



THE JEPSON GLOBE

A Newsletter from the *Friends of The Jepson Herbarium*

VOLUME 25 NUMBER 2, Fall 2015

Director's Column: Sex and the Single Moss

By Brent D. Mishler

Have you ever thought about how difficult sexual reproduction is for a desert moss? They retain the primitive reproductive system of their aquatic ancestors, with swimming male gametes that need to go many times their own length to find a female gamete—an egg cell, retained in the female sex organ (the archegonium). This requires a film of liquid water, a rare occurrence in the desert. If the male sex organ (the antheridium) is produced on the same gametophyte (the green, haploid phase in the lifecycle) as the female one, termed monoicy, crossing is easier but results in a completely homozygous sporophyte (the diploid generation formed after a successful fertilization), thus is essentially asexual reproduction. If the male and female sex organs are borne on different plants (termed dioicy), then crossing results in a new genetic individual but is much more difficult to achieve.

The desiccation tolerant desert moss *Syntrichia caninervis* has been investigated by a research group consisting of Lloyd Stark (University of Nevada, Las Vegas), Nick McLetchie (University of Kentucky), myself, and many others over a period of nearly 20 years. It is a dominant in the Mojave and Great Basin Deserts. Not just a dominant moss, but a dominant *plant* with perhaps the greatest amount of ground cover of any plant in these communities. One might think of Great Basin

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Introducing Carl Rothfels

I'm very excited to join the University Herbarium and Department of Integrative Biology as a faculty curator! California is such a spectacular place for plants, and Berkeley is an extraordinary place to study them. I'm a Canadian, born and bred an hour north of Toronto in rural southern Ontario. My interest in botany really took off when I got a summer job as an Interpretive Naturalist at Algonquin Provincial Park, at the border of the boreal forest and the broad-leaved hardwoods of the Laurentian forest. My fellow naturalists and I spent our working days delivering interpretive presentations and guided hikes for the park's visitors, and our days off scouring the park for unusual dragonflies, early migrant warblers, and, of course, rare plants! Two friends and I spent most of our free waking

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Grant Received to Digitize Our Historic Slide Collection of Botanical Images!

Through a generous award from the California Digital Library, the Jepson Herbarium has received funding to digitize a significant portion of the University and Jepson Herbaria Slide Collection. Through the years, over 11,000 color 35mm slides of California plants were organized in family order and labeled with taxon name, date, and location. Amy Kasameyer, Archivist, has transferred these slides into archival boxes and they will be scanned in the coming year. The slides date from the 1940s and include photos from notable herbaria scholars including Bruce Baldwin, Annetta Carter, Lincoln Constance, Lauramay Dempster, Larry Heckard, James Hickman, Robert Ornduff, and Alan Smith. The bulk of the photographs were taken in the field and include slides showing growth habit, landscape context, and close-ups of key taxonomic characters. These

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ALSO IN THIS ISSUE

- 🔍 Revisions of Geographic Subdivisions
- 🔍 Undiscovered fern species
- 🔍 Protection for Livermore tarplant
- 🔍 Welcome new graduate students
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- 🔍 New *Jepson eFlora* display
- 🔍 2015 Workshop Year In Review

Cover photo: Carl Rothfels in southern Mexico, with a handful of *Cheiloplecton rigidum* (Pteridaceae). Photo by Mónica Palacios-Rios.

Collaborative Effort Produces Revisions for the Jepson Manual Geographic Subdivision Boundaries of the Klamath and Cascade Ranges of Northwestern California

By Julie Kierstead Nelson and
Len Lindstrand III

On the way to nowhere, in the epicenter of poison-oakiness, steep and rocky, with blast furnace heat in summer and torrential rains in winter; it's no wonder the southeastern Klamath Ranges (KR) remain a mystery landscape explored by very few botanists. This is the area visited by John O. Sawyer's "Off the Beaten Path in the Shasta-Trinity National Recreation Area" Jepson workshop in May of 2008; the oldest part of the Klamath Ranges.

When the 1993 *Jepson Manual* was published, its map of Geographic Subdivisions of California drew the KR boundary to exclude this landscape, including it in the adjacent Cascade Ranges (CaR). At its eastern boundary the predominantly metamorphic KR meets the volcanic Cascade Range (CaR) in an area roughly interpreted by the 1993 Jepson map as the Interstate 5 corridor north of Redding, following the upper Sacramento River canyon. This interpretation omits most of the southeastern Klamath Ranges, a significant portion of the KR unique in its own right, and incorrectly includes the area in CaR, resulting in large areas of limestone and metasedimentary geology being placed in CaR, which is inconsistent with the Jepson description for that volcanic region.

One outcome of the original KR/CaR boundary that is problematic results when conducting floristic analysis in this area; for example, *Ageratina shastensis*, a rare KR endemic of limestone and metasedimentary rock outcrops, has its range described in the second edition of *The Jepson Manual* (TJM2) as "CaR" because of the misinterpreted KR boundary. Other KR endemics, such as *Arnica venosa*, are currently described in TJM2 as occurring both in KR and CaR.

It's certainly understandable that the KR region was not interpreted to

extend so far east. While relatively near population centers and major transportation corridors, this area is functionally very remote and characterized by steep terrain, intense summer heat, and miles of poison oak. Besides recreation at Shasta Lake, this area receives little visitation and has largely been underexplored botanically for years.

Why change the boundary now? Several large federal agency projects in this area in the last two decades have produced an abundance of new plant distribution and ecological data. Additionally, digitized Consortium of California Herbaria (CCH) records with coordinates now make floristic analysis much more feasible, and several new southeastern KR endemic species have been recently described or are in process. The time seemed right to make much-needed changes to the KR boundary.

Since early 2014, a team has worked together to address this issue and improve the Jepson map by revising the KR and CaR boundaries to better align with current scientific consensus about the extents of these geographic subdivisions and published geology, soils, and vegetation maps. This team includes Jepson staff and associates Staci Markos, David Baxter, Heath Bartosh, and three botanists familiar with the geography and flora of the area: Shasta-Trinity National Forest Botanist Julie Kierstead Nelson, Len Lindstrand III of North State Resources Inc., and botanical consultant Dean W. Taylor.

Our team started with our collective experience and existing ecological subregion and geology

maps to identify the "disputed area" requiring boundary revisions. Then we took a hard look at the taxa documented from the disputed area to see if they merited geographic range updates based on the new geographic subdivision boundaries. Using CCH records to identify these taxa, Jepson staff developed a list of over 230 species for review. We reviewed each taxon to identify those occurring in the KR, those that occur in both KR and CaR, and those that don't occur in KR, and submitted the results for appropriate updating. Meanwhile, Jepson associate Heath Bartosh created a new KR GIS boundary with our input. Following the boundary change, we updated the existing Jepson geographic subdivision descriptions for KR and CaR to reflect the boundary revisions. Following review and acceptance by the Jepson Curator, Bruce Baldwin, we declared victory! The result is more accurate KR and CaR boundaries, including the CaRF

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Map courtesy of Len Lindstrand and Teri Mooney, North State Resources, Inc.

California Maidenhair Fern Eludes Discovery for Over a Century

By Layne Huiet

The California Floristic Province is one of the most intensively collected of the 35 global hotspots tracked by Conservation International, which makes it an unlikely place to find an undiscovered fern species. But, that's exactly what happened when a team of botanists described *Adiantum shastense*, a new species of maidenhair fern that is endemic to northern California and currently known only from Shasta County (Huiet et al., *PhytoKeys* 53:73-81. 2015).

While filing herbarium specimens at the Duke University Herbarium, I noticed a recently received collection identified as *A. jordanii* from Shasta County. I was aware of several records of *A. capillus-veneris* from the county and thought that this specimen, labeled as *A. jordanii*, was misidentified. Identification of *Adiantum* taxa can be tricky—there are three species of maidenhair fern found throughout California; *Adiantum aleuticum*, the

five-finger fern, is very easy to identify but *A. jordanii* and *A. capillus-veneris* have a frond architecture that is very similar even though molecular data shows that they are not closely related. Juvenile and sterile forms of these two taxa can be difficult to distinguish. The most striking difference between them is that *A. jordanii* is ephemeral, dying back in mid-summer.

To further investigate the identity of the specimen from Shasta Co., DNA sequencing was employed and, shockingly, it revealed that the plant was neither *A. capillus-veneris* nor *A. jordanii*. Collaborating with Alan Smith, Curator of Pteridophytes at the University and Jepson Herbaria, and Julie Nelson and Martin Lenz of the USDA Forest Service, we found that this new taxon occurred exclusively around Shasta Lake. Appropriately, it has been named *A. shastense* or the Shasta maidenhair fern. It is evergreen, in contrast to its sister species *A. jordanii* and is found on both limestone and metasedimentary

substrates. Surprisingly, *A. shastense* isn't rare, or found only in inaccessible regions. In fact, a specimen had been collected in May of 1894 by Milo Baker and Frank Nutting and was filed in the UC Herbarium, originally identified as *A. jordanii*. This serendipitous discovery only confirms that herbaria still are the most likely place to find undiscovered species! 📷



Adiantum shastense, Shasta Co. Photo by Layne Huiet

(Klamath Range, continued from page 2)

and CaRH geographic subdivisions, updated geographic division descriptions, and updated range descriptions for selected taxa occurring in this area.

The new KR boundary now encompasses most of the lands east of Interstate 5, south of Highway 89, and north of Highway 299E to include Shasta Lake, the McCloud and Hoselkus limestone formations, and Grizzly Peak. The new CaR boundary now starts entirely east of Shasta Lake, and abuts the Inner North Coast Ranges subregion along Interstate 5 from west of Redding south to Red Bluff.

Our newly drawn boundary and analysis of CCH specimens have also shown clearly that the flora of the southeastern KR has more affinity with the Sierra Nevada than with the intervening CaR; but that is a story for another day.

(Slide project, continued from page 1)

photographs of living plants complement the preserved specimens in our collection and support students studying the California flora.

Historically the slide collection has been used as a teaching tool by faculty but use has significantly declined as digital presentations have replaced the slide carousel. We are excited to make this valuable educational collection once again available for teaching and research use but this time, the images and the metadata (identification, photographer, locality, date) from the slide mount will be made available online via our collections database (CollectionSpace) and the Jepson eFlora (ucjeps.berkeley.edu/IJM.html).



A sample of slides from our collection. Photo by Amy Kasameyer.



The Livermore tarplant steps toward official state protection

By Heath Bartosh, Research Associate,
University and Jepson Herbaria

This past spring, the Livermore tarplant, *Deinandra bacigalupii*, officially became a candidate species under the California Endangered Species Act (CESA), and it is now afforded the same legal protection as an endangered or threatened species until a final decision is made.

This conservation success story, a collaborative effort of the Jepson Herbarium and the California Native Plant Society, is centered in the Livermore Valley, an interior portion of the East Bay where the habitat is more similar to the Carrizo Plain or southern San Joaquin Valley than ecosystems typical of the Bay Area. The best example of this alkaline influenced habitat is the Springtown Alkali Sink. It is here that a taxon went undescribed for nearly 40 years even after being collected by Robert Hoover at the corner of Ames Street and Raymond Road. Less than a year later, the first Jepson Curator, Rimo Bacigalupi, wrote a note dated April 26, 1967, on Hoover's specimen stating, "Does not seem to match any thus far published species." It wasn't until the late 1990s that investigations by tarplant expert and current Jepson Curator, Bruce Baldwin, took Rimo's note further and resulted in describing the Livermore tarplant (*Deinandra bacigalupii*) as a new species (*Madroño* 46: 55-57. 1999).

Since the taxon was first collected in 1966, much of this regionally significant alkali sink has been lost to residential subdivisions and there are only a few populations of the Livermore tarplant that remain. The core population is mostly contained at the city-owned Springtown Wetlands Preserve and there are two others populations on private land. Sadly one of these populations has been extirpated by dumping clean fill on the population alongside Greenville Road. The other remaining population is located near the southeast corner of the Livermore Valley and has

the potential to be impacted by agricultural or horse boarding operations based on current zoning designations.

It is because of these serious threats that I decided to prepare a petition to list the Livermore tarplant as endangered under CESA. Following an expert review from Bruce Baldwin and Sue Bainbridge (also from the Jepson Herbarium) the petition was submitted to the California Fish and Game Commission (Commission) in late August of 2014, triggering the process for listing consideration.

It can take up to two years to complete the listing process. The first step in this process is for California Department of Fish and Wildlife (CDFW) personnel to review the petition and make a recommendation to the Commission. On September 19, 2014, CDFW personnel Jeb Bjerke, Cherilyn Burton, and Marcia Grefsrud accompanied me on a tour of accessible populations. It was on this date that we observed the final deathblow being dealt to the Greenville Road population, which, although disheartening, demonstrated the serious threats the Livermore tarplant faces. Based on this site visit and a review of

the petition, CDFW staff determined there is sufficient scientific information available at this time to indicate that the petitioned action may be warranted and they recommended to the Commission that the petition be accepted for consideration. The April 9, 2015, Fish and Game Commission meeting provided an opportunity to testify before the commissioners prior to them voting on whether listing was warranted. In addition to myself, representatives of CNPS, with whom I had worked closely during petition preparation, spoke in support of the Livermore tarplant. In front of nearly 200 attendees, the commissioners surprised themselves by voting unanimously to accept the petition for consideration. The Livermore tarplant has officially become a candidate species!

From this point, it may take up to a year and a half for a final decision to be made on whether to list the Livermore tarplant as endangered under CESA. In the end, if the Commission designates the Livermore tarplant as Endangered, it will have received the highest level of protection for a plant that lives off federal and state owned lands. Stay tuned!



Livermore tarplant (*Deinandra bacigalupii*) at the Springtown Wetlands Preserve in Livermore, the largest population known. Photo by Heath Bartosh.



Welcome new graduate students

Javier Jáuregui-Lazo

Javier Jáuregui-Lazo is a Chilean native who recently joined Brent Mishler and the BryoLab as a first-year graduate student. Javier was born in Santiago, Chile, and started to make connections with plants when he studied horticulture for his undergraduate degree. He worked on the postharvest physiology of fruits and developed a system to identify the susceptibility of sweet cherry fruits to physical injury.

He was later awarded a Chilean scholarship for graduate study at UC Davis. There, he changed his research interests to the study of botany and evolution of plants. Javier worked on the phylogeny and biogeography of the genus *Acaena* (Rosaceae), which is widely distributed in the Southern Hemisphere, especially in Chile and New Zealand. At UC Berkeley, his work will focus on measuring and comparing the biodiversity of bryophytes in Chile and California, both of which have Mediterranean climates.

Javier's main objective after com-



Javier Jáuregui-Lazo in Torres del Paine National Park, Region of Magallanes and Antártica Chilena, Chile. Photo by Dominique Dhainaut.

pleting his degree at UC Berkeley is to educate future generations of Chilean students and society about the benefits of doing research and communicating science in an easy way for everyone.

During his free time he enjoys hik-

ing, drawing, playing soccer, and having a good time with friends. Spiritually and personally, he is proud of starting an independent life with his family in another country. 🧭

Jenna T. Baughman

Jenna is a first-year Integrative Biology doctoral student in the Mishler lab. Prior to this, she earned bachelors' degrees in Biology from Purdue University and Religious Studies from Indiana University, and a master's degree in Environmental Science, Biology option, from California State University, Los Angeles. While at Cal State LA, Jenna used next generation sequence data to investigate sex ratios and genetic variation of the desiccation-tolerant moss *Syntrichia caninervis* (Pottiaceae) among Mojave Desert microenvironments and also characterized a newly discovered Mojave hypolithic moss community.

While she is still exploring dissertation ideas, Jenna hopes to continue the theme of ecology and evolution of mosses in extreme environments. She is interested in utilizing multiple in-

ter- or cross-disciplinary approaches, potentially including genomics, geoinformatics, biogeochemistry, morphometrics, citizen science, and others.

In her free time, Jenna enjoys moss hunting, hiking, camping, painting, animal training, and, recently, small-boat sailing. Jenna lives in Fremont with her partner Somi, her cat Paws, and her bulldog mix Billy. 🧭

Jenna Baughman on the Devil's Backbone trail to the summit of Mount Baldy in the San Gabriel Mountains of Southern California. Photo by Edith Martinez.





Photo by Jack Owicki, TinyURL.com/OwickiPhotos



Photo by Jeanne Marie Acceturo

2015 WORKSHOP YEAR IN REVIEW

This year's highlights included (clockwise from top left): blue skies and bristlecone pines in the White Mountains; intrepid agrostologists at "Advanced Grasses;" *Bursera*, boobums, and cardons in the Cataviña boulder fields; *Epilobium oreganum* in the Trinity Alps; peeling fossil imprints from coal balls at "Lycophytes, Past and Present;" the Santa Rosa Island endemic *Dudleya blochmaniae* subsp. *insularis*; and trailside keying with Linda Beidleman at "50 Families in the Field."



Photo by Alisha Kerschbaum



Photo by Billy Hoyer



Photo by Jeanne Marie Acceturo




Photo by Jeanne Marie Acceturo



Photo by Aaron E. Sims and CNPS

New Jepson eFlora Display!

We invite our *Friends* to visit the new *Jepson eFlora* display pages! Currently in beta (on the *eFlora* home page), these new pages will soon replace the old display. Enhanced features include illustrations from *The Jepson Manual* (2012), more photographs on each page, and a streamlined display of taxonomic information. See ucjeps.berkeley.edu/IJM.html.

We welcome your feedback about additional photos that can be included and resolution of “yellow flags,” which represent incongruencies between taxon distributions in the *Jepson eFlora* and the georeferenced specimens in the Consortium of California Herbaria. Please email Staci Markos with your comments/suggestions (smarkos@berkeley.edu). 

Calochortus striatus

ALKALI MARIPOSA LILY

Higher Taxonomy

Family: Liliaceae	Description	Dichotomous Key
Genus: Calochortus	Description	Dichotomous Key

Calochortus striatus Parish
NATIVE

Stem: 1--5 cm. **Leaf:** basal 10--20 cm, generally withering; cauline 1--2, 6--8 cm. **Inflorescence:** +- umbel-like; flowers 1--5, erect; bracts 1--3 cm, linear. **Flower:** perianth bell-shaped, base narrowed; sepals 10--20 mm, lanceolate; petals 20--30 mm, obovate to wedge-shaped, irregularly toothed above, white to lavender, purple-veined, sparsely hairy near nectary, nectary not depressed, oblong, densely simple-hairy; filaments 5--7 mm, +- dilated below, anthers 4--6 mm, oblong, lilac, purple. **Fruit:** erect, 4--5 cm, linear, angled. **Seed:** flat, light +- yellow or tan, net-like.

Ecology: Alkaline meadows, moist creosote-bush scrub; **Elevation:** 800--1400 m. **Bioregional Distribution:** s SNF, w DMOj; **Distribution Outside California:** western Nevada. **Flowering Time:** Apr--Jun **Note:** Threatened by grazing, urbanization.

eFlora Treatment Author: Peggy L. Fiedler
Jepson Online Interchange
Listed on CNPS Rare Plant Inventory

List of species

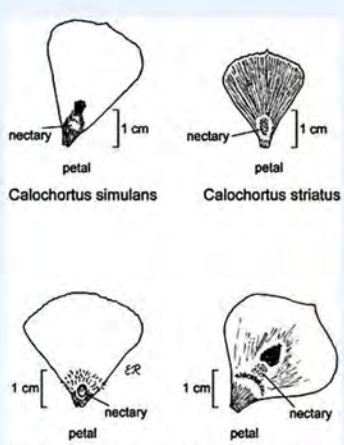
Previous taxon: *Calochortus splendens*
Next taxon: *Calochortus superbus*

Name Search

Contact/Feedback

Citation for this treatment: Peggy L. Fiedler 2014. *Calochortus striatus*, in Jepson Flora Project (eds.) *Jepson eFlora*, http://ucjeps.berkeley.edu/cgi-bin/get_IJM.pl?tid=16761, accessed on September 14, 2015.


Citation for the whole project: Jepson Flora Project (eds.) 2014. *Jepson eFlora*, <http://ucjeps.berkeley.edu/IJM.html>, accessed on September 14, 2015.



Calochortus simulans Calochortus striatus


Calochortus splendens Calochortus superbus

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Calochortus striatus

© 2013 Neal Kramer




Calochortus striatus

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Calochortus striatus

© 2005 Thomas M. Elder, M.D.




Calochortus striatus

© 2010 James M. Andre



Calochortus striatus

© 2005 Thomas M. Elder, M.D.

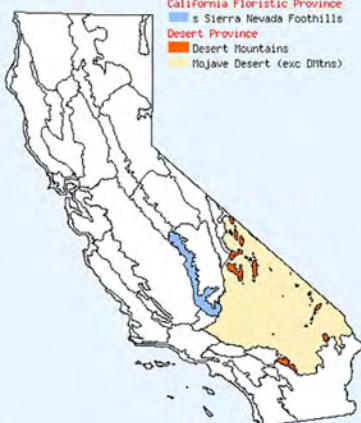


Calochortus striatus

© 2010 James M. Andre

[More photos of Calochortus striatus in CalPhotos](#)

Geographic subdivisions for *Calochortus striatus*:
s SNF, w DMOj;




(Note: any qualifiers in the taxon distribution description, such as 'northern', 'southern', 'adjacent' etc., are not reflected in the map above, and in some cases indication of a taxon in a subdivision is based on a single collection or author-verified occurrence).

[View elevation by latitude chart](#)

Markers link to CCH specimen records. If the markers are obscured, reload the page [or change window size and reload]. Yellow markers indicate records that may provide evidence for eFlora range revision or may have georeferencing or identification issues.

READ ABOUT YELLOW FLAGS



Map data ©2015 Google, INEGI Terms of Use Report a map error

Data provided by the participants of the Consortium of California Herbaria.

[View all CCH records](#)

CCH collections by month

Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
			1	14	33	41					

Duplicates counted once; synonyms included.
Species do not include records of infraspecific taxa.
Blue line denotes eFlora flowering time.

(Director's column, continued from page 1)

sagebrush (*Artemisia tridentata*) as having the greatest cover in dry valleys of Nevada and Utah, but *S. caninervis* grows under every bush, and the space in between them, too. It covers a high percent of the soil surface as part of the cryptobiotic soil crust.

How did a moss achieve such a smashing success in a harsh environment? Apparently not via sexual reproduction! It is a dioicous species, and our studies show that sporophytes are quite rare. It is a red letter day when you find one in most locations. Male plants themselves are quite rare—this species has one of the most skewed sex ratios known in plants—as many as 20 females for every male! We don't yet know exactly the basis for this biased sex ratio. Maybe males are really there in equal proportions, just less prone to produce their sex organs (the “shy male” hypothesis). Or, alternatively, the males tend to die at some step in development (the “rare male” hypothesis).

My former PhD student, Kirsten Fisher, now a professor at Cal State LA, and her students (the third gen-




Closeup of a clump of the desert moss *Syntrichia caninervis* (photo by Kirsten Fisher).



Mojave Desert site near Phelan, California, Kirsten Fisher and Jenna Baughman gathering samples of *Syntrichia caninervis* along a transect (photo by Brent Mishler).

eration of *S. caninervis* aficionados!) are investigating this question using modern genomic tools. One of her students, Amber Paasch, led a study using microsatellite DNA markers (now in press in the *International Journal of Plant Sciences*) that confirmed a highly clonal population structure in these mosses. Others of her students, Jenna Baughman (who is just beginning PhD studies in my lab!) and Israel Jimenez, have helped to develop sex-linked molecular markers that will allow identification of any developmental stage as male or female.

These molecular tools, coupled with careful ecological studies in the field and developmental studies in the lab, should allow us to finally understand just how this moss is able to thrive in such an unexpected habitat. 

Curatorial Volunteers Needed at the University and Jepson Herbaria!

Please help us with mounting, databasing, and filing herbarium specimens! We have group volunteer days listed below and also welcome volunteers during regular business hours. Weekday volunteers help with routine tasks and specialist projects such as working on specific collections or taxa.

2015-2016 Group Volunteer Schedule

September	19	
October	10	
November	7	
December	5	
February	6	
March	5	
April	16	Cal Day
May	7	

For more information about our volunteer opportunities or to be added to the reminder list, please contact Ana Penny 510-642-2465. No previous curatorial experience necessary.

KQED public television released a video and story about desiccation-tolerant mosses, featuring the Mishler Lab. See: kqed.org/science/2015/06/25/these-resurrection-plants-spring-back-to-life-in-seconds/

(Rothfels, continued from page 1)

hours wading through bogs and sidling along cliffs, trying to see each of the 1100+ species of vascular plants recorded from the park. I still remember the first new record I found for the park—an unassuming little weed by the name of *Sanguisorba minor*. And with that, I was hooked on botany!

I did a broad undergraduate degree at McMaster University in Hamilton, Ontario (Canada's banana belt, full of exotic southern things like *Liriodendron* and *Hamamelis*), graduating with a Bachelor of Arts & Science and a combined honors in biology. After my undergraduate studies, I travelled for a year and then found myself with a real job, at Royal Botanical Gardens (RBG), Ontario, where I would spend the next four years as Field Botanist, Herbarium Curator, and Natural Lands Steward (coincidentally, RBG would also play an important role in David Baxter's path to botany, some years later). My responsibilities at RBG ranged from ecological restoration, to rare species inventory and management, herbarium curation, and interpretation and visitor services, all in RBG's >1000 hectares (~2500 acres) of nature sanctuaries.

After RBG, I was drawn back to school, this time for my PhD, and it was at this time that I turned to the dark side (i.e., ferns). I headed south, to Duke University in North Carolina, where I studied fern phylogenetics under Kathleen Pryer (Brent Mishler's former PhD student). My particular interest was in the effects of polyploidy (the state of having more than two entire sets of chromosomes) on the evolutionary fate of lineages (do polyploids tend to speciate or go extinct more quickly than their non-polyploid relatives?). To study this question, I focused on the most ferny of ferns, the genus *Cystopteris* and its relatives in the Cystopteridaceae. After graduating from Duke, I spent two years at the University of British Columbia with Sally Otto studying methods for inferring diversification rates from evolutionary trees.

I maintain a strong interest in the

fate of polyploids and in Cystopteridaceae—I just scratched the surface of each during my dissertation, and *Cystopteris* in particular contains a lifetime of thrilling frustration. I am also interested in almost any question that involves the inference of evolutionary histories and their use in understanding patterns of biodiversity and the processes that generated them. If polyploidy and hybridization are involved, all the better! I look forward to continuing these studies at Berkeley, home of the world's best curated fern collection. Please come by and say hi, and I'll be looking for any available assistance in overcoming my terror at the prospect of learning the California flora. 🐼



Carl recreating an iconic image from pteridology: that of Alan Smith's advisor John T. Mickel pressing plants at Rancho Tejas, Oaxaca. Photo by James Beck.



Notholaena ochracea (Pteridaceae), a xeric-adapted fern, showing its abaxial covering of orange farina. Photo by Carl Rothfels.

JEPSON HERBARIUM RESOURCES & PROJECTS RELATED TO THE CALIFORNIA FLORA

Approximately 400,000 plant specimens from California

Director: Brent D. Mishler
California Phylodiversity Project
Systematics and ecology of *Syntrichia*

Jepson Curator: Bruce G. Baldwin
Jepson eFlora

Systematics and evolution of Calif. tarweeds and relatives (tribe Madieae, Compositae), *Chaenactis* (Chaenactidiaceae, Compositae), and *Collinsia* (Plantaginaceae).

Curator of Ecology: David Ackerly
Ecology and evolution of California flora
Climate change impacts and conservation strategies

Curator of Ferns and Lycophytes: Carl Rothfels

Divergence and hybridization in Californian ferns and lycophytes (especially *Notholaena*, *Cystopteris*, *Isoetes*).

Curator of Monocots: Chelsea D. Specht
Evolution and biogeography of Calif. monocots (including *Allium*, *Nolina*)

Population structure and floral color pattern diversity in the *Calochortus venustus* complex

Curator of W. N. Am. Botany: Barbara Ertter, *Flora of Mount Diablo* and flora of the East Bay,
North American Potentilleae

Asst. Director for Collections and Curator of Cultivated plants: Andrew Doran

Asst. Director for Development & Outreach: Staci Markos, *Jepson eFlora*, CCH & *Globe* editor

Biodiversity Informatics Manager: David Baxter

Collections Staff & Plant Identification: Kim Kersh, Clare Loughran, Ana Penny, and Margriet Wetherwax

Archivist and Librarian: Amy Kasameyer

Public Programs: Jeanne Marie Acceturo

Membership, workshop enrollment, and *Globe* design: Edith Summers

Staff Research Associate: Bridget Wessa

Trustees:

Vice Chancellor Emeritus Beth Burnside; UC Botanical Garden Director Paul Licht; Cathy Park; Professor Emeritus Russell Jones; Professors John Taylor and Brent D. Mishler (ex officio)

Constancea: UC Publications in Botany (online)

REUNION OF HERBARIA ALUMNI

In August, current and former members of the Baldwin and Mishler labs met in Roberts Park (Oakland, Calif.) for a reunion and to introduce new faculty, students, and post-docs. Many of our alumni now hold prestigious positions around the world and in this issue, we share an update about two herbaria alumni that hold faculty positions at California State Universities.


Ben Carter (PhD, Mishler lab, 2012) recently accepted a position as Assistant Professor and Director of the Carl W. Sharsmith Herbarium at San Jose State University. Since finishing his PhD in bryophyte systematics, he has worked as a research scientist on Santa Catalina Island and as a postdoctoral scholar at the Duke University Herbarium. Although broadly interested in plant systematics, Ben is particularly interested in the California bryophyte flora. He maintains active research projects in floristics, molecular systematics, and biogeography of California bryophytes, and is particularly interested in understanding how the bryophytes, with their unique physiology and ecology, contribute to a richer understanding of plant evolution in California.

Kirsten Fisher (PhD, Mishler lab, 2004) is an Associate Professor of Bio-



Herbaria alumni reunion and new introductions (Roberts Park, August 2015). Left to right, Back row: Tracy Misiewicz, Somi Ekwealor, Tom Madsen, Naomi Brydon, Andrew Thornhill, Carl Rothfels, Brent Mishler, Kirsten Fisher, Eric Harris (with son Henry), Dean Kelch, Andrew Murdock, Susan Tremblay, Staci Markos. Middle row: Abby Wall, Bruce Baldwin, Jenna Baughman, Dennis Wall (with son Tanner), Cathy Rushworth, Sophia Khan, Will Freyman (with daughter Aliya Freyman), Lisa Schultheis, Patricia Sanchez (with son Pablo), Danica Harbaugh (with daughters Taylor and Indigo), Ben Carter (with daughter Cayenne), and Cleo (Andy's daughter). Front row: Ty and Nate Norvell. Photo by Craig Norvell.

logical Sciences at California State University, Los Angeles where she has been a faculty member since 2008. Kirsten's research interests include plant molecular systematics, phylogeography, and the use of phylogenetic trees for exploring evolutionary questions. In particular, she applies molecular phylogenetic

methods to understanding cryptic diversity in mosses. She and her lab group are investigating the potential link between physiological specialization and cryptic diversification in mosses, focusing on the desiccation-tolerant model moss *Syntrichia ruralis*. 

LIFETIME MEMBER'S ANNUAL EVENT



Bruce Baldwin (above) answering questions for Lifetime Members during the hike in Old St. Hilary's Preserve. Calochortus tiburonensis (left) at Ring Mountain. Photos by Staci Markos.

On May 17, 2015, Brent Mishler and Bruce Baldwin met with Lifetime Members on the Tiburon peninsula for a morning of botanical walks and discussion. Guests were treated to breakfast at The Lodge at Tiburon, and then everyone joined in walks at Old St. Hilary's Open Space Preserve and Ring Mountain. Highlights seen during the walks were *Streptanthus niger*, *Hesperolinon congestum*, and *Calochortus tiburonensis*.

Lifetime Members provide significant support for the Herbarium and its programs.

We are grateful for their commitment!

THE IMPORTANCE OF ENDOWMENT FUNDS

Larry R. Heckard, former Jepson Curator, and Robert Ornduff, former Director and Professor, each established an endowment fund with a gift from their estate. These endowment funds support graduate students with funding for research expenses and travel to scientific meetings.

2015 Award Recipients

The Lawrence R. Heckard Fund of the Jepson Herbarium

Will Freyman, Graduate Student, Baldwin Laboratory, UC/JEPS and Department of Integrative Biology. Funds were awarded for research titled: *Chylismia* (Onagraceae) phylogenomics and reticulate evolution.

Prahlada Papper, Graduate Student, Ackerly Laboratory, Department of Integrative Biology. Funds were awarded for research titled: Species concepts in Californian white oaks (*Quercus*, Fagaceae)



Emerging leaves of *Quercus* sp.
Photo by Prahlada Papper.

The Robert Ornduff Fellowship of the University and Jepson Herbaria

Jeff Benca, Graduate Student, Looy Laboratory, UC Museum of Paleontology and Department of Integrative Biology. Funds were awarded for Jeff to attend the Next Generation Pteridology Conference at the Smithsonian National Museum of Natural History in Washington DC.

Andrew P. Weitz, Graduate Student, Ackerly Laboratory, Department of Integrative Biology. Funds were awarded for Andrew to attend the annual meeting of the Ecological Society of America in Baltimore, Maryland.

With an estate gift of \$50,000 or more, you too could have a lasting legacy on California botany by establishing an endowment fund that will support work that is of particular interest to you.

SUPPORT THE JEPSON HERBARIUM

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☐ **Basic Membership (\$35 individual, \$50 family)**

Basic members receive *The Jepson Globe* and discounts on Weekend Workshops.

☐ **Sustaining Membership (\$200)**

Receive basic membership benefits plus acknowledgment in the *Jepson eFlora*.

☐ **Lifetime Membership (\$5,000 total, or pledge a minimum of \$250/year)**

Demonstrate your dedication and commitment to the Jepson Herbarium with a lifetime membership. Gain recognition for your support in *The Jepson Globe* and the *Jepson eFlora*. Share your ideas with the Director and Curator at special, invitation-only events.

☐ My or my spouse's employer will match this gift. (Please enclose company form.)

☐ This gift is ___ in honor of / ___ in memory of _____

☐ Please send me information about including the Herbarium in my will or estate plan.

Please make your check payable to the **UC Regents**, charge your gift, or give online at:
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Jepson Herbarium, 1001 Valley Life Sciences Building #2465, University of California, Berkeley, CA 94720-2465

Thank you for supporting the Herbarium and its programs!



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Spaces Available in Jepson Workshops!

There are a few spaces left in the following Berkeley-based Jepson Workshops:

October 17-18 ***Restoration Ecology***

This workshop will approach work in modified systems through the lens of water, soil, and people. We'll use local and national case studies as a catalyst for group discussion. Sunday, we'll visit a large-scale restoration in an urban context.

December 11-13 ***Evolution and Diversity of Mushrooms***

This workshop will provide an introduction to the biology and identification of California's mushrooms. Through a combination of lectures and discussions, workshop participants will learn about the evolutionary history of fungi and the ecological role of fungi in nature.

Advanced Registration is required: information is available at: ucjeps.berkeley.edu/workshops/2015/regform_2015.html

Please call the Herbarium at (510) 643-7008, if you have additional questions.



Amanita muscaria. Photo by
Else Vellinga.

Registration for 2016

The 2016 Jepson Herbarium Workshop Program schedule will be announced in late November. Current members of the *Friends of the Jepson Herbarium* can register for workshops one week before the general public. So, if your membership recently expired, or if it will expire soon, be sure to renew – check your address label for your expiration date.