

THE JEPSON GLOBE

A Newsletter from the *Friends of The Jepson Herbarium*

September 2004

Director's Column: *Graduate Student Research* by Brent D. Mishler

One of the most important roles of a university-associated herbarium is to foster the research of graduate students. The University and Jepson Herbaria have developed an increasingly broad and interactive group of graduate students over the last decade. They span an incredible array of topics and approaches; we are very proud of them all. Several Ph.D. students have graduated recently and are off to promising starts in their careers (including Raymund Chan, John McMurray, Staci Markos, Terry O'Brien, Patricia Sanchez, Lisa Shultheis, and Dennis Wall). I'll let the current group of students tell you about themselves in their own words:

Kirsten Fisher

Because they have little economic value to humans, and are therefore unlikely subjects for anthropogenic dispersal, mosses provide an excellent system for investigating natural dispersal patterns and diversification processes across oceanic islands. My dissertation research has focused on the systematics and biogeography of a small clade of mosses, *Leucophanella*, that occur throughout the Paleotropics. Until recently, this group of mosses was recognized as a single polymorphic species, *Syrrhopodon involutus*; however, phylogenetic analyses of morphologi-

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Special Feature: 2004 Botanical Expedition To Iran

by Fosiee Tahbaz



The flora of Iran is very diverse: with over 8,000 species (450 endemics), it is richer in vascular plants than Central Europe. Climatically and physiographically, the Iranian deserts and mountains are very reminiscent of the Great Basin and Mojave Desert of North America. In 1998, I accordingly suggested to the President of Iran that a visit to Iran by US botanists might be a fruitful starting point for restoration of scientific and social relationships between Iran and the United States. The suggestion was accepted!

In 1999, I and Dr. Barbara Ertter (a research botanist at UC Berkeley with special expertise in the flora of western North America) realized the first of these visits, full of excitement and uncertain anticipation. In a second visit in 2002, we were accompanied by

Above: Tahbaz with U.S. and Iranian botanists in the Bakhtyari region.

two bryologists: Dr. Brent Mishler, professor and Director of the University and Jepson Herbaria; and Dr. Dan Norris, Emeritus Professor at Humboldt State University. On this second trip, we undertook extended field trips in various regions of Iran and collected numerous specimens. We visited several universities, met botanical colleagues and their students, and presented lectures (Jepson Globe 10[3], 1999, and 14[1], 2002).

Funding for these expeditions to Iran and follow-up visits to Berkeley by two Iranian scholars was from the National Geographic Society. For a third NGS-funded expedition, a team of botanists representing a diversity of institutions around the United States gathered to undertake a comprehensive collection of Iranian plants and to further advance scientific relationships with their Iranian colleagues. Fortunately, the Dean of the Science College of the University of Tehran, Dr. Hassan Ebrahim-Zadeh, a friend and classmate of mine from 1959, graciously offered his institution as our host for this expedition. Dr. Ahmed Ghahreman, Professor of Botany of the Science College and Director of the Herbarium, who is

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my old friend and colleague, also agreed to help ensure the success of this expedition.

The International Relationship Office of the University of Tehran provided all the supporting correspondence necessary for visa applications. The Office of Interests Section of the Islamic Republic of Iran (housed in the Pakistan Embassy in Washington, D.C.) facilitated the granting of visas for all expeditioners. The chancellor of Uromieh University, Dr. Gudarz Sadeghi-Hashjin; the Director of International Relations Offices of the University of Guilan, Professor Dr. Masoud Vahabi Moghaddam; and the Chair of the Biology Department of Esfahan University, Dr. Jamal Moshtaghian, all welcomed collaboration. Their warm acceptance of our program was the best news that the expedition could receive. My contacts to establish scientific relationship with these universities began in 1999, and I was very happy and appreciative to see the results of my efforts approaching reality. I was also in contact for many months with Assistant Professor Dr. Shahin Zaree, an energetic young botanist of the Sciences College, to coordinate plans for this expedition. I am grateful to him and to his colleague, Assistant Professor Dr. Farideh Attar, for their efforts on behalf of this expedition.

On May 12, 2004, I left the States three days early to check out and confirm one more time the details of the expedition's schedules that were initiated and planned several years previously. The other participants of this expedition were Drs. Ihsan Al-Shehbaz, Head of the Department of Asian Botany, Missouri Botanic Garden; Kelly Steele, Associate Professor of Arizona State University East; Travis Columbus, Associate Professor at Rancho Santa Ana Botanic Garden; David Charlet, Professor of Community College of Southern Nevada; William Shepard, Professor Emeritus and Research Associate entomologist; and

Barbara Ertter, Research Botanist from the University and Jepson Herbaria. The team of US scientists met each other at Frankfurt airport in Germany before proceeding to Iran. At 1:00 AM on May 17, 2004, after their very long flight (24 hours from Berkeley!), the group of six enthusiastic US biologists were welcomed at the Mehrabad airport by myself and Dr. Zaree. After some welcome sleep in the guesthouse of the University of Tehran (our base camp for the coming three weeks), the US team spent their first day visiting Golestan Palace (Palace of Flowers), the oldest historic monument of Tehran that belongs to a group of royal buildings (1502-1979), and the famous Tehran Bazar, where they had a traditional meal called Chelo Kabab. This day was a relaxing and attitude-adjusting preparation for our heavy and full botanical schedule that was to follow.

Our formal schedule began on the second day, starting with a meeting to discuss our goals with Drs. Ghahreman, Zaree, and Attar, at the University of Tehran's Central Herbarium (TUH in Index Herbariorum). These last two young botanists accompanied the expeditioners on most of the field trips, handled the assembling of field equipment, helped press specimens, and most important, provided identifications and shipment of all collected specimens. After an introduction by Dr. Huri Sepehri, Chairwoman of the Biology Department, the expeditioners were welcomed by the Dean of Sciences College, Dr. Ebrahim-Zadeh. Drs. Al-Shehbaz, Ertter, and Charlet then gave talks and answered a series of insightful questions from an attentive audience. The afternoon and evening were spent in the herbarium identifying specimens and reviewing Iranian manuscripts intended for publication in US scientific journals.

Next day at the Agriculture College in Karaj, the group met Dr. Alireza Talaii, Dean of the Agriculture College. Dr. Ali Vezvaei and Eng. Marzieh Mahdavian, our hosts at Karaj,

THE JEPSON HERBARIUM PROJECTS & RESOURCES

The Jepson Flora Project

Second Edition of *The Jepson Manual*
Online Interchange for Advances in
California Floristics
Jepson Desert Manual
Online Horticultural Database
Electronic Publication of Jepson's
A Flora of California

Publications & Research Projects

Constancea: University of California
electronic publications in botany
*Tarweeds & Silverswords: Evolution of
the Madiinae*
DeCew's Guide to the Seaweeds
Flora of Mount Diablo
Unravelling the dynamics of mating-system
evolution in tribe Collinsieae
Building the Tree of Life -- A National
Resource for Phyloinformatics and
Computational Phylogenetics
Deep Green Plant Phylogenetics: Novel
Analytical Methods for Scaling Data from
Genomics to Morphology
Beyond "Deep Green": Towards an Integra-
tion of Plant Phylogenetics and Plant
Genomics
Demography and Germination Ecology of
the Endangered Santa Cruz Tarplant
Sierra Nevada Plants Project

Educational Services & Resources

Botanical Workshops & Courses
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Photographic Slide Collection
Map Collection & Locality File
Botanical Library (non-circulating)

Administration

Trustees: Vice Chancellor Emeritus Roderic Park, Chairman; Vice Chancellor Beth Burnside (on leave); UC Botanical Garden Director, Paul Licht; Professors John Taylor and Brent Mishler (ex officio)

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Jepson Horticultural Database

The use of native plants in restoration efforts and home gardens is an important conservation strategy. Up to now, the Jepson Herbarium has contributed to this effort through the publication of horticultural information in *The Jepson Manual*. To increase our support of native plant horticulture, the Herbarium has developed a horticultural database that provides new and innovative ways to access the large amount of morphological and horticultural data that already exists for ~3000 taxa in *The Jepson Manual*.

Native plant enthusiasts are now able to make personalized queries and create customized lists of plants that may grow well and suit particular needs in their gardens. The database contains information on plant name, climatic zone, environmental conditions, life-form, flower color, and many more characters. Possible database queries include:

- ❁ What plants will grow well in a particular climate zone?
- ❁ What plants will grow well in a particular climate zone if they have moderate summer water?
- ❁ What plants will grow well in my shady back yard and sunny front yard?
- ❁ Do cultivars exist for a particular species?

You may access the horticultural database through the Online Interchange (<http://ucjeps.berkeley.edu/interchange.html>) or directly at: http://ucjeps.berkeley.edu/interchange/hort_form.html

The Jepson Herbarium gratefully acknowledges the Elvenia J. Slosson Endowment Fund for support of this project.

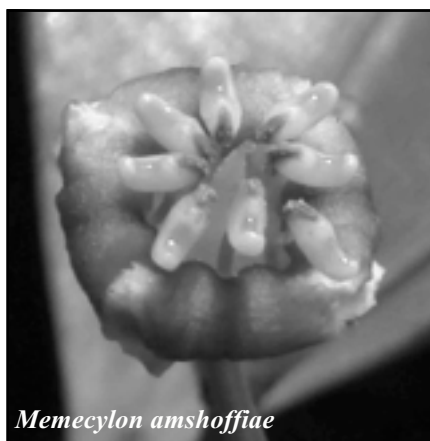
Graduate Students, continued from page 1.

cal and molecular data indicate the presence of several morphologically and geographically distinct lineages within *S. involutus*. I have prepared both a traditional Linnean taxonomic treatment and a rank-free treatment of the *Leucophanella* clade; both recognize five taxa: *Involutus*, *Revolutus*, *Banksii*, *Rufescens*, and *Borneensis*.

The *Leucophanella* group most likely originated in Southeast Asia/Indonesia and subsequently dispersed to increasingly remote islands in both the Indian and South Pacific oceans. The occurrence of *Leucophanella* lineages on continents, near-continental islands, and remote oceanic islands makes it possible to investigate the evolution of reproductive traits in island mosses. Like many other groups of plants, the *Leucophanella* group displays reduced fertility (decreased production of sporophytes and female gametangia) on remote oceanic islands. Additionally, there appears to be an increased reliance on asexual reproduction (an increase in the production of asexual propagules known as gemmae) in the remote island moss lineages. This pat-

tern of reduced fertility and increased asexual reproduction is one component of the paradigmatic “island syndrome” proposed by Sherwin Carlquist in 1974.

Doug Stone



The focus of my dissertation research is the systematics and evolution of the large and widespread tropical family Melastomataceae. In particular, I have been studying the morphologically anomalous subfamily Memecyloideae, a group of shrubs and small trees of which the systematic po-

sition has been a matter of debate since the early 1800's. The “memecyloids” have large seeds and also very hard wood – derived characteristics conferring a specialization for shaded, forest-understory habitats. Also unusual are the anthers, each of which bears a peculiar dorsal gland on the connective tissue. It has been suggested that these are oil-producing glands, and if this is true then the flowers should be pollinated by oil-collecting bees (a common syndrome in the tropics). Given the wide geographic distribution and nearly 500 recognized species in the Memecyloideae, the fundamental challenge for my study has been one of sampling. While other botanists have generously sent samples to me from tropical America and Indo-Malesia, I have personally undertaken two successful collecting expeditions – first in the forests of Madagascar and eastern Africa and more recently in western Africa (Cameroon). A substantial portion of my research has involved phylogenetic reconstruction using evidence from morphology, anatomy, and DNA sequence data. In addition, through my

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Graduate Students, continued from page 3.

field work and herbarium studies I have found many species that are completely new to science. While my interests will always lie more with studying plants than developing policy, I hope that my training and experience will also help me contribute to future tropical conservation efforts.

Anya Hinkle



Anya in the greenhouse

The plant I am working on is *Cordyline fruticosa*. Its common name is “ti.” It is a woody monocot and is closely related to species in the family Agavaceae. It was introduced throughout Polynesia and is an important cultural plant in the Pacific. Uses for the plant include using the leaves for costumes, decoration, wrapping food, and for medicines for fevers, rashes, swellings, sprains, etc. (basically topically for heat related disorders), also as a living fence, and for religious purposes. Its rhizome was used as a source of sugar, particularly in past centuries. My research uses this plant as a proxy for understanding the colonization of this vast area of Earth, the Pacific Ocean. Multiple lines of evidence suggest a general west-to-east pattern of colonization, with Hawaii and New Zealand being some of the last places to have been inhabited by humans. I am using patterns of genetic variation in ti plants from Polynesia to try to better understand the order of Polynesian colonization events. Additionally, I am looking at reproductive and morphological differences in ti from different parts of Polynesia. Most Eastern Polynesian ti plants have sterile pollen and appear not to set any seed, in contrast to ti plants

in Western Polynesian archipelagoes. This may imply that there was selection for sterile plants that possessed different morphological traits. In conclusion, my research on ti plants will help to better understand events in Polynesian prehistory and the cultural role that ti may have played, particularly with its use as a source of food.

Ruth Kirkpatrick



Pellaea truncata

I am interested in evolutionary processes, history, and phylogenetic relationships among green plants, especially ferns. For my dissertation I plan to apply molecular, cytogenetic, morphological, and eco-physiological data to help resolve the phylogeny of the fern genus *Pellaea*. I plan to utilize this information to elucidate the adaptive evolutionary history of several *Pellaea* taxa to their xeric environments. I have more than 100 greenhouse maintained *Pellaea*s and close relatives that I collected from throughout California and the southwestern U.S. I plan to perform physiological, morphological, and cytogenetic analyses on these plants. I have performed preliminary desiccation tolerance experiments and phylogenetic analyses on many of these individuals. I am currently sequencing several genes (rps4, trnS-spacer, and ITS) of *Pellaea* and outgroup taxa in order to generate a robust phylogenetic hypothesis.

Elizabeth Zacharias



Elizabeth examining Atriplex

I am investigating evolutionary relationships, historical biogeography, life-form evolution, and ecophysiological change in the North American lineages of *Atriplex* (Chenopodiaceae/Amaranthaceae), with an emphasis on Californian diversity. I am conducting molecular and morphological phylogenetic analyses to determine whether *Atriplex*, as traditionally recognized, and the North American taxa are each monophyletic groups and whether the current circumscription of the genus needs revision. Many of the annual Californian taxa are found in extreme environments and are highly limited in geographic and ecological distribution, thus making them interesting from an ecophysiological standpoint. Many taxa grow in isolated salt or alkaline scalds, and several have been classified as rare or endangered. *Atriplex* plants are morphologically cryptic in addition to being able to tolerate very harsh conditions, studying their ecophysiology may determine adaptations that allow them such tolerance. I am especially interested in the evolutionary response to aridity and salinity. My research has taken me all around the Central Valley, Owen's Valley, and the Mojave Desert in California, as well as Utah, Nevada, and Arizona to collect *Atriplex*. My research has significance for understanding the origin of arid systems in angiosperm diversification. With salinization and drought increasing in many areas of the world, studying questions about salt- and drought-tolerance using an evolutionary framework is very important.

Vicente Garcia

My project focuses on evolutionary and ethnobotanical aspects of two plant genera in the Piperaceae, *Piper* and *Macropiper*. The genus *Piper*, which *Macropiper* may be nested within, has over 1,000 species distributed in tropical areas around the world. I'm interested in elucidating patterns of colonization and subsequent diversification of the species within the South Pacific. The 40+ species of *Piper* and *Macropiper* in this region appear to form two groups with different histories. The *Piper* vines probably colonized the South Pacific via Southeast Asia where their closest relatives are found, whereas the shrubby *Macropiper* assemblage could be more closely related to plants in Central America and South America. More work needs to be conducted to refine these biogeographic hypotheses. Kava, *Piper methysticum*, holds an important cultural role in the South Pacific. It is used ethnomedically to treat many ailments, it's imbibed socially to create and preserve communal bounds, and it's an important drink in many sacred ceremonies. This plant surely accompanied the Polynesians during their colonization of the Pacific Islands. By clarifying phylogenetic relationships among kava cultivars, and conducting interviews to document the ethnobotanical uses of related species, I can test the patterns of Polynesian movement across the Pacific.

Eric Harris

concerned with the ethnobotany of

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and the Piranshahr area near the Iran-Iraq border. These trips were among the best for collecting plants and comparing diversity of vegetation. On one trip, a new species of mustard (Brassicaceae) was discovered, which Drs. Al-Shehbaz, Zarre, and Attar will describe and name after Dr. Ghahreman, in the spirit of collaboration and in appreciation of all the help of our Iranian botanical colleagues. Our stay in Uromieh ended with a dinner reception given by the Chancellor of Uromieh University at a luxury restaurant on the shores of Lake Uromieh, a saltwater lake famous for flamingos and brine shrimp. Presentations by Drs. Al-Shehbaz and Ertter the next morning were followed by our flight back to Tehran.

The last institution that we visited was Guilan University in the city of Rasht on the Caspian sea coast. At the airport, we were welcomed by Dr. Masoud Vahabi Moghadam, Professor and Director of International Relations of the Guilan University and his staff. At the university, I met with Dr. Moghadam and the chancellor, Dr. Ahmadi, to discuss the goals of the expedition. We were then taken by speedboat through a Phragmites marsh to Guilan Selkeh Wildlife Refuge in the Anzali Lagoon east of Rasht. Back at the University, Drs. Charlet, Columbus, Ertter and I presented our last talks. We also toured the Natural History Museum of the University, where one of my former students, Dr. Latif Salehi, Head of the Crop Protection Department, reminisced with me over photographs of the two of us taken exactly



Dr. Tahbaz at TUH herbarium, along with Drs. Sepehri, Ghahreman, Shirzadian, and Charlet.

30 years ago. Iranians are characteristically appreciative of their teachers, and this meeting was a gratifying example of this quality. That evening we visited the village of Massuleh, an extremely picturesque mountainside village that has been declared a UNESCO World Heritage Site.

On field trips from Rasht we collected specimens in the Alborz Mountains, a range that lies west to east along the entire Caspian coast of northern Iran. At Asalem northwest of Rasht, en route to Khalkhal in Ardebil Province, we saw a mixed deciduous forest extending across the Talesh Mountains. We were reminded of the dense broadleaf forests of the eastern US. Another trip was memorable for the road from Rasht to Deyleman via Siah-Kal, with visits to Lahijan and to the rice fields and tea plantations of this area. Dr. Shahryar Saeidi-Mehrvarz, Botany Professor of Guilan University, accompanied the expedition during all field trips. During our field trip along the coastal region of the Caspian Sea, we were also protectively escorted by an army security vehicle.

Flying back to Tehran in the early morning gave us enough time to press newly collected specimens and to put in order over one thousand specimens collected from 81 sites during this expedition. The last day before departure was occupied until late at night with identification of Iranian specimens and revision of more manuscripts. The last morning in Iran was begun at TUH herbarium at 6:00 AM., allowing time for some last moments visiting and shopping at the Tehran Bazar and meeting with the Vice Chancellor for Research of the University of Tehran, Dr. Mohammad Rahimian.

The Iran-California Botanical Expedition of 2004 was a great success, made possible by the indefatigable enthusiasm of the expeditioners and the gracious welcome and untiring attention of our Iranian hosts. All of us were touched by the warm reception by Ira-

nian faculty, staff and students, and by Iranians we met everywhere in the field. Our fondest hopes are that our visits are only the beginning of productive, ongoing collaborations, with many future opportunities for further rewarding interactions between American and Iranian botanists.

The scientific results thus far have lived up to our early expectations. New species have already been identified among our collections, and critical samples of Iranian species have been made available to systematists working on the molecular phylogeny of Brassicaceae, Fabaceae, Poaceae and many other plant families. As one example, a species of *Trigonella* collected in Iran in the section *Elliptiae* is crucial for determining the sister group relationship of *Medicago* and *Trigonella*. Even more important than the plant material has been the newly forged collaborations between American and Iranian botanists, working on projects of mutual interest that span the continents. Interactions with students has been rewarding as well, with several US participants having already agreed to be foreign supervisor of some of the impressively talented and enthusiastic students they met. Journal exchanges have been initiated, allowing access to research results from both countries that were not otherwise readily in the other country. Seeing these kinds of contacts, collaboration, and close relations between botanists of the two countries is extremely satisfying, and encourages me to continue this botanical project between the two countries. 🌱



Tahbaz with Attar (Univ. of Tehran) and Steele (Arizona State Univ.) collecting plants at Guilian Province.



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September 2004

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September 8 - 12

For more information or to register for a class, please contact Cynthia Perrine at the Jepson Herbarium; phone: (510) 643-7008,
email: cperrine@uclink.berkeley.edu. Please visit our Web site at: <http://ucjeps.berkeley.edu/jepwkshp.html>