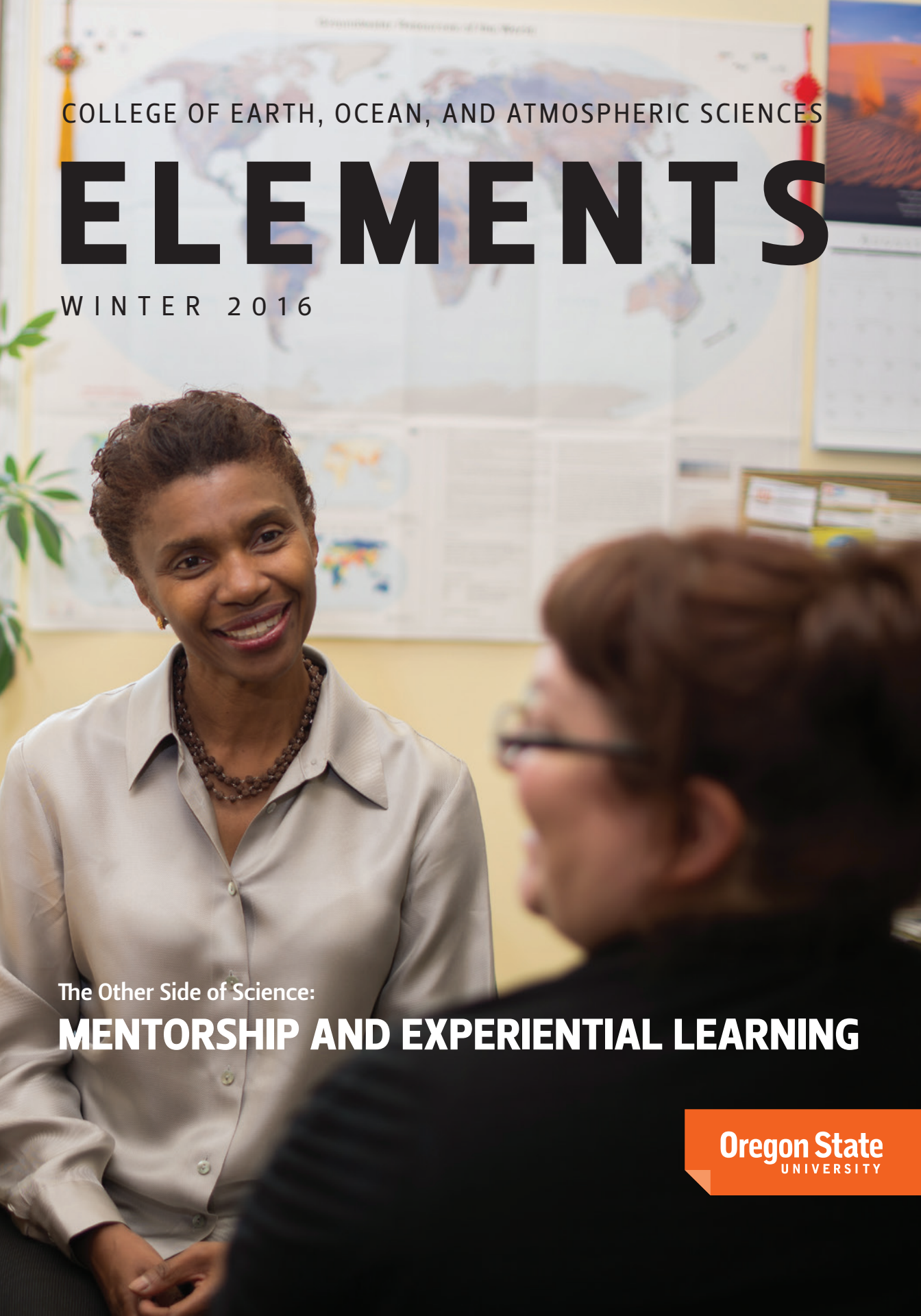

COLLEGE OF EARTH, OCEAN, AND ATMOSPHERIC SCIENCES

ELEMENTS

WINTER 2016

The Other Side of Science:

MENTORSHIP AND EXPERIENTIAL LEARNING

Oregon State UNIVERSITY

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About the College

The College of Earth, Ocean, and Atmospheric Sciences (CEOAS) is an internationally recognized leader in the study of the Earth as an integrated system. With more than 100 faculty, 200 graduate students and 600 undergraduate students, the college has an annual budget of more than $50 million, with much of the research support coming from the National Science Foundation, National Oceanic and Atmospheric Administration, National Aeronautics and Space Administration and other federal agencies.

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On the cover: Lynette de Silva helps a student as part of the Increasing Diversity in Earth Sciences program, an NSF-supported effort that has created mentored research experiences for dozens of underrepresented undergraduates. (Photo by Hannah O'Leary)

EXPLORING THE OTHER SIDE OF SCIENCE

It's a time of transition at the College of Earth, Ocean, and Atmospheric Sciences. We are excited to welcome Roy Haggerty as our interim dean and to continue the search for a permanent leader. We also thank Mark Abbott for his years of service and stellar leadership. No doubt this transition will open up many points of reflection on how we can deliver even more impactful research and academic programs in the Earth system sciences.

One way we are already building a better college is by focusing on the other side of science — the experiential learning, mentorship, leadership skills and professional development opportunities necessary for today's students. We are committed to instilling a strong base of analytical and technical skills, together with real, impactful experiences that build professional competencies.

For example, read about Increasing Diversity in Earth Sciences, an NSF-funded program that has helped scores of underrepresented undergraduates become accomplished researchers through a built-in mentorship experience. For more than 20 years, the Geoclub has taught students about global geology and geography in the best possible way — by exploring the world. The Salmon Bowl has for 18 years improved ocean literacy among high school students throughout the Pacific Northwest, while inspiring future scientists with competition and collaboration. Alumnus Mike Parker ('90 M.S. Geology) understands the importance of enhancing professional skills within the sciences. He has come full circle to mentor students and help them make the leap from college to career.

These real-world efforts are complemented by our strong research program. The Ocean Observatories Initiative made major headway on the Endurance Array that will give scientists and citizens unprecedented access to information about our oceans, including marine dead zones and wave energy potential. Finally, our paleoclimatologists are uncovering the complex link between icebergs and methane levels in the tropics.

Yes, it is a time of change, but it's also a time of opportunity. We invite you to read more, stay in touch and see what we have in store for next year.

Roy Haggerty, Interim Dean

Jack Barth, Associate Dean for Research

Anita Grunder, Associate Dean for Academic Programs

OCEAN OBSERVATORIES INITIATIVE COMPLETES INITIAL PACIFIC NORTHWEST DEPLOYMENTS

Last spring, Oregon State University scientists deployed a sophisticated research buoy and two undersea gliders, all fitted with a suite of oceanographic instruments — a final piece of the Endurance Array, a major component of the National Science Foundation's $386 million Ocean Observatories Initiative.

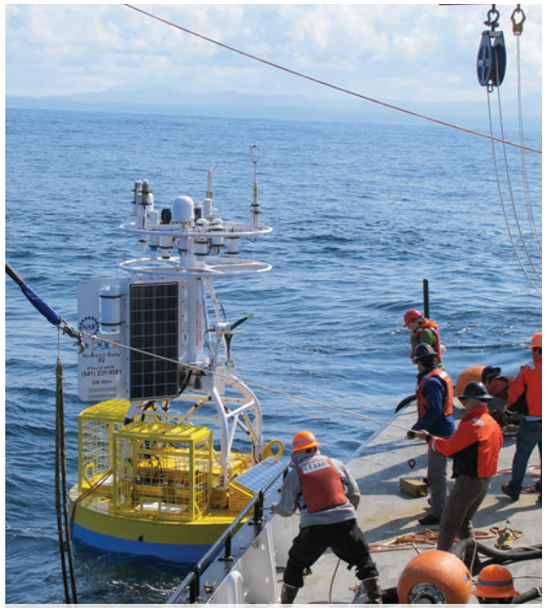
"This observatory opens up a new type of window to the sea, with environmental data available in real time to researchers, educators, policy makers and ocean users," says Ed Dever, project manager for the Endurance Array. "In the short term, it will be a laboratory for the study of processes in one of the great coastal upwelling systems on our planet.

"In the long term, the information it collects will allow us, our children and our grandchildren to better understand the impacts of global climate change on the coastal ocean off Oregon and Washington."

The deployment of an inshore surface buoy about a mile off Nye Beach in Newport — in waters about 25 meters deep — is the third and final platform location in the array's Newport Hydrographic Line. The line includes a shelf surface buoy in 80 meters of water, about 10 miles off the coast, and an off-shore surface buoy in 500 meters of water, about 35 miles out.

"For the first time, the science community will be able to monitor and assess all components of the ocean simultaneously, from the physics to the biology to the chemistry," says Jack Barth, an Oregon State oceanographer who has been a lead scientist on the Ocean Observatories Initiative since the early planning stages more than a decade ago.

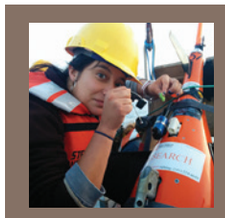
The buoy will have an impressive array of instruments — at the surface, on the seafloor where it is anchored and attached to a cable running up and down the water column. Various sensors will measure water velocity, temperature, salinity, pH, light intensity, carbon dioxide, dissolved oxygen, nitrate, chlorophyll, backscatter (the measure of particles in the water), light absorption — and even populations of zooplankton and fish.



The Oregon shelf surface buoy deployed from the R/V Oceanus has sensors to monitor multiple ocean parameters.

The other two buoys in the Newport Hydrographic Line will be paired with seafloor instruments that will be plugged into an underwater cable operated by the University of Washington.

"These buoys are game-changers," Barth says. "We will be able to better monitor emerging hypoxia threats, toxic plankton blooms and ocean acidification. Fishermen can match oceanographic data with catch records and look at how temperature, salinity and other factors may affect fishing. The possibilities are endless."



ALEJANDRA SANCHEZ

Flows in the upper ocean

Alejandra Sanchez is a Ph.D. student in physical oceanography. Using data collected by underwater gliders, she is working with Associate Professor Kipp Shearman to understand processes that contribute to the mixing and transport of heat, salt and nutrients from the surface to the interior of the ocean. Sanchez has won numerous awards, including the OSU Women's Center Student Leader and the CEOAS Outstanding Service to the College awards.

THE NOT-SO-STRANGE CONNECTION

between icebergs and tropical wetlands

Professor Ed Brook and graduate student Andy Menking core for ice in Antarctica.

Huge influxes of fresh water into the North Atlantic Ocean from icebergs calving off North America during the last ice age had an unexpected effect — they increased the production of methane in the tropical wetlands.

Usually, increases in methane levels are linked to warming in the Northern Hemisphere, but scientists have identified rapid increases in methane during particularly cold intervals during the last ice age.

These findings are important, researchers say, because they identify a critical piece of evidence for how the Earth responds to changes in climate.

"Essentially what happened was that the cold water influx altered the rainfall patterns at the middle of the globe," says Rachael Rhodes, a former research associate at Oregon State University and lead author on the study. "Our data suggest that when the icebergs entered the North Atlantic, it caused exceptional cooling. Then, the rainfall belt was condensed into the Southern Hemisphere, causing tropical wetland expansion and abrupt spikes in atmospheric methane."

Rhodes and her colleagues examined evidence from the highly detailed West Antarctic Ice Sheet Divide ice core. They used a new analytical method perfected in collaboration with Joe McConnell at the Desert Research Institute in Reno, Nevada, to make extremely detailed measurements of the air trapped in the ice. Using the high resolution of the measurements, the team was able to detect methane fingerprints from the Southern Hemisphere that don't match temperature records from Greenland ice cores.

"It is a great example of how interconnected things are when it comes to climate," Rhodes says.

JON EDWARDS

Greenhouse gases trapped in ice cores

Jon Edwards is a Ph.D. candidate in Marine Geology and Geophysics doing climate research under Professor Ed Brook. A first-generation college student, Edwards is studying past climates by measuring ancient gases trapped in small bubbles within ice cores. He is a recipient of the CEOAS Teaching Assistant Award and the Murray Levine Memorial Fund Award.

Students in the Increasing Diversity in Earth Sciences (IDES) program at Paulina Peak in central Oregon.

MENTORSHIP MATTERS:

Increasing Diversity in Earth Sciences program nurtures undergraduates

Eduardo "Lalo" Francisco Guerrero grew up in Mexico with a rich landscape at his feet. Outside his window in Cuernavaca — south of Mexico City — he could see the sweeping rise of a volcano. One of his first memories was the magnitude 8.0 earthquake that shook the capital in 1985. But despite being surrounded by Mexico's vibrant geology, Guerrero never thought about turning his passion into a profession. In fact, he never knew he could become a geologist.

"If you were going into science, it was computer science, chemical engineering or something like that. But the physical sciences weren't presented as a viable option. I never met a geologist. I never talked with someone who had gone through that program," he says.

Guerrero's experience might not be that unique. A 2015 National Science Foundation report on women, minorities and persons with disabilities in STEM fields (science, technology, engineering and math) showed that since 2000, the number of underrepresented minorities in physical sciences has been flat.

"I think that geology and Earth sciences in general, unless you're lucky enough to be exposed to them, are often overlooked as professions. You might not even know you want to do it," Guerrero says.

Fortunately, Guerrero is helping to combat statistics, both individually as a Ph.D. student in geology at Oregon State University, and as the program assistant for the Increasing Diversity in Earth Sciences (IDES) program. Through this NSF-funded program, Guerrero has been able to provide undergraduates with a key ingredient that was missing from his own experience: mentorship.

While funding for the five-year program officially ended in 2015, its successes in nurturing future scientists are commendable. Upwards of 50 students participated in the program over its tenure. Many have continued on to graduate school, earned NASA fellowships, become teachers or coauthored papers. In a final evaluation report, students cited that IDES helped them expand opportunities, establish professional contacts, build self-confidence and improve employment prospects.

Lynette de Silva, the IDES program coordinator who worked with Guerrero, says mentorship was essential to the program's accomplishments, and something they took beyond transmission of information from professor to pupil. "Mentoring is more than providing academic information; it provides understanding through doing and seeing, on many levels. It builds on the successes the students have in the classroom and provides a bridge to the kinds of successes one has in the workforce," she says.

AN ACADEMIC HOME FOR DIVERSE STUDENTS

Launched in the College of Earth, Ocean, and Atmospheric Sciences, the NSF-supported effort recruited and retained undergraduate students in the Earth sciences from diverse backgrounds, while helping them engage in research. The program stands on the shoulders of a decades-long diversity effort within CEOAS, including a predecessor program, Native Americans in Marine and Space Sciences.

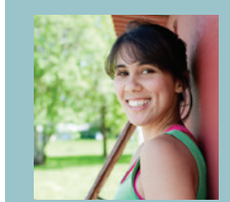
IDES enrollees were mostly transfer students from nearby community colleges, a program hallmark that created a steady pipeline of students. These students represented diversity groups from strictly ethnicity-based to non-traditional students returning to college.

"It's really trying to increase the likelihood of success in transfer students, and we particularly focused on non-traditional students," says Shan de Silva, IDES principal investigator. "IDES students were engaged for two full years, which was key to giving the participants an academic home within the university."

BUILDING A CULTURE OF MENTORSHIP

The IDES program built mentorship early into the process. Every student was assigned a mentor — a faculty member or someone outside the university system who shepherded them through a research project, helped them develop applied skills and transition to the real world. The mentee-mentor pair would then meet regularly to devise a research project, whether documenting hotspots in seamounts or assessing biomass for fuel potential.

Students also had ample opportunities to build a culture of peer mentorship. New recruits participated



2010 COHORT FEATURE

Olivia Poblacion

"In gaining a better understanding of Earth systems through my involvement with IDES and the Ecoinformatics Summer Institute, I have become increasingly committed to communicating geosciences to diverse audiences. I am now minoring in writing."

IDES students participated in summer field trips as part of the cohort experience and to learn about the regional ecosystem and landscape.

in a two-week GIS workshop, summer field trips and monthly cohort meetings.

"We'd take them around Oregon and show them the coast and the Cascades, all while building geological observations and their passion for the Earth sciences," Shan de Silva says.

IDES participants did team-building activities like a ropes challenge course. Guerrero says that these kinds of activities, while lighthearted on the outside, are vital to retaining students and ensuring success as they build cohort identity.

"There's a motto I keep in my mind. The first thing is for students to feel safe, and if they feel safe, then they can have fun. And if they can have fun, then they are going to learn," he says.

A GROUP EFFORT

The IDES program's support structure went deeper than a single mentor or cohort experience. In many cases a whole lab group mentored a student, down to graduate students and post-docs.

"They were part of a team, a team comprised of several national or world-renowned scientists, post-docs and graduate students, all contributing to a project and the success of the mentee," Lynette de Silva says.

As a result, mentees learned how their interests might translate to career choices. That was certainly the case for former IDES student Kristin Richardson. She came into the program with a 10-year teaching career already behind her, but she was eager to become a scientist. Her mentor, Rob Wheatcroft with the College of Earth, Ocean, and Atmospheric Sciences, helped her do just that.

"He taught me many of the basic components of research such as how to review the relevant literature, how to frame questions and form hypotheses and how to write a proposal," Richardson says.

Richardson is now finishing a master's program at Oregon State, where she continues to work with Wheatcroft. Her project investigates linkages between forest harvest practices and increases in offshore sediment rates. Richardson recently accepted a job as a hydrologist on the Lolo National Forest in Montana. Now, she proudly calls herself a scientist.

Mentors also benefit from the relationship, because they earn a productive research assistant. For Joe Stoner, a marine geologist and paleomagnetist, mentoring an IDES physics student led to new instruments that enhanced his sediment core analysis. "He did most of the work — the programming, the building. And now we have an instrument that is probably a third of the cost of what's on the market," Stoner says.

WHAT'S NEXT

As the program sunsets, coordinators and supporters are looking at what the next iteration of IDES might be. Bob Duncan, a co-PI of the project, says the mentorship factor has been so successful in building research interest that he sees potential at the university level.

"I've come to the point of view that this kind of program is what every student at OSU needs," he says.

The OSU STEM Leaders program has adopted many of the core elements of the IDES program, including partnering with community colleges, focusing on diversity and creating mentored research experiences.

"The program has effectively been cloned at the institutional level. We see this as a major success of the IDES program," Shan de Silva says.

IDES students Michelle Neely (left) and Latifa Salih (right) meet with program coordinator Lynette de Silva. (Photo by Hannah O'Leary)

For Guerrero, the Ph.D. student who has helped mentor students in a way he never experienced, the impact of IDES will usher in new opportunities.

"I think bringing underrepresented minorities into the sciences … you can't quantify the success of it right away," he says. "It can seem challenging because you don't see an immediate return on the investment. But in 15 or 20 years, when things within an entire community have changed, you can look back on a program like IDES and realize its importance."

2011 COHORT FEATURE

Coquille Rex

"Through the IDES program, I was fortunate to be immersed in the geology and biology of the Galapagos spreading ridge. I found a love of science and the ocean that I never before knew."

2012 COHORT FEATURE

David Konyndyk

"I'll be working with NASA in Huntsville, Alabama, for 10 weeks. I'm extremely excited and very proud. I know that my internship with the College of Earth, Ocean, and Atmospheric Sciences played a part in my selection, so I just want to extend a HUGE thanks to the IDES program."

2013 COHORT FEATURE

Heather Rice

"My IDES story begins in 2013; I was accepted into the program as one of the last cohort members. I soon found an internship with the Oregon Department of Geology and Mineral Industries (DOGAMI). Overall my experience has opened doors for future work and accomplishments in geology."

WHO'S WHO OF THE IDES PROGRAM:

- Shan de Silva, IDES PI, Professor of Geosciences, CEOAS, Associate Director, Oregon Space Grant
- Dawn Wright, IDES co-PI, Courtesy Professor, CEOAS
- Robert Duncan, IDES co-PI, Emeritus Professor of Oceanography, CEOAS
- Lynette de Silva, IDES Program Coordinator, Professional Faculty, CEOAS
- Eduardo "Lalo" Guerrero, IDES Program Assistant, Ph.D. Candidate, Geology, CEOAS

SUSTAINING THE OCEANS WITH COOPERATION AND COMPETITION:

Reflecting on the Salmon Bowl's broader impact

The perforated metal walls of Gilfillan Auditorium hum with the vibration of tense voices just moments before competition. Sprawled across the stadium seats are 78 high school students, along with at least 100 volunteers, college students, faculty and community members — some of them costumed, all of them defeated earlier in the day's bracket, but still gathered close to chatter with their teammates and supporters in excitement. The final two teams crouch, not quite seated, above tables at either end of the stage to exchange rapid whispers. Tabletop buzzers sit close by and coaches take seats just within reach — proudly positioned at the front and center of the audience. With a flash of light on an overhead screen, every figure in the room snaps to attention. Bodies settle into seats as a low-voiced announcer reads the competition rules for one last time. The final round of the Salmon Bowl begins.

Aiming to fill gaps in high school ocean science education nationwide, the National Ocean Sciences Bowl (NOSB) attracts high school students from coastal and landlocked states alike. Every year since 1998, a local chapter called the Salmon Bowl has attracted more than 150 people, including regional high school students, teachers, coaches and volunteers to the Oregon State University campus in an academic quiz-bowl competition. Hosted by Oregon State University's College of Earth, Ocean, and Atmospheric Sciences (CEOAS) and the Marine Resource Management (MRM) program, the Salmon Bowl has introduced thousands of high schoolers — over half of whom are girls — to STEM fields (science, technology, engineering and math) and has produced at least two national champions among its teams. Approximately 15 schools from across Oregon, and even western Idaho and California (requiring a long drive or flight and paying thousands of dollars out-of-pocket), compete in the event. It has generated student and professional networks, taught leadership, encouraged inquiry and has even planted seeds for inclusion of ocean sciences in school curricula. In short, the Salmon Bowl's broader impact can be felt throughout the state and region — and across a generation of learners, despite operating on a shoestring budget.

IF YOU LOVE IT, DO IT

Tony Baca, whose twice-reigning team from Boise High School travels almost 450 miles to compete every year, sees something special in the Salmon Bowl. "What sets this competition apart from others is the breadth of information the kids have to absorb, the diversity of subjects that pulls in kids from all range of interests," he says.

To conquer the required but vast knowledge base, teams frequently consist of several informal experts who cover a niche of subjects aligned with their own personal aspirations and interests. "So if one kid loves history," Baca explains, "they can dive into the history, culture and social science aspects of ocean and coastal life. Kids who are interested in chemistry — they're allowed to spend hours doing that, too."

As they perform these practices, students and their coaches coincidentally open the door for critical thinking and lifelong learning.

COLLEGIATE CONNECTIONS

For the coaches and students, the Salmon Bowl offers an additional draw: networking and the community it creates for students looking to pursue college degrees. Before and during competition day at the Salmon Bowl, coaches and students bond with each other over practice rounds and on their downtime between study sessions. The Oregon State campus provides an intentional connection to higher education during the tournament through sponsorship, lab tours, presentations and awards. All students are given the chance to personally connect with university professionals in marine science and across STEM disciplines. For some students, the opportunity to envision themselves in the shoes of academics, scientists and professionals becomes a foot in the door for post-secondary education at Oregon State. In addition, the university offers scholarships to members of the winning team.

Every year at Oregon State, Salmon Bowl students participate in an academic quiz-bowl style competition to test their ocean science know-how.

SUPPORTING STUDENTS INTO THE FUTURE

The effects of the Salmon Bowl resonate throughout students' experiences in the classroom; through their abilities and topics of study; in their future work through their development of leadership and strategy; and most often into their reinforced value for marine resources.

"The experience I received participating in the Salmon Bowl helped me in ways that coursework alone did not," says former participant Paul Walczak. "It's important for all of us to understand the ocean — even if we don't work in it."

In addition, the competition has a strong track record of increasing K-12 students' exposure to topics and attracting them to issues of marine science and sustainability. Perhaps one coach's words sum up this flagship program best: "It piques [the students'] interest and helps them to feel that they can do something about someplace they love."

To learn more about the Salmon Bowl, visit the website at **ceoas.oregonstate.edu/outreach/salmonbowl**. To get involved, make a donation or inquire about volunteering, email **salmonbowl.volunteer@gmail.com** or contact MRM Director Flaxen Conway at **fconway@coas.oregonstate.edu**.

SANDRA HUYNH

Marine education and engagement

Sandra Huynh is a master's student in Marine Resource Management (MRM) working with Kerry Carlin-Morgan at the Oregon Coast Aquarium. Her research focus is marine education and engagement, where she is studying visitor motivations for attending aquarium programs that highlight harbor seals, sea lions and the giant Pacific octopus. Recently, she received an award from the Dimmick Memorial Fund, in honor of a former MRM student.

The Oregon State Geoclub group gathers for a group shot at a viewpoint of the Dhauladhar range in India.

Geoclub gains global perspectives in India

In March 2015, 33 students and faculty from Oregon State University's Geoclub flew halfway around the world for a two-week trip to northern India. Travelers saw the Ganges River winding through fertile fields and a Hindu funeral ceremony. They witnessed the august Himalayas and also humble Jains and Buddhist monks. Culture and landscape seemed to merge. Conversations swirled around topics as diverse as structural uplift and displaced Tibetans. Even during this short excursion, students began to understand linkages between the physical world and everyday life.

"We study the mountains, for example, so that we can understand their relationship and impact on society," says Shireen Hyrapiet, an instructor of geography and trip leader. "And likewise, we cannot study human geography without also understanding the physical environment. It's not a duality. It's an integrated system."

First-hand experiences such as the India trip are part of the Geoclub's DNA. Club members travel to a new place every year, alternating between domestic and foreign locations. The blend of culture and place was particularly poignant in India, students said, which may be why some called it a "transformative" experience.

"Any form of travel is a revealing moment," says Hyrapiet, who grew up in India. "For many, it's a once-in-a-lifetime experience to see how people on the other side of the world are living."

Geoclub President Bobby Cruze would agree. Before the India trip, the senior in geology had never traveled outside the country except to Canada. A month after his return, Cruze was still buzzing with excitement.

"I don't even know where to start. We started in Delhi, learned about how the Moguls inspired the architecture and how Hinduism has evolved over the years. The Taj Mahal was definitely an amazing experience in of itself," he says. "This trip was the main catalyst for why I wanted to be president of this club because I have so much faith in it."

For Ben Kane, who was the club's international trip planner during the excursion, the India experience taught him both hard-fought life skills and a newfound cultural appreciation.

He was struck by the diversity of religions and India's contrasts. "We got exposed to a huge number of religions. We went to the Golden Temple in Amritsar, which is the center of the Sikh religion. We saw Hinduism, Buddhism, Jainism — just so many things that aren't here prominently. It was also strange to see shacks with tar paper right next to luxury hotels," he says.

Geoclub students visited the Golden Temple in Amritsar (upper left), the Taj Mahal (upper right) and saw Buddhist monks engaged in debate (left).

Both Cruze and Kane commended trip leader Shireen Hyrapiet for herding dozens of students throughout the trip. "She took 30-some people who were totally ignorant of this country and got us through it," Kane says.

And except for a lost passport that was quickly recovered, the group traveled with few complications.

When reflecting on the overall experience, faculty advisors and trip leaders share similar thoughts. Hyrapiet hoped that students returned with a sense of the bigger global landscape. "We might think we're disconnected from the world, but we aren't. We are connected through the Internet, through the things we own and even through the things we eat."

Club faculty advisor Anita Grunder agrees, saying that international experiences are a must for today's professionals. "There is nothing you will be doing, science or otherwise, that doesn't have something to do with the rest of the world," says Grunder, who is also the associate dean for academic programs at the College of Earth, Ocean, and Atmospheric Sciences.

Geography Professor Larry Becker also attended the trip. He says that real-world learning experiences such as the India trip can disrupt cultural stereotypes. While students encountered language barriers, cultural differences and travel discomforts, they also learned about a place in the best way possible: by being there.

"This was an on-the-ground experience that is much different than learning in the classroom," Becker says. "Even in the two weeks, students had a chance to get out of those boundaries and confront different images that they might have of a place."

Students seem to have absorbed the experience and lessons well, including Ben Kane. "There's no way to be a human being who can responsibly contribute if you don't understand more than what we have here," he says.

Perhaps more than anyone else, incoming club president Bobby Cruze will have to take the lessons of India to heart. He will have to continue the club's commitment to experiential learning, build successful fundraising campaigns to keep the club solvent and take the lead in planning the next trip.

But for now, Cruze is basking in the memory of India.

"How many people can say that for less than $1,500, you got to go to eight different cities in India and look at the Himalayas?" he asks. "If it wasn't for the college, generous donors and the board of advisors who made this trip possible, I would have never seen India."

Follow along the Geoclub's trek through India: **arcg.is/1JLW49N**.

ALUMNI SPOTLIGHT

Mike Parker – Career geologist turned mentor

If you Google the word "mentoring," images of suit-clad professionals dominate the search results. Mentoring is nearly synonymous with the corporate world, but how important is it to the sciences? As Mike Parker ('90 M.S. Geology) would argue — very important. The senior geologist has an impressive résumé with stints at the Bureau of Land Management, BP, the U.S. Forest Service and Collarini Engineering. But he also has more than 20 years of experience in supervising, coaching and mentoring early-career professionals. As a graduate student, he was mentored himself by sedimentary geology professor Alan Niem. We caught up with Parker to learn more about his career advice for students, recent graduates and would-be mentors in the sciences.

Q. How did you get involved in mentoring?

About four years into my career, I was working on a data-rich gas field development project with opportunities for summer projects. The company had an M.S. geology student summer hire coming in and tapped me to build and supervise her program. It was a great fit. I liked to teach, collaborate and provide soft landings for students. The company saw that it worked and kept sending summer students and new hires my way. Twenty years later, I am still doing it.

Q. How does a new hire find a mentor?

Generally, a mentor is appointed or assigned. He or she is usually a relatively early-career person working on the same project as their mentee. Mentoring is often used as a career development tool for employees.

Q. What does my mentor want from me?

Simple: your attention, dedication, enthusiasm and flexibility.

Q. Is a mentor like a teacher?

Yes and no. Usually a mentor is a combination of collaborator, confidant, friend, teacher, sounding board, advisor, encourager and coach. They don't give out grades, but are consulted by management for updates on your progress. Unlike traditional teachers, you work more closely with mentors.

Q. What is the difference between apprenticeship and mentorship? Is the distinction important?

It is fairly common for an early-career professional to have an experience of mentoring that is more like an apprenticeship, characterized by a "shadow, watch and imitate" set of expectations. This is not a disaster. Early on, much of what needs to be learned is procedural, and mastering these basics sets you up for a solid foundation of technical capability and confidence.
But if the important third dimension to your professional development isn't happening, push the boundaries of your relationship by asking lots of questions. You can also expand your pool of advisors to include "unofficial" mentors who have more motivation and varied experience.

Q. What if I don't like my mentor?

I advise hanging in there. Mentors are often selected more on the basis of knowledge and proximity to their mentee than for their people skills or teaching aptitude. Most of the time, you both adjust, and the relationship improves. It can help to have an early discussion about your learning styles and your mentor's expectations. It is also helpful to realize that your sensitivity to correction is almost pathologically high when first entering your career, making even Mother Teresa look like Voldemort. That said, if your mentor is inappropriate or toxic, talk to your line manager.

Q. Let's be fair and also ask about the challenges a mentor may face when guiding a mentee. What are the most common complaints mentees rarely hear?

My mentee:

- Doesn't follow my advice.
- Is argumentative.
- Isn't trying to find the answer for him/herself.
- Isn't available for advising when I am available.
- Is hard to advise because he/she is sensitive to my corrections.
- Isn't around when I'm ready to help him/her.
- Doesn't do the background reading.
- Is submitting work with lots of simple mistakes.
- Doesn't appreciate the hard work I am doing for them.

Q. As many of our students are entering scientific fields, should mentees keep it technical?

No. There are philosophical, procedural and strategic components to becoming a professional. Try to stretch your mentoring experience into these directions by asking lots of questions, hypotheticals and what-if's. "War stories" are particularly informative. The saying "Those who don't learn history are doomed to repeat it" applies. Also, enlarge your training curriculum to include general observations of how other professionals conduct themselves on the job.

Q. What advice do you have for graduates who are nervous about how they will perform in their new jobs?

- Nervousness signifies that you care — and that is good. All of my mentees have gone on to be excellent geoscientists, regardless of how nervous they were at the start.
- Understand that you are likely in one of the most stressful periods of your life (go online and take the Holmes and Rahe Stress Scale rating), but that it is temporary. The "new guy" stress wave generally lasts about two years.
- Most of the preparation needs to be psychological.
- Manage your expectations. You will need to have additional time to learn and adapt, and that time will come from some of your nights and weekends. Prepare yourself, your family and friends for that fact.
- Understand that you will be making lots of mistakes. Make peace with that now. Keep the drive and lose the self-recrimination. It wastes your valuable time and poisons your ability to learn.

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