in allotetraploid hybrids. After using PCR to identify the fragments and using E. coli colonies to produce multiple copies of DNA, I sequenced many sets of colonies. At the beginning, I thought I would not notice the microsatellites, but you could not miss them; they look very pretty in the graph. I spent the last 3 weeks of the summer designing primers to amplify only the microsatellite regions in the genomes of different Dactylorhiza species. After finishing the primers, I began the process of perfecting them and making sure they were amplifying the desired regions in the DNA. Although I did not get to use the primers I had developed in my own research project, Dr. Fay showed me other projects involving microsatellites primers so that I could understand how the primers would be used.

Kew Gardens is a beautiful place as well as an important research institution, and the (Continued on page 10)
Branch Angles: A commonly overlooked threat to a tree’s future

Experts and pruning books often give us the basics of pruning and make it sound very simple. It’s true; the basic rules that apply to almost all pruning decisions can be summed up in a short paragraph. Get out the dead, damaged, diseased material, remove crossing and inward-growing branches, always make your cuts at the branch collar, and so on. What books and experts often don’t warn you about is that with a tree, almost every cut is a judgment call, each with pros and cons. Some decisions are very easy, e.g., that branch is entirely dead and there is a nice, obvious swollen collar at the base telling me where to make my cut; it has to go. One of the most difficult decisions to make is when a tree is just starting to get some size (20 to 30 feet) and you notice that branches that were growing at too small of an angle to the trunk or to an adjacent branch are getting fatter and starting to press against one another.

When looking at a small tree it seems a little counterintuitive that narrow crotch angles in branches would be weaker than a branch at a wider angle. There is less torque at the base and one might think that they would naturally graft, forming a larger, stronger bond. An understanding of how woody plants grow makes us realize that this is not the case, though. Every year a stem will put on a new layer of wood and when this expanding surface meets another one they will push each other apart. This is not a secret in the world of tree care, but a look around at landscape trees everywhere will tell you how often this issue is overlooked. It is hard not to speculate that the reason for this is that problems arising from bad structure in a tree often take decades to develop. I have been thinking about this issue a great deal this winter in relation to our collection at the Botanic Garden because some of our older trees are now starting to suffer severely from problems that would have been most successfully corrected 40 to 70 years ago.

Large pruning cuts on old trees should only be made to slow down decline or manage hazards. A healthy young tree, on the other hand, can recover from a cut that is proportionally as large with no long-term damage.

In an attempt not to repeat those mistakes we are taking an even harder look at young trees and realizing one thing that is not stressed enough in the books: **Make structural decisions early!** This means starting by selecting a good tree at the nursery. If you are in doubt about making a cut, look at an older tree of the same species and see if it has branches at a similar angle and try to judge if it is starting to cause problems for that tree. Making decisions early on can make all the difference between a tree dying prematurely or living a long time.

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London continued

United Nations recently named it a World Heritage Site in recognition of its contributions to science. Queen Elizabeth visited the Gardens in honor of the occasion, and the staff of the Gardens was allowed to stand by the Palm House as she walked by. The Queen was very gracious and spoke to a woman right in front of us in the crowd, but we were more impressed by the height and grandness of her hat than by any other aspect of the royal visit.

Outside the lab, we befriended the students who worked in all the different sections of the Jodrell Laboratory. This friendly group introduced us to English pubs, ice cream in movie theaters, and the intricacies of traveling late at night on London’s bus system. When we were not “hanging out” (a phrase that required some explanation, since the English students had not heard it before) with the gang from Kew, we wandered around London, visiting museums and going to the theater. The Smith College Club of the United Kingdom held a lunch for us at Simpson’s to welcome us and introduce us to traditional English cuisine. We also became deeply engaged in Eurocup 2004, the European soccer tournament. Unfortunately England lost their match against Portugal in the quarterfinals. Their best performance was third place in 1968, and they did not manage to advance any further this year. Nonetheless, watching the games in the company of the fans well known for their football passion was impressive.

Now, many months after our return from London, we both agree that we learned more than genetics—we learned more about ourselves, about each other, about people from other cultures with whom we share a passion for science. The Kew internship provided us with the possibility to grow at multiple levels and, because of that, we call it an experience of a lifetime.
Rediscovering the Rose Woman of America

Elizabeth Anderson ’04

Each spring, the Prize Competition awards over one hundred prizes for excellence to Smith students. Awards are given in every academic discipline and a name is attached to each prize. These names—and the individuals they represent—are generally unknown and all too often overlooked, even by recipients. The Harriett R. Foote Memorial Prize is one such award, given annually “for outstanding work in botany based on a paper, coursework or other contribution to the plant sciences at Smith.”

The name Harriett Foote is perhaps not as familiar as it ought to be, certainly not as familiar as it was in the early decades of the twentieth century, when Mrs. Foote was widely celebrated for her significant achievement in rose culture. Once dubbed the “Rose Woman of America,”1 Harriett Foote is today a relatively obscure figure in American garden history. Yet Mrs. Foote occupied a key niche in the Country Place Era as a fashionable designer of rose gardens (her clients included Mrs. Henry Ford), and she ranked among the leading rose specialists in the country.

Her renowned garden in Marblehead, Massachusetts, attracted visitors from around the globe. Cars from all 48 states lined the street, assembling before her gate, and yachts put into Marblehead just to catch a glimpse of the four acre estate, aptly called The Rose Garden. Rose enthusiasts flocked to Marblehead to experience Mrs. Foote’s astonishing array of 2,000 varieties (approximately 10,000 total specimens at the garden’s peak), towering over them in luxurious good health. Mrs. Foote’s roses were so healthy that visitors, dwarfed by abundant blossoms, often found it difficult to recognize varieties they had seen countless times in other more arid gardens.

Harriett Foote’s success with roses, better known for the difficulties surrounding their cultivation, was a testament to her lifelong interest in the experimental sciences and her keen faculty for observation. Born Harriett Eliza Risley on October 12, 1863, in Waterville, New York, she attended Waterville Academy and entered Smith College in the fall of 1882. At Smith she pursued the well-balanced course load required of students, choosing electives in botany. After her graduation in 1886, she continued her studies in Germany, later returning to the United States to teach chemistry and physics at Holyoke High School. In 1891 she married the Rev. Henry Lewis Foote, rector of Holyoke’s Episcopal Church. Reverend and Mrs. Foote moved to Marblehead in 1895, when Rev. Foote was called to St. Michael’s Church, and it was in the rectory garden at Marblehead that Harriett Foote began growing roses.

At its peak, the rectory garden contained 250 varieties and 650 plants. Mrs. Foote pored over European rose books and catalogues, ordering roses from all over the world in a day when large-scale commercial

In 2004 the Harriett R. Foote Memorial Prize for outstanding work in botany based on a paper, coursework or other contribution to the plant sciences at Smith was awarded to Elizabeth Anderson ’04.
foremost a horticulturist, far more concerned with the beauty and vitality of each one of her roses than with their total effect. In 1927 Mrs. Foote told *House Beautiful*: “Roses have peculiar likes and dislikes: if you want the best roses, you must cater to their tastes…. Roses are very individual and require undivided attention. They will brook no rival and the real rose-lover must bend low to catch the secrets which the rose whispers to those who love her best.”

Harriett Foote was full of such advice for amateurs. Her only publication, *Mrs. Foote’s Rose Book* (1948), is devoted not to her own accomplishments but to recommending varieties she had successfully grown. In her article on Harriett Foote, Virginia Lopez Begg notes that the book is still pertinent and useful for growers today, as are Mrs. Foote’s other instructions for flourishing roses: she advocated deep soil preparation with abundant cow manure, regular cultivation, and minimum pruning to ensure optimum health. Furthermore, Mrs. Foote was very modern in her approach to pest and disease control, “an organic gardener before her time.” In her 1927 interview with Lowell Ames Norris, Harriett Foote gave *House Beautiful* readers the following advice:

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Many people write me asking what preparations I can recommend to rid rosebushes of insects and disease. They look very much astonished when I reply that I believe an ounce of prevention is better than a pound of cure. In other words I try to make my plants so vigorous that they are able to resist and throw off disease. Sprays are used only as a last resort. I find too much spraying tends to stunt the growth of the plant, which is unable to breathe when its leaves are glued up with spray. Again, I rarely find sprays necessary when plants are given the proper sort of attention and kept well and healthy…. Many remedies have been brought forward as positive agents to exterminate rose bugs. I have not found one which is as effective in its action as picking these creatures by hand from the bushes.

Rose lovers would do well to heed these suggestions from the recipient of the American Rose Society Gold Medal, the highest award given by that organization. Other accolades heaped upon Harriett Foote include the Massachusetts Horticultural Society Gold Medal and a “Special Award for Horticultural Achievement” from the National Council of State Garden Clubs. Mrs. Foote was also a member of the Rose Society of England and well-respected internationally.

In 1906 Rev. Foote’s poor health forced his retirement and the Footes moved to a new home that would soon be named The Rose Garden. Four hundred roses were brought from the rectory garden to establish what would become the largest collection of rose varieties in the United States. Mrs. Foote continued working with her roses after her husband’s death in 1918, expanding The Rose Garden so that it eventually encompassed four acres. She established her first prize fund at Smith, in honor of her husband. The Henry Lewis Foote Memorial Prize is still given by the Religion Department for excellence in biblical studies.

Before her death in 1951, Harriett R. Foote ’86 set up another prize fund under her own name, in memory of her parents, for the best student work in botany. She also gave the College a scroll awarded her by the American Rose Society and a paisley shawl, which was placed in the President’s house. In a 1952 letter to the College treasurer, Harriett Foote’s niece, Mrs. W. H. Maynard, recalled that she had accompanied her aunt to her sixtieth reunion, “her last visit to Smith. No one thought more of their alma mater than she did.”

In view of such a statement it is all the more unfortunate that Harriett R. Foote is so unheard of in the Smith community. Her name slipped into obscurity with the era of elaborate estate gardens. Nothing is left of her Marblehead garden and only fragmentary evidence marks her other designs. In illuminating the woman behind the award I hope to raise interest in the life and work of this Smith alumna whose secret for success was in loving roses “so well that neither heat, nor frost, nor rain, nor any other obstacle will keep us from their effect.”

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4. Ibid., 67.
5. Begg, 12.

Thanks are due to Professor Betty Horner for collecting research material from the Smith College Archives and Professor John Burk for suggesting I investigate “The Rose Woman of America.” —Elizabeth Anderson
Upcoming Exhibitions

**Designed Landscapes: A Smith College Alumnae Exhibit**  
April 24 – September 21, 2005  
Opening Reception: Saturday April 30, 2:00 pm – 4:00 pm

Described Landscapes is an exhibition conceived of by the Friends of the Botanic Garden to highlight the work of Smith College alumnae who, after leaving Smith, went on to pursue careers in landscape architecture, garden design, environmental design, or related fields. The first time such a show was mounted was in conjunction with the Design and Nature symposium in 1992. It seemed appropriate to do it again, since we have such talented alumnae working in the field. We hope it will be an inspiration to current students, opening them to a world of possibilities.

The show features twenty alumnae, each presenting one of her projects. Fifteen graduating classes and six decades are represented in the exhibition. There is someone from almost every decade starting with Eunice Campbell Purdy, class of 1939—the first woman to become a member of the British Columbia Society of Landscape Architects—and ending with Dana Nemes Ragouzeos, class of 2004. The class of 1972 is the most represented, with three exhibitors.

Fourteen of the participating exhibitors earned professional degrees in landscape architecture. This includes Eunice Purdy ’39, whose first degree in landscape architecture comes from Smith. It was, in fact, the listing of a major in landscape architecture in the course catalog that attracted Eunice to Smith in the first place.

Many of the graduates from the 1960s and 1970s hadn’t even heard of the landscape architecture profession until after they left Smith. For several exhibitors landscape architecture is a second career. There are attorneys and MBAs among the group. Twelve of the exhibitors majored in either art or art history. This includes one major in architecture and the one landscape architecture major. There are three science majors, two government majors, an English major, and a Hispanic studies major. However, a common theme among all the exhibitors is a love of nature, art, and design. All seem genuinely thrilled to have found such a great profession.

**EXHIBITORS**

- Clara Couric Batchelor ’72
- Katie Brown (Kathrin Schwarzschild) ’69
- Carla Anderson-Chapman ’80
- Eleanor DeLoach Williams Clark ’78
- Susan Cohen ’62
- Paula V. Cortes ’70
- Nancy Watkins Denig ’68
- Carol Guthrie ’72
- Nancy Lyons Hannick (Nancy Anne Israel) ’76
- Ginnie (Virginia) Johnson ’81
- Melissa R. Marshall ’72
- Michele McKay ’73
- Lynden B. Miller ’60
- Lucile Procter Nairn ’62
- Cornelia Hahn Oberlander ’44
- Eunice Campbell Purdy ’39
- Dana Nemes Ragouzeos ’04
- Diantha Carrigan Robinson ’68
- Sarah Chase Shaw ’90
- Shavaun Towers ’71

When I found a major in landscape architecture listed in the Smith College catalogue, I knew right away that this was IT—my two great loves, art and nature combined. The outline of my life plan was formulated at that very moment.  
Eunice Campbell Purdy ’39

**A Place to Take Root: The History of Flowerpots & Garden Containers in North America**  
October 15 – December 15, 2005

Discover the history of the common flowerpot! A Place to Take Root, the first exhibition devoted to the evolution of flowerpots, traces their history and explores their materials and shapes. The exhibition illustrates how pots have developed in response to changes in horticulture and garden styles, from ancient Egypt up to the present day, with special emphasis on American designs in the eighteenth and nineteenth centuries. Over 90 pots will be on display including finely detailed Italian terracotta, wood and cast-iron French tree tubs, traditional American pots, and the latest in plastic orchid pots and ornamental urns.

A Place to Take Root was curated by garden historian Susan Tamulevich in association with the College of the Atlantic. Susan Tamulevich is the author of Dumbarton Oaks: Garden Into Art.

**Discover the history of the common flowerpot!**
Calendar of Events — Fall 2005
All events are free unless noted otherwise

Fall Chrysanthemum Show
Opening Lecture & Reception
Friday, November 4, 2005, 7:00 pm
Seelye Hall 106

Modern Day Plant Hunters
by
Bobby Ward
A retired environmental scientist, past president of the North American Rock Garden Society, and author of A Contemplation Upon Flowers: Garden Plants in Myth and Literature and The Plant Hunter’s Garden: The New Explorers and Their Discoveries, profiling today’s prolific plant hunters and providing an overview of these nursery owners and some of the plants they have collected or introduced in the post-Cold War era of plant hunting.

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

Church Exhibition Gallery
Plant Adaptation Up Close: A Biological and Artistic Interpretation
Through April 24, 2005
Church Exhibition Gallery
Lyman Plant House
Explore the strategies that plants have developed to survive in the specific environments in which they live. Biological explanations and artistic photography bring to life the resourcefulness and beauty of the plant kingdom. Come and delve into a microscopic realm unseen by the naked eye. Put on the 3-D glasses and explore!

Fall Mum Show
Lyman Conservatory
Saturday, November 5 - Sunday, November 20, 2005

Hours:
10:00 am – 4:00 pm Daily

Growing and hybridizing chrysanthemums is a Smith tradition dating back to the early 1900s. The striking features of the annual Chrysanthemum Show are the cascades, hanging “waterfalls” of flowers that line the walls of the greenhouse with brilliant color, and the extraordinary oversized blooms known as standards, growing atop plants as tall as seven feet. Additionally, each year we display hybrids produced by horticulture students at Smith. Don’t forget to vote for your favorite!

Designed Landscapes: A Smith College Alumnae Exhibit
April 30 – September 21, 2005
Opening Reception
Saturday April 30, 2:00 pm – 4:00 pm
An exhibit featuring the works of 20 alumnae who have dedicated their careers to landscape architecture and garden design (see page 13).

A Place to Take Root: The History of Flowerpots & Garden Containers in North America
October 15 – December 15, 2005
Discover the history of the common flowerpot from ancient Egypt up to the present day, amidst a display of over 90 pots. (see page 13).
Garden Gifts Order Form

You can see pictures of all these items on our web site:
http://www.smith.edu/garden/giftorderform.html

- **Botanic Garden T-Shirts with Logo** $15
  Willow Green, Slate, Eggplant, Teal, Natural, or 100% Cotton, S, M, L, XL, 2XL

- **Botanic Garden Sweatshirts with Logo** $25
  Maroon (L & XL only) or Natural (S & M only)
  100% Cotton, being discontinued, limited quantities

- **Botanic Garden Canvas Tote Bags with Logo** $10
  Open Tote—18"×19"×4½" Green or Navy
  Zippered Tote—22"×15"×5" Black or Natural

- **Botanic Garden Aprons with Logo** $15
  24"×28" with two pockets, Forest Green

- **Centennial T-Shirts** $15
  “A Century of Women on Topsoil”
  Brown or Forest Green, 100% cotton, S, M, L, XL

- **Botanic Print** $25
  *Theobroma cacao* (chocolate tree)
  from Lyman Plant House, 7" × 10"
  Limited signed edition by Pamela See ’73

- **Botanic Garden Mugs** $5
  White ceramic with black logo

- **Celebrating a Century:**
  *The Botanic Garden of Smith College*
  A 30 page booklet by C. John Burk (1995) $2

- **Handbook on Troughs** $7
  76 page booklet by the N. Amer. Rock Garden Soc.

- **Butterfly Gardening in New England** $5
  35 page booklet by the NE Wild Flower Society

- **Postcards – Set of 5 assorted cards** $2.50
  Bulb Show, Capen Tulip Garden, Mum Show, Olmsted Campus Plan, Lyman Conservatory in Fall

- **Note Cards – Set of 8 assorted cards** $12
  Conservatory in Winter, Bulb Show,
  Silky Stewartia Flower, Tillandsia by Joan Wiener,
  Japanese Tea Hut by Judy Messer, Frog in Pond,
  Bat Flower, Broccoli ‘Romanesco’

- **Scanning Electron Micrographs**
  Digitally colorized giclée prints by Joan Wiener
  From the exhibition
  *Plant Adaptation Up Close*
  4.5" × 6.5" matted prints of
  *Echeveria, Bladderwort, or Boston Ivy* $25

- **T-Shirts with Logo** @ $15.00 $_________
  Color: ________ Size: ________

- **Sweatshirts** @ $25.00 $_________
  Color: ________ Size: ________

- **Tote Bags** @ $10.00 $_________
  Open Tote(s) @ ________
  Zippered Tote(s) @ ________
  Color: ________

- **Aprons** @ $15.00 $_________
  Color: ________ Size: ________

- **Topsoil T-Shirts** @ $15.00 $_________
  Color: ________ Size: ________

- **Botanic Prints** @ $25.00 $_________

- **Mugs** @ $ 5.00 $_________

- **Celebrating a Century** @ $ 2.00 $_________

- **Handbook on Troughs** @ $ 7.00 $_________

- **Butterfly Gardening** @ $ 5.00 $_________

- **Postcard Sets** @ $ 2.50 $_________

- **Note Card Sets** @ $ 12.00 $_________

**TOTAL** $_________

Members of the Friends of the Botanic Garden take 10% off the total

**TOTAL ENCLOSED** $_________

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Drawing by Jamie Hughes ’08
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The Friends of the Botanic Garden of Smith College

ALL MEMBERS RECEIVE:

♦ A complimentary copy of *Celebrating a Century: The Botanic Garden of Smith College*, by C. John Burk
♦ *Botanic Garden News*, our newsletter and calendar of events, twice a year
♦ Admission to members-only hours at the Spring Bulb Show
♦ Free admission and discounts at 170 other gardens around the country
♦ 10% discount on Botanic Garden merchandise
♦ Free audio tours of the Lyman Conservatory
♦ Invitations to show previews and receptions

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Enclosed is my check payable to The Friends of the Botanic Garden in the amount of $ __________

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Lyman Plant House, Northampton, MA 01063

Or you may join online at [www.smith.edu/friends](http://www.smith.edu/friends)

All contributions are tax-deductible.