The World in a Garden  

C. John Burk

In the summer of 1947, I was eleven years old. My parents subscribed to National Geographic Magazine for my brothers and myself, and sometime that summer I read, in its July issue, an article entitled “The World in Your Garden.” This featured paintings of familiar garden plants growing in the regions where they naturally occur. I particularly liked a page showing a mountain pass through the Andes, with a pack train of llamas making its way through high terrain along a trail bordered by petunias, fuchsias, verbenas, and scarlet sage. I also admired an African landscape, a stretch of open veldt with scattered trees and in the foreground a gladiolus, an African violet, a geranium (i.e., Pelargonium), and a hibiscus, plants that even then I knew would not all grow together in dry grassland of that sort. Other articles in the same July 1947 issue illustrated the destruction that had resulted from the war — “Adventures with the Survey Navy” had a torpedoed tanker going “up in smoke” in Ulithi Lagoon — as well as scenes of postwar recovery. At that time, the United Nations was in its earliest years; and implicit, perhaps, in “The World in Your Garden” was the message that already, in our gardens, an important part of the world had lived peacefully together all along.

The article apparently formed a part of my botanical subconscious. I remembered it at once when I saw my first Bulb Show in the Lyman Plant House in the spring of 1962. Here, in a single greenhouse room were crocuses, snowdrops, and fritillaries from Alpine meadows, hyacinths from the shores of the Mediterranean, and tulips from Turkey. These were mingling with plants that were new to me — Cape cowslips (Lachenalia sp.) from South Africa and spring star flowers (Brodiaea sp.) from western North America. The sight of all these plants, originating from different climes and continents, yet assembled and thriving together at winter’s end, seemed little short of marvelous then, as it still does now. That, some forty-five years later, was one inspiration for the exhibit in the Church Exhibition Gallery that accompanied this year’s Spring Bulb Show and continues through December 21, 2007.

The exhibit has also had a genesis in the botanical books in the Mortimer Rare Book Room in Neilson Library. These are an essential resource for teaching, particularly in discussions of the development of the science of botany and the art of botanical illustration. They also provide an historical record of when plant species from Asia, Africa, and the New World, brought back from the travels of exploration and discovery of the sixteenth and seventeenth centuries, first were seen in European gardens. For example, we see a New World cactus, a prickly pear or Indian fig (Opuntia), growing in a raised bed in an Italian garden in the 1595 edition of Pietro Andrea Mattioli’s Commentarii in sex libros Pedacii Dioscoridis.

The third major influence on the exhibit has been the series of visits my wife and I have made to a number of botanic gardens in the last few years, particularly a trip to the Botanical Garden of Padua in October, 2001. Among the earliest of its kind, the Padua garden was established in 1545 with much of its original layout maintained to the present. Within a walled circular design, two paths meet at right angles at a central pool. The four resulting quadrants, each with a series of interior beds and a central fountain, may have originally represented the four then-known continents — Europe, Asia, Africa, and America. Biblical interpretations held that all plant species were created on the third day; originally

(Continued on page 7)
Public gardens are under continuous pressure to keep visitors coming and to change with the times. This may entail such worthy endeavors as timely seminar series on global warming, flower variety trials displaying new cultivars, or educational exhibits relevant to modern botany. Yet, I have also seen the pressure to increase “gate receipts” result in a dilution of purpose. For example, children’s gardens in some botanic gardens are reduced to play yards with interactive sidewalks, water spray surprises, and giant dinosaurs. What ever happened to exhibits on pollination? Fortunately, colleges have the opportunity to remain focused on educating people about plants and their natural role on the planet as well as their impact on civilizations. Never has this long-term commitment been more evident than at Smith College. From the first director of the Botanic Garden, William Ganong, to the present, our mission has been education.

Over one hundred years after Lyman Plant House was opened, our Church Exhibition Gallery is presenting The World in a Garden, an exhibit written by retiring professor of botany, John Burk. The exhibit captures, in fine liberal arts fashion, the impact plants from all over the world have had on art, history, exploration, landscape, gardening, and food consumption. In the century between Ganong’s directorship and the John Burk exhibit, we have largely been on course, teaching the value of plants from every perspective that we can.

Within the broad mission for the past century, a central Botanic Garden theme has been biogeography, which can be loosely defined as the science that deals with patterns of species distribution and the processes that result in such patterns. Much is to be learned about how well plants can be transplanted to foreign lands by observing where plants come from, in which conditions they thrive, and their relationships to the plants around them.

Last year, Jeffrey Blankenship, landscape architect and lecturer for Smith’s new Landscape Studies minor, brought to my attention the internet availability of an expired journal called Garden and Forest. The journal existed from 1888 to 1897 and was the first American journal to broadly cover plants in the context of horticulture, botany, landscape, parks, forests, and conservation. Established by Charles Sprague Sargent, the founding director of the Arnold Arboretum of Harvard University, it contained a wide range of articles, some scientific, others not.

In 1897, Garden and Forest published an article that is so important to the history of the Botanic Garden of Smith College that we have decided to reprint it in its entirety in this edition of our newsletter (see page 3). After reading the article, I’m sure you will be, as I was, amazed at the importance of Ganong’s comments about education and botany and how his early goals for the Garden have been realized. This article is key to understanding the essence of the Smith College Botanic Garden.
The Botanic Garden of Smith College.

A STUDY OF AN EDUCATIONAL ADAPTATION.

It is plain to all who read the signs of the times that the present trend of botanical activity is toward the study of the phenomena of the life of plants. The facts of plant-structure, and of plant-relations as suggested by resemblances of structure, have been relatively so well studied that for the present and near future the most attractive problems must lie in the investigation of the causes of structure. The plant static needs to be, and already is being,等工作 by the study of the plant dynamic. But as investigation leads, so must education follow. For the systematic pursuit of physiology and ecology, however, a botanic garden with a well-proportioned greenhouse system is the ideal; and it is rapidly coming to pass that a college must provide these if it is ambitious to keep abreast of the general advance.

It is in this spirit that Smith College has established its Botanic Garden. As an attempt to realize with fair rapidity and minimum expense, a preformed plan which should express the optimum of adaptation to the present demands and indicated tendencies of botanical education, this venture is, perhaps, without exact precedent, and its results must possess, botanically and educationally, a far more than sectional interest.

The history of this Garden is very brief. In 1837 the trustees of the college, following the recommendation of President Seelye, to whose initiative and constant interest the Garden owes everything, decided to attempt to combine the beautifying of the college grounds with the formation of a scientifically planned botanic garden which should serve as an adjunct to the department of botany. Messrs. Olmsted, Olmsted & Eliot were engaged to draw up the plans, and in 1841 planting was begun. In 1844 the position of Director of the Botanic Garden and Professor of Botany was established and an appointment made. Since then, though with large changes in the original plans made necessary for practical reasons, development has gone steadily on. Some progress has been made in the school of trees and shrubs; the herbaceous garden is nearing completion; the greenhouses are finished and stocked; the work of administration is systematized.

The college campus contains about thirty acres, including the space occupied by the nineteen buildings (see map on p. 51).
of Sarmecinis, and later are to be added halophytes and alpines. The Experiment House (18½ by 33 feet) is chiefly devoted to the practical study of plant physiology by the advanced students. Here a practicum is carried on in which each student works through a series of experiments upon the nutritional, growth, irritability and other vital operations of plants. The laboratory is used by them in this work. A Propagating House (5 by 66 feet) and the workroom, with the bulb house, complete the series. This brief sketch does not do justice to the botanically and educationally interesting contents of the houses. It is difficult to estimate the number of species in them, but it will give some idea to state that they contain 28 species of Palms, 13 of Aroids, 16 of climbers, 15 of economic plants, 50 of Ferns, 8 of Sensitive plants, 76 of Cactaceae, 37 of Acacias, etc., 20 of Aquatics, 15 of Insectivora, etc. It is not, however, accumulation, but selection, which is the guiding principle here as throughout the Garden.

In practice this arrangement of the houses in parallel series has proved both economical in heat and labor, and convenient for study, and can be strongly recommended. There is but one change needed, a larger cool greenhouse, for the present one is too small. In time the Experiment House will be taken for this purpose and a new house and laboratory built on a space reserved along the north of the present range.

The Propagating Garden contains the usual equipment of frames, bulb houses, etc.; in it plants are grown on for winter-flowering, and woody plants for the School of Trees and Shrubs.

A great element in all adaptation is size. This Garden is not for the public, nor even for University work (which Smith College only permits and does not encourage), but is intended for the botanical education of a growing college of about a thousand undergraduate students. This, and economy, have made the Garden the size it is, and it is believed to be ample for a long time to come. The relatively large size of the greenhouses is made necessary by the nature of the American college year, with a winter session and no summer session. Such houses as these, since they allow the study of living plants to be carried on practically regardless of season, both permit the arrangement of the botanical courses upon the best educational principles, unhampered by the usual practical difficulties, and also allow of constant improvement, through experiment, in the providing of the most illustrative materials, in the best condition, for the most thorough, vivid and economical instruction of the different grades of students. It is plain that efficiency in these respects presupposes a gardener of special and unusual qualifications; such is our head-gardener, Mr. J. Canning, to whom most of the success of the Garden is due.

Of great importance to any American college contemplating such an equipment is the question of cost, which in this case also has had to be considered with great care. Since the grounds of a college must be kept in good order in any case, and their improvement ought to go steadily on, the additional cost of developing them on a botanical system is not great, and the chief expense is in the care of the herbaceous garden and greenhouses. The winter force in this Garden consists of a head and second gardener, aided by about half of the time of one laborer; the summer force consists of the two gardeners, with from three to four laborers. Materials for stock- ing garden and greenhouse are, thanks to the generosity of the older gardens of Harvard, Washington and St. Louis, readily obtainable as gifts, or else may be chosen from the exchange seed-lists of the gardens of Europe. Following their example, this Garden issues an annual exchange list, which is sent to all of the great gardens of the world, for which there are received in return. During the past year we received from other gardens 744 packets of seeds, all we could use, selected from 23 seed-lists, and in return sent out 1,356 packets selected from our own by thirty gardeners, nearly all European. Another question of cost often raised is as to the profit of maintaining a garden when college is not in session at its best time. The answer is, first, if a garden is wanted at all, its maintenance through the summer must be reckoned as a part of its cost, and, second, it is more useful in summer than it seems. The blossom is not always the most important part of the plant, nor is the study of flowers all of botany; it is possible within certain limits to select forms which blossom early and late; summer-blooming materials may now be cheaply and well preserved in formaline for winter use; and finally, summer schools may fully utilize the summer condition of a garden.

Although in this sketch the botanical or educational aspect of the Garden has had first place, it is not to be inferred that its aesthetic side is neglected. Plants for beauty as well as plants for use stand in our beds and houses and are open to all. The Garden is yet too new, and in some respects too incomplete to have ripened to full beauty. But in time and with constant growth, it may yet come to pass that there will gather about the gardens of Smith College something of that charm which makes the gardens of Oxford almost sacred ground, where all that is nearest to vigorous and scholarly youth is associated with all that is most beautiful in man's friendship with Nature.

William F. Ganong.

William Francis Ganong 1895
Photograph Courtesy of the Smith College Archives

View Forest and Garden online
Michael: Every botanist has a reason for choosing the study of plants as a career. What is yours?

John: It just seemed the appropriate thing to do. In the late 1990s, my mother came across a group of photographs taken sixty years earlier, perhaps in 1938 or 1939, at the Royal Botanical Gardens in Hamilton, Ontario. Some of these show me at the age of three or four with my great-grandfather, looking intently down from a bridge into a pond full of water lilies (admittedly there might have been some frogs or goldfish in the water also). Certainly by the time I was in the fourth grade I had a collection of houseplants, and that interest has carried on at various levels since.

Michael: You’ve taught many different courses at Smith. Which ones do you think had the most impact on your students’ lives?

John: In the spring of my first year at the College, I added a course in Conservation of Natural Resources to what was then the Botany Department’s offerings. This was taught through the 1990s, quite often with such high enrollments that I didn’t really know many of the students. Nonetheless, from time to time, a seeming stranger will approach me at the grocery store and say, “You won’t remember me but I took a conservation course with you back in… [1973 or so] … and that got me interested in … [one topic or another] and now I’m on my … [local conservation board or the like].” Of course I have consistently taught upper level courses in Plant Ecology and Plant Systematics, and a satisfying number of students from these classes have gone into careers in related fields.

Michael: What role has the Botanic Garden has played in your own career?

John: The Botanic Garden, and particularly the Lyman Plant House, played a major role in my decision to come to Smith in 1961 (against the wishes of my dissertation adviser, who viewed Smith College as “a hoity-toity girls’ school” and wanted, partly for reasons of his own, to see me hired by a large southern university. Within a year or so, he visited Northampton and changed his views entirely). I cannot imagine teaching either plant ecology or systematics without the Garden’s resources. The 1980 renovation of the Lyman Plant House, which provided classrooms where laboratories for these courses could be taught, added a new dimension to our teaching botany, allowing the opportunity to bring students into contact with living plants on an almost daily basis.

Michael: Which of your various research projects has been your favorite?

John: I’m tempted to say it’s whichever one I’m involved with at the time. Of course, much ecological and taxonomic work is by its nature ongoing — it never really comes to an end with a real conclusion. In general, I think botanists are becoming increasingly aware that plant communities and the plants themselves are constantly changing, as are our views and understanding of them, so there’s always something else to look at, something new to say.

Michael: What groups of plants excite you the most? Do you have personal collections at home?

John: Two questions here — the most exciting plants to me, I believe, are those one finds growing “out of place” outside their normal ranges, additions to the flora. There’s a little Asian geranium that has established itself on campus and up along the Mill River. It has a wonderful scientific name, Geranium thunbergii (formerly Geranium nepalense var. thunbergii — Carl Peter Thunberg was a student of Linnaeus and author of Flora Japonica). It’s found in only in a very few places here in New England, and one wonders how it got here and why it seems so much at home. The second question… I had a collection of African violets when I was in high school; and I have one now. I’ve tried with some degree of success to reassemble the varieties I owned in the early 1950s. Some of these are no longer in cultivation and have apparently (Continued on page 7)
The World in a Garden continued

(Continued from page 1)
present in the Garden of Eden, this original flora was set free to disperse throughout the world when Adam and Eve were expelled. The early botanic gardens were designed to serve as “the whole world in a chamber,” a place where the plants would be reunited (although now the quadrants at Padua are laid out to reflect modern concepts of plant classification).

Since the early nineteenth century, most botanic gardens, including the Smith College garden, have been laid out rather differently, reflecting the English style of gardening with systematic beds confined to an area set off from the broader landscape features. However, the new botanic garden at the University of Hamburg, which we visited in June 2006, seems designed to reflect the Renaissance origins of the garden as an institution. The central core was planned to demonstrate an evolutionary sequence proposed by the Russian botanist Armen Takhtajan in the 1960s. The core is partly encircled by gardens reflecting the plant life of different continents and biogeographic regions.

Outside the Hamburg garden near its entrance, stands a statue of an oversized human figure eating an apple — Adam plündert das Paradies by Waldemar Otto. We had already decided that The World in a Garden would contain several images of Adam and Eve, including a woodcut from Hortus sanitatis, with Adam, Eve, and the serpent, and the frontispiece to John Parkinson’s Paradisi in sole paradisus terrestris, with Adam and Eve still in Eden enjoying its flowers and fruits. Intending to include a photograph of Hamburg’s Adam statue, I consulted my German colleague, Professor Kai Jensen from Hamburg University, who was visiting Smith College this past semester, for help in translating its title. The obvious “Adam plunders (or robs) paradise” had seemed more or less acceptable until Kai pointed out the article das, which has Adam plundering the Paradise instead. Unsure of the sculptor’s intent, we decided to leave the original German for the exhibition panel. Later, recalling the title and the nature of Hamburg’s Adam — grossly corpulent and eating the apple, not inside, but rather outside the garden, where he is often vandalized — I’ve come to suspect that the das is critical, suggesting that the paradise being robbed is the earth itself and reflecting the garden’s mission for plant conservation in the modern world. Inside the botanic garden, enclosed by walls, fences, and hedges, the scattered floras may be reunited, nurtured, and protected. Outside, however, in whatever vestiges of paradise remain, they are exploited, plundered, and in peril.

Putting such dark thoughts aside, I suggest we make it our business to return to primal innocence, if only for a time, by making our way to the Plant House, enjoying yet again the glimpses it brings us of spring and the rich and varied floras of the world.

Interview continued

(Continued from page 6)
disappeared; one was saved only as a pass-along plant, kept successfully now for more than forty years by two retired members of our faculty.

Michael: Without giving away the location of your special places, what areas in the Pioneer Valley do you find the most fun to explore from a botanical perspective?

John: I’ll gladly give the location away — it’s Arcadia Wildlife Sanctuary, just down the Mill River from the College. We went there on my first Plant Systematics field trip in September, 1961. The staff was surprisingly welcoming, given that we were in the midst of the drought of the early 1960s and the Massachusetts woodlands had been officially closed. The sanctuary contains a rich assortment of habitats — upland woods, floodplain forest, grasslands, and freshwater marsh. Documenting their vegetation and observing changes in the plant communities through time has been a major component of my research and the research of my students.

Michael: Your first exhibit is on display in the Church Exhibition Gallery in the Plant House. How does preparing an exhibit compare to your more conventional teaching methods, and did you enjoy working on it?

John: I can’t complain about working on it because I urged us to do it in the first place. Actually, I’ve been involved in several other exhibitions at the College, including, at the Museum of Art, Orchids and Artists in 1991, a display in collaboration with the Massachusetts Audubon Society of plates from Audubon’s Birds of America in 1995, and Idea <> Form: Looking at the Creative Process in 1999, for which I wrote an essay to accompany Dwight Pogue’s images of cacti. I think a strong element of show biz is involved in putting an exhibition together. One has to catch the attention of the intended audience and keep them interested and, if possible, entertained. Otherwise they can simply walk away. There’s undoubtedly an element of show biz in teaching too, but it has to be secondary to the subject matter.

Michael: You’ve spent much of your adult life at the College. What exciting plans do you have now that you will have more free time?

John: I remind myself to say that while I plan to retire from teaching, I do hope to remain professionally active and involved in writing, reviewing, editing, and carrying out at least some research, including long-term projects in collaboration with my former student Marjorie Holland (now at the University of Mississippi) and with Hamburg University colleague Kai...
**News in Brief**

### Invasive Plant Removal

We have accelerated invasive species removal on campus by hiring outside contractors to yank out culprits on the Commonwealth of Massachusetts invasive species list (see the article by Rachael Cain ’08 in the Fall 2006 newsletter). It’s never popular cutting down shrubs and trees but it would be inexcusable for us not to set the example as environmental stewards. We will replant with ecologically friendly species.

### Perennial Display

The A to Z perennial garden at Capen Garden was nearly completed last fall and we should have the remaining plants in this spring. Rather than being artistically designed, it is alphabetically organized by genus to display commonly used herbaceous perennials. We found that in densely planted aesthetically arranged beds, plants were often improperly identified by viewers because the labels were lost in a sea of blooms.

### Campus Guide

A newly released book, *The Campus Guide: Smith College*, highlights campus buildings, their style, and history. Published by Princeton Architectural Press, the guide features a foreword by President Carol T. Christ; an essay, “An Academic Landscape,” by Nina Antonetti, assistant professor of landscape studies; text written by local architectural historian Margaret Birney Vickery; and wonderful color photographs of the campus. The book is available for purchase from bookstores and sells for about twenty-five dollars.

### Stride Students

The Student Research in Departments Program (STRIDE) offers first-year students with outstanding academic and personal qualifications a close working relationship with a faculty member during their first two years at Smith College. The Botanic Garden now has two great STRIDE students. Rachel Rock-Blake is working with Director Michael Marcotrigiano on a plant development research project, and the newest addition to our group, Alexandra (“Punky”) Schellenger is floating between staff members learning plant breeding, plant record keeping, and gardening techniques.

Meanwhile, the new summer internship program, under the management of Gaby Immerman, is growing from six interns last summer to eight this summer. We love having so many students working with us.

### Exhibition on the Road

One of the exhibits produced by the Botanic Garden, *Plant Adaptation Up Close: A Biological and Artistic Interpretation*, is traveling to the New Jersey State Museum in Trenton this spring. It will be displayed at their Galleries at 225 West State Street from May 26 to September 1, 2007. Those in the area who missed the exhibit at Smith have another opportunity to see this fascinating and beautiful exhibition.

Our exhibit, *Plant Spirals: Beauty You Can Count On* was in Italy in 2005, and we are working on sending the Asian Gardens of the 1920s to the West Coast.

If you are connected with any museum or institution that might be interested in showing one of our exhibitions, please call or email Madelaine Zadik (413-585-2743 or mzadik@email.smith.edu). Our past exhibitions are online at smith.edu/garden/exhibits/plant_adaptation/adaptationhome.html.

### Capen Offices Move

Our Botanic Garden crew working out of Capen Garden has moved to the building next door. The offices and workshop are being torn down to make way for a new nursery, our former nursery having been displaced by Conway House, the new Ada Comstock housing.
This spring the Botanic Garden launches its new Curricular Enhancement Program. Designed to help Smith faculty develop Botanic Garden related courses and modules, this program will bring students from a wide range of departments to the Botanic Garden as part of their liberal arts education.

As Friends and visitors know, the Botanic Garden has served as an educational resource since its very beginning (see “The Long Green Line” by Connie Parks ’83, page 5 of the Spring 2000 newsletter — www.smith.edu/garden/Newsletter/sp2000/nlp5spring00.html). Generations of Smith students in horticulture and plant physiology classes have bent over potting benches, studied how plants grow, and learned plant propagation. Twice a year visitors enjoy the results of students’ horticultural labors resulting in the Spring Bulb Show and Fall Chrysanthemum Show. Art students have long wielded their cameras and pencils at the Botanic Garden, and interns contribute their skills on special projects.

The recent renovations brought changes helpful to teaching agendas, such as the rearrangement of the Cool Temperate House along biogeographic lines, and the new Church Exhibition Gallery, which could house a class-organized exhibit. The memorable exhibition Plant Spirals, cocurated by Chris Gole and Pau Atela, members of the mathematics faculty, and by Madelaine Zadik and Michael Marcotrigiano, was used in several courses. The following year, the exhibition Virginia Woolf: A Botanical Perspective portrayed an added dimension to the world of literature.

Our aim is to extend this teaching tradition to all aspects of the liberal arts curriculum. This goal dovetails well with the College’s new initiatives in interdisciplinary teaching. Faculty in any department may apply for stipends to develop courses or portions of courses that utilize the Botanic Garden resources. As Botanic Garden Director Michael Marcotrigiano says, “I have always seen the plant kingdom as the spider in a spider’s web, with connections that reach out to all disciplines. Our collections have inspired many a casual visitor, but our main purpose is to educate the students at Smith. I hope that by offering this opportunity we give faculty the resources needed to bring the plant kingdom into their curriculum.”

On a personal level, when Madelaine Zadik, Manager of Education and Outreach at the Botanic Garden, first approached me about developing a program like this, I jumped at the chance. As Curator of Education at the Smith College Museum of Art from 1990 to 2005, I witnessed firsthand the creative and enlivening impact of original art on the teaching and learning experience. Now, as a doctoral student in Environmental Studies at Antioch University New England, I am convinced that direct experience with plants is not only energizing, fun, and intellectually intriguing, but also increasingly rare and very helpful as we try to make sense of environmental issues.

As one faculty member put it, “There is something very healing about getting my hands in the dirt. It wasn’t part of my growing up, and I really enjoy having that experience now. This new program will make it possible for my students to have that experience in an academically valuable way.”

How might a course involve the Botanic Garden?
Creativity is the password, and flexibility is built into the program. As we talk with faculty about their ideas, we realize more and more that we want to embrace a vision of plants and gardens as complex entities. While gardens are often associated with leisure time and the decorative, that is only part of the picture.
Curricular Enhancement continued

In the arts, plants have served as symbols, settings, subjects, and artists’ materials. Students might write a story that takes place in a desert environment, such as that represented in the Succulent House, compare the appearance of particular flowers to their more fanciful illustrations in a Renaissance herbal at the Rare Book Room, research the symbolism in prints at the Museum of Art, or find their stories in Greek myths.

A class might organize an exhibition in the Church Gallery on women and plants. Women have been herbal healers, cultivators, creators of beauty, agriculturalists, and landscape architects. Records in the Sophia Smith Collection tell about women prominent in some of these areas. The College Archives tell about the women who taught botany at Smith (they even have botany exams from a century ago!) and about Smith students who helped in local Victory Gardens during World War II.

A class might write labels for the Lyman Conservatory as a temporary, self-guided tour of medicinal plants. Engineering students might look to plants for design ideas; after all, the design of the nineteenth-century Crystal Palace was inspired by the venation of giant water lily leaves.

The horticulture lab offers space for students to propagate plants associated with poems or prepare an experiment to teach children about germination. Outdoors, students might study wetland indicator plants around the pond or choreograph a dance. And throughout the Botanic Garden, students might observe how schoolchildren relate to plants or even how we adults do!

My job is to help faculty to make the best possible use of the Botanic Garden’s collections, facilities, and expertise. I am eager to hear ideas and suggestions, and I especially welcome comments now as we begin. Already, potential links with the Landscape Studies program, Environmental Science and Policy program, literature, art, anthropology, and other disciplines have been discussed. We hope that this Curricular Enhancement Program will be a support to the College’s vision of interdisciplinary teaching.

As the program gets underway this fall, look for signs of increased student activity in the Botanic Garden!

Volunteer Training 2007

Seventeen new volunteers participated in the annual three-day training session in late January. Madelaine Zadik, Manager of Education and Outreach, assisted by Meeyoung Lepore, Assistant Volunteer and Tour Coordinator, provided an intense and interesting overview of the history of the Botanic Garden and Lyman Plant House, basic botany and horticulture, and the requirements of working with the public through tours and the reception desk. Director Michael Marcotrigiano, Conservatory Manager Rob Nicholson, and Professor John Burk also assisted in the training, which is unusually extensive compared to other volunteer programs with which I am familiar.

Of the seventeen new volunteers, most come from Northampton and Florence, with Amherst well represented as well as Southampton, Easthampton, and towns along the Connecticut River. Looking at life experience, there were many retired professionals, but certainly not all. One aspiring botanist is a student at UMass, and several were changing careers. As expected, the love of plants and the appreciation of the resources provided by the Botanic Garden motivated the cohort. In private conversations, several admitted to being uneasy about leading their first tours, but the link to experienced volunteers dispelled the anxiety. I was eager to start and had my first tour with several preschoolers, who were much more interested in the humid atmosphere, the smells, and the goldfish they could see in the pond than in the highfalutin botany. However, there is so much opportunity for them to learn on their visits here, and every little thing you can show them makes such a difference.

Madelaine Zadik suggested to our group that one possible goal for a tour might be to present the idea of food for animals, even people. That would be a marvelous concept to get across. This theme was tucked into a training session for the new volunteers identifying various foods and the types of fruits and seeds they represent. Teaching — it happens everywhere!

The goals of the training, from the standpoint of the Botanic Garden staff and the College, are to supplement staff, bring diversity into the staff mix, enlist community ambassadors, and enhance the visitors’ experience. Not least, the spirit of community relations, a broad concept, underlies the program. Additionally, many granting agencies pay particular attention to the number of hours that volunteers put in at an institution.

From the volunteer perspective, learning, having a creative outlet, and making new friends topped the list, but connecting with kids and having fun are also primary motives. Already, I have met interesting folks whom I hope to get to know better.

In keeping with the well-planned program, a luncheon was held in which new volunteers met experienced volunteers, some of whom received awards and recognition.
Hemispheres Apart:
“Conifer Forest” in the Northern and Southern Hemispheres Mean Very Different Things
Dr. Tim Brodribb, University of Tasmania

Talk of “conifer forest” in North America inspires images of tidy tracts of pyramid-shaped trees bearing needle leaves and woody cones. Indeed, this conifer stereotype applies to northern Asia and Europe as well, and derives from the tremendous success of the Pinaceae family (cedars, firs, hemlocks, larches, pines, and spruces) that characterize Northern temperate forests. What most inhabitants of the Northern Hemisphere do not appreciate is that this stereotype is very hemispherocentric (if there exists such a word). Cross the equator into the Southern Hemisphere and you find that Pinaceae promptly vanish, and the conifer flora takes on an entirely different form. The dominant conifer family in the southern hemisphere is the Podocarpaceae, an enigmatic group that shares none of the iconic features attributed to conifers from the north. Broad leaves, fleshy cones, and a habit that is often reminiscent of an evergreen flowering tree illustrate the strong contrast between this antipodean group and its Northern conifer counterparts. Along with the podocarps, the equally bizarre araucarians (monkey-puzzle trees) together define the conifer flora of the Southern Hemisphere as a distinctly different entity from the Northern conifers.

The question is why? Why did the araucarians, once widespread in the Northern landmasses become extinct there, and why did the Pinaceae and Podocarpaceae, despite efficient dispersal, never make it into each other’s hemisphere? The answers will likely provide new insights into the different climatic histories of Northern and Southern landmasses. For this reason, we have begun to dig into the physiology of these different groups seeking explanations. Our central hypothesis is that the conifer characters that thrive in the unstable continental climates prevailing over most of the Northern Hemisphere are a liability south of the equator, and vice versa. For example, frost-resistant needle leaves with high photosynthetic rates are fine at freezing temperatures, but this light-demanding ensemble is lethal in the shady broadleaf equatorial forests that separate the hemispheres. In the Southern Hemisphere, podocarps have gone in the opposite direction, producing an extraordinary array of broadly flattened leaves and shoots. While that helps them succeed under low light in the tropics, it appears linked to drought intolerance, giving them little potential for colonizing the seasonally hot and dry temperate regions of the Northern Hemisphere.

An important test of this hypothesis lies in the few equatorial forests where Northern and Southern conifers meet. In these mixed conifer forests of Indochina the pines make a “last stand” before they become swallowed up by Southern Hemisphere Podocarpaceae species. Strangely enough, it seems that the adaptive response of the pine family in this warm aseasonal forest is to produce a species that looks very similar to a podocarp. The species in question is called Pinus kremphi (see the article by Rob Nicholson on page 9 of the Fall 1999 issue of Botanic Garden News), and it grows in Vietnam alongside several genera of Podocarpaceae. Instead of needles, this bizarre pine species produces flattened leaves and forms a tree that is more reminiscent in leaf and tree form of a podocarp than a pine. Another Northern family, the Taxaceae (yews) also trades narrow “needles” for broad leaves in this equatorial zone, producing the weird genera Amentotaxus, Austrotaxus, and Cephalotaxus. With the help of living collections at the Smith College Botanic Garden and Arnold Arboretum, we will examine those genera to understand why they almost, but not quite, made it to the Southern Hemisphere. At the same time, we will use the University of Tasmania’s large Southern Hemisphere conifer collection to probe the drought and frost physiology of the southern families, Podocarpaceae and Araucariaceae, to determine their physiological limits.

Last year Conservatory Manager Rob Nicholson responded to a request from Australian Research Fellow Tim Brodribb for plant material for his research on conifers. Rob sent him leaves of plants in our collection grown from material he had collected himself in the wild: Amentotaxus yunnanensis (from Vietnam), Keteleeria evelyniana (from Vietnam), Torreya californica (from California), Amentotaxus formosana (from Taiwan), as well as Cathaya argyrophylla, which we received from a plant growing at the US National arboretum with a seed source in China. Our Amentotaxus yunnanensis is growing in the Cool Temperate House (below).

One conifer family, the Cupressaceae, has been absent from this discussion. This big family of conifers has been able to prevail globally where the other families have not. Cupressaceae are amazing generalists, coping with extreme wet (in places like the mountains of Papua New Guinea), dry and hot in the deserts of Africa and Australia, and cold in the mountains of Europe, Asia, and North America. The persistence of this family is crucial to understanding the regionalization of the other families, though it should be noted that the family is rather well divided phylogenetically into Northern and Southern genera. This phylogenetic separation is rather recent, however, and only 30 million years ago Austrosequoia, a fossil tree species almost indistinguishable from the all-American Sequoia, was growing in far southern Australia.

Conifers are a group of ancient and majestic trees and shrubs that deserve our respect. They have borne witness to tremendous climatic and biological upheavals in their long history on Earth, yet they remain ostensibly unchanged. By preserving their form over many millions of years, conifers afford us the opportunity to recreate forests and climates long extinct. The ancestors of our living conifers lived through catastrophes of a scale unimaginable today, and their distribution on earth today may tell us much about the earth’s distant past.
Summer Internship

Natasha Worden ’08

I spent last summer working on a variety of amazing projects, from an ecological study in the Caribbean to a project involving DNA sequencing. It was truly an incredible and immensely valuable experience. The internship at the National Museum of Natural History (part of the Smithsonian Institution) was under the supervision of Dr. W. John Kress in the botany department. Offered through the Smith Botanic Garden, the internship is funded by a generous donation from Deana Bates.

The first three weeks were spent in the Caribbean with Vinita Gowda, a Ph.D. student from George Washington University. She is conducting a pollination study on the heliconias native to the Lesser Antilles, specifically the islands of St. Vincent, Dominica, and St. Kitts, investigating the relationship between the plants and the various hummingbird pollinators on the islands, and whether heliconias are self-pollinated.

During my stay we spent half the time on St. Vincent and the other half on Dominica. Although the islands are relatively close to one another, their pollination ecology is completely different. There are two species of native heliconias: Heliconia bihai and H. caribaea, both found on Dominica (although at different elevations), but only H. bihai is native to St. Vincent. Heliconias are monocots with bright, colorful inflorescences: the flowers themselves are hidden inside large showy bracts. The most notable difference between them is that H. caribaea has larger bracts that are closer together with smaller flowers, whereas H. bihai has longer curved flowers with bracts that are more spaced out. Although there are many hummingbirds on the Lesser Antilles, the main pollinator of heliconias is the purple throated carib hummingbird. The species exhibits great sexual dimorphism: females have large curved beaks, enabling them to feed from both H. bihai and H. caribaea, while males have shorter, straighter beaks, limiting their feeding to the shorter flowers of H. caribaea.

My work took place completely in the field. We spent most days recording observations — sitting in plots of heliconias noting which inflorescences hummingbirds visited and from which bracts they fed. We removed some of the flower styles after they had been visited so that the pollen grains on the stigma and pollen tubes could be analyzed. Vinita and I also took nectar samples every two hours during the morning. The volume of the nectar was assessed and the sugar content was measured, using a refractometer, to find a correlation between the amount and potency of the nectar and the number of visits. We took mite samples from the flowers as well to see if different mites inhabited the different species of heliconias or the different color morphs of heliconias. During this part of the internship I learned critical skills, such as how to set up an ecological study as well as how to use the equipment involved. We used mist nets to catch and tag birds, pollinator bags to prevent pollination when we were not present, and nectar testing refractometers. The best part was being able to see real-life research in the field, as opposed to reading about it in textbooks.

The second part of the internship consisted of seven weeks at the Museum of Natural History in Washington, D.C., during which time I worked on many different projects. The first was the Electronic Field Guide Project, in which a computer program was designed (in association with Columbia University) to identify leaves. Identification is based on shape judging from photos entered into the program. Once the program was written, we collected leaves to be photographed and serve as templates. The first leaves were collected from Plummer’s Island in the Potomac River near downtown. I went on collecting trips to the island with taxonomists from the museum and learned how to identify and key out plants, as well as how to collect good quality samples and set up the plant press. I later sorted and labeled all the leaves.

Another project involved DNA bar coding. One of the postdoctoral researchers was running a project to find distinct portions of DNA in medicinal plants that could be used to identify the species. We collected samples from the National Botanic Garden and the National Arboretum, which allowed me to view many exotic plants along the way. We even went to the herb garden run by Jim Duke, author of The Green Pharmacy, and got a tour of his medicinal plants. The project is funded by the USDA, which is looking for a quick and uncomplicated method of identifying medicinal plants when they are imported into the country for herbal supplements. Once samples were obtained, we ground them up and extracted the DNA. I also performed PCR, the process for amplifying DNA, and loaded the gels for electrophoresis to check the quality of the extracted and amplified DNA. This part of the internship was a great experience for me. I got to work in a lab and gained proficiency in many important procedures used in genetic studies. Additionally, I learned to use various new technologies, better equipping me for labs at Smith and jobs in the future.

Aside from all the scientific knowledge I acquired, I also gained important life experience. It was my first time traveling internationally alone and my first time visiting the Caribbean. I had the opportunity to live with people of another place and culture and experience something totally different from my usual life in the United States. This internship was a good experience overall because it gave me the chance to participate in interesting work and meet influential people, who showed me the ropes in the biological world. Thanks to this fabulous internship, I have gained useful knowledge about my chosen career field, and I am well prepared for future botanical work.
My Summer of Trees

Mo Speller ’08

I know students who interned at other botanic gardens, and when speaking about their jobs they mostly mention one thing: weeding. During my summer 2006 internship with the Botanic Garden I did do a fair amount of weeding, but when I was weeding I had the privilege of working with people like Jeff Rankin, who is in charge of the Systematics and Rock Gardens and could tell me a weed was in the Polygonaceae family and where I might find some of its relatives. Other times Rachel Cain, fellow intern, might inform me that the particularly aggressive weed at hand is an invasive species and rattle off all sorts of information concerning the plant.

When asked about my internship I tend to elaborate on one subject more than others: trees. Trees, their health in particular, were the focus of my independent project funded through a B. Elizabeth Horner Research Fellowship. I chose the project soon after an approximately ninety-seven-year-old Quercus rubra (red oak) in the allée outside Neilson was removed. I was attending a Landscape Studies lecture (LSS 100) at the time, and several students were obviously panicked about its removal, not understanding how a tree that appeared sound to them could need removal. My goal, in addition to collecting necessary information for the Botanic Garden, was to become better informed about why trees fail so that I might educate my fellow students.

I worked with Collections Manager Elaine Chittenden and Chief Arborist John Berryhill to create a Tree Health Survey, designed for collecting data about the visible health of individual trees, their location, and label and maintenance needs. I also met with Jay Girard, arborist, former staff member, and current volunteer at the Botanic Garden, who taught me how to recognize various tree diseases and infestations. During our meeting, Girard noticed a tree infested with Adelges tsugae (hemlock woolly adelgid). Later in my survey I found two more.

Initially, I surveyed trees within a section of campus that Elaine Chittenden identified as containing numerous woody plants without data. After the initial survey, I surveyed primarily “heritage trees,” those planted as part of the Frederick Law Olmsted plan, those predating the college, and champion-sized trees. The reason for using the heritage list was that it would provide the largest and oldest trees on campus.

In the end, information was gathered on 100 trees and 59 were surveyed in-depth. Trees were put into four categories based on health. Twenty-four percent of trees surveyed in-depth were of the highest level of concern. Twenty-two percent were ranked as the lowest level of concern. Fifteen percent were ranked as a low level of concern and thirty-nine percent as a high level. The majority of heritage trees were found in the central campus and generally experienced stress and damage to their root systems. Of all trees surveyed, the average approximate portion of dripline that has been paved is 31%. In the central campus, that average is closer to 50–60%.

Many of the trees in the two highest levels of concern had issues that could be corrected, which John Berryhill has already done. Other trees will require more invasive methods of examination, such as the use of a resistograph, to determine the extent of decay inside the tree, which cannot be seen from the outside.

One of the difficulties in assessing tree health is that the level of decay cannot be determined from the outside alone. Because trees defend themselves by compartmentalization — they section off disease and decay to prevent its spread — wounds or structural problems are often indicators of a larger amount of decay inside. The health and vigor of a tree that is weakened by stress and age determine the tree’s ability to compartmentalize and defend itself.

The “Bicentennial Oak” that stood at Tyler Annex (see Fall 2006 newsletter) is an example of the limits of a visual inspection. I did not survey the tree, although I walked by it often. It was always on my list to be measured, but because I did not think that a tree that had been standing for so long might fall apart the next day, I kept putting off its survey. Before its leaders fell in August 2006, it was obvious the tree was declining, as would any tree its age. The first branch that snapped was one of a pair of codominant leaders. Codominant leaders are a common structural defect in trees that can lead to splitting and decay. They are easily removed when trees are small, but removing them from a mature tree weakens the tree tremendously. Therefore, the leaders are usually cabled, as with this oak, in order to relieve stress and extend the life of the tree. Before the leaders fell, the union of the codominant leaders looked okay from the outside. However, after the leader split off, the extent of decay became apparent. A resistograph found a hollow branch still attached to the tree.

Although I never surveyed the tree, I did complete its final measurements. I feel, as I am sure many of my fellow interns do, extremely honored and humbled to have been present during the last days of such a majestic tree. I hope that with the help of my survey, some of our other trees will be able to live long enough to instill the same sense of awe in future Smith students. 

Alex Julius ’09, a 2007 summer intern, will pick up the baton from Mo, gathering data on more trees and working to ensure their maintenance. She will devise a zone system, dividing the campus into 5 areas of equal labor needs, considering land area, number of trees, their age, proximity to roads or walkways, structural or pest concerns, and other factors. Chief Arborist John Berryhill will use this system in devising a 5-year rotational maintenance plan.
True individual freedom cannot exist without economic security and independence. People who are hungry and out of a job are the stuff of which dictatorships are made.

The wisdom of a president, when it does exist, rarely intersects with the botanical world. But Franklin D. Roosevelt’s dictum echoes that of the Roman philosopher Seneca who said, “A hungry people listens not to reason.” While few of us have to question our food supplies, within our information-driven economy it often seems that plants are a quaint holdover from a long gone agrarian past. Until one starts tallying the billions: A flavor and fragrance company with sales of two billion, an agricultural commodity processor, “Supermarket to the World,” with sales of 38 billion, a coffee giant with branches worldwide, sales of illicit, largely plant-based, narcotics thought to total $400 billion worldwide. Clearly, plants are still a vital part of the world economy, and it was with this in mind that a new biology course, Plants and Human Affairs: Economic Botany, was launched on an experimental basis in the Smith College biology department.

This course is an updated version of one that had been taught at Harvard University since 1876, one of the oldest continually taught college courses in the United States. I had the great fortune to take it under the tutelage of legendary Harvard botanist Richard Evans Schultes, in the Nash Lecture Hall, a temple of botany on the top floor of Harvard’s Botanical Museum. Passing the beautiful Glass Flowers to continue up the stairs and to sit and hear the collected wisdom of Dr. Schultes was one of the great experiences of my life. After dragging out my old notes (the only set saved this long) it was surprising to see how much the world of plants had changed since I took the course a generation ago. To emphasize the point, a laundry list was compiled for the initial lecture: new concepts, terms, and events concerning the world of plants including, Biodiversity, Biopiracy, Bioprospecting, Bioengineering, Bioterrorism, the Rio Biodiversity Treaty, Genetically Modified Organisms (GMO), Tree Architecture, Genomics, Biofuels, Taxol, Global Positioning Devices, Crack, Freebase, Ecstasy, the Internet, In-Situ and Ex-Situ Conservation, Conservation Biology, Ecotourism, Narcoterrorism. I could have continued, but a PowerPoint slide was filled.

Twenty-six students now meet in the classrooms of the Lyman Plant House two evenings a week and study such categories as food, timber, fiber, spices, essential oils and perfumery, plant-based medicines, stimulants and narcotics, biofuels, and biotechnology. It is a rewarding feeling to utilize the economic plants housed within the collections at the Botanic Garden, be it grinding plants to extract fiber to make paper, or smelling the fragrances from various plants used by the perfume industry. If nothing else, the students’ view of the world will become a little more sophisticated about commerce in plants, and they should have an appreciation for how much value still exists in the natural areas of the planet. After formulating a perfume and creating an advertising campaign for it, they will hopefully even smell a bit more worldly.

Dioscorea elephantipes, elephant foot, was a famine food in South Africa. Other plants in this genus are valued for steriodal compounds that are used to produce cortisone and contraceptives. Drawing of the plant in the Succulent House is by Pamela Dods AC.

It appears that some squirrels are using their teeth to “erase” tree labels on campus. Although they have sharp teeth and it seems like a funny thing to see, it is one more problem we now have on the “to do” list — thwart squirrels and engrave new labels. Never a dull moment.
High Tech Botany Part II

Rob Nicholson

Speed in nature is seen mostly as the province of creatures and falling objects, and is not associated with plants. In the few instances where plants have developed quick movements, the exact mechanism is still unknown, and measuring the speed has only been possible with recent technologies.

In The Power of Movement in Plants (1880) Darwin detailed slow plant movements, including how vines twine and leaves move with the sun. He also studied pollination mechanisms of native British orchids as well as tropical “foreign” orchid species. These were provided to him by the Royal Botanic Gardens at Kew and the nursery firm of Veitch Brothers, whose collectors traveled the globe. I like to imagine Darwin pottering up and down the aisles of their hothouses, searching for treasures just as millions of weekend gardeners do today. But few of our purchases result in a body of scientific work that endures after 150 years.

In 1854 the French botanists Baillon and Ménière wrote of a curious mechanism within the flowers of the orchid genus Catasetum. A set of long trigger hairs or antennae, when activated by touch, transmit a signal within the flower. With mousetrap speed, a sudden eruption occurs, and a pollen bearing dart is catapulted onto the back of a foraging insect.

I discovered this astonishing mechanism myself quite by accident. A donation of orchids from noted orchidist Wilford Neptune included among its treasures a dozen catasetums. When I turned a blossom upward and saw the two antennae, I poked a finger inside and the pollinia snapped down onto my fingernail. It didn’t hurt but the rapidity of the transaction caused me to jump thinking I had disturbed some insect inside. Inspecting my finger I saw the pollen sacs firmly glued to my nail. I thought I might have made a new discovery of orchids a dozen catasetums. When I turned a blossom upward and saw the two antennae, I poked a finger inside and the pollinia snapped down onto my fingernail. It didn’t hurt but the rapidity of the transaction caused me to jump thinking I had disturbed some insect inside. Inspecting my finger I saw the pollen sacs firmly glued to my nail. I thought I might have made a new discovery, but the first to study this was none other than Charles Darwin. He considered catasetums the most remarkable of orchids:

How then does nature act? She has endowed these plants with . . . sensitiveness, and with remarkable power of forcibly ejecting their pollinia to a distance. Hence, when certain definite points of the flower are touched by an insect, their pollinia are shot out like an arrow which is not barbed, but has a blunt and excessively adhesive point. The insect . . . flies . . . to a female plant, and whilst standing in the same position as it did when struck, the pollen-bearing end of the arrow is inserted into the stigmatic cavity, and a mass of pollen is left on its viscid surface. Thus, and thus alone, at least three species of the genus Catasetum are fertilized.

This adaptation where pollen is rapidly attached to an insect’s back in response to the motion of that insect is highly unusual and is one of the most elegant and enigmatic in all of botany. I puzzled over how to photograph this phenomenon, each new spike of blooms taunting me further. Film cameras were far too slow, but then I found the webpage of the Edgerton Center at the Massachusetts Institute of Technology. If they could photograph bullets passing through balloons, surely an orchid would be within their reach. A cold call to Dr. Jim Bales found a surprisingly sympathetic and excited ear (the fact that the plant was anointed by Darwin didn’t hurt). He loved the idea of using his gear on a subject as different as a plant, and my son Charles and I found ourselves under the great dome of the Rogers Building carrying the only plant we would see inside MIT. We did attract a few glances, but were probably assumed to be a floral delivery, not carrying a Darwinian legacy.

We had a total of six flowers with us. The MIT camera has the capability to capture up to 60,000 frames per second. Jim estimated that for our purposes, 1000 fps, one frame per thousandth of a second, would suffice. We carefully cut away enough of the petals so that the trigger hairs and launching pollinia could be filmed. One bump of the hairs would trigger the explosion, so it felt as though we were the equivalent of a botanical bomb squad.

Our first flowers were failures, probably having lost their loads when jostled on the ride down the Mass Pike. This did not bode well as we approached the final bloom. Charles slowly extended a wire to the antennae. Something flashed past and the flower twiched, visibly recoiling. Jim, eye to the viewfinder, asked, “Did we get it?” The tiny pollinia on the floor confirmed that we had in fact caused their ejection. We eagerly clustered about his computer for a replay. It was only at extreme slow motion that we could see the pollinia catapult out with the elegance of an Olympian doing a perfect swan dive. We were the first to see this amazing adaptation with the human eye, besting Darwin only by dint of 150 years of technology.

We could now graph the distance moved per millisecond and calculate acceleration, force, and kinetic energy. The fastest speed recorded was 9.9 km per hour, not robust when compared to an Olympic sprinter, but probably faster than most botanists. Since the pollinia started inside a slit, none of our acceleration figures reflect starting from zero. Our calculations of acceleration between frames showed a high of 750 meters per second², 10 times quicker than a striking pit viper.

The question remains how the signal is transmitted from the tip of the antennae to the area that releases the pollen arrow. Venus flytraps operate by means of turgor pressure, but the flytrap seems like a snail by comparison.

I later learned from Dr. Gustavo Romero, curator of the orchid herbarium at Harvard, that student researchers led by Dr. Jacques Dumais were undertaking the same project. We have since compared data. A Catasetum expert, Dr. Romero showed me a small box of specimens. Darwin had never seen the orchids in the wild but theorized that the pollinators were large insects. Dr. Romero had done the fieldwork and in his treasure chest were large Central American bees, each with the pollinium of a Catasetum firmly glued to its back by some wily orchid long ago. It was an amazing box of wonders, true biological treasures.

Our filming provided the eureka moment of discovery and the sublime pleasure of following down a research path blazed by one of the beautiful minds of centuries past. It was, to say the least, a good day in the lab at MIT.

Watch a video clip of the pollinium being ejected.

You are invited to join

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 — 9:00 am to 10:00 am daily during the show
- Free admission and discounts at 200 other gardens in the United States, Canada, and the U.S. Virgin Islands
- 10% discount on Botanic Garden merchandise
- Free audio tours of the Lyman Conservatory
- Invitations to show previews and receptions

☐ YES, I WANT TO BECOME A FRIEND OF THE BOTANIC GARDEN OF SMITH COLLEGE!

<table>
<thead>
<tr>
<th>Membership Level</th>
<th>Contribution</th>
<th>Discount on Merchandise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Grand Supporter</td>
<td>$2000+</td>
<td>$125</td>
</tr>
<tr>
<td>Champion</td>
<td>$1500</td>
<td></td>
</tr>
<tr>
<td>Patron</td>
<td>$1000</td>
<td>$35</td>
</tr>
<tr>
<td>Benefactor</td>
<td>$600</td>
<td></td>
</tr>
<tr>
<td>Sustainer</td>
<td>$300</td>
<td></td>
</tr>
<tr>
<td>Student/Recent Alum</td>
<td>$15</td>
<td></td>
</tr>
<tr>
<td>graduated in the past 5 years</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Enclosed is my check payable to The Friends of the Botanic Garden in the amount of $____. Send to:

FRIENDS OF THE BOTANIC GARDEN OF SMITH COLLEGE
Lyman Plant House, Northampton, MA 01063

Name: ____________________________ Class Year (alumnae): ____________
Address: __________________________
City, State, Zip: ___________________
E-mail: __________________________

Or you may join online at www.smith.edu/friends
All contributions are tax-deductible.