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Horsetails and Whisk Ferns Re-examined

When a “fern ally” is really a fern

It is an exciting time to be an evolutionary biologist, because we now have the tools and techniques to be able to piece together the tree-of-life. Not only has the human genome been sequenced, but the genomes of many organisms, representing different branches in the evolutionary tree, have now been determined and compared. This avenue of research will eventually lead to improved understanding of developmental patterns in plants and how traditional morphological characters have evolved, re-evolved, and sometimes disappeared. In addition, these evolutionary trees, although only a best estimate (hypothesis) of actual evolutionary events, will help us to interpret better the sometimes meager fossil evidence, and then to produce a time line for estimating when certain lineages arose or went extinct.

Most of the 450-million year history of plants on land belongs to the bryophytes (mosses, liverworts, and hornworts), pteridophytes (ferns and fern allies), and gymnosperms (conifers). The flowering plants (angiosperms) are relative newcomers on the scene and came into ecological dominance about 90 million years ago. For over a century



Photo by J. Williams

Horsetails (Equisetum telmateia var. braunii) is prolific in the Garden, especially near Strawberry Creek and the Conference Center.

botanists have tried to understand the relationships among these four major groups of plants. In the past, pteridophytes have often been considered a transitional evolutionary grade leading to the so-called “higher” plants, those producing flowers and seeds, or naked seeds. A consequence of this traditional view is that many aspects of seed plants are commonly regarded as having been derived from fern ancestors. Recent work reported by my colleagues and me shows that the familiar plant organs and development we normally associate with seed plants can not be derived from ferns. This should ultimately lead to a re-interpretation of the

development of structures like leaves and branching patterns in the two groups.

Until recently, *Equisetum*, the genus of the horsetails, and *Psilotum*, the genus of whisk ferns, were considered separate and isolated lineages of plants, dating back into the Paleozoic era. This made intuitive sense because both genera appear to be very different from other vascular plants (tracheophytes),

(continued on page 2)

FERNS *(continued from page 1)*

“simple” in construction and growth and lacking true leaves. Horsetails and whisk ferns were considered “fern-allies,” primitive vascular land plants having well-differentiated special tissues (xylem and phloem) for transporting water and food. Together, the ferns and so-called fern-allies were considered to be “pteridophytes”—organisms having vascular tissue that reproduce by spores and having somewhat independent life-cycle phases, a very small gametophytic phase and a generally much larger sporophytic phase. Pteridophytes were thought to be among the “lower” branches of the genealogical tree, just above the bryophytic lineages (mosses, liverworts, and hornworts) in the land plant tree-of-life. But the exact inter-relationships of these early branches have remained enigmatic, until very recently.

There is new evidence that the horsetails (*Equisetum*) have closer affinities to ferns. The evidence suggests that *Equisetum* and ferns are also sister groups, lineages that diverged from each other early in their history, probably about 350 million years ago. Moreover, these two lineages together form the sister group to all seed plants, both flowering plants and gymnosperms (conifers, cycads, and relatives). Ferns and horsetails make up one genetically related group, which evolved in parallel to all seed-producing plants. Ninety-nine percent of vascular plants living on the earth today fall into these two major lineages, having separate evolutionary histories dating back nearly 400 million years. A third lineage of tracheophytes, the remaining 1%, is the lycophytes — *Lycopodium*, *Selaginella*, and *Isoetes* — and this group is now known to be the sister group to both the ferns (including *Equisetum* and *Pilotum*) and seed plants.

Our most recent research on the relationships of land plants is based on a combination of morphological characters and DNA sequence data from 35 carefully chosen species, representing all of the main groups of land plants—bryophytes, pteridophytes, and seed plants. In this study, DNA sequences, involving a total of over 5000 nucleotide base pairs (the units making up genes and, ultimately, DNA strands) were obtained from all 35 species. Four genes were

chosen for study because of their slowly evolving nature and their function in key biosynthetic and developmental processes. For example, one of the chloroplast genes chosen, a gene called *rbcl*, codes for a protein that helps plants use carbon dioxide to make sugar during photosynthesis. In addition, we scored 136 characters from traditional morphology, characters that relate to all parts of the plant body and all stages of the life cycle. Because the mode of inheritance of most of these morphological characters is believed to

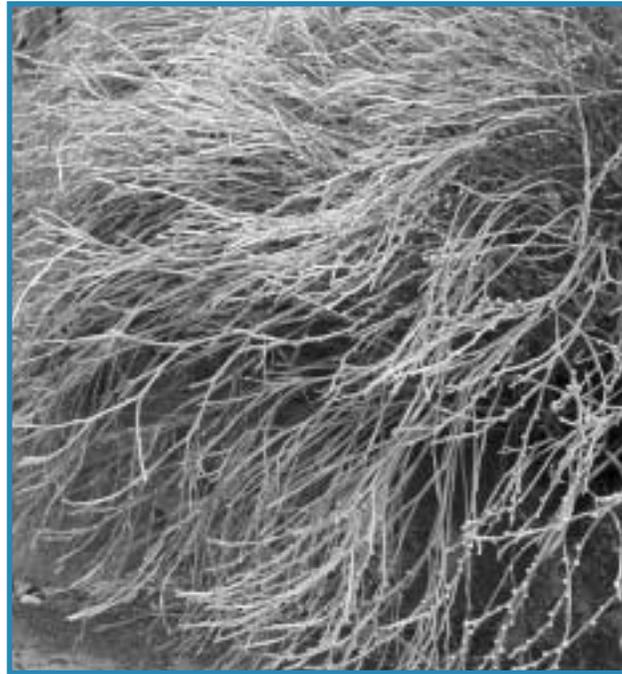


Photo by J. Williams

Whisk fern (*Pilotum nudum*) makes a show in the Tropical House.

be complex and the characters and character states themselves are controlled by many genes, it was hoped that data based on morphology might augment the results obtained from the DNA sequence data. This approach of integrating both morphological and molecular data to hypothesize relationships was first attempted in ferns by my colleagues and me in 1995. In that study, the combining of independently derived data sets resulted in evolutionary trees that were more robust (having greater statistical support) than trees produced using single data sets.

We continue our efforts to understand the relationships of all spore-bearing vascular plants. We are attempting to unravel the

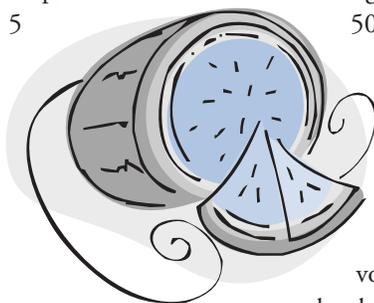
relationships of living horsetails (*Equisetum*), a genus inhabiting north-temperate regions. In addition to being morphologically fascinating, horsetails have an extensive fossil record. A comparison of nucleotide sequences from all 15 species has produced a tree that supports the traditional separation into two main subgenera, *Equisetum* and *Hippochaete*. This same tree also shows, somewhat surprisingly, that the basal-most member of the tree is one of the few tropical species in the genus, the Andean *Equisetum bogotense*; this result conflicts with trees based on morphological analysis.

Researchers are now producing trees for many families of ferns, including the polypody family (Polypodiaceae), whose members include the familiar staghorn (*Platycerium*), licorice (*Polypodium*), and rabbit's foot (*Phlebodium*) ferns. When these are done, we shall have a much better idea of the closest relatives of living genera and families of ferns, why some lineages became dominant while others disappeared, and why certain morphological forms have evolved repeatedly.

—Alan Smith

THE DOCTOR SAYS

■ It recently has been shown that fresh watermelons are a good source of lycopene, an antioxidant that has a number of health benefits. Commonly reported in tomatoes, gram for gram, watermelon has about 4 times as much as tomatoes. However, processed tomatoes as ketchup, spaghetti sauce and tomato juice contain 5 grams per ounce as contrasted with one gram per ounce in watermelon. Canned tomatoes, tomato soup, tomato sauce, and vegetable juice contain 3 grams per ounce. *The California Tomato Grower* 46(2):3.



■ Recent warnings from the EPA have been released about the use of vermiculite. Any that is more than a decade old may be laced with asbestos. This is because prior to 1990, vermiculite came from a site near Libby, Montana, where a deposit of asbestos ran through the mine tainting much of the vermiculite. *Science News* 163(22):350. While this report had to do with the use of vermiculite as an insulation material, it should be noted that some gardeners use vermiculite in the preparation of potting mixes, seed beds, and other gardening functions. Though not a good material for such uses, this new information adds a very good reason for not using it.

■ In Florida, a researcher has developed a diet pill for mosquitoes that alters their digestion, making it impossible for them to feed, lay eggs or survive. It is environmentally safe. *Citrus and Vegetable Magazine* 62(6):54, 56.

■ Two new strains of trailing snapdragons soon will be available. "Sultan" will have 10 colors and "Crocodile" will have 8 colors. *Greenhouse Manager* 21(6):30-31.

■ A new deer repellent is reported to be better than other repellents. Unlike other repellents, it is a paste material in which porous paper tags are dipped. A tag is then hung on or near the plant to be protected. The material should not be in direct contact with the plants to be protected, only near them. In vegetable gardens, sticks can be dipped in the material and placed near the plants. Under normal rainfall conditions it will last two months or longer. It is reasonably priced and one quart will last an average garden for one whole season. It does not freeze and can be used in winter. DeerVik: <http://www.deervik.com>.

■ Orange juice formerly came as freshly squeezed or canned juice. In 1948, USDA and Florida researchers perfected a method to produce frozen concentrate. Today US consumption from frozen concentrate comes to more than 1.97 billion gallons a year. *Agricultural Research* (USDA-ARS) 50(12): 5.

■ In a Central American rain forest, a cinnamon tree was found that was unharmed by any of the many organisms that might attack it. Isolations from the plant resulted in finding a fungus, *Muscodor albus*, which lives in the plant and produces volatile materials that control fungi and bacteria. It also has been shown in a Montana laboratory that the materials control nematodes and some insects. It is hoped that this material may be a replacement for methyl bromide. A commercial company is working to get it cleared and into production. *Western Fruit Grower* 122(2): 14B

— Robert Raabe

Spring Bulb Bonanza

March 15 – April 15, 2004

The Garden will offer a special large collection of potted bulbs from around the world either blooming or ready to bloom this year, all at incredibly low prices, including multiple species or varieties of *Allium*, *Babiana*, *Brodiaea*, *Bulbocodium*, *Calochortus*, *Crocus*, *Dracunculus*, *Erythronium*, *Ferraria*, *Freesia*, *Fritillaria*, *Gladiolus*, *Hesperantha*, *Ipheion*, *Ixia*, *Ixiolirion*, *Leucocoryne*, *Melasmaerula*, *Muscari*, *Narcissus*, *Oxalis*, *Romulea*, *Sparaxis*, *Tritonia*, *Tulipa*, *Zigadenus* and others. These plants will be available daily while they last along with a large array of other unusual perennials and houseplants on the plant deck.



Visit our website <http://botanicalgarden.berkeley.edu>

DIRECTOR'S COLUMN

It was with some trepidation but anticipation that I watched the summer draw to a close. This will be my first winter/rainy season in the Garden as Director and while I know it will be very different from the past few months, I have no doubt that it will hold an equal set of adventures and pleasures. If nothing else, one can anticipate the excitement of watching for the new flush of growth, and, of course, there is little to equal the spectacular bloom that we enjoy in all sections of the Garden in late winter and spring. I am constantly reminded of the simple but eloquent reason a new member of the current docent training program listed as her reason for wanting to work in the Garden: “it’s a *magical place*”.

I began my duties by examining the staffing organization, space allocation and various infrastructural needs of the Garden. Some of these issues involved overdue or ‘stalled’ projects while others have led to new and I think exciting projects. I’d like to address and report progress on several of these.

With regard to staffing, our new Business Manager, Rose Katsus, evaluated and, in some cases, reassigned duties for several of the administrative staff; the curatorial and horticultural staff will continue in their traditional roles. Related to staffing, I’ve undertaken a major relocation of space that will open possibilities for completing other important projects; more on this shortly. I devoted a lot of time this past summer to familiarizing myself with the horticultural staff and their duties and have come to appreciate even more the quality of this talented and dedicated crew; their pride in their areas is contagious.

In this connection, I’d like to share some data that will help you appreciate the Garden in the larger world of plant collections with the aid of data recently compiled by the Royal Botanic Garden in Edinburgh. Briefly, this compilation clearly shows that the UC Botanical Garden represents one of the major plant collections in the world. Based on the diversity of our extensive living collection, we are among the top 15 gardens in the world and among the top 3-4 in the United States; none of the latter are associated with universities. Our collection is all the more special because it is largely based on materials of wild provenance. This is a message worthy of broadcast. This story may be hard to believe given the rather

deplorable appearance of the entrance, but I have plans to change this—read on. In the meantime, in my last *Newsletter* column, I reminded you that as a member supporting the Garden, you have ‘bragging rights’: Don’t be shy!

Several changes in space utilization are noteworthy. First, the availability of new office space in our Plant Conservation and Research Center (PCRC), across the road from the entrance, has opened up several new possibilities. The curatorial staff relocated to an office in this building and the conference room in this center will be used to establish the long overdue Myrtle R. Wolf Horticultural and Botanical Library. This library was announced a few years ago (Summer 2000 *Newsletter*) but several obstacles have prevented its realization. We will consolidate our extensive reference collection and

create an atmosphere conducive to studying and enjoying it.

With regard to the PCRC, I am happy to report that the construction of the new Jane Gray Research Greenhouse remains on schedule and we anticipate a mid-winter completion. It will represent a state of the art facility for the diverse botanical research on

campus. The Arid House has been fitted with large external fans to aid in temperature control, improving the functionality of this facility. Remember that we house one of the most diverse cactus and succulent collections in the world. Finally, the space reorganization has also allowed us to identify a new “Volunteer Center” in the Garden; this will be located in the trailer next to the Entrance Kiosk.

A number of other projects have been initiated. The first to be completed was the installation of a series of new traffic signs on Centennial Drive related to the Garden. The next time you visit, I am sure you will be aware of, and hopefully pleased to see, the large blue signs with white lettering alerting visitors to the approaching entrances to the Garden and parking lot. A consideration of parking and traffic allows me to segue into the most exciting event since the last *Newsletter*; namely, the Fall Plant Sale.

You may recall that the last Spring sale was the biggest ever and now I am happy to report that the recent Fall Sale was not only the largest fall sale ever, but it was almost equivalent to the main spring sale. Parking has always been a major obstacle to expanding such events, but I think we have

A PROGRESS REPORT

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solved the problem by employing continual shuttles to parking lots at the nearby Lawrence Hall of Science. A large and devoted crew of staff and volunteers worked together to create a truly exciting event, and the feedback from visitors was effusive. To quote one visitor “The whole event had a high conviviality factor, more like a party than a sale, but it didn’t seem to keep people from shopping”. We plan to make the next Spring sale in April even bigger and better; we have set our goals high.

Many of you may be unaware of an exciting “satellite” facility associated with the Garden. A bequest by William Stephen Allen, of Anshen and Allen Architects, left the Tanglewood Estate in Sausalito, CA, to the Garden in 1994. This residential property comprises 1.2 acres of garden with a 2800 sq. ft. home. The residence, built in 1873, is the second oldest home in Sausalito and is listed as an historic landmark. Sadly, the age of the residence and early funding limitations allowed it to deteriorate into a state of disrepair. I have initiated steps to renovate and restore the dwelling to its original state for occupancy as a single-family residence. Work will commence immediately and we look forward to an appropriate celebration event next year.

New Garden Entrance

So far, I have restrained my excitement with regard to the launch of the campaign to create a new Garden Entrance, because it should not displace all the other news. But I can resist no longer; it is the one subject that everyone associated with the Garden has enthusiastically, even vehemently, agreed upon. In another part of this *Newsletter*, I have reproduced the letter/case statement that you all should have received regarding our plan to complete a project that I know has been in everyone’s consciousness for a very long time; namely, to create an Entrance befitting the significance of our Garden. (We have had some difficulty with the mailings, so please contact us if you have not received this information). Many of you know that there have been several previous plans and attempts to do something about the Entrance and many of you may have even donated to these earlier attempts. Unfortunately, despite their very best intentions, they failed due to several problems, including design elements that failed to receive campus approval. I have taken steps to avoid both. First, the architectural plan was approached by seeking a design based on a well-defined and, I believe, affordable budget. Also, rather than waiting until after the fact, I have sought and obtained advance campus approval of the project by working closely with appropriate campus offices. We have the blessing of higher administration to proceed. By preparing a phased architectural plan starting with the installation of an attractive safer access to the Garden with separate gates for visitors and vehicles, we



Service and other vehicles now enter the Garden and maneuver in space shared with pedestrians of all ages.

can at least complete part of the project if full funding is not realized.

The timeline depends on your support, but I am confident that if the support for this project is proportional to the interest that I have heard expressed, we can together make this transformation in the appearance and functionality of the Garden happen soon. My goal, with your help, is to break ground in fall 2004 (after the busy summer visitor season). I hope you will ‘dig deep’ so we can complete the entire project. Imagine the celebration we can look forward to when we start and complete the new entrance!

—Paul Licht



Vehicles entering through our single gate create concerns for visitor safety.

THE NEW GARDEN ENTRANCE

Dear Friends of The Garden,

It is not just a matter of pride; it is a matter of necessity! Help us build everyone's dream: **A new Entrance to the Botanical Garden.** A safe and attractive entrance to the Garden will transform the currently uninviting chain link fence and asphalt lot. The new entrance will ensure the safety of visitors and staff while promoting the magnificent plant collection within the Garden. The old parking lot will be transformed into two attractive terraced patios with shaded seating and plantings. We have a realistic working plan and campus approval to proceed (see the exciting architectural schematics enclosed). Now your support can make a new entrance a reality. The project target is \$250,000 with a phased implementation approach, starting with new gates—all gifts will help to make the difference!

It is a matter of pride: You, who visit, support and love the Garden, will not be surprised to hear that recent data show that the UC Botanical Garden is ranked among the top four of all botanical gardens in the whole USA based on the diversity of our living collection. The Garden is a truly beautiful place, and as a veritable gene bank of species from their native habitats, the collection is an invaluable tool in the battle to conserve endangered plants. The new Garden entrance will reflect that prestigious ranking and the reality of the important conservation role it represents. It will also provide a wonderful space to expand our already prodigious education program with enhanced interpretation of the collection.

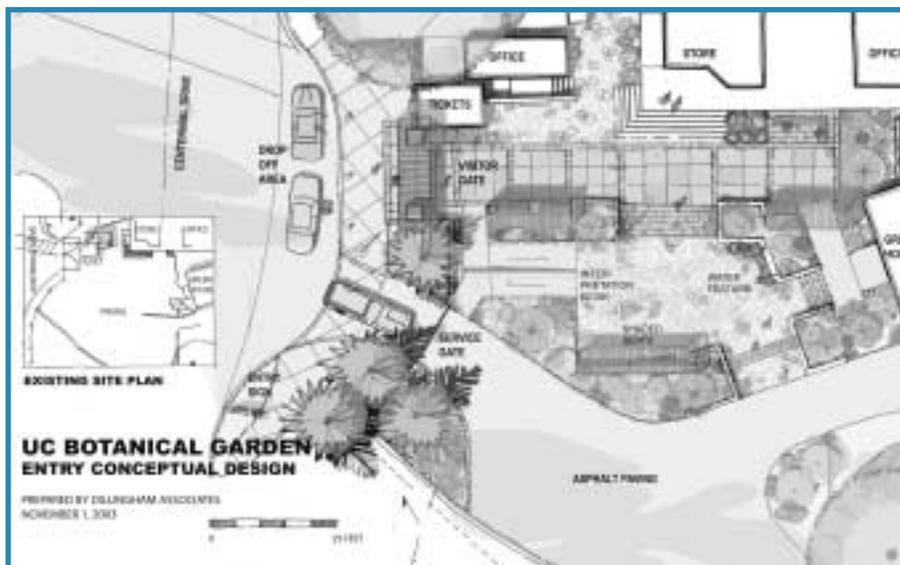
It really is a matter of necessity due to concerns for visitor safety: Service and other vehicles now enter the Garden at the gate and maneuver in space shared with pedestrians of all ages. There is no well-defined visitor or tour group loading area. The new Garden entrance with two distinct gates would separate the visitors from the vehicles and effectively solve this access problem.

It really is a matter of necessity in terms of economic planning for the future: With state support for universities radically and continually declining, it is essential that the Garden move forward to raise additional funds. The university provides only a portion of the Garden's base operating budget; visitors, educational programs, facility rentals and sales are critical to supporting the Garden. The Garden's ability to expand these uses and attract visitors and supporters is crucial in promoting revenue growth, but is hampered by the currently unappealing condition of the entry. The new Garden entrance will provide "curb-side appeal", visibility and an inviting appearance.

Quite simply: The Garden has long needed a new entrance and your help to build it is critical! As you will see on the remittance form in this packet I am urging you to please "dig deep" and contribute (or make a pledge) this year to the entrance project as well as the annual appeal to keep the Garden operating on a day-to-day basis. Please join us in accomplishing this exciting step forward: I believe that we will all take great pride in achieving this essential goal which will have a transforming effect on the Garden.

Sincerely,
Paul Licht

Support Us As We Create *The New Garden Entrance*



An attractive and safer entrance, welcoming the world to the Garden's magnificent collection!

ABOVE: *The current asphalt "parking lot" will be converted into several terraces of planting and shaded seating, including wheelchair access. An enhanced passenger drop-off area on the street will also be an important safety improvement.*

RIGHT: *The attractive new Entrance, anchored by striking granite pillars will be a solution to current safety problems, separating visitors and service vehicles. Visitors enter through the portal onto a paved terrace with plantings and shaded seating.*



*Mail your donation today!
Share this great news with your friends.*

Contact the Garden at 510-643-2937 for more information or visit our website to find links where you can make your donation online.

YOUR HELP TO BUILD THE NEW ENTRANCE IS CRITICAL!

EDUCATION

Collaboration is an integral feature of the Garden's Education outreach programs. Strong collaborations with teachers at diverse local elementary and middle schools enabled our program to develop exciting, relevant science and mathematics curricula that tie into school garden programs. Collaboration with Kathy Barrett and others at the Lawrence Hall of Science have strengthened and diversified our teacher training offerings as we support our local teachers. Collaborations with campus faculty and staff have enabled us to enrich our docent training classes as well as embark on joint public science research programs.

We recently began a collaboration (Plant Genomics Training and Education Program) with Dr. Barbara Baker and the Baker Lab's Potato Genome Project. Dr. Baker, an adjunct associate professor in the UC Berkeley Department of Plant and Microbial Biology and a Senior Scientist of the Agricultural Research Service of the US Department of Agriculture (USDA-ARS), is the head principal investigator on this National Science Foundation (NSF)-supported project. The Plant Genomics Training and Education Program promotes science education and environmental awareness through public exhibits, community biodiversity gardens, and summer training and education workshops using real-world application of the latest genomic technology. In addition to the Garden, partners in this collaboration include The Institute for Genomic Research (TIGR), UC Berkeley/USDA-ARS Plant Gene Expression Center, the UC Berkeley College of Natural

Resources and Department of Plant and Microbial Biology, El Cerrito High School, and the Yakama and Makah nations of the state of Washington.

The direct real-world applicability of the latest science and technology makes genomics an ideal field for an introduction to the exciting and important world of biotechnology. The Potato Genome Project hosted a summer workshop designed to provide under-represented high school and college students with the opportunity to conduct a unique

question-based genomics experiment with real world applicability.

The Garden component of this summer workshop provided stimulating science and technology experiences outside of the formal classroom environment. Two students from El Cerrito High School, Tara Jones and Tomas Santiago, learned the relevance and significance of bioinformatics and genomics

research projects, as well as how to communicate research results and biological information to community audiences. At the Garden, the students learned to identify the Solanaceae (potato family) and the genus *Solanum* (the common potato is *Solanum*

tuberosum) using morphological characters. Curator Holly Forbes gave Tara and Tomas a tour of the Garden, providing a worldwide view of the diversity of the potato family. Crops of the World Garden Manager Lauri Twitchell familiarized them with horticultural techniques such as transplanting, propagation, inter-cropping, and organic farming. They propagated a variety of wild and heirloom potatoes and

COLLABORATION

Strong collaborations with teachers at diverse local elementary and middle schools enabled our program to develop exciting, relevant science and mathematics curricula that tie into school garden programs.



Photo by M. Flanagan

Tara Jones and Tomas Santiago propagate heirloom, wild, and Ozette potatoes at the Garden with training from Garden staff Lauri Twitchell.

planted them in our Crops of the World Garden. Learning to plant and re-pot potatoes was a highlight for the students.

“I really enjoyed transplanting the small fragile potato and tomato plants into slightly larger containers. It helped me understand how the roots form as they take hold in the soil,” declared Tomas.

After receiving an introduction to creating signs for the Garden from Education Assistant

Christine Manoux, the students used our library and went online to research the unique qualities and cultural significance of these wild potatoes and their heirloom cultivars. One of these potatoes is the Ozette potato, which has been culturally significant to the Makah Indian nation in the state of Washington for 500 years. Unlike other potatoes whose origins can be traced to areas in South America, the origin of the Ozette and how it got to the Seattle area is unknown. Tara and Tomas then created interpretive signage that they installed in the Crops of the World Garden.

This thorough and comprehensive introduction to biodiversity, morphology of the Solanaceae, and real-world applications of genomic technology prepared students to train at The Institute for Genomic Research (TIGR) in Rockville, MD. TIGR’s “Genomics Boot Camp” taught Tara and Tomas about the future of genomics research, provided them with the opportunity to practice DNA extraction, and familiarized them with the latest genomic technology while they conducted a unique question-driven experiment. Students extracted DNA from seven wild potato species and screened selected potato for polymorphism with four primers. The students determined that the genetic material they were looking at, microsatellite sequences, can vary among species and can subsequently be used to prove diversity and explore evolutionary relationships among several species with genomic similarity. Ultimately it is hoped that this research can shed light on the origin of the Ozette potato.

Tara and Tomas returned to the Baker Lab to present experimental results in lab meetings. Thus, not only were Tara and Tomas able to learn about SSRs (Simple Sequence



Prof. Barbara Baker, Project Director Meghan Flanagan, Tara Jones, Tomas Santiago, Lauri Twitchell, and Dr. Jennifer White at the Chancellor’s University/Community Partnerships awards ceremony.

Repeat DNA makers) and their role in biodiversity and evolutionary studies, they were also able to educate scientists and researchers in the field.

“...after researching for the signs (for the Garden) and learning about the beneficial traits that different potato species had to offer to the *Solanum* gene pool, I began to realize the importance of biodiversity. However, the results from our experiment helped give me a better view of what biodiversi-

ty is all about. Looking at the different bands (microsatellites) gave me a different view of biodiversity, as it showed me what made the particular species so unique,” summarized Tomas.

Concluding their work, Tara and Tomas developed a poster about their research that was included as a permanent part of the potato booth in the Garden’s annual *Foods of the Americas Festival*. This useful addition to the current displays will help visitors better understand genetics, and how it has been used to alter foods throughout the history of human involvement.

In mid-September, Chancellor Robert Berdahl presented a University–Community Award to the Plant Genomics Training and Education Program and its collaborators to recognize their joint efforts to enhance the quality of life for area residents. Garden staff Jenny White, Christine Manoux, Lauri Twitchell, and Director Paul Licht were on hand to receive the joint award and to celebrate.

In a final outreach element of this year’s collaboration, the Baker, Brown and Helgeson labs provided the UC Botanical Garden with thirty-seven new *Solanum* species for inclusion and display in the Crops of the World Garden, as well as distribution to local elementary and community gardens. Park Elementary School in Hayward, and Oxford and Thousand Oaks Elementary Schools in Berkeley received a variety of Solanaceae species donated by the Center for Plant Genomics Training and Education. Plant biodiversity programs at these schools taught gardening, health and nutrition in addition to plant morphology.

— Jenny White

GARDEN NOTES

STAFF CHANGES IN THE LATTER HALF OF 2003... **Candice Schott** assumed the responsibilities of Volunteer Coordinator following the resignation of **Kim Kaso** in October. Horticulturist **Bridget Lamp** resigned in August to pursue opportunities in the Seattle area. Visitor Services Specialist **Crissy Bilyk** resigned in September to complete her teaching credential. We wish them all well in their new endeavors.

WE WELCOME THE FOLLOWING NEW STAFF...

Rose Katsus: Rose joined the Garden staff in July as our new MSO (Management Services Officer). She came to us directly from a position in the College of Chemistry here on campus, where she has worked for two years as a financial manager. Previously, she worked as office manager in an engineering firm and for about ten years as a manager at the UC San Francisco campus. Rose has assumed responsibilities for finance and budget and management for the office staff (with oversight of human relations, financial, kiosk, shop, rental and volunteer services). Rose brings a wealth of experience in both personnel and financial management and has a love of the out-of-doors, especially hiking; she already knows the Garden as a visitor.

Colin Baxter: Originally from New South Wales, Australia, Colin brings a broad range of experience to his position as Horticulturist in charge of the Mediterranean and Eastern North American collections. He possesses a Parks and Gardens Trade Certificate in horticulture from Charlestown Horticulture College, and has worked as a gardener in both the USA and Australia. He has worked in public parks and

gardens; his resume includes employment with the Wyong Shire Council, Wombarra Orchids, and the Diggers Club of St. Erth. He is familiar with Mediterranean flora from his work in Australia, where Mediterranean plants are widely used due to climatic similarities. In addition Colin received a visual arts degree from the University of Newcastle. His specialty is oil painting, with an emphasis on landscapes and birds. He also possesses a valid California Drivers License and drives on the correct side of the road.

Gemme Von Knopka: The Garden welcomes Gemme Von Knopka as Assistant Horticulturist in the California Area. In addition to her duties with Horticulturist Nathan Smith, she will begin to restore the Garden's Tanglewood Estate property in Sausalito. Prior to joining the staff, Gemme worked for California State Parks in Lake Tahoe, assisting with restoration projects, rare plant surveys, exotic plant eradication, and wildlife surveys. Her experience is varied and ranges from helping out on the Apple Farm in Philo to creating environmental education materials on California flora and fauna. Gemme gained her real "hands on experience" with California natives while in college at the University of California at Santa Cruz. During her senior year in 1999, she participated in a natural history field quarter which involved the development of plant identification skills using The Jepson Manual at University of California Natural Reserve System properties in four distinct ecological regions. Gemme is happy to be back with familiar plants and is looking forward to meeting their extended families and relatives. Her earliest memories of the UC Botanical Garden are of the New World Desert, which she, at the age of five, frequented with her mother's art class.



Rose Katsus.



Colin Baxter



Gemme Von Knopka

GARDEN NOTES *(continued from page 10)*

DEATH OF FORMER HORTICULTURIST... We are sorry to report that former Garden Horticulturist **Wayne Roderick** passed away in August at the age of 83. For those of you who did not have the pleasure of knowing him, Wayne was the California Area horticulturist from 1960–1976. He was a main instigator of the construction of the vernal pool, bulb beds, and the precursors to the Alpine Fell-field (the scree bed) and the Serpentine Plant Communities Display (serpentine bed). He left the Garden in 1976 to assume the director's position at the Regional Parks Botanic Garden (commonly referred to as the Tilden Botanic Garden) until his retirement from that position in 1982.

Wayne was well-known for his curmudgeonly but good-natured ways, and was active in all things horticultural, especially California natives and bulbs from all over the world. He frequently hosted international visitors and toured them around California to see special plants. During his retirement he remained a fixture at both gardens, participating at UCBG by providing materials for and/or teaching workshops on wreath-making during the holidays. An oral history of Wayne was done in 1990 for the California Horticulture Oral History series of The Bancroft Library. It is available for perusal on-site at the Garden.

GARDEN IMPROVEMENTS... There were been a number of facilities and landscape projects in the Garden in late 2003. We completed the **installation of new cooling fans** on the Arid House and **installed a small storage building** adjacent to the office. Upstream from the Japanese Pool, we **repaired the damage from the 1997 El Niño storm**; this entailed re-grading the slope and removing the checkdam, bringing the channel back into a more natural conformation. The **Jane Gray Research Greenhouse** is nearing completion (projected for February 2004).

A major **irrigation system upgrade** project will begin in March 2004, which may close the main road between the Garden Entrance and the Conference Center for approximately four weeks. This is phase one of a three-phase replacement of the main irrigation loop through the Garden, made possible through the campus' deferred maintenance program. Phases two and three will follow in April–June 2004; portions of other main roadways through the Garden will be subject to temporary closure. We regret the inconvenience this may cause to our visitors, but hope you will appreciate these improvements to water pressure, which will help us water the collections more efficiently. We are also pleased to report that this project will restore potable water to the Garden.

NEW MEMBERSHIP BENEFIT! ... In the New Year we are pleased to announce that we are collaborating with *Bay Nature* magazine to add a new benefit to our membership package. Garden members will be eligible to take out a discounted subscription (with their membership renewals) to the *Bay Nature* quarterly. This educational and stimulating magazine is devoted to exploring, understanding and celebrating nature in the San Francisco Bay Area.

GARDEN STAFF

Dr. Paul Licht, *Director*

ADMINISTRATION

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 Rose Katsus, *Management Services Officer*
 Afrooz Navid, *Administrative Assistant*
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 Barbara Keller, *Curatorial Assistant*
 Anthony Garza,
Supervisor of Horticulture and Grounds
 John Domzalski, *Propagator*
 Bill Barany, *Horticulturist*
 Colin Baxter, *Horticulturist*
 Judith Finn, *Horticulturist*
 Peter Klement, *Horticulturist*
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 Jerry Parsons, *Horticulturist*
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 Eric Schulz, *Horticulturist*
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 Nathan Smith, *Horticulturist*
 Gemme Von Knopka, *Assistant Horticulturist*
 Gerald Ford, *Building and Grounds Maintenance*

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NEWSLETTER

Holly Forbes, *Editor*

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The Garden Shop	642-3343
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Tours/Rentals	642-3352
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CALENDAR OF EVENTS

SICK PLANT CLINIC

First Saturday of every month, 9 am to 12 pm

UC plant pathologist Dr. Robert Raabe, UC entomologist Dr. Nick Mills, and their team of experts will diagnose what ails your plants. Free. No reservations required.

SENSATIONAL SALVIAS FOR THE MEDITERRANEAN GARDEN

Sunday, February 29, 2004, 1 pm to 4 pm

Discover the beauty and versatility of salvias with author Betsy Clebsch, including a book signing of the revised edition of her book, *New Book Of Salvias: Sages for Every Garden*.

\$45; \$40 members. Registration required. Space is limited.

WILDFLOWERS OF THE EAST BAY

Tuesdays, March 2 through March 30, 2004, 7 pm to 9 pm

Field trip, Saturday March 20, 10 am to 2:30 pm

Be prepared to greet our glorious spring wildflowers by learning to identify the beautiful, native wild flowers of the East Bay. Plant expert Glenn Keator will guide you in using plant keys to make positive identifications, using the Jepson Manual, microscopes, and the resources of the Garden. Dr. Keator makes the tough task of keying easy, and will share fascinating information about local plants, both common and rare.

\$145; \$125 members. Registration required. Space is limited.

ORCHID IDENTIFICATION AND CULTURE

Saturday, March 6, 2004 9 am to 12 pm

Treat yourself to a behind-the-scenes tour of the Garden's orchid collection, normally closed to the public, and a rare sale of unusual orchid species from the collection! Workshop and tour led by Horticulturist and orchid expert Jerry Parsons, who will help you gain confidence with the basic skills of orchid ID and culture. Workshop covers the major groups of orchids, how to divide and mount them, and their care and culture.

\$50; \$40 members. Registration required. Space is limited.

SCHOOL GARDEN CONFERENCE

Saturday, March 13, 2004 9 am to 3 pm

Join teachers, school volunteers and parents at a one-day conference in a roundtable of activities to share successes and learn new best practices in Bay Area School gardens. Experience new curricula and learn to identify resources and strategies for linking curricula to the gardens and involving volunteers.

Registration \$10. Space is limited. Conference to be held at the Lawrence Hall of Science.

A GARDEN WALK WITH A CHEMIST

Saturday, March 20, 2004 9:30 am to 12 pm

Learn about the mysterious and powerful world of plant chemistry with Dr. Margareta Sequin, professor of chemistry at San Francisco State University. Course includes slide lecture introduction and a guided walk in the California Area. No previous chemistry knowledge required.

\$30; \$25 members. Registration required. Space is limited.

WILD ABOUT CALIFORNIA

Saturday, March 27, 2004 10 am to 12 pm

Prepare to be inspired by the California spring time on a walking tour of the Garden's extensive collection of California native plants with area Horticulturist and native plant expert Nathan Smith. The California collection will be flush with spring growth, from the weirdly Dr. Seussian giant coreopsis to the billowing, fragrant flower clusters of our native *Ceanothus*. Hear stories about the plants and people. Learn about how nature, art and science shaped this section of the Garden.

\$17; \$12 members. Registration required. Space is limited.

WILDFLOWER SHOW

Saturday and Sunday, April 3-4, 2004

The annual wildflower show at the Oakland Museum will feature flowers from the South Coast of California.

Free with museum admission.

FIBERS & DYES EXHIBIT

Saturday, April 10 to Sunday, April 25, 2004, 9 am to 5 pm

Satisfy your curiosity about the materials used for the world's fabrics and dyes at the Fibers & Dyes Exhibit! Spinning demonstration by the Spindles & Flyers Spinning Guild on April 25, 1 to 2 pm.

Free with Garden admission.

SAVE THE DATE! ANNUAL GARDEN PARTY

Savor the Solstice in the Summer Garden 2004

Saturday, June 19, 2004, 3:00 pm – 6:00 pm

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. 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.

GARDEN HOURS: The Garden is open from 9 am – 5 pm year round. Closed first Tuesday of each month. Closed on university holidays during fall and winter months. The Garden Shop is open 10:30 am to 4:30 pm daily.

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