

Botany News. 5.

California Academy of Sciences



The Russian Wilderness in early April

Hi everyone,

We hope you are having a nice spring and enjoying the bloom. A few of us have been busy in the field checking on blooming conditions and collecting plants. The offices and departments at CAS remain shuttered until the CDC outlines new recommendations, however, a few staff at a time are permitted entry for the day so we're slowly chipping away at projects. We all look forward to the day there are no restrictions on office space and we can all work together again.

Take care, stay safe and enjoy the newsletter!

-The Botany Department

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Rose De Guzman

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Research and Education on the Chocolate Islands—São Tomé and Príncipe

Tom Daniel

In 2001 Academy herpetologist Bob Drewes began a project to study the diversity of organisms in Africa's second smallest nation, which consists of two islands in the Gulf of Guinea—São Tomé and Príncipe (STeP). Because these islands (a former Portuguese colony) were a major source of the world's chocolate supply in the early 20th Century, they have been referred to sometimes as the "chocolate islands." Because the islands are relatively old (13 and 30 million years), have never been connected to each other or to the African continent, and were uninhabited when first encountered by Portuguese sailors in the 1470s, all of the organisms or their ancestors that were not brought there by humans in recent times arrived by chance dispersal. Given the diversity of habitats on these small volcanic islands and their relative isolation, those organisms that happened to arrive sometimes evolved into different species, resulting in numerous endemic (i.e., only known from there) creatures. These include many amphibians, birds, and plants (especially orchids, begonias, and members of the coffee family Rubiaceae).

Activities of the teams of Academy scientists, students, and other researchers that Bob assembled for the numerous expeditions to the islands over the past 20 years have resulted in more than 30 publications. These have helped to better understand the diversity of life on these remarkable islands. Primary goals of the expeditions have been to document and study poorly known groups of organisms (with a focus on the endemic taxa), and to collaborate with local educators in disseminating the scientific knowledge gained to the local populace. Schooling for the islanders is mandatory only through the sixth grade, and we discovered that the curriculum provided little, if any, information on the local flora and fauna.



Cover of a 2020 issue of the journal *Proceedings of the California Academy of Sciences*, with photos of Príncipe by two former Academy graduate students in botany (Rebecca Wenk and Miko Nadel), who participated in expeditions. In that issue, I reported some new plant distribution records for Príncipe and summarized the numbers of vascular plants and endemic species on each of the islands.

In addition to participating in four of the expeditions, I was fortunate to be part of a team that developed educational tools for the teachers and students (of grades 4-6) focusing on the two islands' unique plants and animals. The team included scientists, educators, illustrators, graphic designers, photographers, and Academy docents. Collaborating with local educators and using research results and imagery from the expeditions, we developed sets of educational materials for all primary schools on the islands: posters, coloring books, biodiversity activity cards, a student handbook to the islands' birds + binoculars, a guide to the coastal and marine life, etc. Project educators 1) developed curricula and games for each set of materials, 2) conducted workshops for teachers, and 3) participated in classroom sessions that introduced the materials to students. Goals of these educational materials are to augment biological sciences currently taught in the schools using local examples, and to stress the uniqueness of the plants and animals of the nation—practices that were not previously part of the biological curriculum. Along the way, we learned several things that informed our efforts. For example, the materials we provided to every student in the particular grade level were widely shared with the students' brothers and sisters, as well as with students in other grade levels. Thus, we were having a greater impact than originally perceived. So we designed subsequent activities accordingly.

We feel that our efforts are particularly important and timely because oil has been discovered in the nation's territorial waters. Thus, major changes are likely forthcoming for these largely undeveloped islands. Knowledge of their biotic systems and resources, both marine and terrestrial, will be essential for making informed decisions as development proceeds. We hope that our efforts will help the current generation of young islanders be in a position to make decisions that will benefit the unique natural resources of their home.

The project is to continue under the leadership of Academy herpetologist Rayna Bell, in cooperation with a recently organized international association, the Gulf of Guinea Biodiversity Center/Centro de Biodiversidade do Golfo da Guiné.



Drawing by former Academy graduate student (and botany illustrator), Sean Edgerton, showing some of the endemic plants and animals of STeP.



Some of the educational tools/activities developed for primary schools in STeP.



Portion of a poster on some noteworthy native plants of the islands.



Classroom activities (top left), a teacher workshop (top right), and students (bottom) with educational materials.

Another California bryophyte project begins

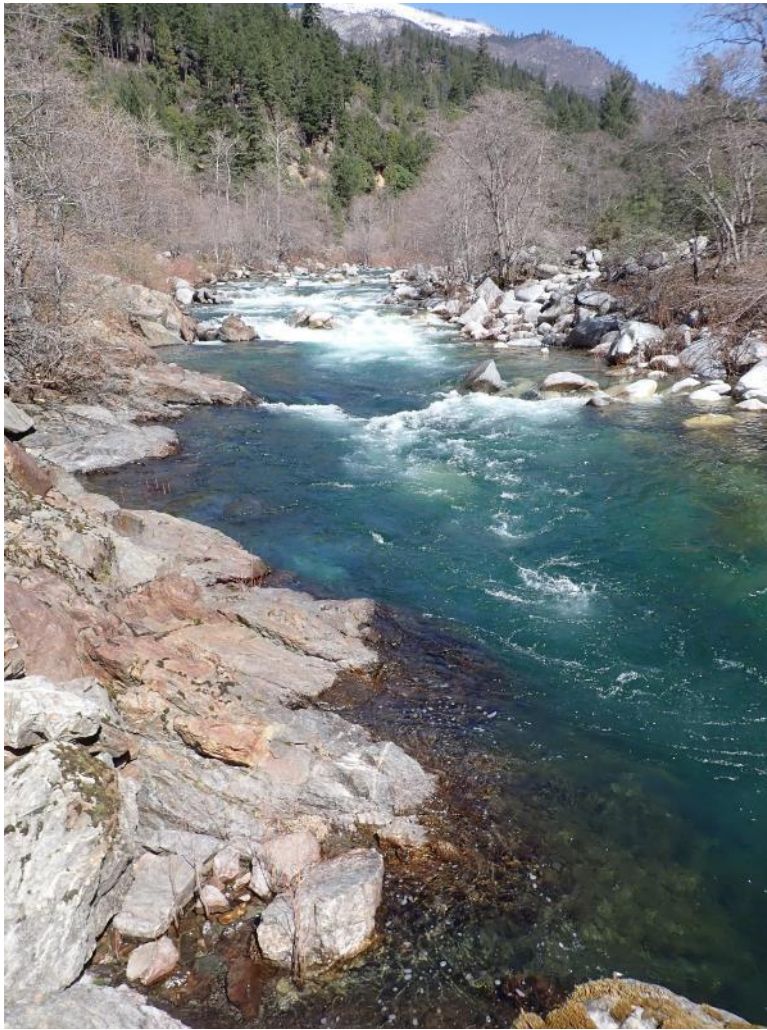
Jim Shevock

With over a year of no international expeditions due to the COVID-19 pandemic, I am once again planning to conduct more field work in California until I can resume my foreign collecting adventures. As I reported previously in these botany department newsletters, I spent most of 2020 exploring and collecting in the Russian Wilderness and adjacent slopes of the Salmon Mountains. It was a lot of strenuous hiking but the scenery was spectacular and the diversity of bryophytes was rather remarkable. The total acreage covered by this bryoflora is only 1.8% of the land base of Siskiyou County, yet, it contains 33 percent of both the liverworts and mosses reported for California! This flora in partnership with my co-authors David Toren and David Wagner, is now written and will appear in *Madroño, A West American Journal of Botany* this fall. This paper will be one of six contributions of a Special Bryophyte Issue where I am serving as the guest editor.

So I am now actively working on the next California bryophyte project. This will be a Bryoflora of the Marble Mountain Wilderness, Siskiyou County. This is a very large area with over 300 miles of trails and around 80 lakes. Elevation ranges from around 550-7500 ft. As its name implies, there are high elevation areas of marble in this wilderness along with metavolcanics, ultramafics and granitic rocks, so the geology is very complex. The Pacific Crest Trail bisects this wilderness area for nearly 35 miles. This area was recognized early on as a very special area and was established as a National Forest Primitive Area back in 1931 by President Herbert Hoover. When the Wilderness Act was created in 1964, this primitive area was renamed and incorporated into the Wilderness Act. This wilderness was later enlarged during the Marble Mountain Wilderness boundary amendment within the California Wilderness Act of 1984 and signed into law by President Reagan. The Marble Mountain Wilderness is about 5 times larger than the Russian Wilderness immediately to the south along the crest of the Salmon Mountains.

During the last week of February 2021, I began my first collecting trip of the year along the Salmon River and the North Fork Salmon River. I just completed another trip during the last week of March. At this time of year I am focusing on the lower elevations. At elevations under 1500 feet, this area is perfect to hike and explore in the spring but should be avoided during the hot summer months. The subalpine areas are still covered in snow but this is indeed a drought year and the snowpack is considerably reduced so it will not be long before I can access slopes above 5000 ft. My plan is to make 2 trips to the Marbles each month in 2021 until the snows return by November, with the goal of obtaining 100 bryophyte collections each trip. It will likely take 2 years to adequately cover this area before a flora can be written.

I have ventured into the Marbles previously so I already have a couple hundred collections. One of Dan Norris' master's students did an inventory of the Mosses of the Marble Wilderness back in the 1970s but that work only explored 5 areas. I am projecting that the Marble Mountain Wilderness will have over 40 percent of the liverworts and mosses known for California. There is a good chance that new state records will be discovered. Distribution of bryophytes across the landscape can be exceedingly hard to predict. It boils down to the amount of microhabitats encountered and the amount of area surveyed. Many of the bryophytes will only be collected once in the project area and the next occurrence can be great distances away. Some bryophytes are simply rare across the landscape and the next occurrence can be more than 1000 miles away. Mountain streams in the mountains generally have a great diversity of rheophytic (aquatic) species and can be very different in species composition from creek to creek. It is one of the many mysteries regarding bryophyte distribution and colonization of suitable habitats. These rheophytic bryophytes are nearly always sterile when encountered so the rate of colonization has to be both slow and occurring over millennia. How they get from one stream to another and get established in flowing water is not easily explained, especially when the next stream is over the ridge through a forest of unsuitable habitat.



View along the North Fork Salmon River. The river bank has both metamorphic (reddish) and granitic (whitish) rocks. The white alder, as the dominant hardwood tree lining riparian areas, has not yet produced leaves this spring. Snow is on the higher elevations of the Marble Wilderness in the background. This stretch of the river is basically devoid of bryophyte cover.

The high mountain streams and creeks are the most species-rich habitats for bryophytes. This is partly due to the cooler air and humidity offered in these canyons and more protection from prolonged direct sunlight. The Marble Mountain Wilderness is going to be a fabulous place to explore.

On the herbarium front, bryophyte specimens continue to be accessioned even during the pandemic. We are now just under 4000 collections away from reaching 150,000 labeled and processed bryophytes in the CAS herbarium. More specimens from international partner institutions continue to arrive. Of course we have thousands yet to curate in the backlog, thanks in part to the arrival of the Horton and Jamieson herbaria back in 2019. Hopefully soon we will be informed how and when volunteers can return to the Academy. I for one look forward to that day that the bryophyte cadre is together again.

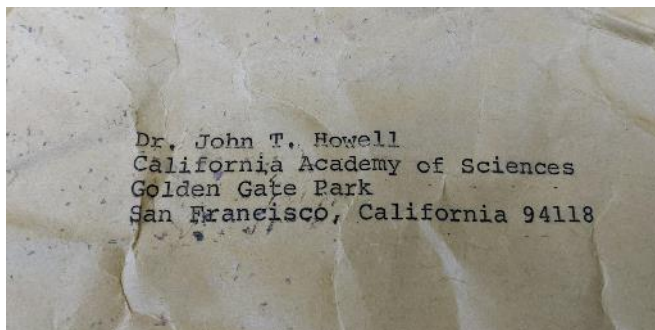
A Botanical Life Remembered: Ted 'Gene' Carter

Emily Magnaghi

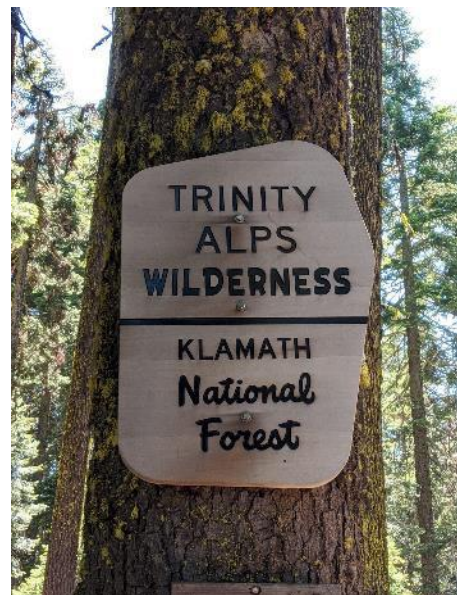
I met Gene Carter around 2002 while working at the Presidio Native Plant Nursery. He came in to join our volunteer program and began discovering new populations of native plants for us to collect seeds from. Gene used to walk all the way from his place in North Beach over to the Presidio Nursery at Fort Scott. He loved sharing his plant knowledge with us and accompanying us on seed collecting missions around the Presidio.

Through hours in the field together, I learned Gene was an amateur botanist, identifying plants in the field with his old Munz manual in Northern California in the 1970s. He made many collections in the Trinity Alps area while camping after laying transmission lines on the east side of Interstate 5. Apparently, he would camp for weeks and sort of lose himself in the wilderness. I suspect he had a mining claim up there. He told me he deposited all his collections at the Cal Academy.

Gene was in touch with John Thomas Howell, at the time, and sent over 800 specimens from his rambles. I can't give an exact number yet since we have not finished databasing our California holdings. Currently, his collection number is well into the 700s and there are several large families to go so I imagine it will exceed 800 specimens.



One of Gene's shipping labels for a box of specimens.





I'm not sure if Gene ever made it up over the crest to the Carter Summit, but I thought of him when we were there last year!



Lilium pardalinum, a species Gene collected along the North Fork of the Trinity River near Hobo Gulch

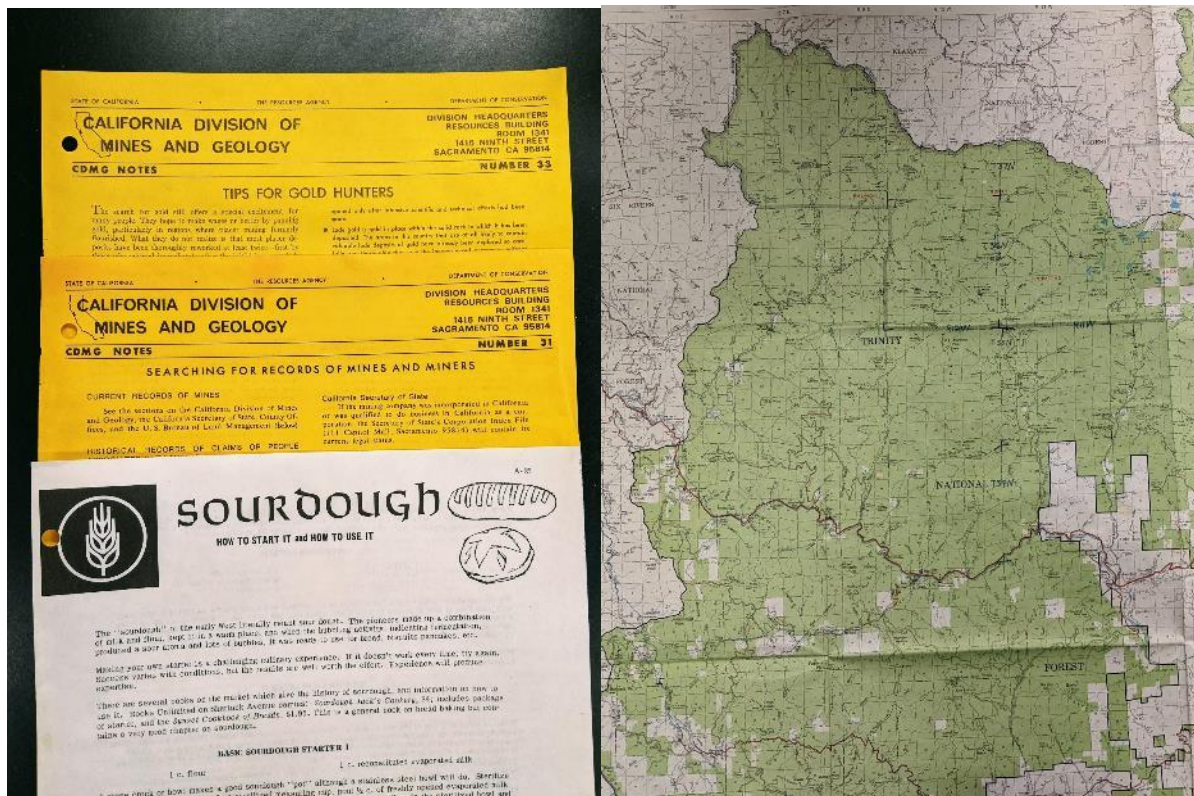


Duplicate specimens, a field notebook, and extra labels from one of Gene's boxes.

Unfortunately, due to poor health and the shelter in place order, Gene was unable to get out and about and ramble as usual last year. After several weeks of poor health he quietly passed away at home. A couple of months later we made contact with his niece and nephew. She lives in the San Diego area and flew up to take charge of dealing with Gene's place and belongings. Gene was not very forthcoming with personal information so my friend and I were always trying to piece together his family story. It was really great to meet them and know they had good memories of their uncle. They were equally comforted to know we were so fond of their "Uncle Ted" and had many questions for us.

Gene always spoke of his duplicate specimens and asked, years ago, if I would distribute them for him. I owed it to Gene to find those boxes so I worked with his niece to locate them. Over the years, Gene had acquired a lot of possessions so there was a lot to clear out of his apartment. Finally, nearing the end of the big tidy up, she found several boxes of specimens! Gene treated these with a heavy handed dose of moth balls so I suspect the specimens inside are intact. They have since been frozen, repackaged in clean boxes, and await further inspection and shelving in our herbarium. I really hope there are nice specimens to send to Chico State and Humboldt State as it would be good to share the specimens with institutions near the collecting sites.

Last year, I made my first collections in Siskiyou County, just over the ridge from where Gene was collecting when I was a toddler. I can't help but think his early stories from 2002 had an influence over my decision to collect up there. I am very glad of the opportunity to accompany Jim Shevock up there last year and this year and to continue the collecting legacy the Academy has in Northern California. I think Gene would be proud!



Items from Gene's specimen boxes including everything one might need when exploring the Trinity Alps and Gene's trusty Forest Service map.

Wildlife safari to Botswana and Victoria Falls

Frank Almeda

I have been spending the lion's share of my time as co-editor and author of a book on "Advances in Melastomataceae Systematics and Biology" for Springer Nature Publisher in Switzerland. All chapters are due from contributors by May 1st so we can get them peer reviewed and ready for final submission to the publisher on October 1st. I will be telling you more about this project in a future newsletter. I have also made some time to complete four other manuscripts with collaborating colleagues. Alas, I have also spent some time labeling and culling some 4000 digital images from a trip we took across Australia following the Botanical Congress in Melbourne in late August and early September of 2011. I will share some of the highlights of this trip in a future newsletter as well.

In our previous newsletter I noted that I was working on labeling images and assembling a powerpoint for the last of the trilogy on wildlife of southern Africa. In the current powerpoint I have focused on the wildlife of Botswana and Victoria Falls. I have even tried to include some video clips for your enjoyment. The new assembled file is available [here](#) (this file is almost 2 GB so it is downloadable, but requires a bit of patience since it is so large). As you go through the powerpoint if an image appears a bit blurry or unclear click on it and an arrow will appear in the lower left of the screen. Click on this arrow and the video should start.

Our stay in Botswana was largely confined to the Okavango Delta in the far north of the country. We were there during the dry winter season when game viewing is best and movement by field worthy vehicles is easiest. This meant that few plants were in flower but the animal life was evident everywhere.



Sleeping lion seen on safari

Unlike most rivers, the Okavango, which has its source in the highlands of central Angola, never reaches the sea. Instead the river fans out onto the sand of the Kalahari basin to create a unique oasis in the desert. This has resulted in a mosaic of river channels, islands, lagoons, forests, and woodlands that support a wealth of wildlife that includes large carnivores, herds of elephants, a diverse mammal fauna, and spectacular birdlife. To end our trip we spent a few days on the Zimbabwe side of Victoria Falls. Victoria Falls is some 5600 feet wide, twice the height of Niagara Falls, and one and a half times as wide. Victoria Falls and the Zambezi River form the border between Zambia and Zimbabwe. The Zambezi River is the only major river in Africa to flow into the Indian Ocean. Despite its fame and popularity the area around the falls has not been over commercialized, and there are unobstructed views from many vantage points connected by paved paths. The continuous spray from the falls even supports a small luxuriant rain forest on the Zimbabwe side of the falls so getting wet is part of the experience.

Botanical adventures around the globe

Nathalie Nagalingum

When the NightSchool organizers approached me about hosting an online evening event, I immediately knew the theme would be “Botanical Adventures” where botanists take viewers to all corners of the earth to collect plants and blooms all around the world. The line up featured four very accomplished and well travelled women who talked about their travels to four continents, collecting living and fossil plants and interesting encounters along the way.



Local delights, from my talk about Aussie botanical adventures

Here was the night's line up and you can view all the talks on [YouTube](#):

- Let's (virtually) head to the Andes! Forget the alpacas, this South American mountain range is home to 15% of all flowering plant species, including pantry staples like potatoes and quinoa, as well as spectacular bromeliads, orchids, and fuchsias. Join Dr. Laura Lagomarsino as she describes her encounters with the region's lesser-known plants and their hummingbird and bat pollinators!
- Australia is known as the place where everything is trying to kill you—and plants are no exception. Dr. Nathalie Nagalingum takes you on a virtual adventure to discover the beauty and dangers of the fascinating island country.
- Most people think of the “Big 5” and other charismatic animals when thinking of South Africa, but did you know if you looked down this beautiful country has some of the world's highest plant diversity? Learn about the country's Cape Floristic Region (CFR), a “knee-high” biodiversity hotspot, where Dr. Tanisha M. Williams studied the impacts of climate change on flowering plants found there.

- Dr. Dori Contreras hunts for leaves in both living and fossil tropical forests. Find out why she does it, and listen as she recounts some of the wild encounters and experiences working in vastly different environments during her quests to study forests past and present.

