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Leaf Evolution *in the California Chaparral*

There are several key interpretive themes used in the Garden that help us bridge what would otherwise appear to be gaps between collections and plant types. One of these, convergent evolution, describes an evolutionary process by which unrelated plants adapt in similar ways to similar environmental conditions, often resulting in similar looking plant forms and communities. The morphological and physiological similarities among woody plants of Mediterranean-type ecosystems have been heralded as examples of convergent evolution. For instance, the California chaparral is dominated, in part, by members of the rose (*Rosaceae*) and buckthorn (*Rhamnaceae*) families, while the similar appearing South African fynbos features plants from different families, like protea (*Proteaceae*) and restio (*Restionaceae*). Though these plants are distantly related, they share many ecologically important traits, such as the characteristic thick, leathery, evergreen leaves, known as sclerophylls.

The functional fit between these plants and their environments is an essential feature of biodiversity. Plants generally appear well-suited to their environments, possessing traits

that enhance performance and Darwinian fitness in their current environment. This observation addresses the current pattern—the state of adaptation or adaptability. The ecological and evolutionary processes underlying these patterns have been hotly debated in recent decades.

One key question is essentially this, Which came first, the adaptive trait or the environment? Did the sclerophylls of the ecological community of plants known as the California chaparral evolve from ancestors that lacked this leaf type, due to the action of natural selection in the Mediterranean-type environments?

Alternatively, did their ancestors already possess this distinctive leaf trait, allowing them to expand and occupy the chaparral environment as climates changed and summer drought conditions became prevalent in California over the past five to ten million years?



Photo by H. Forbes

Wartleaf Ceanothus, 82.0484 Ceanothus papillosus in Bed 12B of the Californian Area, one of dozens of Garden plants used in this research project.

Convergent evolution describes an evolutionary process by which unrelated plants adapt in similar ways to similar environmental conditions, often resulting in similar looking plant forms and communities.

(continued on page 2)

LEAF EVOLUTION *(continued from page 1)*

The first hypothesis represents the process of evolutionary adaptation, the production of new phenotypes (traits that result as a combination of heredity and environmental influence) by the action of natural selection.

In contrast, the second hypothesis of adaptive traits pre-existing the environment they are suited for offers an ecological explanation for the observed match between plants and their current environment. In a diverse flora, such as the American West over the past 20 million years, species with many different traits coexist. As conditions change, or a new climate appears, species that possess appropriate characteristics will expand and colonize the landscape, while other

As conditions change, or a new climate appears, species that possess appropriate characteristics will expand and colonize the landscape, while other species migrate away or become extinct.

species migrate away or become extinct. This ecological sorting process, also known as the “assembly of communities”, will produce a match between plant traits and corresponding environments, even if there is little or no evolutionary change in the process. This process has been termed ‘niche conservatism’, as the ecological characteristics of the species (the niche) may be conserved and exhibit relatively little evolutionary change for long periods of time.

A minimum criterion to test the hypothesis of adaptation versus sorting is whether a trait exhibits a significant evolutionary change associated with a particular selective factor. For example, did California-lilac (*Ceanothus*) evolve to a shrub with thick leathery, sclerophyll leaves in response to the selective factor of summer-drought conditions, or did the ancestors of *Ceanothus* already possess these characteristics?

I examined the evolution of leaf traits (leaf size and the area to mass ratio of the leaf) in the Mediterranean-type woody vegetation of California (chaparral) and focused on



Bearberry, 91.1471 Arctostaphylos uva-ursi 'Mt. Vision' in Bed 2 of the Californian Area.

Photo by H. Forbes

the question of adaptation versus niche conservatism as factors shaping the modern plant community. The morphological and physiological similarities among woody plants of Mediterranean-type ecosystems have been heralded as examples of convergent evolution. However, there is considerable comparative and paleobotanical evidence that many of the relevant traits (e.g., small evergreen leaves with low ratio of leaf area to mass, strongly seasonal photosynthesis and growth, vigorous resprouting following fire, and related



Hoaryleaf Ceanothus, 94.0349 Ceanothus crassifolius in Bed 5A of the Californian Area.

Photo by H. Forbes

attributes) predate the relatively recent onset of the summer-drought climate. These observations support the view that the traits did not arise in response to Mediterranean-type climates, though they may have played an important role in the ecological success of these plant lineages when Mediterranean-type climates appeared.

Twelve focal lineages in four families [cashew family (Anacardiaceae), heath family (Ericaceae), buckthorn family

(Rhamnaceae), and rose family (Rosaceae)] were selected from the evergreen chaparral of California. These represent approximately 50% of the genera and 75% of the species of chaparral evergreen shrubs. Leaves were sampled from taxa in several botanical garden collections, including many from the UC Botanical Garden, as well as from the UC and Jepson Herbaria on campus. The evolutionary history of the groups (phylogenetics) were based on published works by other researchers, and the ancestral state reconstructions for leaf size and area-to-mass ratio were conducted as part of this project to test the hypotheses of adaptation vs. niche conservatism.

For the case studied here, it appears that leaf traits of evergreen sclerophylls are highly functional in Mediterranean-type climate conditions, but that in many plant lineages these traits evolved in ancestral non-Mediterranean-type environments. Lineages possessing such traits were apparently successful and persisted in the face of the transition to summer drought, subsequently expanding to form a dominant vegetation type in California and other Mediterranean-type climates. This pattern is especially clear for important lineages such as manzanita (*Arctostaphylos*) and California-lilac (*Ceanothus*). In a few cases, such as chamise (*Adenostoma*), there is clear evidence that the small, thick leaf type is a novel adaptation associated with the Mediterranean-type environment of California.

The maintenance of sclerophylly and related traits reflects the adaptive value of these characteristics in the face of environmental changes. Assuming that genetic variation has been



Photo by H. Jones

Bearberry, 83.1172 Arctostaphylos nummularia in Bed 2 of the Californian Area.

It appears that leaf traits of evergreen sclerophylls are highly functional in Mediterranean-type climate conditions, but that in many plant lineages these traits evolved in ancestral non-Mediterranean-type environments.

available for these traits, the lack of substantial evolutionary change suggests that stabilizing selection (selection favoring the current average values for a trait) has played an important role in maintaining the ancestral traits.

The similarities in leaf traits among species in the California chaparral reflect a mix of conserved traits that arose prior to Mediterranean-type climates and more recent adaptive shifts in lineages derived from cooler climates. These conclusions are consistent with evidence from biogeographic and paleontological studies, and importantly, they are based on entirely independent data sets and methods. The

results highlight the importance of both ecological and evolutionary processes contributing to contemporary patterns in the fit between organisms and their environment.

—David Ackerly

Editors Note: Prof. Ackerly has recently joined the faculty of the Department of Integrative Biology at UC Berkeley. This article was adapted and excerpted from his paper, "Adaptation, Niche Conservatism, and Convergence: Comparative Studies of Leaf Evolution in the California Chaparral," which appeared in The American Naturalist, 2004. Vol. 163(5): 654-671.

You can learn more about his research program at <http://ib.berkeley.edu/faculty/ackerlyd.html> and read the original paper at <http://ib.berkeley.edu/labs/ackerly/research/ackerly-pubs.html>.

DIRECTOR'S COLUMN

While I am tempted to put off the best until last, I cannot resist announcing the ground-breaking for the new Garden Entrance! After some difficulties with the initial bidding, we modified the plans slightly and obtained a satisfactory bid. The contract was awarded to Sposeto Engineering on January 11th and physical groundbreaking occurred on February 8. It was quite exciting since on the same day, a huge crane appeared to relocate a larger planted palm that was blocking the work area. (We hope to eventually relocate it as part of the new planting in the Entrance). I hope to have images of the new Entrance for the next Newsletter and I hope you will check into our website frequently to keep abreast of progress. The new internal terraces will have extensive planting beds and the horticulture staff are already working on planting design plans. While we have been successful in rais-

ing sufficient funds for the basics, we will need additional funds to help complete this planting. Look for more details on this later in the spring - we will be able then to share the exciting designs our horticultural team are creating for the new entrance and give you the chance to help the Garden by adopting a plant. I consider this a momentous undertaking and I hope you will share my excitement.

The Entrance project is but one on a lengthy list of improvements that have been

undertaken in an attempt to address the many infrastructural needs of the Garden. As you may have surmised from recent *Newsletters*, these issues have occupied a great deal of my attention since assuming the directorship. I thought you might enjoy a visual representation of some of the improvements that we have accomplished and I offer the images on these pages to illustrate some of the major ones.

ACCOMPLISHMENTS

Many improvements have been undertaken to address the infrastructural needs of the Garden.

1



Photo by J Williams

New halogen track lighting lends an attractive glow to the room.

1. **The remodeling of the Conference Center** was discussed in earlier *Newsletters*, but we have finally reached the end of our efforts, at least for the immediate future. This work began with the replacement of the disintegrating wall holding up the Cycad and Palm Garden opposite the Conference Center thanks to a generous donation from Norman and Janet Pease. We then tackled the interior, beginning with removal of cabinets blocking the view of the Garden and removal of the old corkboard walls, accompanied by upgrading the projection screen and white boards in the front. The tired old drapes were replaced and we completely renovated the two kitchenettes. The pièce de résistance was the replacement of the old industrial fluorescent lights with attractive track lighting made possible by gifts from Sarah Simonet and Curtis and Kristine Hoffman. With an attractive new lectern equipped with microphone and the existing internet connections, we now have a Conference Center in a beautiful setting that is ideal for educational functions, conferences and special events like weddings, other parties and memorials; these offer potential new sources of income. In conjunction with the latter, we have started advertising in bridal magazines and other publications. Please do consider using this beautiful garden venue for your own special celebrations in the future.

2



New irrigation lines.



New retaining wall in Cycad & Palm Garden



New railing across stone bridge.

Photos by J Williams

2. I reported on the **major irrigation project** (affectionately known as the “irritation” project) last spring that was so disruptive. Besides bringing drinking water to the Conference Center and improvements in the control of our antiquated irrigation system, we ended up with a **new**

paved road and acquired a wonderful **new railing over the stone bridge** that spans Strawberry Creek on the way to the Conference Center (image second row-right). We have also just received a new drinking fountain that we will install on the terrace near the front of the new Entrance.

3



A delightful spot for a picnic, on the Bonnell Table.

Photo by J Williams

3. Not all work is related to repairing infrastructure. A **new picnic table** is now available in the Mexican Area at the front of the Garden (image bottom row-left); this addition, dedicated in honor of Sylvia Edelglass Bonnell, is especially suited to the new front Entrance and is a wonderful contribution to the Garden.

4. **The Pygmy Forest** section of the Californian Area has been expanded and reconfigured to make it more discrete; the signage has been moved from the roadway to the internal side of the bed and new paths better delineate the collection.

4



The Californian Area's pygmy forest with new boundaries.

Photo by J Williams

(continued on next page)

5



Photo by J Williams

The armillary installed in the Garden of Old Roses

5. Finally, the **Garden of Old Roses** has enjoyed the addition of a **new piece of art**, an armillary shown on this page. Many of you are no doubt now wondering “what is an armillary?” at least that was my initial response. It is an ancient form of sundial and celestial globe that tells both the time of day and season. The red bronze, 75 pound armillary sundial was created by former City of Oakland civil engineer, the late Mr. Frank Cheney, who was famous for the large sundials that he produced as a hobby after retiring. Many processes were used in order to create the armillary, including sand casting, the lost wax process, forging and lithography. Several of his large sundials are found locally, most famously the one that anchors University Avenue at the Berkeley Pier, which was sponsored by the City of Berkeley’s sister city of Sakai in Japan. Landscape gardener Aaron Parr, Mr. Cheney’s grandson, has worked with Garden staff to design and enact the installation of the new armillary here at the Garden. The Cheney family will be dedicating the armillary on Saturday, April 16th.

6. Another exciting event for us this winter was the completion and **final publication of the *Waterwise Gardening Tour* book**. We have chosen plants that we believe are especially suitable for creating an interesting water-wise garden; all are shown in full color and I think the final result is stunning. The book is offered at a very affordable price in our Garden shop. In addition, we were invited to present a two hour symposium related to the publication at the spring San Francisco Flower and Garden Show on March 18th. This publication is the result of a large volunteer and staff effort and the generous underwriting by the several water companies and donors. Many thanks to everyone involved in this magnificent Garden publication. See the full article on page 13.

6



I hope you have all put the **Spring Plant Sale**, April 29th-30th on your calendars. We are planning another reception at the members’ only preview on Friday evening, April 29th. This year will be special for at least several reasons: you will be entering through the new Entrance Gate, we will host the event in the newly remodeled Conference Center and perhaps most importantly for some of you, we will be introducing several newly propagated plants, some

never before offered; quantities will be limited so be sure to take advantage of your member privileges. The layout for the spring plant sale will be modified to accommodate the new terraced entry.

I look forward to seeing many of you again this spring. Please join us to celebrate both the new Entrance and the eternal beauty of this wonderful garden. Our upcoming **annual Garden Party** is an excellent opportunity to enjoy both the Garden and the new Entrance and will be held on Saturday, June 11, 2005 from 3 to 6 pm. In fact, I hope you will bring a group of friends—block tickets are available at discount prices (see page 16 for more information). This year’s theme is “Passport to the Summer Garden” and will highlight international food, wine, music and of course, plants. A professional shuttle service will quickly ferry attendees to and from their vehicles parked at the overflow parking lots at the Lawrence Hall of Science.

In addition to attending, and even if you cannot, I invite you to help us by donating to the silent auction. Donations of services, materials or even vacation opportunities are greatly appreciated. The success of last year’s fundraiser was largely attributable to the enthusiastic and dedicated volunteers who helped plan and staff the event. If you are interested in donating, planning and/or volunteering during the event, contact Perry Hall, Programs Coordinator at 510-643-7265 or perry@berkeley.edu.

—Paul Licht

VOLUNTEERS AT THE GARDEN

Two-thousand four was a busy year with so many new volunteers! Working in the role of Volunteer Liaison, **Gayle Roberts** has offered enormous support in introducing new volunteers to the Garden and helping them fill out their paperwork. She has shepherded in close to one hundred volunteers with most of them still active in the Garden.

Because people's lives and schedules change we always welcome new volunteers to help with the Volunteer Propagation program, the Curatorial office, the Garden Shop, Garden marketing and outreach event programs, the Garden Party, Education and more. If you are interested in becoming a volunteer, call and make an appointment to have Gayle show you around and match you up with the opportunity that suits you best.

In the Spring we will hold a Volunteer Orientation Day. Long-time, new and thinking-about-it volunteers are invited to attend. It's a great occasion to learn about the Garden, its history, staff, volunteers and how you can help support the Garden through volunteering. Look for the date and time on the Garden website.

Snow Flower *Sarcodes sanguinea*

*The snow melted by the sun
Unfolds the mysteries from below
Out of the black earth under the pine
Rises a coiled mass
Pointing and reaching for it to be seen
Yet no animal will eat it. No human will take it
A reverence has unfolded. A beauty unrivaled
Her majesty commands a lingering stillness of awe
Our eyes basking in flaming sensuality
Bees waiting for the blood-red flowers to be
revealed from the bracts
Short lived. Majestic in its beauty
It returns to the black rich earth under the
slumbering pines
Then it will come again and again
Birth. Beauty. Simplicity out of complexity.
Transformation*

by Sonja Altena

Over the last year the Garden has lost two wonderful volunteers.

Sonja Altena volunteered in many areas of the Garden. She started out as a docent and when her health slowed her down, she moved on to volunteering with the horticulturists and the volunteer propagators. She will long be remembered for her positive outlook and the many ways in which she touched the Garden and by so many who knew her. Among the list of her many talents was writing poetry. Her poem "Snow Flower *Sarcodes sanguinea*" is a testament to her love and understanding of life and the world around us.

For many years **Jean Nunnally** was a mainstay on Tuesday mornings in the

Garden Shop. Jean was an adventurous spirit who travelled extensively, often to remote exotic locales, and who, even in her nineties, was an avid gardener, hiker and needlepoint artist. When her brother died she remembered him with a Garden bench that she would often visit. Thanks to her family, she too, now has a Garden bench dedicated in her honor on the Oak Knoll amongst her beloved California natives.

The following volunteers have reached milestones of service in five-year increments:

Five Years

Lauren Ritter
Lynn Winter
Anne Packer
Jan King
Ruth Ann Pearsons
Fran Costa
Wendy Draper
Shela Ray
Kenneth Mohler

Ten Years

Elizabeth Medwadowski
James Merrill
Eugenia Ng
Hildegard Paxson
Ellen Peterson
Eleanor Stark
Pennie Warren
Patricia Wolf
Julie Dobson

Janean Jaklevic

Eleanor Jardine
Linda Govan
Lee Hafter
Mary McCarthy

Fifteen Years

Liz Jewell
Kay Riddell
Elizabeth Waterman

Twenty Years

Dick Emory
Joan Minton
Pete Shell
Nancy Swearingen

Twenty-Five Years

Kate Heckman

Thirty Years

Margaret Mitchell

EDUCATION

The Education Program staff and volunteers continue to make progress on many fronts— interpretative signage; visitor tours of the Garden; programs and tours for children; teacher, student and parent programs out in partner schools, and evaluation of our programs.

A major recent accomplishment for volunteers and staff alike resulted in the publication of *Waterwise Gardening Tour*, the beautiful self-guided tour book that grew out of the Garden's award-winning exhibit at the 2000 San Francisco Flower and Garden Show. An attractive logo trail for the tour has been set out in the Garden and books are available in the Garden Shop. This exciting new Garden publication is featured in a following article.

New interpretive projects are underway. Thanks to the generosity of Garden members Laverne and Doug Leach, new interpretive signage for the extraordinary Arid House collection is nearing completion. The committee developing the signs consists of staff **Bill Barany**, **Chris Carmichael**, **Holly Forbes**, and **Jenny White** and volunteers **Holly Hartley**, **Christina Lederer**, **Cynthia Plambeck** and **Sally Schroeder**. Content for this anticipated Garden interpretive project supports the needs of three pri-

mary audiences — the general public, docent-led tours and Biology 1B undergraduates.

As one enters the main display room of the Arid House, visitors are introduced to the collection and given an explanation of what is meant by arid regions around the world. Signs highlight arid regions from which our worldwide collection comes. Special signage tells the story of convergent evolution in succulents with reference to plants on display, while other signage uses the collection itself to illustrate plant adaptations to arid environments. Along the public aisle on the south side of the house, six dioramas feature special stories and plants from our fabulous and diverse cacti and succulent collection, while additional signage answers your questions about how and under what conditions the collection is maintained.

The committee tested the prototype signs with the public, volunteers and staff in early February. During this important formative evaluation phase, our target audiences had an opportunity to review the text and illustrations. All the comments have been used to create the final version of the signs, which are now in production. The signs will be installed in the Arid House during the spring.

PROGRESS

Visitor tours of the Garden;
programs and tours for children;
teacher, student and parent
programs out in partner schools,
and evaluation of our programs.



Photo by J. White

Bringing together multiple talents from our Garden community, ideas for Arid House signage are shared by horticulturist Bill Barany and docent Sally Schroeder.



Photo by J. White

Chris Carmichael, Holly Hartley, and Cynthia Plambeck discuss options for placement of new signage in the Arid House to best interpret this unique collection for visitors.

Looking at the other end of the environment spectrum, interpretive efforts also in progress include a new self-guided tour of the Tropical House, written by volunteer **Maureen Appel**. Volunteer **Barbara Lyss** is reviewing text and pulling together the final elements on an introductory sign to the Tropical House begun by John F. Kennedy University museum studies student **Elijah Mermin**. Garden visitors will be able to enjoy these “new eyes” into our tropical collection this spring.

Docent training, which began last September, graduated 10 new docents in February. Through our docents' excellent tours, they give a face to the Garden for thousands of student and adult visitors each year.

In addition to in-Garden educational activities, staff have been incredibly busy supporting our more than 60 teachers in 17 schools across five East Bay school districts who are participating in our new National Science Foundation grant project, “Growing Learning Communities.” This project is a collaborative effort with **Katharine Barrett** and her staff (**Mary Connolly and Peggy Storrs**) at the Lawrence Hall of Science. This project will use the teacher professional development process of “Lesson Study” to effectively teach mathematics, science and language arts in school gardens. “Lesson Study” in the United States has been inspired by the reflective use of research lessons practiced by Japanese teachers. The process has been extraordinarily successful in getting teachers to work together and to break down the isolation that is so characteristic of American educational systems. Teachers involved in “Lesson Study” develop effective collegial collaborations that allow them to reflect on their larger educational goals for their students while developing and



Photo by D. Wellhausen

Visiting each other's school gardens, Growing Learning Communities teachers discover what's growing at Melrose Elementary School in Oakland.

observing research lessons taught by themselves or their colleagues.

Monthly sessions hosted by different schools give participants a chance to share progress and discoveries from their research lessons, as well as give staff opportunities to bring in experts and additional resources. One thrust this year is to include activities that integrate food portion size, the new food guidelines, and mathematics standards for teachers.

School gardens provide

the natural environment for discussion about kinds of foods and the importance of fruits and vegetables, and for giving children an opportunity to taste crops they have grown.

Such experiences are powerful influences in encouraging children to try and adopt new foods. At one of our partner schools in Hayward, after students had experienced jicama as part of our program, they began asking the Food Services staff to include it in the salad bar at lunchtime. The school's consumption of jicama increased over 300%! The academic year sessions also allow schools to show off their school gardens and share resources, strategies and activities that have helped them succeed.

These teachers joined 40 other teachers and volunteers from local school garden programs at our ninth annual School Garden Conference that was held on Saturday, March 12. The conference continues to be an avenue for sharing successes and best practices for transforming education through inclusion of school gardens. We have discovered that mathematics, nutrition and literacy are increasingly being taught through the aid of garden programs and teachers are finding that test scores are improving. Students' enthusiasm to learn, in general, also increases.

—Jennifer White

GARDEN NOTES

LIBRARY OPENING: The **Myrtle R. Wolf Botanical & Horticultural Library** was opened and dedicated on October 6, 2004, in the company of **Mrs. Wolf** and **Mrs. Marion Greene, Mrs. Gladys Eaton, Dr. & Mrs. William Bade**, and more friends. A delightful afternoon was spent among the new oak shelving and delicious repast. The library is available as a reference resource. Please contact the Entrance Kiosk for open hours.

CANARY ISLAND COLLECTION: Many plants from the Canary Islands thrive in our Bay Area climate, and indeed feature prominently in local horticultural displays. With affinities to both the Mediterranean and African floras, for years we grew these plants with our African collection.

With our greater emphasis on the plants of southern Africa, we recently moved this collection to series of beds in the Mediterranean Area. Located at the very top of the section in the area around the water tanks, we look forward to seeing this collection flourish in this sun-drenched location.

DOUGLAS FIR REMOVAL: Related to the item just mentioned, we recently removed some Douglas firs (*Pseudotsuga menziesii*) in the area surrounding the water tanks. These trees have for years shed large branches in even the smallest wind storms, making them a particular hazard for visitors and for gardeners working in the area. Removal of this planted California native has allowed us to expand our Mediterranean holdings, and has provided more room for our recently moved Canary Island collection.

In addition there are now clear views of native north coast scrub in the hills above the Garden, evoking the feel of the Mediterranean maquis, the ecological analog of our chaparral.

NEW PATHS IN SEVERAL AREAS: Several garden sections have seen the addition of new paths over the past several seasons. Installation of switch-back trails in the chaparral section at the far end of the Californian Area provides much better access to this interesting part of the collection. Ongoing work in Australasia and Eastern North America



Photo by J. Williams

Congratulations to Garden Propagator John Domzalski, who celebrated 30 years of university service in 2004.

will result in smaller, more easily accessed beds, providing a new perspective on these collections.

GARDEN CO-HOSTING MEETING: The Garden is one of several Bay Area public gardens that will be co-hosting the annual meeting in June 2006 of the **American Association of Botanical Gardens and Arboreta**, along with the San Francisco Botanical Garden at Strybing Arboretum, the San Francisco Conservatory of Flowers, Filoli Center, and the University of California Santa Cruz Arboretum. Held at the Hyatt Regency San Francisco, the meetings will feature

visits to all host gardens. We look forward to welcoming our friends and colleagues to the Garden!

FLOWER SHOW: The Garden is again participating in the **Wildflower Show** at the Oakland Museum, also co-sponsored by the California Native Plant Society, the Jepson Herbarium, and San Francisco Botanical Garden at Strybing Arboretum. This year the show will feature plants from the California deserts on April 16th and 17th.

GRADUATE STUDENT RESEARCH: **Anna Larsen** has returned during Spring 2005 semester to make permanent vouchers of the Garden collections, for deposit in the Jepson & UC Herbaria on campus. This work is funded as a graduate student research position by the Vice Chancellor for Research, **Dr. Beth Burnside**.

PLANT ECOLOGY CLASS: **Prof. Todd Dawson's** class on physiological plant ecology is once again using the Garden's collection to learn course concepts and how to operate sophisticated equipment to measure water uptake and other physiological processes in Garden plants.

NEW STAFF: **Ms. Tracy Cockrell** is our latest addition to the Education Program. Tracy is in charge of the Crops of the World Garden. We reluctantly bade farewell to Education Program Assistant **Dana Wellhausen**. She accepted another position closer to home.

Spring Plant Sale!

Expansive offerings from the Garden

Members' Preview Sale
Friday, April 29th, 2005
5 pm to 7:30 pm

Public Sale
Saturday, April 30th, 2005
9 am to 2 pm

The annual spring Plant Sale will feature expansive offerings from the Garden's collections.

One of the many highlights of this year's sale will be four spectacular species of *Beschorneria* including: *B. wrightii*, *B. yuccoides* ssp. *yuccoides*, *B. rigida* and *B. albiflora*.

You will also discover hard-to-find orange-flowered passionflower (*Passiflora parritae*) and a climbing *Dicentra scandens* with yellow flowers. We will continue to feature a large selection of rare and unusual Chilean bellflower (*Lapageria rosea*) vines from Chile.

The Member's Preview Sale will include food and wine; there will also be a Silent Auction of rare plants from 5–6:30 pm. We are putting together a choice group of rare and unusual plants for the Silent Auction that are guaranteed to elicit active bidding.

We will feature numerous selections from the Garden's Central and South American collections, including a stunning *Acalypha* species, *Eryngium alternatum* and a truly unusual *Baccharis*. We will also feature unusual trees and shrubs: anchor plant (*Colletia paradoxa*), *Isoplexis canariensis* and *Illicium mexicanum*. For those who love grasses, look for sea oats (*Chasmanthium latifolium*) and *Stipa ramosissima*.



Photo by B. Lys

One of the four spectacular *Beschorneria* species available at the plant sale.



Photo by J. Williams

Flowering *Lapageria rosea* (Chilean bellflower)

You will also find several plants featured in the Garden's newly published *Waterwise Gardening Tour*, including: *Libertia peregrinans*, sea-daffodil (*Pancratium maritimum*), *Eryngium venustum*, *Phlomis russeliana* and *Justicia fulvicoma*.

You will also find a significantly expanded selection of California natives and a new section of hardy ferns from the Garden's collections. Also, look for extraordinary South African bulbs: blue squill (*Scilla natalensis*) and Josephine's lily (*Brunsvigia josephinae*). As always, there will be a great selection of cactus and succulents, carnivorous plants and orchids.

You can find a more complete list of plants to be offered at the sale, on the Garden's web site, <http://botanicalgarden.berkeley.edu>.

THE DOCTOR SAYS

■ Dahlia species are being shown for the first time at the Royal Horticultural Society Garden at Wisley, to celebrate the 200th anniversary of the garden *Dahlia*. Nineteen of the 35 known species are being grown, including one which was discovered only last year (*Dahlia hjertingii*). All are native to Mexico and Central America. In addition to having flowers with a diverse color range, some have highly ornamental foliage. *The Garden* 129(12): 759.

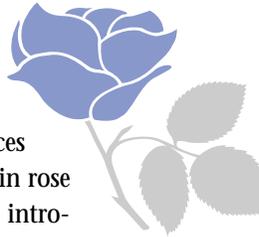
■ Researchers in Japan and Australia have developed a blue rose. This same group developed the first blue carnation, 'Moondust', in 1995. The gene that produces the blue pigment delphinidin is not found in rose plants, so it was extracted from pansies and introduced into roses. It is admitted that more work is necessary before roses will be created with sky blue flowers. The creators also admit that they are only halfway there for their rose to be recognized by everyone as blue. *The Garden* 129(9): 671.

■ Sandalwood forests are spread over three states in India. Under existing laws, the trees are state property and no one has rights over them whether they are on state or private

property. The legislative assembly in the state of Karnataka recently passed legislation to deregulate the sandalwood business. This was done to reduce smuggling and to curb the takes of Veeappans (a group of suspected outlaws) and to save the trees from extinction. *Down to Earth* Vol. 10(8): 5.

■ North Americans use more pesticides on their lawns than on their farms. In addition to their adverse effects, most have a bad odor. In Ontario, a Master-Aid Odor Concentrate has been introduced which comes in "bubble gum" and "cherry". No mention was made of concern about the attractiveness of these odors to children. *Earth Island Journal* 16(1): 13.

■ In New York, researchers found that certain wild species of tomatoes are not bothered by insects and that this is due to a complex waxy substance that commercial cultivars do not have. A patent has been applied for a simplified formulation of the chemical from the wild species. When sprayed on tomatoes, damage from the tomato fruit worm and from the beet army worm are greatly reduced. It is expected that the material will protect crops against mites, beetles, leaf miners, flies, whiteflies, aphids, leafhoppers, mealy bugs, worms, and thrips. *Cornell Focus* 7(1): 3.



RESEARCH ON BUTTERFLIES AND GARDENS

The Garden is a rich research resource for more than studies of individual species. Many undergraduates have used the Garden as a study site for class projects in animal behavior, such as territoriality among western fence lizards and defense of nectar sources among hummingbirds.

A recent twist on this use of the "garden as habitat" was a study by then graduate student Jacqueline M. Levy of San Francisco State University. Her project included garden-grown populations of the California pipevine (*Aristolochia californica*) and com-



Photo by J. Williams

California pipevine (*Aristolochia californica*)

pared them with naturally-occurring populations of the pipevine in terms of supporting populations of the pipevine swallowtail butterfly. She explains the basis of her study thusly, "People have known for centuries that adult butterflies will visit gardens to feed on the nectar of flowers. What remains unknown is if gardens can provide all the necessary resources for butterflies to complete development from egg to adult. The California pipevine (*Aristolochia californica*) is the larval host plant for the pipevine swallowtail butterfly (*Battus philenor*). This planting (the large planting in Bed 10 of the Californian Area), along with others in gardens throughout the Bay Area, was part of study to determine what is necessary for butterflies to thrive in a garden." We are pleased to report that her findings were published with her co-author, Edward F. Connor, in the *Journal of Insect Conservation*, Vol. 8, pp. 323-330, in 2004, titled "Are gardens effective butterfly conservation? A case study with the pipevine swallowtail, *Battus philenor*."

A Guided Tour

In our densely populated urban area, we on the one hand are constantly encouraged to conserve water yet we desire to have our gardens beautiful and interesting year-round. What to do?

You are invited to come to the Garden and discover fascinating, beautiful plants in our scientific collection that are water efficient for our Coastal California Mediterranean climate, and which can provide color, beauty, structure and interests to our gardens throughout the year.

The stunning, full-color, 72-page *Waterwise Gardening Tour* book features 107 plants from around the world. This interpretative tour and accompanying self-guided book germinated in and grew out of the award-winning display that the Garden created for the 2000 San Francisco Flower Show. The interest generated in the Garden's collection

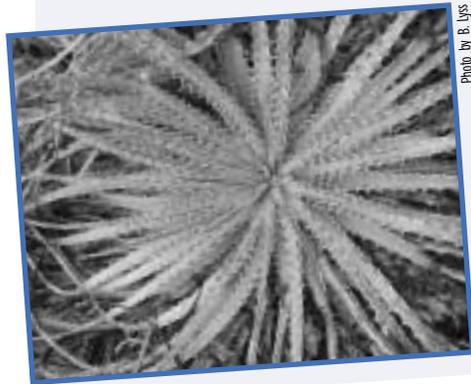


Photo by B. Lyss

Hechtia texensis in the New World Desert.

and in water-efficient plants encouraged the Garden to develop a new self-guided tour featuring such plants.

This publication is the Garden's first-ever full-color book that features almost every part of the Garden. Reminiscent of Cecil B. DeMille's "cast of thousands" this project included the talents and expertise of most Garden staff and many volunteers. Spearheading this effort for the Garden were staff **Janet Williams, Chris Carmichael and Jennifer White.** **Barbara Lyss** embodied the volunteers' enthusiasm, energy and commitment to the project. Assisting Barbara in writing the plant text were volunteers **Alison Mills and Kathy Welch.** Horticulturists participated in every phase of the effort—creating lists of plants, providing horticulture expertise, reviewing text, assessing and cultivating plants, and reviewing photos. Horticulture staff involved included **Bill Barany, Colin Baxter, David Brunner, Chris Carmichael, Daria Curtis, John Domzalski, Judith Finn, Anthony Garza, Peter Klement,**

Bridget Lamp, Larry Lee, Jerry Parsons, Roger Raiche, Eric Schultz, Elaine Sedlack and Nathan Smith. Curator **Holly Forbes** and Curatorial Assistant **Barbara Keller** provided the critical eye from their realm. Volunteers **Elly Bade and Jan Vargo** produced the bibliography and resource lists. **Barbara Lyss'** hours behind the lens has paid off beautifully in the resulting photographs. **Liz Bade** volunteered her time to edit the final text. East Bay MUD staff **Chris Finch, Susan Handjian** and **Scott Sommerfield** advised on the project.



Photo by B. Lyss

Garrya elliptica 'James Roof' in front of the Annex.

Designed by **Kajun Design** of San Francisco, the printing of this beautiful book is made possible through the generosity of **Park Water Company** and **Antelope Valley Ranchos Water Company** in Southern California. East Bay MUD is producing signs that will identify each stop on the tour.

Books are available in the Garden Shop for \$5.95 and members can pick up a one dollar discount coupon at the Garden's Entrance Kiosk. They are sure to become favorite remembrances for visitors.

CALENDAR OF EVENTS

SICK PLANT CLINIC

First Saturday of every month, 9 am to 12 pm.

Free. No reservations required.

A CHILD'S CONTAINER GARDEN: FAMILY WORKSHOP

Sunday, April 17, 2 - 3:30 pm

With the Garden's Christine Manoux and Lauri Twitchell, begin a love of plants early with this succulent container gardening workshop for the whole family.

Registration required. Space is limited.

\$18, \$14 members for one parent & one child.

Additional child or adult per family, \$7.

WATERWISE WORKSHOP — GARDENING WHERE YOU ARE

Saturday, April 23, 2005, 10 am to 1 pm

EBMUD and Garden workshop with Kate Frey, Garden and Landscape Manager for Fetzer Vineyard's Valley Oaks Garden and winner of the Silver Gilt medal for organic garden design at the 2003 Chelsea Garden Show. Presentation will highlight key principles of biodiversity, healthy soil and plant selection. Workshop includes the Garden's new Waterwise Tour.

Free. Registration required. Space is limited.

SPRING PLANT SALE

Members' Sale: Friday, April 29, 5 - 7:30 pm.

Public Sale: Saturday, April 30, 9 am - 2 pm.

WALKING TOUR OF THE GARDEN OF OLD ROSES

Saturday, May 7, 1 - 3 pm

Join the Garden's Horticulturist for the Garden of Old Roses, Peter Klement, to see the peak of the rose bloom and learn about the history of the collection.

\$12, \$8 members. Registration required. Space is limited.

Save the Date!

PASSPORT TO THE SUMMER GARDEN
ANNUAL GARDEN PARTY FUND-RAISER

Saturday, June 11, 2005

3:00 to 6:00 p.m.

Featuring exotic food, wine, music and
plants from around the world!

Silent auction & raffle

\$40, \$35 members; \$45 at the door.

10% discounts on bulk tickets of 10 or more.

Invitations will be mailed April 15, 2005.

Call 510-643-2755 to reserve your tickets.

GARDEN PARTY 2005

UNSELT LECTURE: THE BRAIN ON PLANTS

Sunday, May 8, 2 - 4 pm

Explore some of the medicinal powerhouses of the plant world and the brain chemistry behind the buzz with Dr. David Presti, neuroscience instructor in the Department of Molecular and Cell Biology, UC Berkeley.

Free. Registration required. Space is limited.

UNSELT BIRDING BREAKFAST AND SPRING BIRD WALK

Saturday, May 14, 8 - 11 am FULL

BAY FRIENDLY GARDENING DESIGN WORKSHOP

Saturday, May 21, 10 am - 1 pm

Get help designing a Bay Friendly garden from a local landscape designer! Recommended prerequisite. Register at Stopwaste.org.

Free. Registration required. Space is limited.

Call 510-643-2755 for more information or to register. Reservations are required for all programs and events, except the Sick Plant Clinic and Plant Sales. Parking is available in the UC lot across Centennial from the Garden Entrance at \$1 per hour. Program fees include Garden admission. Register early, class space is limited. Cancellations received at least two weeks prior to program date are subject to a \$10 service fee. Program fees of \$10 or less and cancellations received less than two weeks prior to the program are non-refundable. Program fees will be refunded if the Garden cancels the program.

All the Garden Has to Offer *Rental of Garden Facilities*

Whatever the occasion for the joyous gathering of family and friends, we urge you to consider the Garden as the location to hold that special event.

During construction projects at the Garden, the Conference Center is definitely available for rental. The new entrance project is slated for completion this spring. Every effort will be made to accommodate renters and members are assured that the Garden continues to appreciate their renting the facilities.

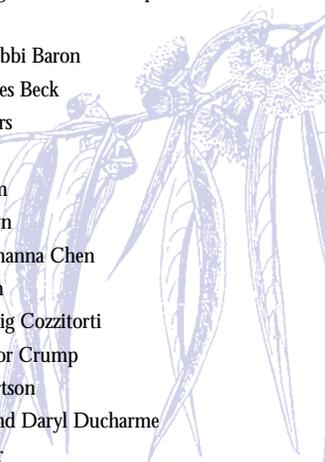
Information about the rental facilities is available on the Garden web site <http://botanicalgarden.berkeley.edu> or call Rentals Coordinator Margie Richardson at (510) 642-3352.



Enjoying their wedding ceremony on the Terrace are Pulla Kaothien and Hideki Nakayama who were married in May 2004.

NEW MEMBERS

August 3, 2004 to January 15, 2005



Ms. Regina Acebo
Denise and Tim Aedan
Mr. Mark Aikele
Elizabeth Alexandro and J. Flather
Ms. Francesca Archer
Ms. Deirdre Arima
Keira Armstrong and Steve Thompson
Mr. John Artim
Marvin and Bobbi Baron
Marcia and James Beck
Mrs. Marie Behrs
Ms. Kate Benn
Dr. Shelley Blam
Mr. Justin Brown
Charles and Jomanna Chen
Ms. Susan Chen
Kirsten and Craig Cozzitorti
Nick and Eleanor Crump
Mr. Tim Culbertson
Casper Curto and Daryl Ducharme
Mr. Evan Dellor
Theodore and Mary Fainstat
Mrs. Marjorie Freedman
John and Laura Furstenthal
J. Ruth Gendler and Richard Stangl
Ms. Tracey Goldberg
Mr. Michael Goloff
Ms. Marsha Goodman
Lawrence and Thea Gray
Dina and Adrian Halme
Jane Hammond and John Skonberg
Eleanor and Mark Hawkins
Annette and Harlan Hays
Richard and Beatrice Heggie
Catherine Heike and Claire Wing
Angela and Mathew Henshall
Kern and Arlene Hildebrand
Ms. Jean Marie Hill
Mr. Carlos Ibarra
Mr. John Igo
Francesco and Tasha Isolani
Ms. Carole Johnson
Marty and Joseph Kaiser
Mr. Eeloko Kanamee
Andreas Keiling and
Beverly Smith-Keiling
Ms. Laura Kennedy
Karen Klier and James Leventhal
Mr. Karl Krause
Dietmar Krauss-Varban and
Mathilda Varban
Julia and Greg Kurtzer
Mark and Katie Lederer
David Lerman and Carmen Domingo
Mrs. Susan Linn
William and Deborah Lloyd
Dr. Mary Loomis
Mr. Kevin Luo
Merry Luskin and Meredith Florian
Ms. Katherine Mackey
Paul and Violeta Maddox
Ms. Kelly McCoy
Joye and Chuck McCoy
Mr. Aerin M Moore
Ms. Kathleen Murphy
Ms. Helen Newman
Mrs. Ann Nichols
Ms. Linda Noel
Chuck and Jim Peet
Ms. Nicole Piver
Dr. David Presti
Dr. Beatriz Quiñones
Mr. Andreas Reik
Ms. Tola Rissman
Mr. Dan Rodrigo
Mr. Joseph Rogers
Christine and Ken Rosen
M. Toni Ross
Nancy and Alan Saldich
Ms. Jacqueline Sanden
Susan and Martin Scolnick
Uthara Srinivasan and John Heck
Bill and Donna Stanton
Ms. Alison Steele
Ms. Sandy Steinman
Ms. Rigel Stuhmiller
Dr. Athanasios Theologis
Ron and Dorothy Thomas
Ms. Lili Tom
Mr. Mukta Tripathi
Margie and Jeff Tyre
Mr. Peter Veilleux
Ms. Inez Villasañe - Leon
Mr. Kenneth Walker
Ms. Victoria Weatherbee
Mr. Joseph White
Mrs. Barbara Whitridge
Ms. Verna Winters
Emily Wright and Kirstin Miller

GARDEN STAFF

Dr. Paul Licht, *Director*

ADMINISTRATION

Perry Hall, *Tour & Program Coordinator*
Rose Katsus, *Management Services Officer*
Afrooz Navid, *Administrative Assistant*
Margaret Richardson, *Rental Coordinator*
Michael Rimar, *Membership Coordinator*
Candice Schott, *Volunteer Coordinator*
Janet Williams, *Marketing & Development Officer*

COLLECTIONS & HORTICULTURE

Dr. Christopher Carmichael,
Associate Director of Collections and Horticulture
Holly Forbes, *Curator*
Barbara Keller, *Curatorial Assistant*
Anthony Garza,
Supervisor of Horticulture and Grounds
Bill Barany, *Horticulturist*
Colin Baxter, *Horticulturist*
John Domzalski, *Propagator*
Judith Finn, *Horticulturist*
Peter Klement, *Horticulturist*
Jerry Parsons, *Horticulturist*
Dr. Robert Raabe, *Garden Pathologist*
Eric Schulz, *Horticulturist*
Elaine Sedlack, *Horticulturist*
Nathan Smith, *Horticulturist*
Gemme Von Knopka, *Horticulturist*
Gerald Ford, *Building and Grounds Maintenance*
Alan Porter,
Volunteer Propagation Program Coordinator

EDUCATION

Dr. Jennifer White,
Associate Director for Education & Programs
Elizabeth Baker, *Lesson Study Specialist*
Tracey Cockrell, *Administrative Assistant*
Lauri Twitchell, *School Garden Specialist*
Christine Manoux, *Program Assistant*

FACULTY ADVISORY COMMITTEE

Dr. Lewis Feldman, *Chair, Plant Biology*
Dr. Bruce Baldwin, *Integrative Biology*
Dr. W. Zacheus Cande, *Molecular and Cell Biology*
Dr. Todd Dawson, *Integrative Biology*
Dr. Mary Firestone, *Environmental Science,
Policy, & Management*
Dr. Alan R. Smith, *Herbarium*
Dr. John Taylor, *Plant and Microbial Biology*

NEWSLETTER

Holly Forbes, *Editor*

Administration	642-0849
Development	643-2937
Director's Office	643-8999
Education	495-2805
Entrance Kiosk	643-2755
The Garden Shop	642-3343
Plant Collections	643-8040
Programs & Tours	643-7265
Rentals	642-3352
Volunteers	643-1924
Fax	642-5045

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Save the Date!

PASSPORT TO THE SUMMER GARDEN
ANNUAL GARDEN PARTY FUND-RAISER



Saturday, June 11, 2005 3:00 to 6:00 p.m.

FEATURING EXOTIC FOOD, MUSIC, WINE,
AND PLANTS FROM AROUND THE WORLD!
SILENT AUCTION 🌿 RAFFLE

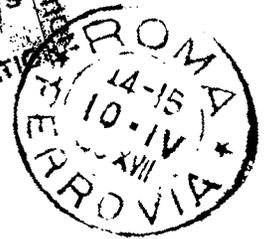
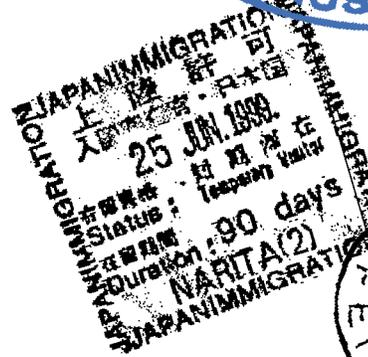
JOIN US WITH YOUR FRIENDS AND FAMILY TO HELP US...

- 🌿 Continue to maintain the Garden's vast collection
- 🌿 Promote our educational mission
- 🌿 Conserve plants for future generations

\$40 and \$35 for members
\$45 at the door

10% discounts on bulk tickets of ten or more.

Invitations will be mailed April 15, 2005.
Call 510-643-2755 to reserve your tickets.



🌿 GARDEN PARTY 2005 🌿

GARDEN HOURS: The Garden is open from 9 am – 5 pm year round. Closed first Tuesday of each month.
The Garden Shop is open 10:30 am to 4:30 pm daily.

University of California Botanical Garden
200 Centennial Drive, #5045
Berkeley, California 94720-5045

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Public Tours are offered at 1:30 pm each Thursday, Saturday and Sunday. Call (510) 643-2755