

THE JEPSON GLOBE

A Newsletter from the *Friends of The Jepson Herbarium*

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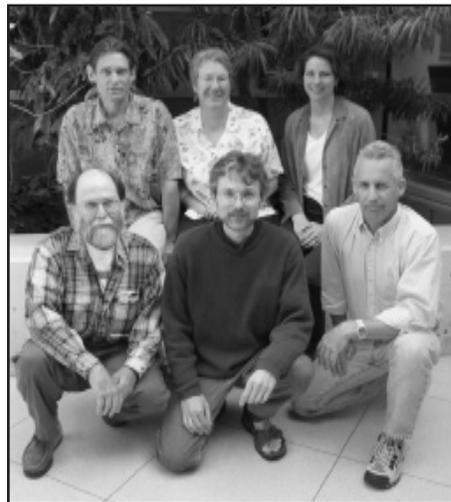
Director's Column: *Graduate Student Research* by Brent D. Mishler

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 morphological

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Jepson Flora Project Staff

by Bruce G. Baldwin
Curator, Jepson Herbarium
Convening Editor, Jepson Flora Project

As many of you know, the production of a Second Edition of *The Jepson Manual* (TJM2) is underway. Continued success of the project will depend in part on authors who will be contributing revised taxonomic treatments, the Jepson Flora Project Editors, and the hard-working and dedicated Jepson Flora Project staff. The staff is a great group of people and I hope this article will serve as a brief introduction to each of them.

Jeff Greenhouse Collections Research Specialist

After years of volunteering in the Herbarium, Jeff officially joined the Herbarium staff in 2001. Jeff is responsible for gathering initial reports

Above: Richard Moe, Margriet Wetherwax, Staci Markos, Jeff Greenhouse, Bruce Baldwin, and Tom Rosatti (left to right)

for possible updates to TJM, conducting research to evaluate the reports, revising distribution or other descriptive information in TJM accounts, updating the on-line accounts, and reviewing photographs of California plants. In addition to his important roles in the Jepson Herbarium, Jeff is also leading the effort to accession the Baja California collections made by Annetta Carter into the University Herbarium.

Staci Markos Project Manag. & Development Coord.

In 1995, Staci came to UC Berkeley as a graduate student working in the Herbarium and in the Department of Integrative Biology. She studied the evolutionary patterns in *Lessingia* (Compositae). She completed her degree in December 2000 but not before she had accepted the position of Coordinator of Public Programs (February, 1999). Staci coordinated the program for five years. Last fall, we hired a new Education Coordinator (Cynthia Perrine) and Staci became more involved in the Jepson Flora Project (although you may still see her on a workshop or two).

Richard Moe Database Administer & Webmaster

Dick first visited the Herbarium in 1973 to examine the marine algae collections on his way to Antarctica, where he spent 15 consecutive months. After his big southern adventure, Dick returned to UC Berkeley to pursue

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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.

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



Memecylon amshoffiae

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 position 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 field work and herbarium

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Graduate Students, continued from page 2.

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



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 Poly-

nesian 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



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 pellaesas 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



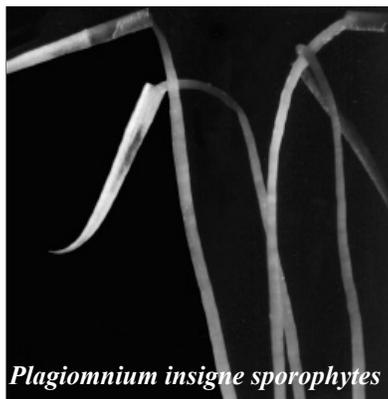
I am investigating evolutionary relationships, historical biogeography, life-form evolution, and ecophysiological change in the North American lineages of *Atriplex* (Chenopodiaceae/Amaranthaceae), with an emphasis on Californian diversity. I am conducting molecular and morphological phylogenetic analyses 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.

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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



Plagiomnium insigne sporophytes

My dissertation research is concerned with the ethnobotany of moss, an area

of research that has been called “ethnobotany.” My research is focused on the moss genus *Plagiomnium*, one of the few mosses that has specific human uses. This genus is interesting because it has reported medicinal uses by the Oweekeno and Bella Coola people of the central coast of British Columbia and by herbalists in China. Also, some species of *Plagiomnium* are cultivated in areas of southwest China to encourage the growth of gall-aphids that over-winter in *Plagiomnium*. The aphids are critical in the production of economically valuable gallnuts on sumac trees (*Rhus* spp.). I am currently working on reconstructing the evolutionary history of *Plagiomnium* in order to understand how a group of potentially medicinally important chemicals, flavonoids, have evolved in this group. In addition, I will soon be conducting ethnobotanical fieldwork in Yunnan, China, to investigate the uses of *Plagiomnium* and other mosses in the area.

Anna Larsen



Through my graduate studies, I am dabbling in diverse areas of study including: the processes of plant evolution, the ethnobotany of the Pacific Islands and Indonesia, the co-movement of plants and people, and the genetic and socio-cultural methods used to tackle questions in these fields. In my dissertation research, I am using genetic and cultural data from an ethnobotanically-important

tree crop, *Aleurites moluccana* Willd. (Euphorbiaceae) to study the human colonization of the Pacific Islands. Within the last 5,000 years, *Aleurites moluccana* (Candlenut tree, bancoulier, kukui, tutui, tia'iri, kemiri) was spread from Southeast Asia or Near Oceania through the Pacific Islands by the first human colonists. Because of the nature of this relationship in which humans have served as the dispersal agent for the Candlenut tree, I have proposed that the geographic distribution patterns of the genetic variants within the species, as well as the cultural uses of the tree, will reflect the human settlement route through Oceania. This research provides me with ample opportunities for fieldwork in physically and spiritually challenging localities like Hawaii, Tahiti, Samoa, Indonesia, and many other blue-skied, beach-ridden islands in between.

Danica Harbaugh



I am studying the systematics and biogeography of sandalwoods (*Santalum* spp.), a genus of plants that includes the sandalwoods. This is one of the most heavily exploited groups of plants across its range from Indomalaysia to Hawaii because it has a diverse array of uses and is commonly known for its use as a scent in perfume and incense. The demand for its valuable oil has led to drastic over-harvesting by people, in almost all regions where it grows. It is an interesting group to study because all species of *Santalum* are hemi-parasitic on the roots of other plants. Parasitic plants represent interesting models to study molecular

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Plant Identification Services Provided by The Jepson Herbarium

The Jepson Herbarium now offers a plant identification service.

Plant Identifications include determination of plant name, statement about toxicity and weediness, geographic distribution, and if needed, library research.

Fees are determined on an hourly basis, with a 1-hour minimum charge of \$75. After the first hour, the fee will be applied in 20-minute intervals.

Send specimens by mail:

- 1) Wrap the specimen in newspaper and place it between two pieces of cardboard.
- 2) Include information on where the specimen was collected including habitat information, state, county, nearest town, and approximate elevation.
- 3) Include the following contact information: name, address, telephone number, and email address.
- 4) Please indicate if an official letter should be provided with determinations
- 5) Mail the specimen to: Margriet Wetherwax, Jepson Herbarium, 1001 VLSB #2465, Berkeley, CA 94720-2465.

Upon arrival at the Jepson Herbarium, dried specimens will be frozen for seven days before they are examined.

Once the plant specimens have been identified, you will be contacted. The specimens, a list of determinations, and an invoice will be mailed to you. Payment will be due within 30 days of receipt of the invoice.

Use our convenient drop-in service:

- 1) Please call and schedule an appointment with Margriet Wetherwax (510) 643-7008 or send an email to margriet@uclink4.berkeley.edu. Depending on the number of specimens, you may be able to wait for identifications.
- 2) When you come to the Herbarium, please bring the specimens and all of the information requested above.

For more information, please contact Margriet Wetherwax (510) 643-7008 or margriet@uclink4.berkeley.edu

THE JEPSON HERBARIUM PROJECTS & RESOURCES

The Jepson Flora Project

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

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electronic publications in botany
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Cynthia Perrine

Graduate Students, continued from page 4.

evolution because their evolutionary history may be linked to that of the host species, or genes may be transferred from the host plant to the parasite. Currently, I am building a phylogeny of the entire genus of about 25 taxa, using the nuclear rDNA gene ITS, and am pursuing the use of additional nuclear and chloroplast genes. I have already done extensive collecting in Hawaii and plan to collect in Australia, the South Pacific, and India. With my resulting phylogeny, I hope to address several questions, such as where and when the genus diverged, the biogeographic patterns across the Pacific, host-specificity, and evolution of polyploidy, among others. In addition, I will use the phylogeny to make any appropriate changes to the classification of the group, and identify populations for conservation.

Andy Murdock



Angiopteris frond uncurling

My research is focusing on the systematics of the family Marattiaceae, an early evolutionary branch of the ferns. The Marattiaceae has an extensive fossil record, and members of this group were dominant trees in Carboniferous coal swamps. The large tree ferns of this group are long extinct; the extant members of this family, while still quite large (with fronds to 7 meters in length in the genus *Angiopteris*), never reach the height nor the ecological dominance of the ancestral tree ferns. This extant lineage of ferns

in the Marattiaceae has been termed a “living fossil” lineage in that the morphology has changed insignificantly over extensive periods of time in the fossil record and the rate of molecular evolution of the genes thus far examined has been shown to be significantly slower in the Marattiaceae than in any closely related lineage of plants (with the possible exception of the tree ferns of the Cyatheaceae and Dicksoniaceae). I hope, in the course of my research, to reveal more about the nature of living fossils and to determine whether the diversity in the group as we see it today is a result of relatively recent speciation (i.e., going against the standard dogma surrounding living fossils) or a result or more ancient divergence. I also hope to use the phylogeny of the Marattiaceae to shed light on questions concerning functional arguments surrounding some novel morphological features found in the family (incorporating evidence from both fossil and living material), and to investigate the historical biogeography of the family. 🌿

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JFP Staff continued from page 1.

graduate studies in phycology, including the description of 4 new genera and 6 new species of Antarctic seaweed. After completing his degree, he stayed on as a researcher and worked with Paul Silva on the *Catalogue of the Benthic Marine Algae of the Indian Ocean*. Dick's career took a different turn when he started learning more about electronic cataloguing; he is now administrator for the Herbaria's online database (SMASCH), webmaster, and technical developer of the Jepson Online Interchange and Jepson Horticultural Database.

Tom Rosatti Scientific Editor

In 1987, Tom moved west from Michigan to accept the position of Scientific Editor of *The Jepson Manual*. Tom also contributed many taxonomic treatments that had been orphaned late in the project. After the *Manual* was published in 1993, Tom became the Project Coordinator for

the Specimen Management System for California Herbaria (SMASCH). The database now contains over 365,000 specimen records and serves countless numbers of people outside of the Herbaria who access SMASCH over the web. In 2000, Tom began developing the Index to California Plant Names, the core of the Online Interchange for California Floristics. As Scientific Editor for TJM2, Tom's roles include reviewing and editing taxonomic treatments for scientific content, preparing treatments for groups not assigned to external authors, and assisting authors in the preparation of electronic keys.

Margriet Wetherwax Managing Editor

Margriet officially joined the Herbarium staff in 1990 and was immediately involved in The Jepson Manual Project. She wrote 14 Scrophulariaceae treatments and worked with the production team. From 1994–1998, she managed corrections to TJM, oversaw the Jepson Library, and assisted me with growing tarweeds for my research. Margriet's attention then turned to *The Jepson Desert Manual*. As Managing Editor, she edited treatments, corresponded with authors and the Editorial Board about taxonomic treatments, worked with illustrators, and interacted with the production staff at UC Press. Margriet is also the Managing Editor for TJM2 and will have many of the same responsibilities she had during the Desert Manual project.

In future issues of the *Globe*, the Jepson Flora Project staff will provide updates and short articles discussing taxonomic changes and other revisions and additions that will be recognized in the Second Edition of TJM. We look forward to sharing the evolving understanding of California's flora with our *Friends*. Stay tuned! 🌿

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- \$5,000** Support floristic effort for a particular bioregion (Twenty-four listed in the *Manual*)
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THE JEPSON HERBARIUM

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Although housed on the UC Berkeley campus, the Jepson Herbarium is largely supported by grants and private donations. The Herbarium gratefully acknowledges the following individuals for their generous support of the Annual Fund, the Jepson Flora Project, and the Second Edition of The Jepson Manual.

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June 2004

Spring Mountains, Nevada

June 17 - 20

July 2004

Mt. Lassen Flora

July 22 - 25

September 2004

*Vegetation Mapping *WL only*

September 8 - 12

For more information or to register for a class, please contact Cynthia Perrine at the Jepson Herbarium; phone: (510) 643-7008,
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