SPRING 2018 NEWSLETTER The Department of Integrative Biology University of California at Berkeley

THE BIOLOGY SCHOLARS PROGRAM REDEFINING WHO CAN SUCCEED IN SCIENCE

C Berkeley prides itself on attracting the best and brightest students, as well as being a public university that's accessible to all. But Cal admission and academic success are evaluated on traditional measures like test scores and GPAs. For students coming from under-resourced high schools, economically disadvantaged backgrounds, or are first in their families to attend college, such rigid rubrics can put success out of reach. And the STEM fields are even less forgiving for students who enter university with inadequate preparation.

"Institutions like Berkeley best support students from backgrounds similar to those who've been historically successful," says John Matsui, co-founder and director of the Biology Scholars Program (BSP). Matsui co-created the program in 1992 to better serve "those students whom no one really expected to survive or succeed in science." Nationally, 60 percent of freshmen who intend to major in STEM fields leave the major.

The BSP challenges the traditional beliefs about who can or should do science. In the past 26 years, more than 3,500 undergraduates (567 of which were IB majors) have completed the program; of these, 60 percent have been underrepresented minorities, 70 percent women, and 80 percent from low-income backgrounds or were first-in-family to attend college. Potential STEM majors — who are screened not for race but for socio-economic background — are identified during the admissions process. That's when the BSP which is compliant with Proposition 209, the California Civil Rights Initiative — lets admits and their families know that there's a place for them at Cal. The BSP provides an academic family that achieves excellence through the support and collaboration of a community of scholars from diverse cultural and economic backgrounds.

Once the student arrives on campus, BSP helps them develop a customized plan for academic success. They're advised on what classes to take and when. They're connected with resources like study groups where they can feel comfortable admitting if they don't know an answer. And they're strongly encouraged not to engage in extra-curricular activities for the first

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Jessica Ortiz BS 2014, Integrative Biology

Professional goal: To obtain an MPH or MPP degree and work with public health policy-makers to address the health disparities faced by low-income communities.

The BSP difference: "Thanks to BSP, I hold a BA in integrative biology, I'm a skilled biologist capable of entering various fields, and I've gained a community that supports and guides me every step of the way."



Mario Eusebio BA 2015, Integrative Biology

Professional goal: To become a physician in the field of forensic pathology, emergency medicine, or cardiology. And to start a non-profit organization to mentor and assist students from underrepresented and low-income communities who are interested in pursuing careers in the medical field.

The BSP difference: "After an atrocious first semester at Cal, I was placed on academic probation and contemplated dropping out. I got into BSP the following semester and from then on it was just a steady upward progression. It's left a lasting mark on me that I will continue to carry into my professional career."

NOTE FROM THE CHAIR

iology — and science more generally — transcend national boundaries. And in California, a historically polyglot and multicultural state, we're lucky to celebrate high levels of biodiversity as well as diverse human contributions to the scientific enterprise. As chair of the Department of Integrative Biology, I'm gratified to hear spoken in our building so many different languages and intonations from around the world. In order to broaden the impact and potential outreach of our newsletter, we will now provide translations of selected newsletter content, starting with this message, into Mandarin and Spanish.

Members of our department (including undergraduates, PhD students, postdoctoral fellows, and faculty) conduct fieldwork around the world, and continue to lead internationally in the fields of ecology, evolution, physiology, and behavior. Support for this work is always appreciated, and we've recently received a number of generous gifts from benefactors that have greatly enhanced undergraduate and graduate student support. As always, visitors to the department are welcome, and I'd be pleased to discuss (in five different languages!) any and all ideas to enhance our capacities in education and research.

Robert Dudley Professor and Chair

Projessor and Chair

La biología, y la ciencia en general, trasciende fronteras nacionales. En California, un estado históricamente polígloto y multicultural, tenemos la suerte de poder disfrutar de altos niveles tanto en biodiversidad como en contribuciones humanas a la iniciativa científica. Como presidente del Departamento de Biología Integrativa, el poder escuchar tantos idiomas y entonaciones de todo el mundo hablados en nuestro edificio me da una inmensa satisfacción. A fin de ampliar el impacto y el alcance potencial de nuestro boletín informativo, ahora proporcionaremos traducciones de contenido selecto, empezando con esta Nota, a chino mandarín y español.

Miembros de nuestro departamento (incluyendo estudiantes de licenciatura y doctorado, becarios posdoctorales, y profesores) conduce trabajo de campo de investigación por todo del mundo, y continúan siendo líderes internacionales en los campos de ecología, evolución, fisiología, y comportamiento. Siempre apreciamos apoyo para este trabajo, y recientemente hemos recibido un número de donaciones de benefactores que han mejorado extremadamente el apoyo para estudiantes de licenciatura y doctorado. Como siempre, damos la bienvenida a quienes vengan a visitar nuestro departamento, y yo estaré encantado de discutir (ien cinco idiomas diferentes!) cualquiera idea para aumentar nuestras capacidades en educación e investigación.

Sara Kahanamoku-Snelling

生物学,或者更广泛地说科学,都是可以超越国界的。在加利福尼亚这个自古以来就存 在多种语言和不同文化的州,我们幸运地享有高度的生物多样性和各类对科学事业做出 的贡献人们。作为系主任,我对能够在我们的大楼中听到如此多来自世界各地的不同语 言和腔调感到十分高兴。为了能够扩大我们新闻通讯的影响力和影响范围,从这份简 报开始,我们将会提供通讯中部分内容的普通话和西班牙语译文。

我们系的成员(包括本科生、博士生、博士后研究员和全体教职员)在全世界进行野外 工作,并且一直在生态学、进化学、生理学和行为学方面保持世界领先地位。我们十分 感激人们对这项工作的大力支持,而且我们最近刚刚收到许多来自捐助者的慷慨解囊。 这些捐赠极大地增强了我们对于本科生和研究生的支持力度。我们一如既往地欢迎客人 来本系参观访问。我很荣幸能(用五种语言!)和来访者讨论可以提高我们在教育和研 究能力的任何意见和建议。

Huanjie Sheng

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semester or year. "That first semester is critical," Matsui says. "They need to get a sense of where they are in relation to Berkeley's expectations." And because 80 percent of BSP students are in financial need, after their first year, they're connected with paid STEM research internships.

It's hard to argue with the results. BSP graduates — most of whom plan to pursue

careers in health fields — average 85 percent acceptance from medical schools. Berkeley's average is 55 percent, and the national average is 50 percent. In terms of diversifying the STEM professoriate, four BSP alumni have recently accepted prestigious faculty positions in the Bay Area — two at UC Davis, one at UCSF, and one at Stanford. "Berkeley is a place that emphasizes excellence, but *potential* excellence is not always appreciated," says Matsui. "Twenty-six years of BSP success data suggests that the science community must rethink its notion of who can do science. The 'one size fits all' approach to developing STEM talent just doesn't work."

GRADUATE STUDENT PROFILE

BETSABÉ CASTRO ESCOBAR AND BORICUAS IN BERKELEY

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etsabé Castro Escobar is a botanist interested in ethnobotany, ecology, evolution, and biogeography whose research often takes her to the Caribbean Basin. But since coming to Berkeley, a second passion has developed: creating a community with fellow Puerto Rican students and organizing hurricane relief for her devastated country.

A third-year PhD student with Paul Fine (PI) and Thomas Carlson (co-adviser), she studies human-plant interactions and is interested in how humans promote evolutionary responses in culturally significant plants. "Through history, people have engaged closely with plants for a variety of purposes, from food to medicine to shelter and more," she explains. "They've also selected certain plants for particular desirable traits."

As a Latina woman of color in science, Castro Escobar is a strong advocate for promoting diversity within STEM fields in academia and beyond. Within the Department of Integrative Biology, she serves on the IB Diversity Committee and represents the department in the Graduate Assembly. She has also used her projectmanagement and outreach skills to become active in graduate student affairs and departmental activities.

Castro Escobar was born and raised in Trujillo Alto, Puerto Rico, then earned her BS in integrative biology at the University of Puerto Rico. She later pursed her master's at the University of Missouri in cultural anthropology to round out her education in the natural and social sciences. Once at Berkeley, she wanted to create a group to support its Puerto Rican graduate students, keeping them connected to their roots. Then Hurricane Maria struck the island, and the group became born of necessity. "It was a very emotionally charged time," she remembers. "Most of us had no news from our families and friends. Those first couple of weeks were a silent wait."

The term "Boricua" comes from the indigenous *taino* name for Puerto Rico,



Boricuas in Berkeley has made four independent trips to Puerto Rico.



PhD student Betsabé Castro Escobar studies human-plant interactions.

Borikén, and is used by descendants of Puerto Rican heritage. Thus the group named itself Boricuas in Berkeley (BiB). As news of the disaster's magnitude grew, BiB's purpose expanded to assist in hurricane relief. Since then, four trips have been organized to deliver more than 1,750 pounds of basic-need donations, and fundraising events have raised more than \$12,000.

BiB representatives went down again during spring break to initiate an "alternative break" program for Cal student volunteers to work in affected communities. While Puerto Rico has made progress to repair the storm's overwhelming damage, there is still much that needs to be done before the next hurricane season starts in June. "I think of our BiB work as a tiny effort," Castro Escobar says. "The real heroes of this story are the Puerto Ricans doing the active community and grassroots work every day."

To learn more about Boricuas in Berkeley or get involved, visit the group's Facebook page or email boricuasinberkeley@gmail.com.

MATTHEW LORINCZ FROM ZOOLOGY TO GENETICS

n 1990, Matthew Lorincz received his master's degree from Berkeley in zoology a year after that department ceased to exist, having been incorporated into the new Department of Integrative Biology in 1989. He remembers being influenced by such faculty as herpetologist David Wake and food-web ecologist Mary Power. But perhaps the greatest moment of inspiration came from the late animal behaviorist and evolutionary biologist George W. Barlow, a renowned expert on cichlid fishes. "He asked me, 'What fish species are you interested in? Become the world's expert in that," Lorincz remembers. He took that advice to heart when he decided to change course and focus on a career in genetics.

After graduation, Lorincz spent a summer working at Berkeley's Richard B. Gump South Pacific Research Station in Moorea, French Polynesia, before pursuing his PhD in genetics at Stanford and becoming a postdoctoral fellow at the Fred Hutchinson Research Center in Seattle. Today he's a professor in the Department of Medical Genetics at the University of British Columbia. His lab studies how endogenous retroelements — which make up about 10 percent of the human genome — are suppressed and how such parasitic elements have been co-opted or exapted by their mammalian hosts for gene regulation.

A basic research study — "Vitamin C Induces Tet-Dependent DNA Demethylation and a Blastocyst-like State in ES cells" conducted with colleagues at UCSD and UCSF and published in 2013 in *Nature*, instigated a new area of research in the role of this essential vitamin, with clear implications for treatment of specific cancers.

Lorincz's connection to Cal precedes his undergraduate experience. His father, a Holocaust survivor from Budapest, Hungary, came to the U.S. in 1947 on Thanksgiving Day with nothing but a jar of goose liver in his pocket. He learned English, took some math courses, and attended UC Berkeley on a scholarship, working at a student co-op. From there, he



Matthew Lorincz BA 1990 and three generations of the Lorincz family.

went to graduate school at Yale and realized his lifelong dream of becoming an architect. Among the many structures he designed is a home in Kensington that Lorincz still owns and rents out to Cal students.

That family legacy, and the excellent education he himself received at Berkeley, is the reason Lorincz still supports the University as an alumnus. "It's so important to support integrative and organismal biology," he says. "We live in a world where molecular biology gets most of the headlines, but we need to support the ecologists and botanists, too. When George Barlow passed away, he took with him a unique breadth of knowledge in the field of ethology — what we now call sociobiology."

Lorincz's advice to current students? "Pursue your dreams and interests, and try to ignore all the noise. Just concentrate on doing good science. It'll maximize your chances of staying in your chosen field."

GRADUATE STUDENT AWARDS

- Outstanding Graduate Student Instructor (OGSI) Awards for 2017-2018:
 Sofia Chang (Dudley and Koehl labs); Gabriel Damasco (Fine lab); Audrey Haynes (Sousa lab); Renske Kirchholtes (Looy lab); Peter Kloess (Hlusko lab); Daniel Latorre (Marshall lab); Prahlada Papper (Ackerly lab); Julianne Pelaez (Whiteman lab); and Huanjie Sheng (Kaufer lab).
- 2018 NSF Graduate Research Fellowships: Kelsey Crutchfield-Peters (Dawson lab); Jesus Martinez-Gomez (Specht lab); and Julianne Pelaez (Whiteman lab).
- **Gabriel Damasco** (Fine lab) received a \$2,000 grant from the International Association for Plant Taxonomy Research.
- Betsabé Castro Escobar (Fine/Carlson labs) was awarded a two-year Botany in Action Fellowship from Phipps Conservatory and Botanical Gardens, which supports emerging plant-focused scientists.

- Catherine Hernandez (Koskella lab) was selected for the Australia-Americas PhD Research Internship, where she will be performing a microscopy project with Dr. Jeremy Barr at Monash University.
- Ana Lyons (Williams lab) was recently accepted to the NSF Antarctic Biology Training Program.
- Tim O'Connor (Whiteman lab) received a Student Research Award from the American Society of Naturalists that will fund his research on co-speciation between creosote bush and its herbivorous insect community.
- Aaron Pomerantz (Patel lab) received a Jacobs Institute Innovation Catalysts grant for his project to design low-cost, portable tools for science and education.
- Ashley Poust (Marshall lab) recently published a paper on the geographic and geochronologic range of early pinnipeds, which was chosen as an Editor's Choice article by *Acta Palaeontologica Polonica*.

FACULTY NEWS

- "My Love Affair with the Brain," a documentary about the late Professor Emeritus **Marian Diamond**, has won the Kavli-AAAS award for Science Documentary of the Year.
- Professor **Mimi A. R. Koehl** has received the 2018 Distinguished Alumni Award from the Graduate School of Duke University.
- Professor **Paul Fine** has received an award from the National Geographic Society to conduct research expeditions in the Andes.

IB 131: THE ANATOMY OF A POPULAR CLASS

he undergraduate course Anatomy and Physiology (IB 131) and its corresponding lab (IB 131L) stand out for a couple of reasons. First, it's one of IB's most popular classes, attended by approximately 1,000 students annually. And second, its success is owed in large part to a group of dedicated IB alumni and students who donate their time to help teach the course and run the lab. Thomas Carlson delivers the lectures.

Harold Chun is the lead alumni volunteer, coming to campus weekly during fall and spring semesters and twice weekly during the summer. He graduated from Berkeley in 2016 with a BA in human biology and health sciences. As a medical scribe at Augmedix — which provides technologyenabled documentation services for doctors and health systems — he assists physicians in documenting patients' medical records. He's been helping with the IB 131 lab since he was an undergraduate himself, and continues doing it because he enjoys the teaching aspect. He also wants to maintain his exposure to the anatomy coursework since he hopes to go deeper into the medical field.

As an alumni volunteer, Chun lectures on various topics using anatomical models

and cadavers; organizes and teaches review sessions on histology; assists the lab instructors in setting up and teaching the course material; and answers individual questions from the students.

Invariably, Chun says, students' favorite part of the course is seeing a real cadaver for the first time. "They get particularly excited about the digestive system," he says. "They're surprised that food can travel that far in about 16 hours. The human body is amazing."

Isabelle Tan, an undergraduate student instructor for IB 131L, is a third-year integrative biology major with a creative writing minor. Ultimately she'd like to become a physician, possibly a surgeon. She took Anatomy and Physiology herself last year, and says it was the first course that reminded her why she had chosen to study IB. Although she'd struggled through all the rigorous lower-division requirements, she really enjoyed this course and remembers thinking, "Oh right, *this* is why I want to do this!"

Tan enjoyed having undergraduate student instructors herself, and loves both the subject and the opportunity to share her own experience with her peers. It's also



Harold Chun and Brendon Ghiringhelli share their love for anatomy on Cal Day.



IB 131 GSIs bring their fascination with anatomy to the radiology department at the Tang Center. Photo: Peter Kloess

excellent training to become a GSI in graduate school, she says. During her own student experience, she remembers one moment in particular. "With each cadaver you get an information sheet listing their age, occupation, and how they died. Our specimen had been a 'book-binder' and, as a writer, I felt a special connection to him. He had clearly loved books and now his body was serving as a kind of textbook for us to learn from."

The experience made her aware of the humanity of the cadavers, and she felt a deep gratitude for the opportunity to work with them. No doubt it was one of many such defining moments that occur during the teaching of IB 131.

A special thanks to the following individuals for their contributions to the course:

IB 131 Alumni Volunteers Harold Chun Oliver Guevarra Arjun Gupta Samuel Shu

Graduate Student Instructors Eric Holt Peter Kloess

Undergraduate Student Instructors Veronica Chang Samantha Finn Isabelle Tan Paul Van Schuyver

POSTDOC PROFILE

SUZANNE PIERRE SCIENCE IN A SOCIALLY CONSCIOUS FRAMEWORK

Until she was a junior in college, Suzanne Pierre was a journalism major her heart set on becoming an international correspondent. But an environmental science class provided a tipping point: "I realized that not having a ton of lab experience or feeling like I'm not good at math wouldn't stop me from becoming a scientist," she says. The two interests have since merged to put Pierre on a hybrid path, conducting research and writing about it for a broader audience. She hopes to pursue a career that combines science, advocacy, and policy-making around how people are adversely affected by climate change.

Pierre — a new UC President's Postdoctoral Fellow — has joined Todd Dawson's lab and will be completing her PhD at Cornell University's Department of Ecology and Evolutionary Biology before beginning two years of postdoctoral work. Pierre first met Dawson at the University of Utah Stable Isotopes Course in 2014. His expertise in stable isotopes is central to her work in understanding how nutrients and water move around the earth and into the biosphere.

Using an interdisciplinary suite of tools from molecular biology, isotope mass spectrometry, and ecosystems ecology, her research has focused on how temperature affects microbial-community and ecosystem nitrogen and carbon dynamics across natural environmental gradients. "As an ecologist and biogeochemist, my goal is to understand how these controls may be altered by rising mean annual temperatures, intensifying droughts, and rapid urbanization," she explains.

Pierre first became excited about soil biogeochemistry and ecosystem change in 2012 while working at the Cary Institute of Ecosystem Studies in Millbrook, New York. She graduated from New York University the following year with a BA in environmental



Pierre hopes to pursue a career that combines science, advocacy, and policy-making. Photos: Sasha Israel, Cornell College of Agriculture & Life Sciences



Suzanne Pierre has joined Todd Dawson's lab, where she will pursue her postdoc work.

studies, then pursued her PhD in ecology and biogeochemistry at Cornell University. While at Cornell, she was a Sloan Fellow and an NSF Trainee in the Cross Scale Biogeochemistry and Climate IGERT, as well as a teaching assistant and research mentor to undergraduates.

As she grew up in suburban Somerset, New Jersey, where there were still sheep farms on her street, Pierre's interest in nature was "purely wonder-based." She remembers playing in the soil and experiencing "the shock and awe of understanding the connectivity of everything."

It was in a high school environmental science class where she saw an image of the nitrogen cycle. "All those arrows connecting every aspect of the environment just blew my mind and made me think, I really love nitrogen!" she says. "It's the holy grail of the environment." As a core nutrient for plants, the chemical element serves as home base for her research questions and the lens of her analysis. "Nitrogen is the core of my long game," she says.

Outside of her actual research, Pierre is interested in science communication. She writes essays and feature articles about marginalized experiences in science and nature, and runs a personal blog and an Instagram account (@belowground_activity) about social and ecological concepts.

"As a scientific field mobilized for social change, ecology needs a cultural shift," she says. "It isn't just about basic science, but about putting a social context on findings and practices. I want to bring science to a socially conscious framework."

150 YEARS OF SCIENTIFIC DISCOVERY

he University of California is celebrating its sesquicentennial this year and, although the Department of Integrative Biology (IB) wasn't created until 1989, it has evolved from departments like zoology, botany, physiology, anatomy, paleontology, and genetics — many of which originated in the 19th century. The year before IB was founded, for instance, the Department of Zoology celebrated its 100th anniversary. Brothers Joseph and John Le Conte were founding faculty members of scientific study at Berkeley, teaching all of the biological and physical sciences and hanging out with the likes of John Muir.

Those previous departments were consolidated into a larger framework to emphasize leadership in the advancement of the biological sciences and to address new and larger questions in 21st century biology, says Marvalee Wake, the founding chair of IB and currently a professor of the Graduate School. "Integrative biology provides both a philosophy and a mechanism for the collective expertise from diverse but relevant scientific fields," she says. "It seeks both diversity and inclusiveness. And it deals with questions across all levels of biological organization." Current leaders in the science are finding wide-ranging applications for both humans and the biodiversity of the planet.

It's impossible to name all the countless discoveries and achievements that have been made during IB's short history or the longer history of its predecessors. However, here's a partial list:

- Understanding early human evolution
- Conducting the first experimental work on physiological ecology of plants
- Developing bio-inspired materials and robots
- Assessing and understanding the Tree of Life – the relationships of living and extinct species with each other and the environment
- Understanding how new species arise, and how some go extinct



The original Museum of Vertebrate Zoology in 1909.



electrophoresis lab, 1983.

- Providing new insights into the neurobiology, ecology, and the evolution of behavior
- Assessing the biotic and physical interactions, past and present, that are involved in climate change and its known and potential effects
- Developing new ways of integrating the accumulating knowledge of the genetics, physiology, development, structure, ecology, and evolution of life's processes in diverse species, especially the implications for human biology

In the course of their work, IB faculty have earned all the most prestigious awards and prizes in their general areas of research and have held presidencies of the major national and international professional societies. Several have received honorary degrees from other institutions. Seven members of the department belong to the National Academy of Sciences — which is more than those held by 21 *states* in the U.S. Eight are members of the American Academy of Arts and Sciences, three of the American Philosophical Society, one is a MacArthur Fellow, and several are medalists or fellows of various academies and societies.

Imagine what advances are possible in the next 150 years! You can help to fund future discoveries in the Department of Integrative Biology. Just contact Kirsten Swan, Senior Director of Development at 510-643-2228 or kswan@berkeley.edu or donate online at: give.berkeley.edu/ib. University of California Berkeley Integrative Biology 3040 Valley Life Sciences Bldg #3140 Berkeley CA 94720-3140

BALUMNI WHERE ARE THEY NOW?

- Yair Chaver (BA 2000) worked as a wildlife biologist before becoming a coastal program analyst with the California Coastal Commission and practicing environmental law.
- Janet Brandi Dobbs (BA 1973) has been a teacher for 29 years and is currently teaching science in Pleasanton, CA to elementary school students.
- Asal Fathian (BA 2003) is currently a perinatologist at UCSF Benioff Children's Physicians/Maternal Fetal Medicine in Oakland.

- Teresa Feo (BA 2007) has joined the Senate Office of Research as a science and technology policy fellow to explore a year of public service and government leadership training.
- Abbas Hasnain (BA 2004) is a physician specializing in internal medicine in Porterville, CA.
- Soumya Karlamangla (BA 2013) is now a public health reporter at the Los Angeles Times.
- Brendon Kyle Luvisa (BA 2014) is now in medical school at Georgetown University School of Medicine with plans to become a surgeon.
- Jacqueline Meijer-Irons (BA 1997) is currently working as a research scientist at the Center for Studies in Demography and Ecology at the University of Washington, Seattle.
- Rebecca Moon (BA 2015) is currently working as a research associate at UCSF, conducting pulmonary research.

- Patricia Nguyen (BA 2011) is now a thirdyear dental student at Western University of Health Sciences.
- James F. Parham (PhD 2003) is an assistant professor in Cal State Fullerton's Department of Geological Sciences and is faculty curator of paleontology of the John D. Cooper Center.
- Genevieve Ryan (BA 2012) is currently a PhD candidate in biomedical sciences at UC San Diego, studying reproductive neuroendocrinology in Pamela Mellon's lab.
- Paris Salar (BA 2007) went on to pursue a career in pharmacy after studying at the Thomas J. Long School of Pharmacy.
- W. Brian Simison (PhD 2000) has been the curator and the director of the Center for Comparative Genomics at the California Academy of Sciences since 2007.
- Scott Smiley (BA 1979) was a professor at the University of Alaska Fairbanks for 23 years and is now an assembly member for the Kodiak Island Borough Assembly.
- Neil Zhang (BA 2011) is currently a fourthyear medical student at UCSF.





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