Lakes

UC DAVIS TAHOE ENVIRONMENTAL RESEARCH CENTER
SUMMER 2015

THE TAHOE ENVIRONMENTAL RESEARCH CENTER (TERC) is a global research leader providing the science for restoring and sustaining Lake Tahoe and other treasured lakes worldwide for over 50 years.

TERC educates the next generation of leaders and inspires environmental stewardship in thousands of students, community members and visitors annually through its outreach centers in Incline Village, Nevada and Tahoe City, California.

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SCIENCE TO SAVE THE LAKE

RESEARCH BUOYS being prepared by NASA-JPL and TERC staff for deployment on Lake Tahoe

RESEARCH UPDATES

NEW RESEARCH BUOYS FOR LAKE TAHOE

If you have spent time in a boat on Lake Tahoe, you may have seen the four massive research buoys that TERC operates with NASA-JPL. These buoys collect data that help check the accuracy of satellite information, provide instantaneous weather data, and even measure the dust and nutrients that fall out of the air and onto the lake.

Two of the older buoys, which have been in service for over 10 years, are being replaced by new, more robust buoys. The buoys and their 1.5 ton anchors were delivered to the TERC Field Station in May, prior to being outfitted with new instruments. Data from the buoys will soon be available online, along with wind maps and wave maps for the entire lake.

DROUGHT CONDITIONS

Have you noticed anything different about Lake Tahoe this summer? For one thing it is lower than it was at this time last year, one of the consequences of the continuing drought. And it will continue to get lower throughout the summer and fall. Before the first significant rains of the fall, the lake will possibly drop another 18". In some parts of the

Continued on Page 3

LETTER FROM THE DIRECTOR

When it comes to science, there is always much to talk about. For that reason, TERC has hosted monthly presentations for the public since we opened our doors in October 2006. Since then we've hosted discussions about the science of Lake Tahoe as well as topics as diverse as animal and human health, recreation, global environmental ecosystems and, of course, wine and cheese.

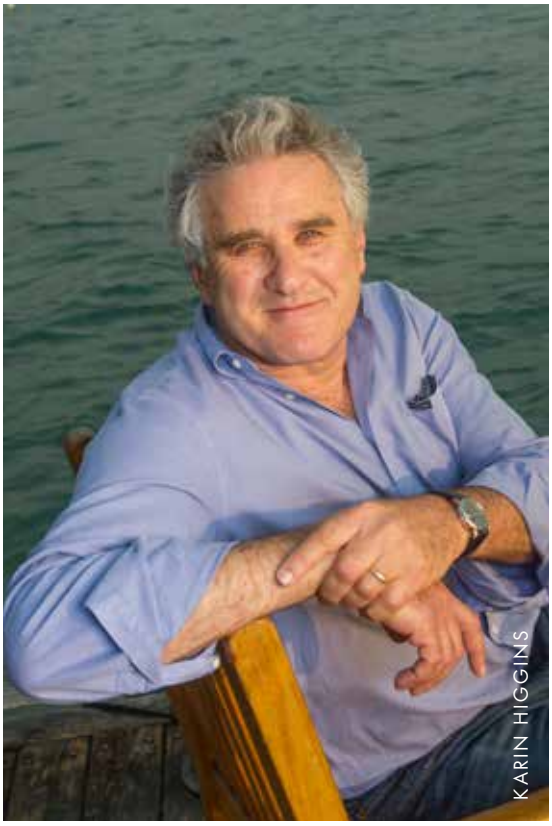
This year, on June 4, we were treated to a very different presentation. Rather than a conventional lecture, we heard from Dr. Charles Goldman. He spoke about the more personal side of conducting a half-century of lake research to a packed auditorium of TERC donors, friends and community members. Whether the stories concern crocodiles in Lake Victoria or beer making in Antarctica, there was always a learning moment. These stories reminded us that science can be both fun and hard at the same time.

It was a presentation that took the audience back to a time when, surprisingly, restoring and stewarding the lake was not an idea that everybody embraced. Since that time, fortunately, a lot has changed. The local community now fully understands the role a healthy lake plays in our economy, our way of life, and how the rest of the world views us. Much of that change was led and inspired by Charles Goldman.

For that reason, I am proud to announce that TERC has launched the Charles Goldman Endowed Fund, which will support students and young researchers, and honor the lifetime efforts and achievements attained by Charles Goldman. Details of the Fund are in this newsletter (on Page 7). I hope that you will join me and others in supporting this endowed fund, and thereby ensure that research at Lake Tahoe will be here for generations.

The challenges that TERC researchers are seeking to address, which will impact the future state of Lake Tahoe, are clear. They range from the health of the nearshore, to the impacts of climate change, to how best to manage the lake today for our grand-children's benefit. But the answers to those questions are not always so clear. As Einstein said, "If we knew what it was we were doing, it would not be called research, would it?" Yet these are challenges I know we can answer if we work together.

This team effort includes staff, faculty, students, young researchers and YOU—our donors, friends and community partners. Your efforts to fund students and young researchers and the innovative programs and projects we conduct every day will help us answer these complicated and complex questions. Thank you for all that you do for TERC and we look forward to continuing our partnership with you going forward so that together we can preserve, steward and better understand one of the most beautiful lakes in the world, which happens to be in our backyard.



GEOFFREY SCHLADOW, Ph.D., Director Tahoe Environmental Research Center

RESEARCH UPDATES *(Continued from Page 1)*

shoreline, that means the beaches will widen by many hundreds of feet.

The lake is also clearer and bluer than it has been for a number of years. Part of the reason is that with less rain and snow, fewer nutrients and particles are carried in from streams and storm drains. But another important reason is that the drought conditions have slowed down the internal mixing that normally takes place deep inside the lake. This mixing is responsible for bringing up dissolved nutrients from the deep waters, and these are essential for algal growth.

The full story behind the drought impacts will be in the *2015 Tahoe: State of the Lake Report*.

MAJOR STORMS produce very different water quality changes around the lake

NEARSHORE NETWORK UPDATE

TERC's Nearshore Network of environmental monitors is up and running, and producing data the likes of which have never been seen before – not at Tahoe, not anywhere. By the beginning of June, seven stations were recording data and posting results online every 30 seconds. And more nearshore stations will be added in 2015.

What are we learning? For the first time we are getting a sense of what the "normal" and "extreme" water quality conditions in the nearshore can be. For example on December 13, 2014, a tremendous wind storm hit Lake Tahoe, with sustained wind speeds of over 40 mph. What the network told us was that 5 foot waves were pounding the north shore, producing very high turbidity. At the same time, only 4 inch waves were lapping Rubicon on the west shore, and turbidity was 100 times lower. At the same time water from a depth of over 800 feet was rising up in Meek's Bay, lowering the water temperature to a frigid 41 degrees Fahrenheit. The impacts of such events are discussed further in the *2015 Tahoe: State of the Lake Report*.

NEARSHORE NETWORK environmental monitors are providing continuous water quality data from all around the lake

EDUCATION AND OUTREACH

CITIZEN SCIENCE APP COMING SOON

TERC has been developing a new mobile app for citizen science in the nearshore of Lake Tahoe with funding from the Institute for Museum and Library Services (IMLS). With help from TERC supporter John Keagy and consultant Tisha Carper Long, an app design competition for undergraduates at UC Davis was launched.

The best proposal was submitted by Shahzeb Khan, a computer science major. Shahzeb has earned the TERC Application Development Award and will develop the first version of the app. Congratulations Shahzeb!

The Tahoe App is currently under beta-testing and will be available to the public in mid-August 2015.

STUDENTS ENJOY SCIENCE EXPO and learn about keeping their brains, hearts, lungs, and the environment healthy

SCIENCE EXPO A SUCCESS AGAIN

TERC's 10th annual Science Expo was a huge success! During the week of March 16—20 we hosted over 1,200 local students at the UC Davis Tahoe Science Center for a Life Science Expo and Health Fair.

The Science Expo included more than 30 science activities exploring Organisms and Ecosystems (plant and animal life cycles, food webs, local and global ecosystems, and the diversity of life), Inheritance and Adaptation (genetics, natural selection, and adaptations), and Health Science (human health, nutrition, anatomy, and physiology).

"The students left with so many discoveries, insights, and questions, which has led them on further explorations. Your team is amazing," said a third-grade teacher from Creekside Charter

SCIENCE EXPO 2015 included some opportunities for audience participation as we shared the big ideas of energy, matter, and life

SCIENCE EXPO 2015 included a health fair sponsored by the Rotary Clubs of Incline Village

EDUCATION AND **OUTREACH**, CONTINUED

in Tahoe City. Bijou Community School explained, "We debriefed almost a week later and many retained information they learned and/or were able to recall significant facts when reviewing their passports."

And students enjoyed it too. "I had so much fun at the Science Expo. My favorite part was the bunnies and the brains. I learned that brains and hearts are very important."

This hands-on learning experience would not have been possible without our wonderful volunteers. TERC would like to thank all the community members that participated, as well as our regular volunteers from IVGID, Nevada's Northwestern RPDP, Rotary Club, Sierra Nevada College, Sierra Watershed Education Partnerships (SWEP), and the South Tahoe Environmental Education Coalition (STEEC).

And special thanks to our sponsors—IV Coffee Lab, Pet Station, Rotary Club of Tahoe City and Tahoe-Incline, Susie Scoops, and our partners—the American Lung Association, Animal Learns, Tahoe Forest Hospital District, Tahoe Institute for Natural Science, Tahoe Institute for Rural Health, Sierra Nevada College, and the US Forest Service.

YOUTH SCIENCE INSTITUTE participants included Mitchell Martin, Tatum Bunnett, Charlie Zendner, Avery Fournier, Edward Parkhill, Sophie Pokorny, Cas Dalsey, Avery Spencer, Carley O'Connell, Diana Hitchen (back row), Athena Collier, Laynie Saidnawey, Esten Flores, Zali Hankinson, Katie Haran (front row), and Aiyana Fraas (missing from photo)

CHILDREN'S ENVIRONMENTAL SCIENCE DAY

This summer we will be hosting our 16th annual Children's Environmental Science Day on August 2nd at Commons Beach in Tahoe City from 12:30—3:30 p.m. If you are interested in participating or volunteering, visit http://terc.ucdavis.edu/events for event details.

YOUTH SCIENCE INSTITUTE

The 2015 Youth Science Institute had 13 participants graduate this year with all students indicating that they found the program "very useful" for helping them determine which scientific fields they will pursue upon graduation from high school.

The program is dedicated to exposing high school students to various types of science by hosting an interactive lesson with a different science professional each week.

One participant commented after the program, "I'm still very interested in science, and the program heightened the potential of science in my life". Congratulations to the 2015 YSI graduating class.

UPCOMING **EVENTS**

JULY 11, 2015: Fishing and Historical Hatchery Event, with Dave Long at the Tahoe City Field Station

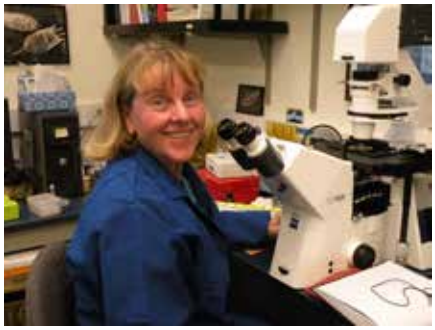
JULY 23, 2015: The annual State of the Lake presentation by TERC director Dr. Geoff Schladow. Doors open at 5:30 p.m. No-host bar available. Program begins at 6:00 p.m.

AUGUST 2, 2015: Children's Environmental Science Day will be held at Commons Beach in Tahoe City from 12:30 p.m.—3:30 p.m. Join UC Davis and partnering organizations for hands-on science activities and games related to Lake Tahoe, watersheds, water quality, water conservation, food webs, aquatic invasive species, litter, recycling, and more!

SEPTEMBER 17, 2015: Using LiDAR imagery to re-examine faulting and geologic history of western Nevada, with Courtney Marie Brailo, Nevada Seismological Laboratory. Doors open at 5:30 p.m. No-host bar available. Program begins at 6:00 p.m.

STAFF HIGHLIGHTS: **DEBBIE HUNTER**, **ANNE LISTON**, AND **PATTY ARNESON**

Ever wanted to know how many phytoplankton there were in Lake Tahoe, and what their names were? If so, **Debbie Hunter** would be the person you would ask. Debbie has been looking down a microscope and counting and identifying phytoplankton at Lake Tahoe and other lakes for over 30 years. Before that she ran the Tahoe Research Group chemistry labs. Debbie will be retiring at the end of June, signaling the end of an era. We wish Debbie all the best for her retirement, and thank her for all that she has done by shining a light on the smallest residents of the lake.



DEBBIE HUNTER at her microscope counting and identifying phytoplankton

Fortunately **Lidia Tanaka** has been undergoing training with Debbie for the last two months, and will take over as TERC's Chief Phytoplankton Officer (CPO). Lidia earned her Ph.D. in Japan, working on the phytoplankton of Lake Biwa. Welcome Lidia!

Congratulations to our head chemist **Anne Liston**, who received a campus Safety Star Award for her leadership in implementing the new campus safety protocols in all TERC labs. Our labs our now among the safest in all of the UC system.

ANNE LISTON receives the UC Davis campus Safety Star Award from Tony Schrick for her leadership in implementing the new campus safety protocols in all TERC labs

And long time data analyst **Patty Arneson** received an award from the campus earlier this year for her 35 years of service. Patty is the guardian of TERC's data, and among her many accomplishments is compiling the data for the State of the Lake Report.

STUDENT HIGHLIGHTS

Congratulations to **Derek Roberts**, who was awarded a prestigious NSF Graduate Fellowship for his Ph.D. studies. Derek has been leading the development of the Nearshore Network. He has a separate NSF EAPSI award to work in New Zealand with Dr. David Hamilton's group at Waikato University for the summer. There he will be working on Tahoe's sister lake, Lake Taupo.

Farewell to **Heather Sprague**. Heather will be graduating this summer and has accepted a position with ARCADIS in San Francisco. Heather has been studying the internal motions of Lake Tahoe, specifically relationship between lake-scale waves and dissolved oxygen movement, with data from the Homewood Nearshore Sensor Station.

Congratulations to graduate student **Tom Mathis** who will also be graduating this summer. Tom has been measuring the evaporation from Lake Tahoe using data from the NASA/JPL buoys. Results indicate that more than 4 feet of water evaporate off of Lake Tahoe each year which equates to more than 160 billion gallons! More congratulations to Tom and to Christina Kim who will be getting married this summer.

Farewell to **Francisco Bellido**, our visiting student from the University of Granada, Spain. Francisco has been undertaking the computer modeling of Lake Tanganyika, the second deepest lake in the world.

Welcome to **Perrine Ratouis**, a visiting student in the fall from the Swiss Federal Institute of Technology of Lausanne. Perrine will be looking at the motions of water in the near-shore regions of Lake Tahoe.

Welcome to **Karen Atkins**, a new hydrology student who will also start in the Fall 2015. Karen is currently an Americorps member, working in Nevada City with the Sierra Fund.

ALUMNI NEWS

Dr. Kristin Reardon, who completed her Ph.D. late last year, is now a post-doctoral researcher at the University of Alaska, Anchorage.

CHARLES GOLDMAN
ENDOWED FUND TAKES OFF

The Charles Goldman Endowed Fund was created to honor Dr. Goldman's pioneering research on threats to Lake Tahoe's quality. Established with a generous gift from Robert and Patricia Ronald and family, the Fund supports student research focused on solutions to sustain the health of Lake Tahoe and other lakes worldwide. The goal is to grow the fund to be self-sustaining to ensure that his legacy of science-based restoration will continue in perpetuity. For information on contributing to the Charles Goldman Endowment Fund, please contact Dr. Geoff Schladow at gschladow@ucdavis.edu or (530) 902-2272.

CHARLES GOLDMAN on the UC Davis research vessel with vice president Al Gore and president Bill Clinton in 1997 (courtesy of The Sacramento Bee)

ABOUT DR. CHARLES GOLDMAN

In 1959, Dr. Goldman formed the UC Davis Tahoe Research Group and began regularly monitoring Lake Tahoe. He successfully combined effective research and social action with his pioneering studies of lake eutrophication—the over-abundant growth of algae caused by excessive nutrient inputs. Decades of extensive, internationally-renowned investigations by Goldman and his many students provided clear evidence for the onset of eutrophication in Lake Tahoe.

These findings have served as the underlying basis for nearly all major policy decisions regarding water quality in the Tahoe Basin, including exportation of sewage and solid waste; controls on building, pollution and dredging; installation of major erosion control projects; and protection of wetlands, to name a few.

Dr. Goldman retired from UC Davis in 2010 where he had been a professor since 1958. He developed the first courses in limnology (the study of fresh waters) and oceanography at UC Davis. Goldman's career work was honored with the prestigious Albert Einstein World Award of Science in 1998—recognizing those who have accomplished scientific and technological achievements that advanced scientific understanding and benefited humanity.

In addition to his professional contributions, he personally worked tirelessly with community members to help raise the $13 million in philanthropic gifts needed for state-of-the-art facilities to house the UC Davis Tahoe Environmental Research Center, which opened in 2006.

TERC **VISITORS**

Welcome to Drs. **Rita Adrian** and **Ulrich Göringer**, visiting researchers from the Technical University of Darmstadt, Germany. They will be spending a 9-month sabbatical at TERC.

Dr. Adrian is a plankton ecologist. She is head of the Department of Ecosystem Research at the Leibniz-Institute of Ecology and Inland Fisheries in Berlin and she teaches Limnology at the Free University of Berlin. She is particularly interested in studying Tahoe's bears.

Dr. Göringer is a biological chemist. He is head of the Department of Molecular Genetics at the Darmstadt University of Technology (TUD) and Adjunct Professor of Chemistry at TUD.

Dr. Paula Marín from the Universidad Austral de Chile visited TERC in March 2015 and participated in Science Expo. Paula is an expert in science education, and will be collaborating with TERC to advance science education in northern Patagonia.

Dr. Takuro Ito, a research scientist at Keio University, will visit TERC in early July.

GIVING TO THE TAHOE ENVIRONMENTAL RESEARCH CENTER

PRIVATE SUPPORT is critical to continuing the Tahoe Environmental Research Center's legacy of groundbreaking work in restoring and sustaining Lake Tahoe. Gifts at every level support research, education and outreach, and give the flexibility to address emerging needs and opportunities. Every gift makes a difference and there are many ways to give. Thank you!

SCIENCE SUSTAINER

There are two easy options for giving:

1) Make a secure online gift at https://give.ucdavis.edu/JMIE/TERCGFT
2) Fill out the information below and mail with a check payable to UC Regents

☐ **YES**, I wish to support the Tahoe Environmental Research Center with the gift amount shown below.

☐ Please contact me about how I can make a deferred or estate gift to UC Davis.

☐ I wish this gift to remain anonymous.

Mail to: *UC Davis Tahoe Environmental Research Center*
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