



Smithsonian Environmental
Research Center

ON THE EDGE

News from the Smithsonian Environmental Research Center

Summer 2018



Searching For Palau's Secret Orchids

ALSO INSIDE:

The Hunt for Chinese Mitten Crabs is Back On

The Nightly Rap Battles of Bocon Toadfish

"Orchids in Classrooms" Brings Citizen Science to 6th-Graders

Meet Pepper, The New Android Docent

Even Global Science Is Local

THE DIRECTOR'S LETTER



There's a reason we're stationed on Chesapeake Bay. It's a wonderful and highly visible place to study the coastal zone and all its varied ecosystems. The issues at play here—sustainable fisheries, invasive species, pollution, rising seas, watershed dynamics and land use—are also playing out on coasts throughout the world.

But the reverse also holds true. SERC scientists work all over the globe, and many of their discoveries abroad can help us better understand and protect the Chesapeake.

This winter one of our postdocs, Benjamin Crain, journeyed halfway around the world to the island nation of Palau. Palau has some of the largest intact forests left on Earth, and some of the world's rarest orchids. Of the nearly 100 orchid species that grow there, 33 are found only on Palau. At first glance, Crain's mission might seem limited to conserving Palau's rare orchids. But as Crain and his partners explore how to germinate and grow these orchids in the lab, in the hope of reintroducing them in the wild, they're uncovering secrets that could help us conserve the 100-plus threatened and endangered orchids in the United States.



Benjamin Crain (right) examines an orchid with naturalist Ron Leidich. (Credit: Glenn McKinlay)

Closer to home, in a marsh on Maine's Penobscot River, scientists led by Cindy Gilmour are testing a new way of fighting mercury pollution. Tiny pellets of "activated carbon," when sprinkled on marsh soil, can bind to inorganic mercury, keeping it out of the water where it could enter the food web. The solution works even better for methylmercury, the neurotoxin that contaminates tuna and other seafood.



Herve Memiaghe, front, in Gabon's ForestGEO plot. The red line marks where they measure the tree's diameter. (Credit: Smithsonian Institution)

Many times simply joining forces with other communities can spark new revelations. In a SERC study this year, over 30 scientists pooled data from wetlands all over the U.S. and discovered—much to their amazement—that the nation's tidal wetlands are more alike than we thought in their ability to store soil carbon. And this summer, our Marine Invasions Lab is recruiting boaters on both U.S. coasts to help find invasive Chinese mitten crabs. If people catch one, they can freeze it, snap a picture and report it on the new Mitten Crab Watch site (mittencrab.nisbase.org).

Of course, how things work in Maine or Palau isn't a mirror reflection of how they work in the Chesapeake. Every environment has its own idiosyncrasies, and smart scientists

take local conditions into account. But most lessons can cross borders. Even if things don't operate exactly the same way in all ecosystems, learning how to conserve species and habitats abroad can provide clues to conserving them here, and vice versa. That's one of our key goals in working with the Smithsonian's Global Earth Observatories networks for forests and coastal marine ecosystems (ForestGEO and MarineGEO).

I'm continually inspired by the journeys our scientists make to uncover more of the planet's secrets. I'm equally grateful for the scientists outside the Chesapeake, and outside the U.S., who have shared their findings with us. In my own research on blue crabs, I have learned a great deal from crab aquaculture and fishery scientists who have shared their data and techniques from China, Japan, the Philippines, Thailand and Australia. As we collect long-term data here in the Rhode River, the larger Chesapeake, San Francisco Bay and beyond, we have exchanged new insights with other bays and estuaries around the world, gaining a deeper understanding of how our Bay fits into the health of the planet now and in the future.

— ANSON "TUCK" HINES, SERC DIRECTOR

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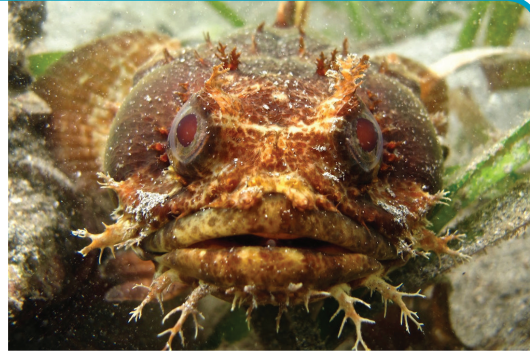
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Soil scientist Pat Magonigal scoops up a handful of mud in Sulawesi, Indonesia. (Credit: Rebecca Howard/Conservation International)

HOW DO MALE TOADFISH HOOK UP? NIGHTLY SING-OFF.

If you've never heard of the singing Bocon toadfish of Panama, you're not alone. They don't have the charisma of whales or dolphins, the ocean's more famous vocalists. But in a study this spring, scientists discovered male toadfish engaging in nightly underwater rap battles—and each toadfish had its own unique song.



To win a mate, Bocon toadfish compete by singing in “grunts” and “boops.” (Credit: Study authors)

Male toadfish sing in series of “grunts” and “boops” to attract mates. Erica Staaterman and Simon Brandl (SERC postdocs at the time) and three other biologists recorded 14 male toadfish singing from their burrows. While this study was the first to record unique songs in Bocon toadfish, the authors suspect it may be quite common among other fish species. “Sound travels very well underwater, so it's actually a really great medium to communicate,” Brandl said.

Link to study: <https://doi.org/10.1007/s10641-018-0752-0>

NEARLY 800 MILLION TONS OF CARBON MAY LIE BURIED IN U.S. TIDAL WETLANDS

Wetlands are among humanity's best defenses against climate change. Besides shielding us from hurricanes and other extreme weather, their soils soak up massive amounts of carbon. But nailing down how much carbon America's wetlands store proved challenging. Most datasets focus on other soil types, like agricultural soils.



Ecologist James Holmquist explores a wetland in Humboldt Bay, California. (Credit: Lauren Brown)

In a June study, over 30 scientists conquered that problem by pooling data from nearly 2,000 wetland soil cores, from their own research or previous studies. Led by SERC ecologist James Holmquist, they ran the data through models and other techniques for a better estimate. In the end, the simplest estimate proved most accurate. They averaged the carbon in all cores, and applied it to all tidal wetlands in the contiguous U.S. The final figure: 793 million tons.

Link to study: <https://www.nature.com/articles/s41598-018-26948-7>



Pellets of activated carbon can absorb toxic mercury and methylmercury before they enter the water. (Credit: Upal Ghosh/University of Maryland)

CLEANING UP MERCURY-POLLUTED MARSHES MAY BE SIMPLER THAN WE THOUGHT

A new weapon is proving its worth for fighting mercury pollution. It's called activated carbon, and scientists tested its abilities in one of its first field trials in a contaminated Maine marsh.

Activated carbon comes in tiny pellets of sand, clay and superheated carbon. Its power is its “stickiness.” It can bind to mercury—and mercury's seafood-contaminating cousin, *methylmercury*—keeping them from entering the water. In a new study led by SERC microbial ecologist Cynthia Gilmour, scientists sprinkled activated carbon onto polluted soil plots. After just one month, porewater mercury dropped 70 percent compared to untreated plots. Methylmercury dropped 90 percent. Activated carbon's power tapered off after about two

years, so it would need reapplication. But it's inexpensive, nondestructive, and it works.

Link to study: <https://doi.org/10.1016/j.scitotenv.2017.11.050>

The *Secret* Orchids of Palau

In a land with nearly one hundred different orchids, scientists are on a mission to conserve some of the world's rarest

BY KRISTEN MINOGUE

Most visitors to Palau don't come for its forests. The chain of 300-plus Pacific islands is more famous for coral reefs, giant rays and hundreds of flamboyantly-colored fish species.

"It's known as one of the top dive sites on the planet," said Benjamin Crain, a postdoc at the Smithsonian Environmental Research Center (SERC). Crain is the exception. He's visited Palau twice in the last year. Naturally fair-skinned, with a dark blond beard and ponytail, Crain has earned plenty of suntans and callouses trekking across the islands' uneven terrain. He was seeking some of Palau's forgotten gems on land—its rich diversity of orchids.



SERC postdoc Benjamin Crain hikes through Palau's Ngardok Nature Reserve searching for orchids. (Credit: Melissa McCormick/SERC)

A CONSERVATION HOTSPOT

Palau is an island nation in the southern Pacific, west of the Philippines and Indonesia. Though it spans 344 islands, its total land area is less than a tenth that of Hawaii. But there's one area where Palau outstrips Hawaii: Hawaii has just three native orchid species (the rest are nonnative or invasive). Almost all of Palau's 90-plus orchid species are native. Some grow nowhere but Palau. And orchids aren't the exception: Palau is a biodiversity hotspot, with some of the largest natural forests in the western Pacific.

Some of Palau's biodiversity can get chalked up to location. Sandwiched between Southeast Asia and Oceania, Palau has received "island hopping" species from both continents. Palau's people also have a strong conservation ethic, which makes them eager to preserve their forests.

"Protection of the environment has always been a part of Palau since I remember," said Omar Faustino, program manager in Palau's Ngardok Nature Reserve. "It is due to the fact that the environment is connected to how we live, and it is also connected to our cultural beliefs. In our way of life and our beliefs, marine life and terrestrial life go hand in hand to provide all the resources we need, such as medicine, timber, food security, and water."

That same environmental ethos has made Palauans cautious of outsiders studying the islands. Exotic orchids can fetch a high price, and even the best-intentioned research projects could potentially disturb the environment.

"The main concern is not the person who's doing the research or leading it, but the effects of the research on the land," Faustino explained. But after Crain and his team had overcome some initial skepticism, Palauan scientists like Faustino embraced the project.

"Once they knew that we were doing something to try and help out the local flora—once they knew that we weren't orchid pirates—they were really enthusiastic," Crain said.

ORCHIDS, ORCHIDS EVERYWHERE

Crain's team journeyed to Palau in September 2017 and February 2018 at the request of the U.S. Forest Service. Its Institute of Pacific Islands Forestry wanted more information on Palau's orchids, and

they knew SERC had experience studying orchids as the headquarters of the North American Orchid Conservation Center.



Omar Faustino, a scientist with the Ngardok Nature Reserve, plants seedlings of a *Calophyllum* tree variety that grows only on Palau. (Credit: Lomalinda Gabriel)

The team's first goal was nailing down how many orchid species Palau has. That became tricky once the team realized just how abundant orchids are on Palau, period.

"There would literally be epiphytic orchids that would cover the tree from the ground all the way up to where I couldn't even see them," Crain said.

Palau has two kinds of islands, sheltering different kinds of orchids. Crain spent most of his time exploring Babeldaob, Palau's largest island. Babeldaob rests on an extinct volcano. Volcanic islands like Babeldaob harbor the widest orchid diversity in Palau, with "terrestrial orchids" (orchids that grow in soil) and "epiphytes" (orchids that grow on trees).

Dotting the sea south of Babeldaob are hundreds of smaller "rock islands" made of limestone. Here, the terrain was more precarious.

"It's basically like walking on uplifted coral....It's an ankle-breaker," Crain said.

Rock island orchids tend to be tree-hugging epiphytes. But several orchid species managed to flourish on both island types. One especially tough terrestrial orchid, the purple *Crepidium calcereum*, grows only on Palau's rock islands.

Before arriving, Crain's team recorded 94 orchid species on Palau by scouring museums, herbaria and literature. In the field, they discovered a couple more species never formally documented on Palau, bringing the total to 96 (for now). One, a member of the genus *Agrostophyllum*, possesses long dark leaves and tiny flowers clustered into a tight ball. Crain said they're still not sure exactly what species it is, but its nearest relatives grow in Southeast Asia. Another with white and yellow flowers, *Dendrobium crumenatum*, also grows in Southeast Asia. A few *Bulbophyllum* orchids (orange on the big island, yellow or white on the rock islands) may even be hybrids, according to preliminary genetic analyses from SERC ecologist Melissa McCormick. But they need more info before making a final call.

Perhaps even more striking than the beauty or diversity of Palau's orchids is their uniqueness. More than a third—33 species—grow only on Palau. At least nine are very rare. It's an odd conservation paradox: In a place with an almost embarrassing richness of flora, why would nearly a tenth of its orchids struggle to survive?

THE UNDERGROUND NETWORK

The key to any orchid's survival lies underground. Orchids' tiny, dust-like seeds can't germinate without nutrients from special fungi in the soil.

"Without the fungus in the life cycle, the orchid is pretty much stuck," said Lawrence Zettler, an orchid biologist at Illinois College who partnered with Crain. "It's not going to develop. It'll just die."

But not all orchids need the same fungi. Some orchids can choose from dozens of fungus "donors." Other orchids pair up with just one species. To conserve Palau's rare orchids, Crain and the other scientists needed to know which fungi they required.

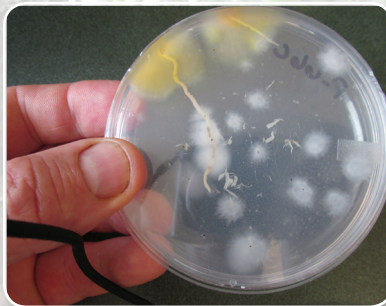
On Crain's first Palau trip, his team collected fungi-covered root samples from nearly 90 orchids. Because the U.S. government views foreign

fungi as disease threats, he needed a special quarantine facility to house them. Enter Lawrence Zettler. Zettler directs the Orchid Recovery Program at Illinois College. His lab includes a USDA-certified quarantine room perfect for growing fungi.

"It's under lock and key, 24 hours a day," Zettler said.

Since last fall, Zettler and his students have been isolating fungi from the Palau orchid roots and growing them on petri dishes. Zettler suspects some of Palau's orchids are rare because they're compatible with fewer fungi. But they're still awaiting results of molecular work to identify the fungi. Until then, he said, the jury is out.

Crain and Zettler both hope to launch another Palau expedition. They have 29 fungal cultures growing in Zettler's lab in Illinois College. If scientists collect orchid seeds too, there's a chance they could germinate some of Palau's more uncommon orchids in the lab and eventually reintroduce them into the wild.



Fungi from orchid roots grow on a petri dish in Lawrence Zettler's lab. Orchids need specific fungi to germinate. Zettler's lab is trying to find out which fungi Palau's orchids require. (Credit: Lawrence Zettler/University of Illinois)

The future of Palau's orchids is far from certain. If rising seas claim some of the orchids' territories, conservationists may need to find new homes for these orchids outside Palau.

"Climate change or human development may have some influence on their decline," Faustino said. "And we hope it does not end that way for Palau."

Reintroduction is still years away. But if the scientists can pull it off, it could mean additional ecotourism revenue for Palau, and a new lease on life for some of the world's rarest orchids.

An Orchid Oasis

More than 90 species of native orchids blossom on Palau, and 33 of them grow nowhere else. Here are a few of Palau's most eye-catching orchids:



Sarcanthopsis warocqueana

Epiphytic (tree-growing) and lithophytic (rock-growing) orchid native to Palau, also found in Papua New Guinea



Dipodium freycinetioides

A terrestrial and epiphytic orchid found only on Palau



Dendrobium brachyanthum

Short-flowered dendrobium, an epiphytic orchid found only on Palau



Crepidium calcereum

Also called Chalk crepidium, a terrestrial orchid found only on Palau's rock islands



Spathoglottis petri

A terrestrial orchid native to Palau, also found on the islands of New Caledonia and Vanuatu near Australia



Spathoglottis carolinensis

Caroline ground orchid, a terrestrial orchid native to Palau, also found on the Caroline Islands just west of Palau

(Credit: Benjamin Crain/SERC)

“Orchids In Classrooms” Turns Sixth-Graders Into Citizen Scientists

BY HANNAH-MARIE GARCIA

Think back to your early childhood science classes or science fair projects. Now, imagine the work you did as a kid was part of a larger scientific project, with real-world applications. That is exactly what four sixth-grade classes are doing this year at Walker Mill Middle School. Walker Mill is one of seven schools in Maryland working with the Smithsonian Environmental Research Center (SERC) on a project called “Orchids in Classrooms.”

More than half of the 200 native species of orchids found in North America are threatened or endangered. This project aims to figuring out the best growing method for orchids to help conservation efforts.

Joyce Park, recently voted Walker Mill Middle School’s Teacher of the Year, is a sixth-grade science teacher who helped engage her students in the project. She and her

students set up two metal shelves with an assortment of polka dot watering cans and color-coded trays. For about four months, they monitored the orchid seedlings.



Walker Mill Middle School sixth-grade students pose with their orchid experiments. (Credit: Hannah-Marie Garcia/SERC)

They grew all the orchids in the same soil, but used three different nutrient treatments: one control group (no added nutrients), one with fertilizer, and one with fungi, which orchids in the wild rely on for nutrients.

“It is easier to use fertilizer, because you don’t have to know what species of fungus an orchid likes or keep the fungus alive,” said Alison

Cawood, SERC’s citizen science coordinator. “But we don’t know what the differences in growth or survivorship might be for different species if we use fertilizer versus fungus.”

This project is part of a large-scale citizen science effort. SERC partnered with the Fairchild Tropical Botanic Garden in Florida and the North American Orchid Conservation Center, a coalition of orchid-researching organizations based out of SERC.

“It’s really cool to be working with the Smithsonian and know that what we did is going to help other real scientists,” one male student said as the project began to wrap up.

Citizen science projects like this allow scientists to gather data over a much larger scale than would be possible without the help of students and teachers. The information gained can aid orchid conservation projects and urban ecology efforts throughout the country. Here at SERC, we are excited to see what will come from something as simple as planting a seed.

Left: Downy rattlesnake plantain orchid (*Goodyera pubescens*), a species found in Maryland that next year’s students will grow. (Credit: Melissa McCormick/SERC) Right: Pine pink orchid (*Bletia purpurea*), a species from Florida that this year’s students grew in their classrooms. (Credit: Jay Staton)

Wanted: The Hunt for Chinese Mitten Crabs is Back On

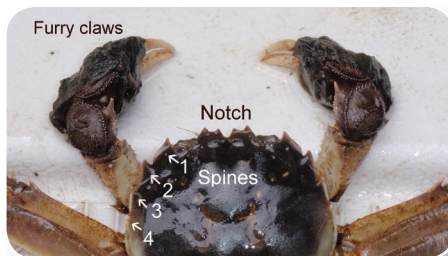
BY KRISTEN MINOGUE

An army of invading crabs has disappeared. But scientists are skeptical about whether they’re gone for good, or just hiding. This summer and fall, Smithsonian scientists are asking boaters to report any sightings of the elusive Chinese mitten crab.



Back in the 1990s and early 2000s, Chinese mitten crabs caused scares on both U.S. coasts. They made their debut in 1992, caught by a team of surprised fishermen in San Francisco Bay. Six years later, their numbers had exploded to nearly three quarters of a million in the North Bay alone.

“It was spectacularly abundant. A true outbreak,” said Greg Ruiz, a biologist with the Smithsonian Environmental Research



Center (SERC). “And it clogged the water intakes. Water is the economy in California.” The same story played out on a smaller scale on the East Coast, where over 100 mitten crabs appeared in the Hudson River. Dozens more showed their furry claws in Chesapeake Bay, Delaware Bay and New Jersey.

And then they vanished. Mitten crabs haven’t been seen in California since 2010. East Coast reports tapered off in 2009 and stopped altogether in 2014.

At first glance, this could be a rare victory against invasive species. Native to East Asia, Chinese mitten crabs are considered a delicacy in Chinese cuisine. But abroad, they’ve earned a reputation as one of the world’s worst invaders for clogging water systems, disrupting fishing and destabilizing river banks.

However, the mitten crabs could also be slipping under the radar. This year, SERC biologists are reaching out to boaters, fishers, scientists and government agencies throughout the U.S. asking them to report mitten crab sightings. They’re focusing on three regions: San Francisco Bay, Chesapeake Bay and the Hudson River.

They’ve already found three. A waterman on the Hudson caught the first in May and reported it to the New York State Department of Environmental Conservation. Summer yielded two more in the New York-New Jersey area. It seems the crabs haven’t vanished after all.

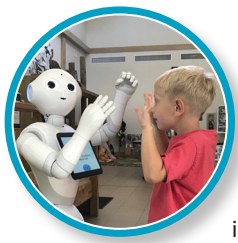
IF YOU ARE (UN)LUCKY ENOUGH TO CATCH A MITTEN CRAB HERE’S WHAT TO DO:

1. Don’t throw it back alive.
2. Take a close-up photo.
3. Note the location where you found it.
4. Freeze it, put it on ice, or (last resort) preserve it in rubbing alcohol.
5. Report your discovery to the Mitten Crab Watch

Website at <https://mitten crab.nisbase.org> or by calling 443-482-2222.



Left: A mitten crab discovered in 2007 in Chesapeake Beach. Center: Mitten crabs are known for their brown, spiny shells, furry claws and the u-shaped notch in their shells. Right: Flyer put out by SERC’s Marine Invasions Lab to encourage the public to search for Chinese mitten crabs.



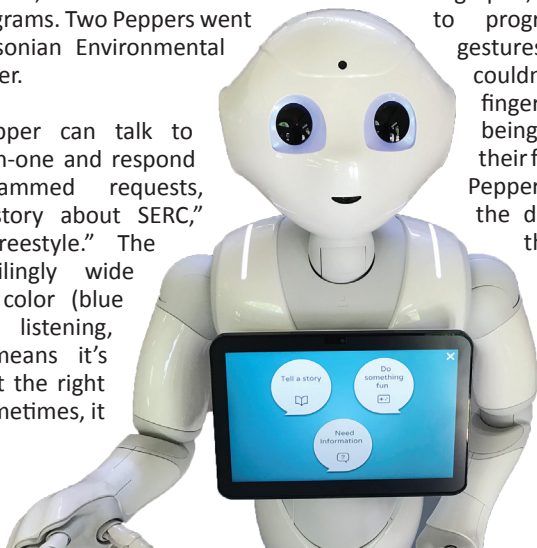
Meet Pepper, The Android Docent

BY KRISTEN MINOGUE

Don't panic. The new robot at SERC isn't about to stage a technological coup. But it can pose for selfies, talk about SERC programs and break out a dance move or two.

The robot goes by the name Pepper. Technically, Pepper has no gender, though most visitors—and a few staff—call the robot “she” by default. The Smithsonian received a team of Pepper robots in February from SoftBank Robotics, to test in their museums and other programs. Two Peppers went to the Smithsonian Environmental Research Center.

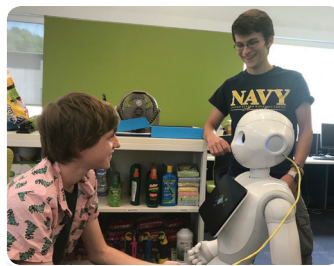
The first Pepper can talk to visitors one-on-one and respond to preprogrammed requests, like “tell a story about SERC,” or “dance freestyle.” The robot’s unfailingly wide eyes change color (blue means it’s listening, and green means it’s thinking about the right response). Sometimes, it even blinks.



“Having that little tiny detail of blinking, it makes her more human-like and more ‘alive,’” said Cosette Larash, SERC public engagement assistant who’s been programming the first Pepper.

The second Pepper spent the spring at South River High School, in Edgewater, Maryland, with three computer science students. Pepper number two has a different software, called Choregraphe, that enabled the students to program more specialized gestures Pepper number one couldn't do, like pinching its fingers like a crab. Of course, being high schoolers, one of their first priorities was teaching Pepper a dance move called the dab. (For the uninitiated, this looks something like sneezing into your arm).

“The first dab was definitely a crowd pleaser,” said Dan DeRycke, a rising senior at South River High who worked on Pepper with



classmates Cole Kindig and Zach Livesay.

But despite the rise of automation, Pepper won't be taking away any jobs. If anything, Pepper is creating them. After working on Pepper in the spring, both DeRycke and Kindig are continuing as SERC summer interns. And Pepper still needs a supervisor when receiving visitors.

You can meet Pepper during special events at SERC, or by coordinating a group visit. Check the calendar on SERC's Website (<https://serc.si.edu>) to see what events Pepper will be at, or contact Cosette Larash (larashc@si.edu) to organize a group visit. Pepper is also on view at the Smithsonian Castle, the National Museum of African Art, the Hirshhorn Museum and Sculpture Garden, and the National Museum of African-American History and Culture.

Top left: Pepper #1 dances with 6-year-old Michael McConnell in SERC's Reed Education Center. Right: SERC interns Dan DeRycke (left), Cole Kindig, and fellow classmate Zach Livesay (not pictured), helped program Pepper #2 to do more specialized gestures, including the dab. (Credit: Kristen Minogue/SERC)

Donor Spotlight: Chuck and Mindy Gallegos

BY BRIAN MAGNESS



Dr. Chuck Gallegos and his wife, Mindy. (Photo courtesy of Chuck Gallegos)

Dr. Charles “Chuck” Gallegos was the Principal Investigator of SERC’s Phytoplankton Laboratory from 1986 until his retirement in 2014. Using the Rhode River and the Chesapeake Bay as his base, Dr. Gallegos investigated how phytoplankton—microscopic algae that form the foundation of aquatic food webs—affect the water, especially its clarity. The legacy of the Phytoplankton Laboratory is a long-term dataset on phytoplankton dynamics and water clarity in estuaries spanning two decades.

After retiring, Dr. Gallegos joined SERC’s volunteer docent program, where he gives tours and shares his knowledge and the history of SERC with visitors. “Being a docent has allowed me to stay engaged with the SERC science community,” he said. “I meet with our scientists to learn about their newest research projects and then communicate that information to our visitors. And I keep apprised of the latest scientific research in the process.”

Dr. Gallegos and his wife, Mindy, have been regular donors to SERC since his retirement in 2014. “We know first-hand that it is going to a good cause. We make unrestricted gifts because we know how important it is for SERC to have funds to address unanticipated opportunities and needs,” said Dr. Gallegos. “Sometimes, a postdoc

might need an extra month to complete a project or a lab might need a summer intern. I am a big believer in SERC’s mission to train the next generation of environmental scientists. I am glad to know that our gifts support this mission.”

Over his 28-year tenure at SERC, Dr. Gallegos also developed another passion: photography. “I found that by extending my workday—coming in early or staying late—I was able to get better lighting and take more interesting pictures,” he said. His images have appeared extensively on the SERC website and in publications. Below is one of his favorites, shot on the Fox Point shoreline of the SERC property.



“Autumn Tracks,” showing raccoon footprints on the SERC shoreline, one of many photos Dr. Gallegos captured on the SERC campus. (Credit: Chuck Gallegos)



1965-2015

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Edgewater, MD 21037

Autumn Activities Lineup:



FAMILY CANOE DAYS

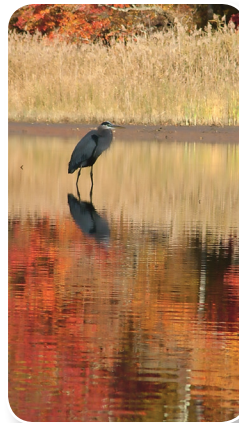
**Saturday, September 15th
and Saturday, Oct. 20th
9am-noon and 1-3pm**

Bring the family for a paddle on the Rhode River! We'll look for wildlife, talk about research and enjoy time outside on the Bay. Bring a picnic lunch and eat before or after the paddle at our picnic area. No experience necessary!

Children must be 6 years or older. Children 16 or younger must be accompanied by an adult. Cost is \$18 for ages 13-adult and \$16 for ages 12 and younger. Signups via email only at SERCoutreach@si.edu.

Above Photos Credit: SERC

*Front Cover Photo: One of Palau's many "rock islands," made of uplifted limestone. Palau is a biodiversity hotspot, and SERC scientists visited it earlier this year to study the island chain's 90-plus species of orchids. Insert Photo: *Dendrobium brachyanthum*, one of the species that's only found on Palau (Credit: Benjamin Crain/SERC)*



FALL FOREST FAMILY DAY

October, date to be determined

Soak in the autumn colors at SERC's fall festival! Enjoy hay rides and other hands-on activities while learning about how forests support life in the Bay. Check our Website in mid-September for more details.

BAY OPTIMISM LECTURES

Dolphins in the Chesapeake Bay

Tuesday, September 18 • 7pm

Speaker: Dr. Helen Bailey, University of Maryland

Keynote Robert Lee Forrest Lecture

Rhode to Globe: SERC Science Changing the Chesapeake and the World

Tuesday, October 16 • 7pm

Speaker: Dr. Anson "Tuck" Hines, SERC director



The Smithsonian Environmental Research Center is recognized by the IRS as a 501(c)3 nonprofit organization. Contributions to SERC may be tax-deductible.

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ON THE EDGE

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