Leave a legacy, plant a seed

I’d wager that every professor, PhD student, and professional botanist who’s a member of the California Botanical Society has – at one time or another – funded part of their research with a very small grant or fellowship provided by an individual, botanical society, or a college or university endowment. A few hundred dollars at a critical time in a young botanist’s career can make the difference between not having quite enough data to support an innovative hypothesis and obtaining a publishable data set. In turn, this could make the difference between publishing a career-
changing research paper and...well, you get the point.

You may know that the California Botanical Society currently administers two small grants competitions: the annual Paul Silva Student Research Grants (up to $600), in honor of Paul Silva (1922-2014), a UC Berkeley phycologist; and the Annetta Carter Memorial Fund Grants (up to $1000), awarded every other year, in honor of Annetta Carter, an explorer of the Baja California flora. Thanks to the endowments provided by these generous donors — and to the CBS members who have augmented them — early-career botanists in the western United States have a stable source of potential funding.

In recent years, as western North American wild flora has become increasingly imperiled, the need for these financial resources has also intensified (evidenced by the increase in the number of applications we’ve received). With this great need in mind, we invite those of you who are seeking novel ways to make a difference to offer your support to the California Botanical Society in one of four ways:

(1) **Augment our current research endowments:** Please consider donating whatever you can to the Paul Silva and Annetta Carter endowments; we’d love to increase the size, number, and frequency of these awards.

(2) **Create a new named permanent endowment:** Offer a donation of sufficient size to create a named endowment (in your name or in the name of an honored mentor or loved one) from which the interest can be drawn in perpetuity to provide annual or semi-annual grants (e.g., $600 - $1500) to early-career botanists.

(3) **Create a new named short-term fund:** Offer a donation of sufficient size to create a named fund from which the capital can be drawn over the next three to five years to provide larger (e.g., $1500 - $3000) annual grants to early-career botanists. You may either specify the amount of each annual grant or leave this decision to the CBS Council.

(4) **Fund banquet tickets for students!** Are you able to support the attendance (and feast!) of a student at the banquet that follows our semi-annual Grad Symposium? These $25 tickets are often out of reach of students, so a small donation could go a long way towards helping our students network informally (and over a great meal!) with a wide range of professional botanists. Your donations will be acknowledged at the banquet (to great applause) and on our website.

Should you wish to discuss in detail these (or other) options, please email me (sjmazer@ucsb.edu) or any other Council member (https://calbotsoc.org/about/). If you feel ready to contribute in one or more of the ways listed above, it’s simple! You may send a check to the address below, with instructions for how you wish it to be used, or you may donate to specific funds and programs through our website (https://calbotsoc.org/membership/#donate).

David Margolies
Treasurer, California Botanical Society
1001 Valley Life Sciences Building #2465
University of California
Berkeley, California 94720-2465

As always, the California Botanical Society Council members would be delighted to hear from you with suggestions for Society activities that will enhance its value to you, your colleagues and your students.

*President, California Botanical Society
sjmazer@ucsb.edu*

P.S. The California Botanical Society is a non-profit organization; your donations are tax-deductible.
Announcements and Events

2019 Annual Banquet and Graduate Student Symposium

Banquet and symposium information

The 2019 Annual Banquet and biennial Graduate Student Symposium will be held on Saturday, April 6th, 2019 at Cal Poly San Luis Obispo, with local field trips on Friday the 5th and Sunday the 7th. This year’s banquet speaker is Dr. David Lowry, Assistant Professor of Plant Biology at Michigan State University.

Information about travel grants, registration (including for field trips before or after the meeting), and lodging will be posted on our website - https://calbotsoc.org/events/ in the near future.

Please spread the word to save the date among your institution’s senior undergraduate and graduate students!

Call for abstracts

Students of all levels engaged in a project relating to any aspect of plant science in western North America are encouraged to submit abstracts. Abstracts for completed, in-progress, or proposed research will be accepted, and presentations may take the form of talks or posters. Each talk will be 10 minutes with 5 minutes for questions. Past meetings have drawn students and faculty from across the western United States.

To submit abstracts, please go to https://calbotsoc.org/grad-students/

Abstracts are due March 1, 2019.

Botany Ambassador Program

The goals of the Botany Ambassador Program are to give our early-career botanist and student members experience in science communication and professional development opportunities, as well as to increase the reach and readership of Madroño.

As part of this program, The California Botanical Society is publishing general summaries of Madroño research articles in the Nemophila newsletter and on our website. Participants may volunteer to write lay translations of Madroño articles that they select; these translations will be edited and then posted on-line and in Nemophila.

To participate in this opportunity, please choose a recent Madroño article that you are most interested in (available at: www.calbotsoc.org/madrono), and refer to this sheet to make sure other Ambassadors have not chosen the same article (https://tinyurl.com/yb39udo9).

Additionally, volunteers should contact our Outreach Coordinator, Dani Black (danielleblack@ucsb.edu), to set this process in motion. If you are fluent in another language, we would love to have your summary translated into any other languages that you speak!

See recent lay translations on pages 4-7 of this issue

In addition, graduate student and postdocs may hone their editorial skills by volunteering to review submitted Madroño articles at the discretion of our editor — to participate in this activity, please fill out the google form: https://goo.gl/forms/PpAQf6r3WfVvpzxv1

We have also been busy assembling K-12 botanical lesson plans, which are freely available for anyone to use when volunteering in local classrooms, outdoor education programs, or botanical gardens. These can be found at: https://calbotsoc.org/outreach/
**Student memberships are now only $20!**

Thanks to sustaining members and donations to the society, we are able to subsidize student memberships and event attendance costs. If you are interested in donating to our education fund, grants, or scholarships you can do so online: [calbotsoc.org/membership](http://calbotsoc.org/membership)

**Student membership benefits:**

- Subscription to our journal *Madroño*, and our digital newsletter *Nemophila*
- Eligibility to apply for Paul Silva Student Research Grant and the Annetta Carter Memorial Fund
- Five page credits for publishing your peer-reviewed work in *Madroño*
- Eligibility to apply for travel support for our Graduate Student Symposium (April 6, 2019)
- Membership in our Botany Ambassador program (Learn more at [calbotsoc.org/outreach](http://calbotsoc.org/outreach))
- Free access to *Madroño* though the BioOne portal
- Opportunity to submit announcements and articles to *Nemophila*

For more details, please visit [https://calbotsoc.org/](https://calbotsoc.org/), or email Rachael at [membership@calbotsoc.org](mailto:membership@calbotsoc.org)

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### Botany Ambassador Highlight: Sraavya Sambara

Sraavya is a Botany Ambassador attending at Dougherty Valley High School in San Ramon, CA. She is also a member of the Rothfels lab at UC Berkeley, where she participates in research on ferns.

As part of the Botany Ambassador Program, Sraavya visited Bella Vista Elementary School to lead a lesson on plant anatomy. She taught a class of 4th and 5th graders about major plant organs, the anatomy of an angiosperm, and flower parts. Although the students were familiar with flowers generally, they realized that they didn’t know too much about the different parts of a flower and their functions.

To discover more about flowers, Sraavya’s students formed small groups to examine and sketch the parts of lily flowers. After sketching, students attempted to identify parts’ functions based on their morphology - for example, since the stigma felt sticky, the students reasoned that it functioned in holding on to pollen.

Students had a lot of fun botanizing in the classroom!

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### Webmaster & Social Media Chair Search

The California Botanical Society is looking for a new Webmaster & Social Media Chair. This board member position entails keeping our website up to date, periodically posting new content, and making announcements via social media (Facebook, Twitter, Instagram).

If you are interested in this volunteer position, please email Rachael at [membership@calbotsoc.org](mailto:membership@calbotsoc.org).
Deciphering plant genomes can affect plant conservation policies

Summary by Lorena Villanueva-Almanza

Conservation genetics of the endangered Del Mar manzanita (Arctostaphylos glandulosa subsp. crassifolia) based on RAD Sequencing data

Authors: Dylan O. Burge, V. Thomas Parker, Margaret Mulligan, and César García Valderrama

Madroño 65(3):117-130. 2018
http://www.bioone.org/doi/abs/10.3120/0024-9637-65.3.117

Summary by:
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Significance statement
The advent of accessible DNA sequencing techniques has led to an unprecedented understanding of speciation and to question taxonomic relationships that had once been stable. Besides adding elements to question, yet again, what plant species are, these findings raise dilemmas regarding species conservation. The study of Burge and colleagues is relevant to the binational conservation debate concerning the US and Mexico. Their study also highlights the power of using genomic data along with morphological traits. As a researcher working on the taxonomy of Washingtonia, a group of palms found in the US and Mexico, I found Burge’s team discussion on plant conservation very pertinent.

A team of botanists led by Dylan O. Burge has used genomic and morphological data to confirm plants know nothing about country boundaries.

Arctostaphylos glandulosa Eastw. subsp. crassifolia (Jeps.) P.V.Wells, commonly known as Del Mar manzanita, is a beautiful shrub that grows in the chaparral of San Diego County and northern Baja California. Despite being considered an endangered plant in San Diego, Del Mar manzanita has no special legal status in Baja California. To complicate things further, the group of researchers considered Del Mar Manzanita could exchange genetic material—hybridize—with a close relative, Eastwood manzanita (A. glandulosa Eastw. subsp. glandulosa; including A. glandulosa Eastw. subsp. zacaensis (Eastw.) P.V.Wells). Hybridization would result in plants having intermediate characteristics, thus making identification, and conservation, problematic. Burge’s research is another example of the growing dilemma in conservation biology resulting from the clarification of taxonomic relationships.

To find out whether Del Mar and Eastwood manzanitas were indeed two different subspecies, the team of California-based botanists turned to a powerful molecular technique: a type of DNA sequencing known as RAD sequencing. The team also used morphological data from stems and leaves, such as trichomes, to look for differences between both taxa and to see whether the genetic patterns matched those of the morphological data.

RAD sequencing is a useful method to study plants that lack a previously published reference genome. This is because during the analysis of RAD data, it is possible to construct a type of reference genome using the sequence data from the plant with the greatest number of RAD clusters. This genome can then be used to
compare the rest of the individuals’ DNA and call differences at individual DNA bases. These differences are termed Single Nucleotide Polymorphisms (SNPs).

One of the caveats of the study was the low number of individual samples the researchers could collect. However, they could not differentiate subspecies using morphological traits since plants varied within the same location. The researchers also found Del Mar and Eastwood manzanita belong to two distinguishable genetic groups and that hybridize. The fact that they hybridize would suggest del Mar Manzanita is a widespread taxon occurring in Mexico and the US. However, when looking only at the regional scale, del Mar Manzanita could be considered to only occur in San Diego County, where one of the easily recognizable genetic groups occurs. The authors consider necessary to have a larger sample to make a formal taxonomic decision on *A. glandulosa* which would impact the conservation of this species in both countries.

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Descifrar el genoma de plantas puede afectar las políticas de conservación biológica

Conservation genetics of the endangered Del Mar manzanita (*Arctostaphylos glandulosa* subsp. *crassifolia*) based on RAD Sequencing data

Autores: Dylan O. Burge, V. Thomas Parker, Margaret Mulligan, and César García Valderrama

Madroño 65(3):117-130. 2018

http://www.bioone.org/doi/abs/10.3120/0024-9637-65.3.117

Resumen por:

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Declaración de mérito

La llegada de técnicas accesibles de secuenciación masiva de ADN ha permitido un mejor entendimiento de los procesos de especiación. También ha llevado a cuestionar relaciones taxonómicas que se consideraban estables. Además de agregar elementos para cuestionar una vez más—qué es una especie—este tipo de estudios conduce a un debate en el campo de la conservación. El estudio de Burge y colaboradores es relevante para la conservación de especies entre Estados Unidos y México. Su trabajo es un buen ejemplo del uso de datos genómicos en conjunto con caracteres morfológicos. Como investigadora trabajando en la taxonomía del género *Washingtonia*, un grupo de palmas que se distribuye en Estados Unidos y México, me parece que el trabajo del equipo de Burge es muy apropiado para el debate de la conservación florística en la frontera.

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Un equipo de botánicos dirigido por Dylan O. Burge ha usado datos genómicos y morfológicos para confirmar que las plantas no conocen el significado de fronteras políticas.

*Arctostaphylos glandulosa* Eastw. subsp. *crassifolia* (Jeps.) P.V.Wells, comúnmente conocida como manzanita Del Mar, es un hermoso arbusto que crece en el chaparral del condado de San Diego y en el del norte de la península de Baja California. A pesar de ser considerada como una planta en riesgo en San Diego, en México no tiene ningún tipo de protección especial. Para complicar incluso más la situación, el grupo de investigadores sospechaba que la manzanita del Mar podía intercambiar material genético—híbridar—con una planta cercanamente emparentada, la manzanita de Eastwood (*A. glandulosa* Eastw. subsp. *glandulosa*; incluyendo a *A. glandulosa* Eastw. subsp. *zacaensis* (Eastw.) P.V.Wells). La
posible hibridación entre ambas subespecies podría potencialmente generar plantas con caracteres morfológicos intermedios. Esta situación podría generar problemas en la identificación de las plantas y, por tanto, en su estatus de protección. El trabajo de Burge y colaboradores es un ejemplo más del dilema que el campo de la conservación biológica enfrenta como resultado de aclarar relaciones taxonómicas en plantas.

Para encontrar si la manzanita Del Mar y la manzanita de Eastwood son dos subespecies distintas, el grupo de investigadores de California usó una poderosa herramienta molecular: un tipo de secuenciación de ADN conocida como RAD-seq. Los investigadores también usaron datos morfológicos de tallos y hojas, como tricomas, buscando diferencias entre ambos grupos y para ver si el patrón morfológico coincidía con el patrón genético.

La técnica RAD-seq es muy útil para el estudio de plantas que carecen de un genoma de referencia. Esto es debido a que, durante el análisis de datos RAD, es posible construir un tipo de genoma de referencia usando a la planta con el mayor número sitios polimórficos. Este genoma puede ser usado para comparar el ADN de los demás individuos y notar las diferencias en las bases individuales de ADN. Estas diferencias son consideradas como marcadores moleculares llamados

**Figura 1.** Frutos inmaduros de *Arctostaphylos glandulosa* subsp. *crassifolia* tomada en el Parque Estatal Torrey Pines, California. Fotografía de Dylan O. Burge.
polimorfismos de un solo nucleótido, o *Single Nucleotide Polymorphisms* (SNPs).

Una de las desventajas del estudio es el bajo número de plantas muestreadas. A pesar de ello, los investigadores encontraron que ambas subespecies no pueden diferenciarse usando caracteres morfológicos ya que en una misma localidad existe gran variabilidad morfológica.

El trabajo de Burge y colaboradores también muestra que la manzanita Del Mar y la manzanita de Eastwood pertenecen a dos grupos genéticos distintos que hibridan. El hecho de que hibriden sugiere que la manzanita Del Mar es un grupo taxonómico de amplia distribución a lo largo de Estados Unidos y México. Sin embargo, a nivel regional la manzanita del Mar podría considerarse de distribución restringida al condado de San Diego, donde se encuentra uno de los grupos genéticos. Los autores concluyen que es necesario usar un mayor número de individuos para tomar una decisión formal sobre *A. glandulosa*. Esto, evidentemente, tendría un impacto en la conservación de este grupo de plantas en ambos países.

**Contribute to *Nemophila***

*Nemophila* is a quarterly newsletter compiling and disseminating information and announcements for the members of the California Botanical Society, as well as highlighting and sharing member news and stories.

We are seeking short articles, letters to the editor, photos, and other items of interest to the members of the California Botanical Society.

Do your kids love to draw plants or of botanists? Submit those too!

Please email your submissions to Josie at: membership@calbotsoc.org