



TIPPING POINTS

2022 DEAN'S REPORT

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MIND

Our nimble and complex minds power our lives, safeguarding our knowledge, experiences and recollections. Keeping our minds sound throughout our lives has become an important consideration for us all.

BODY

The mind thrives in tandem with the body. For most of us, better physical health makes better brain health more likely and helps us flourish, no matter our age.



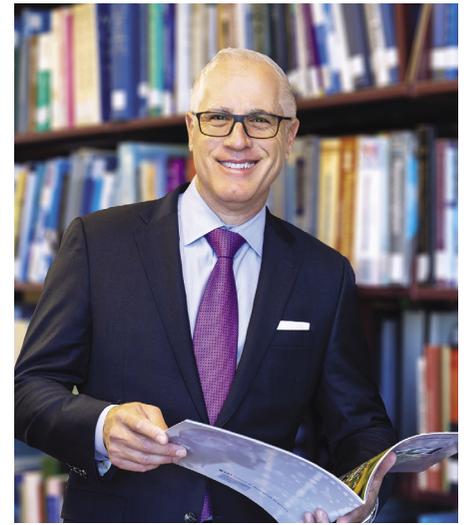
WORLD

The health of our minds and bodies depends on the planet's air, water, soil, flora and fauna. If the well-being of the world around us declines, so will our individual health and the collective destiny of humanity.



Confronting the Cascade of Tipping Points through Research and Innovation

MESSAGE FROM THE DEAN



The theme for this year's Dean's Report is Tipping Points, to call attention to the perilous and impending loss of biodiversity on the planet caused by human activity. Hotter summers, larger and more frequent fires, flooding and extreme changes in weather are just some of the manifestations of climate change impacting us in Southern California. Moreover, ecological disasters like the recent oil spill off the coast of Huntington Beach are further evidence of damage that continues to afflict our ecosystems. We have been asking too much from Earth and must reverse course before we reach the point of no return.

There is no other way to say it: our ecological systems are in crisis. The rate at which we are imposing ourselves on the important balance of ecosystems that surround us, and host us, is not sustainable. Rainforests are disappearing; oceans are dying. As biodiversity in these systems continue to fade, so does the future of life on Earth. Some of those systems can recover, but we must act soon before fundamental species — and the ecosystems they support — are lost forever.

Our school's researchers are seeking to understand why this is happening, what it means for humanity and the planet, and how we can work to halt the many forms of destruction we have caused. Once we understand the impact of our harmful actions, we can begin to rebuild biodiversity. We can no longer press the snooze button on this issue. The reality is that our minds, bodies and the world are interconnected; therefore, we can no longer operate as though they are mutually exclusive.

We are dependent on our ecosystems for life, but they are dependent on diversity. As we continue to impact them in a way that makes diversity impossible to sustain, we too will suffer. We know this because numerous UCI studies show us that entire ecosystems can unravel with the loss of a single plant or animal species. On a macro scale, we can see the devastation.

Our responsibility as scientists and citizens of Earth is to develop a rescue plan for nature.

UCI BioSci can help stave off the tipping points. Using our research discoveries as tools, we can learn how to invest in our ecosystems and take the necessary, sustainable steps as a society to restore balance and interactions that respect the MIND | BODY | WORLD connection.

Woven between the cautionary revelations of my message within this report is visionary optimism for implementing positive change hand-in-hand with the pursuit of scientific discovery. UCI's research efforts can play a vital role in halting irreversible climate tipping points. Through education and awareness, it is my sincere hope to inform current and emerging generations to commit to curb climate change. To learn more about our leading-edge research efforts, I welcome you to visit the UCI BioSci website. I also invite you to stay connected via our monthly newsletters and share your ideas or suggestions directly with my team.

Regards,

Frank LaFerla

Frank LaFerla, PhD
Dean and Chancellor's Professor



A GIANT LEAP FOR DEPRESSION RESEARCH



\$55MCG



Depression is a common mental disorder that affects millions of individuals, and according to the World Health Organization it is the leading cause of disability worldwide. More work needs to be done to understand this disorder and uncover new treatment modalities.

Now, thanks to a \$55 million gift from the estate of Audrey Steele Burnand, UCI will soon be making inroads in the study and treatment of depression. This legacy gift — believed to be the largest philanthropic donation to a U.S. university to support research focused solely on this disorder — will fund the creation of the Noel Drury M.D. Depression Research Center, named after a former UCI assistant clinical professor of psychiatry and board-certified psychiatrist who practiced in Newport Beach.

Since 1964, when BioSci's Department of Neurobiology and Behavior was established and became the first department in the world devoted to the study of the brain, UCI has been lauded for its research in that field. UCI is also home to the Center for the Neurobiology of Learning and Memory (CNLM), the Irvine Center for Addiction Neuroscience (ICAN) and the Institute for Memory Impairments and Neurological Disorders (MIND), where world-renowned researchers have been uncovering secrets of the brain and associated disorders for decades. With the recent gift, the university has real opportunity to make a significant impact in depression research and treatment.

The Drury Depression Research Center will be established under the Office of Research, as the lines of research are expected to encompass many disciplines from several schools on campus. Leading the committee that will determine the path of the center is Dean Frank LaFerla, who will work with Vice Chancellor of Research Pramod Khargonekar and Dr. Michael J. Stamos, dean of the School of Medicine, to outline the center's planned focus.

"UCI is fortunate to both receive this gift and have the talent required to bring about meaningful change in this field," said LaFerla. "We only get one opportunity to build something, and we want to do it right. We are looking at depression across the lifespan and will likely tackle it from a biological, medical and engineering point of view."

UCI researchers have long been at the forefront of knowledge creation, and it is through community engagement and philanthropic donations that support their pursuit of solving real-world problems.

THE MIND CONNECTION

The ongoing crisis for the past two years has been the COVID-19 pandemic but that hasn't stopped Alzheimer's disease from wreaking havoc on society, nor has it stopped our steadfast pursuit of researching this progressive neurological disorder. Scientists are dedicated to studying changes in the brain and body fluids with the hopes of detecting the disease before any symptoms appear. Finding a cure is not just a hope, it is a need since deaths from Alzheimer's disease have increased 145% in the past two decades.

No matter what strides are made in healthcare to improve wellness and longevity, Alzheimer's has the ability to undercut all our progress. In fact, unless there are medical breakthroughs, the number of Americans 65 and older with Alzheimer's could rise from 5.8 million in 2020 to 13.8 million by 2050, according to the National Institute on Aging. Additionally, the annual cost of Alzheimer's is projected to more than triple to \$1.1 trillion by 2050, without a treatment or other change to the trajectory.

As one of the most significant public health problems of our time, world-renowned researchers at UCI are working in tandem with the National Institutes of Health (NIH) to address this devastating disease. The UC Irvine Institute for Memory Impairments and Neurological Disorders (UCI MIND) is internationally recognized for its research accomplishments in disorders of the brain, particularly those that are age-related. UCI MIND is home to one of 33 Alzheimer's Disease Research Centers funded by the National Institute on Aging and is one of 10 California Alzheimer's Disease Centers funded by the California Department of Public Health.



This past year, BioSci researchers developed a new genetically engineered mouse model based on the most common form of Alzheimer's disease, an advancement that holds promise for making new strides against the disease as cases continue to soar. This new model could potentially help translate lab results into the clinic with greater success than before and is an exciting addition to the field of Alzheimer's research. The results, which were published in Nature Communications, reveal a new way to understand early events in the brain and ways to use environmental and genetic factors to examine the aspects of aging that are important in developing late-onset Alzheimer's.

This is just one example of the types of advancements BioSci and UCI MIND hold for making new strides in research and treatments. By tackling threats from the perspective of the interconnectedness of MIND|BODY|WORLD, our scientists drive the kinds of discoveries that can truly challenge a disease like Alzheimer's.

**BY
2050**

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- The number of Americans 65 and older with Alzheimer's could rise to **13.8 million**, up from 5.8 million in 2020.

Source for both: National Institute on Aging





Head 32 posterior

CAUTION
LASER
APERTURE

THE SCIENCE BEHIND MATERNAL GRIEF

Grief is a powerful emotion. Those who have experienced grief have not only described severe emotional symptoms, but also debilitating physical symptoms.

“For as long as we have existed as a social species, we have struggled with the nature of grief and loss of a loved one. While we all experience grief at some point, the effect of grief on the brain has only begun to be studied systematically in recent years,” said Professor Michael Yassa, director of the UCI Center for the Neurobiology of Learning and Memory and associate dean of Diversity, Equity and Inclusion in the School of Biological Sciences.

One subset of individuals who have reported more profound symptoms — including cognitive impairment and yearslong difficulties with memories and daily functions — is mothers who have lost a child. Charged with learning more about this phenomenon, Professor Yassa and Dr. Tallie Z. Baram, Distinguished Professor of Pediatrics and director of the Conte Center @UCI, employed advanced imaging techniques to find answers.

Baram and Yassa examined fMRI scans of willing participants and what they found corroborated the mothers’ accounts of what amounted to serious cognitive issues. They saw that indeed the wiring of their brains looked remarkably different from the brains of those who did not experience such loss.



“This is why this work is so important,” said Professor Yassa. “It paves the path to a more nuanced understanding and recognition. With this, we hope that society will come to appreciate the significance and impact of grief, particularly on mothers who have lost their children, and begin to change our collective expectations and policies to reflect this understanding and appreciation.”

Additionally, the team discovered a connection between these altered brains and a part of the brain called the paraventricular nucleus of the thalamus (PVT), which science is still trying to understand. Recent work by Baram and colleagues has found that the PVT in rodents is involved in storing and processing long-term adverse memories, which lends credence to the possibility of the same being true for humans.

In 2021, Yassa’s team published the first report of the PVT’s connectivity pattern in humans and plans to follow up on that work to try to understand how it is implicated in maternal grief.



THE BEST WAY TO GROW OLD

Advancements in healthcare and medicine have had a positive impact on life expectancies around the world. As more people live longer, it is up to scientists to study these “successful agers” to understand how and shed light on ways in which everyone else might better their chances at living long and healthy lives.

One expert in this field is Dr. Claudia Kawas, co-principal investigator of The 90+ Study, which has followed and performed various tests on willing participants aged 90 and above since 2003. “Over the past century, life expectancy has been extended by more than 27 years. People over 90 are now the fastest growing segment of the population in most of the world, but we know little about these pioneers of aging,” said Dr. Kawas, professor of Neurology and Neurobiology and Behavior. “The more than 2,000 participants of The 90+ Study are giving us a window into determinants of successful aging.”

One major goal of the study is to examine cognitive decline, as many researchers agree normal cognitive function is crucial for a long and healthy life. To that end, many in the field place an emphasis on lifestyle choices that are beneficial to the brain. This includes eating a healthy diet, avoiding stress, getting moderate exercise, practicing good sleep hygiene and properly managing existing medical conditions.

And for individuals who worry they’re making healthier lifestyle choices too late, there’s good news for both young and old. According to Psychiatry & Human Behavior and Neurobiology and Behavior Professor Josh Grill, director of the UC Irvine Institute for Memory Impairments and Neurological Disorders (UCI MIND), there’s growing evidence that shows the earlier we start living a healthy lifestyle, the better we are in our

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older years, as well as evidence that shows it is never too late to start positively impacting our brain health. “Should we start as early in life as possible? Absolutely. But does there come a point where it’s too late? No. In fact, exercise has been shown to lower our risk for Alzheimer’s disease, and in clinical trials for people who are suffering from Alzheimer’s disease, exercise has been shown to improve cognitive performance,” said Professor Grill.

There is still much to learn about what factors matter most when it comes to living longer lives, but exciting discoveries continue to be made all the time. “Intriguingly, about 40% of individuals in the study who die without dementia have significant Alzheimer’s disease neuropathologic changes but appear resilient to effects on cognition,” said Dr. Kawas. “Greater understanding of the role of lifestyle, genetic and other factors in relation to this apparent resilience in the oldest-old will promote successful aging in all of us. They have a lot to teach us!”





BUGGED ABOUT CLIMATE CHANGE

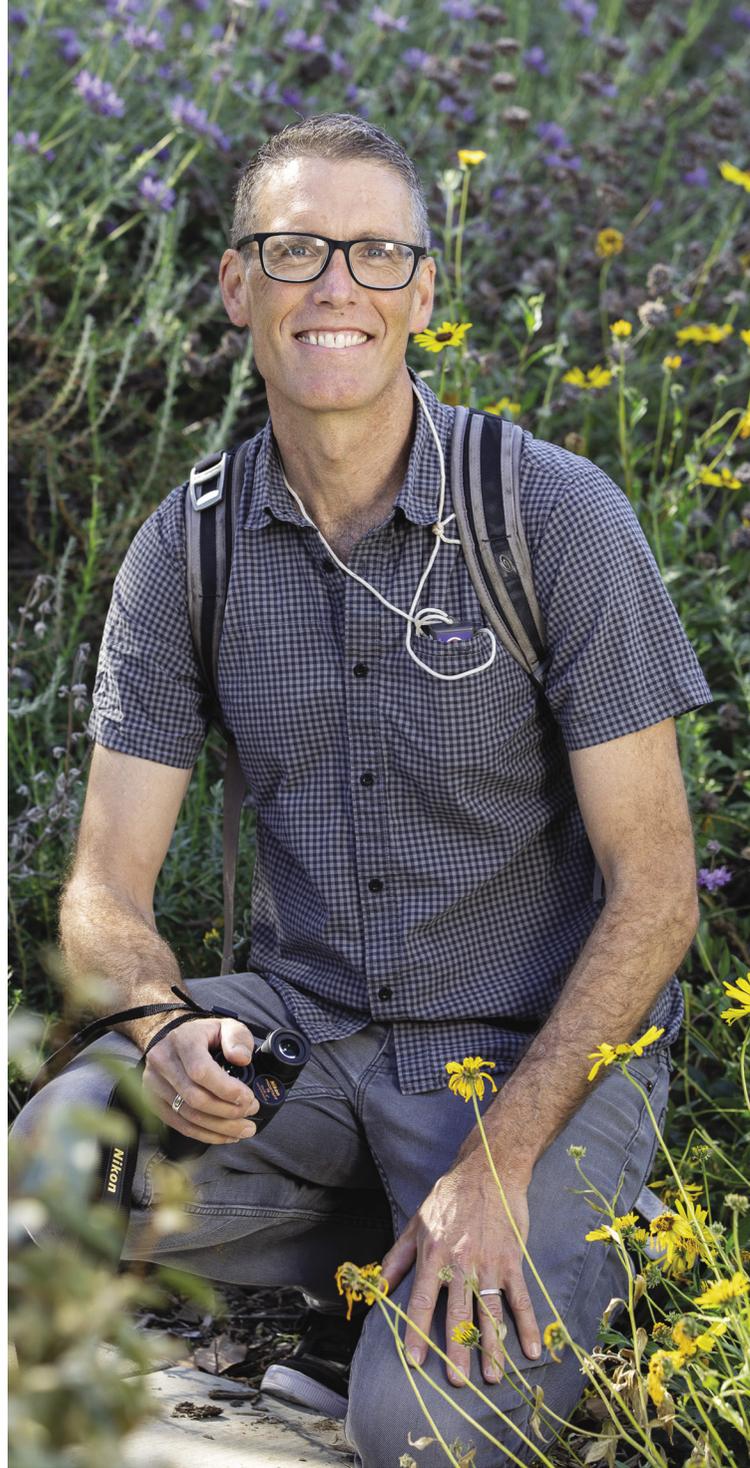
Unless you hear buzzing or spot something skittering across the floor, you might not think about insects very often. But they represent at least 80 percent of animal species, provide important services such as pollination, and if environmental stresses reduce their numbers, it could have a major impact on our planet. Among those studying what some have called the possible “insect apocalypse” is Ecology and Evolutionary Biology Professor Kailen Mooney.

He and his colleagues have been looking at how climate change and other human impacts affect insects in Southern California coastal sage scrublands. “What we have found is insect density falls off during drought conditions and comes back during wetter conditions,” Professor Mooney said. “With drought becoming more common, we can predict the density will be lower.”

An area of focus has been determining the ways the availability of insects affect local endangered species, including the cactus wren, a songbird declining in population that feeds on them. “If cactus wrens don’t have access to enough insects or the right mix, it appears to have an impact on their ability to provide adequate food for their offspring.”

Besides climate change, factors such as invasive plants and insects can displace native species, reducing the food source. The researchers have also been creating experimental drought conditions for numerous plant species to find out which ones are best at continuing to support insect communities.

While insects may not get a lot of appreciation, “the most common interaction on Earth is an insect feeding on a plant,” Professor Mooney said. “By shaping plant evolution, insects are fundamental to the functioning of our planet and for our own well-being. We need to care about them.”



	• 900,000 different kinds of living insects are known (source: The Smithsonian Institution)	01
	• It is estimated at least another 2 million types of unknown insects exist (source: The Smithsonian Institution)	02
	• At any given moment, it is thought 10 quintillion individual insects are alive (source: The Smithsonian Institution)	03
	• The U.S. has 91,000 described insect species and an estimated 73,000 undescribed insect species (source: The Smithsonian Institution)	04
	• Over 40% of insect species worldwide are threatened with extinction (source: ScienceDirect)	05
	• Poor nutrition, largely caused by loss of habitat, is a major contributor to declining honey bee populations (source: The Agricultural Research Service at the United States Department of Agriculture)	06

"If cactus wrens don't have access to enough insects or the right mix, it appears to have an impact on their ability to provide adequate food for their offspring."

INSECT APOCALYPSE



An aerial photograph showing a person in a yellow kayak on a body of water. The water is clear and blue in the upper half, but becomes murky green in the lower half where a large, dense pile of plastic waste is visible. The kayaker is positioned in the lower right quadrant, paddling towards the left. The text is overlaid on a dark semi-transparent rectangle in the center of the image.

A global crisis made personal is one that galvanizes the masses and generates action toward a solution.

MAKING IT PERSONAL: CLIMATE CHANGE IN YOUR BACKYARD

Over the last two years, we have learned that the average person has the capacity to quickly internalize scientific concepts, even adding the words “transmission,” “variant,” “mutation,” and “asymptomatic” to their vocabulary. This phenomenon of mass education was driven by the tangible effects of the pandemic.

Despite our best efforts—and the growing frequency of wildfires on newsreels—the ongoing crisis of climate change has not gripped the public in a similar way. Even as the compounding consequences of our current practices and the inaction of lawmakers are more visible than ever, people have difficulty prioritizing risk that is offset into the future or spread across large populations.

To make climate change more of a public priority, it is paramount that we educate the average person on how climate change will impact individuals. By doing so we might elicit a response similar to the pandemic in which the public is motivated toward fruitful discussion and meaningful action.

“Climate change touches us all in ways big and small,” said Professor and Chair of the Department of Ecology and Evolutionary Biology Travis Huxman. “In your own backyard, the amount of water needed to keep your garden alive is directly related to temperature and rainfall. Or it could be your energy bill; when there are more hot days each year, the air conditioning is on longer, which drives up energy bills. There are real costs of these impacts, and they are growing every year.”

The impact on our wallets is certainly the clearest way in which our daily lives are being affected, but it is not the most troubling. Earth is experiencing unexpected and severe weather events at higher frequencies, giving nature little time to bounce back. As a result, much of what makes places like California so desirable is becoming less and less habitable or usable for recreation. Drier years result in a reduced snowpack, which doesn’t just mean less skiing and snowboarding — it also means less water for cities and agricultural production. And increases in wildfire occurrences continue to damage more housing communities, animal habitats and outdoor spaces.

Society is late in accepting the effects of climate change as affronts to their personal lives, but the sooner we acknowledge it the more time we’ll have to think about how we want our landscapes to look in the near future. As for educating the public, the next generation of biologists are already hard at work.

“When I was in grad school, we didn’t talk about our science outside of academia or our profession,” said Professor Huxman. “My students are not like that. I think of them as ambassadors or public intellectuals; they realize they have a position in society where they’re here to educate, inform and disseminate information. It’s exciting.”



PROUD HERITAGE, BRIGHT FUTURE

Just a few miles south of the California State Capitol is the city of Elk Grove. The city's motto of "Proud Heritage, Bright Future" is more than aspirational—it aptly describes fourth-year Microbiology and Immunology major Quinn Arius Iñiguez, who happens to call that city home.

A first-generation Mexican American, Iñiguez recognized how fortunate he was to work toward a degree, so he made sure he found the best opportunity. "Applying to colleges, I really prioritized the list of majors schools had," said Iñiguez. "I knew I wanted to go to med school to become an infectious disease specialist and I saw that UCI had not only a Microbiology and Immunology major, but also the Institute for Immunology with lots of research opportunities."

Upon arrival, Iñiguez was quick to take advantage of many of the opportunities on campus, something he notes that many students overlook. "A lot of students don't really appreciate how many resources UCI has to offer, and I think it's mind-blowing how many different organizations and opportunities go unused," said Iñiguez. "I always encourage new students to use as many resources as they can. There are people using these resources who are getting further ahead in academics and their careers, so it only makes sense to do the same."

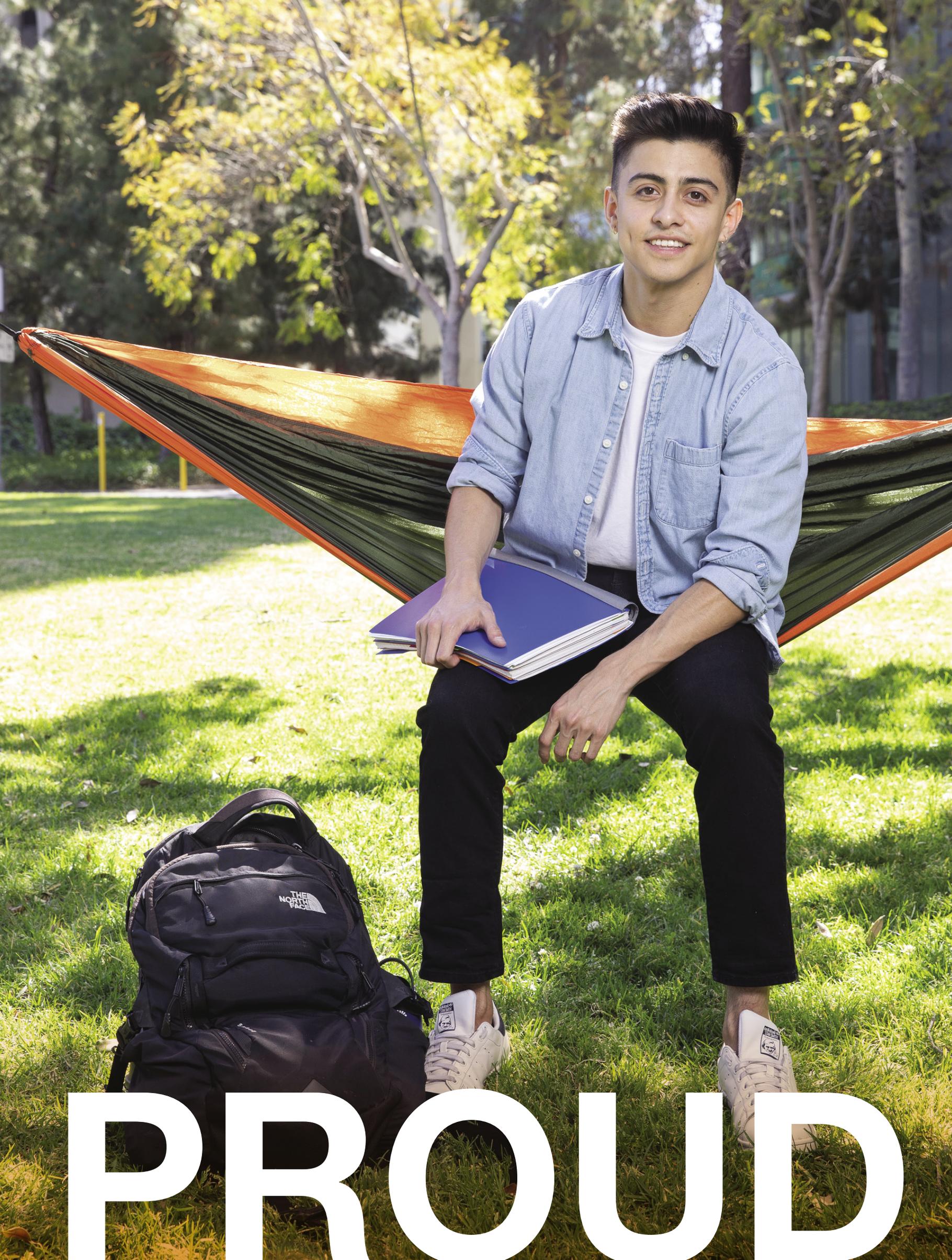
As a first-year student, he participated in the Enhanced Academic Success Experience (EASE) initiative, which provided peer guidance and support, created lasting connections and an opportunity to return the favor. "I still keep in touch with my mentor who is now in med school," said Iñiguez, who is now a Lead Peer mentor for the program. "It's a very encouraging environment to be in and I wanted to give back to the program that helped me so much throughout my first year as a BioSci major."

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Iñiguez also had the opportunity to join a research lab the summer session of his first year and has continued throughout his academic career. His real-world lab experience got very real when the pandemic started, which found him studying SARS-CoV-2. This experience, as well as a volunteer opportunity with a COVID-19 testing startup, only affirmed his passion for the field and his dreams of becoming an infectious disease specialist. "Participating in research is still exciting to me, especially with everything going on with SARS-CoV-2. It's ever-changing and there's never a dull moment," said Iñiguez. "It's exciting to apply the knowledge in real-world situations rather than just reading it from a textbook."

While you may have found him lounging in a hammock in Aldrich Park in his first year, Iñiguez now spends a lot of his time mentoring EASE students, working in classrooms as a certified learning assistant, volunteering at UCI Medical Center and shadowing at Long Beach Medical Center.

After graduation, Iñiguez plans to take a well-earned break to surf, snowboard and travel, as well as spend time with family, which has largely been put on hold during the pandemic. After some rest and relaxation, he'll be back hitting the books and logging more clinical hours before applying to medical school.



PROUD

TRANSFORMING THE LEARNING EXPERIENCE, FROM CLASSROOMS TO OFFICE HOURS



Students sit in groups of eight around tables with attached monitors spread throughout the classroom, sharing their ideas via laptops. As opposed to relying exclusively on the instructor to provide them with information, they become the drivers of the learning process. Known as "active learning," this approach and other academic innovations are crucial to how BioSci is shaping education to train biologists to solve the future's great challenges.

"In the real world, science is about initiative and discovery," said Professor of Teaching Brian Sato with the Department of Molecular Biology and Biochemistry.

"That's why we want to push students to work together to be the ones who generate knowledge as opposed to waiting for the instructor to tell them what's right."

Besides breaking away from the traditional theater-style classroom with rows of seats, active learning emphasizes student involvement. "Often we will provide a scenario and a problem they need to solve, asking them to draw out the different techniques they would use, rather than us telling them how to do it."

About a quarter of BioSci's classes now use active learning and the approach matches with what workplaces are seeking, Professor Sato said. "Employers tell us they want people who are innovative and work well with others, and these are things that are more difficult to foster in a traditional classroom setting."

Removing barriers between faculty and students is another vital component of educational innovation at BioSci. Molecular Biology and Biochemistry Assistant Professor of Teaching Rachael M. Barry is examining how students use faculty office hours. "At a large university like UCI, we want to create spaces where students are comfortable interacting with their instructors," she said. "It helps with classwork, and it is also a networking opportunity."



A group of undergraduates has been helping Professor Barry design the survey used for the project. One goal is to understand the reasons students do not attend office hours. "We might need to make small changes in language and messaging," she said. "It has been shown for example that some first-generation students aren't familiar with the term 'office hours' and aren't sure what they are." Faculty could enhance their language, welcoming students to attend office hours rather than simply stating the times and location.

"It's all about how we can make this work better," Professor Barry said. "For people who are interested in improving the student experience, this is an understudied interaction."

A PASSION FOR GRADUATE STUDENTS

For 23 years, R. Michael Mulligan has served as BioSci's associate dean of graduate education. His leadership and passion for the School have been essential in building BioSci's world-class graduate program. In stepping away from the post this year, he leaves BioSci in a superb position to continue its trajectory in graduate education under his successor, Molecular Biology and Biochemistry Professor Craig Walsh.

A professor in the Department of Developmental and Cell Biology, Professor Mulligan demonstrated exceptional leadership skills as a graduate program director and graduate advisor before assuming the associate deanship. Complementing that capacity was his vision for evolving the graduate student experience. Besides conducting research, he sought to give graduate students training in professional development and guidance on becoming responsible biologists. BioSci's dedication to solving the challenges threatening mind, body and world well-being would not be possible without this evolution.

Doctoral enrollment has risen 30% under his leadership—the best and the brightest are coming to BioSci.

Among his many other achievements are innovative programs of financial support for graduate students and the faculty hiring them in their labs. Mentoring and academic progress initiatives ensure students are advancing smoothly through their careers here. Doctoral enrollment has risen 30% under his leadership—the best and the brightest are coming to BioSci, with outstanding diversity in which he takes pride.

Ongoing enhancement and expansion of educational offerings have been priorities. Several years into his time as associate dean, BioSci teamed with the UCI School of Medicine to launch the Interdepartmental Neuroscience Program. More recently under his leadership, BioSci established professional master's programs in conservation biology and restoration science and in biotechnology management, the latter in partnership with the Paul Merage School of Business.



In addition to his service to the graduate school, Associate Dean Mulligan has been a dedicated researcher and educator. He ran a well-funded laboratory during his first 15 years as associate dean, and he obtained 22 years of federal research support. He served on the editorial board of the *Journal of Biological Chemistry* from 2015 to 2021 and has been a regular reviewer for the National Science Foundation Graduate Research Fellowship Program.

Following his service as associate dean, he will remain an enthusiastic member of BioSci. He will teach the upper division undergraduate course Plant Cell and Molecular Biology and give the photosynthesis lecture for Bio 93, the freshman biology course.

About his successor, Professor Craig Walsh, Associate Dean Mulligan says, "I wish him the best. I know he will do an outstanding job." From everyone at UCI BioSci to Mike Mulligan: "The very best to you and thank you for your extraordinary service!"



YEARS



A GREAT TIME IS PART OF GREAT GRADUATE EDUCATION

For Molecular Biology and Biochemistry Professor Craig Walsh, grad school was “one of the best times of my life, where I found I could dig in and uncover things no one had ever uncovered before.”

As he assumes the role of BioSci associate dean of graduate education this year, a major focus is constantly enhancing the student experience. Doing so will help reinforce the School’s standing as the ultimate destination for life sciences graduate education, he says.

Professor Walsh will take over the position from 23-year Associate Dean R. Michael Mulligan, whom he credits as his inspiration. Besides developing students’ science expertise, “we want to cultivate leadership and interpersonal capacities while having a great time.” His slate of initiatives includes:

Establishing more student research presentations, symposia and networking opportunities, so they can polish their communication and share their knowledge with the greater community.

Creating a BioSci certificate program where students learn in-demand skills such as CRISPR, stem cells, and bioinformatics, regardless of their academic area of interest. “It would be important for them to show they understand these technologies and have trained to a particular standard,” Professor Walsh said.

Expanding recruitment and opportunities for post-doctoral students, who often serve as mentors for grad students while boosting their own scientific and leadership capacities. “We also need to make it possible for post-docs to become more engaged and feel part of the UCI community.”

Further increasing enrollment diversity. “This was crucial under Mike Mulligan’s associate deanship and is a priority,” Professor Walsh said. “It is essential to create educators who can move forward with diverse experiences and ways of doing things to advance science and society.”

Professor Walsh plans informal monthly coffee get-togethers with graduate students, inspired by BioSci Dean Frank LaFerla’s highly popular Donuts with the Dean events for undergraduates. “When prospective students visit, they come away knowing that our grad students are really happy,” Professor Walsh said. “That’s vital and we will continue to build on it.”

THE BENEFITS OF DIVERSITY TO SOCIETY AND SCIENCE

A diverse workforce can leverage the unique perspectives of its members to find solutions to problems, overcome obstacles and focus on collaboration rather than competition. When we work with people who are not like ourselves, we are encouraged to consider new and differing viewpoints, and create better work as a result. If our end goal is excellence, diversity is an essential ingredient. In the context of biomedical science, a wealth of evidence has demonstrated that scientific workforce diversity is essential for discovery and innovation. Promoting diversity does not only promote fairness and justice but also leads to higher quality science.

Despite the abundance of data that shows diversity enhances the quality of science, biomedical research faculty diversity continues to be an ongoing challenge. Across academia, women comprise more than 50% of PhD graduates in biomedical research disciplines, but only 27% of tenured faculty and only 14% of department chairs. Furthermore, underrepresented racial and ethnic groups comprise 34% of the U.S. population, but only 15% of the PhD recipient pool, 9% of current assistant professors and 4% of tenured faculty. The low diversity of faculty compared to the available talent pool is primarily driven by institutional cultures that have perpetuated systemic inequities and created a climate that has made it difficult for underrepresented groups to thrive in biomedical science.

BioSci's Office of Diversity, Equity and Inclusion (ODEI) was created in September of 2020 to address these systemic inequities. First, we aim to improve diversity among faculty, staff and students through enhanced outreach, hiring, retention and professional development. We are developing strategies to remove inequities and encourage the adoption of broader perspectives on judgments of achievement and academic merit. This work will allow us to improve institutional policies and practices and ensure equity across all stakeholder groups. In addition, work is being done with campus partners to regularly assess needs, create inclusive spaces for sharing and reflection, and commit to action to fulfill those needs.



Over the last year, ODEI has collected comprehensive data, which informed several new initiatives, including student-led mentoring programs, inclusive spaces for LGBTQIA+ community, outreach programs to K-12 students, and educational and training activities focusing on diversity and inclusion. However, this is only the beginning. Addressing workforce diversity, equity and inclusion issues in academia is a multifaceted, long-term commitment and will require a concentrated and sustained effort. BioSci is committed to lasting, meaningful change to achieve our goal of transforming into a fully inclusive, anti-racist, multicultural organization as we forge our path to a brilliant future.





ACROSS ACADEMIA

Women

Over **50%** of
PhD Graduates in
Biomedical Research
Disciplines

27%
of Tenured
Faculty

14%
of Department
Chairs

Underrepresented
Racial and
Ethnic Groups

34%
of the U.S.
Population

15%
of the PhD
Recipient
Pool

9%
of Current
Assistant
Professors

4%
of Tenured
Faculty





The Great Smoky Mountains are not actually smoky. The “smoke” that appears above its forests and others is the result of photochemistry in which compounds emitted by plants into the air are oxidized and can create atmospheric nanoparticles — precursors to cloud droplet formation — under certain conditions.

AN EVERGREEN INTEREST IN RESEARCH

Take a hike through a forest and one might get a better understanding of Celia Faiola, associate professor in the Department of Ecology and Evolutionary Biology. One would not only participate in a favorite pastime of hers, but also become engulfed in the subject of her main research interests — plant volatile emissions, or compounds emitted by plants into the air.

This convergence of the outdoors and science is directly attributed to her grandfather, a high school biology and physics teacher and avid hiker and fisherman. She took those passions and pursued them in her studies.

Originally planning to major in biochemistry, Professor Faiola had a profound experience that altered her trajectory while attending the funeral of her grandmother, who was also a teacher. She saw students from decades prior come and speak about the impact her grandmother had on their lives and decided to pursue science education to inspire students as her grandmother did.

What followed was nothing short of a deluge of strong female scientist role models, encouraging and elevating her into the stratosphere.

Undergraduate research experience under Professor Anne Johansen of Central Washington University taught her how to build and test a research project from the ground up, which led her to pursue and receive a PhD in Engineering Science from Washington State University. Her work conducting atmospheric research then landed her at the University of Eastern Finland for post-doctoral work under Professor Annele Virtanen, and a chance meeting with Distinguished Professor Barbara Finlayson-Pitts at a conference led to Professor Faiola joining UCI, where she continues to study atmospheric aerosol — small particles that are ubiquitous in the atmosphere.

Among the plant emission processes that Professor Faiola's lab studies include understanding how plant volatile emissions will adjust in a changing climate, and how the chemical interactions of dozens of emitted compounds compare to existing predictive climate change models that were built from studies of much simpler chemical systems. One of the most studied of these compounds is alpha-pinene, which gets its name from pine trees and is responsible for the distinct smell of pine forests.



Her lab also studies how the emissions change when plants are subjected to stresses, such as exposure to heat, drought conditions and herbivores, as well as how policymakers might want to avoid planting specific trees in urban areas, as some trees could become major contributors to air pollutants because of the types and quantity of compounds released in these plant emissions.

Professor Faiola now educates the next generation of plant ecologists and atmospheric chemists and instills in them the same passions for science and the outdoors.

LEADING THE VIRUS HUNTERS

A BioSci expert researching the long-term consequences of COVID's impact on the brain now leads the UCI Center for Virus Research. Chancellor's Professor Thomas Lane in the Department of Neurobiology and Behavior, who has studied coronaviruses for over two decades, became its director in January. Spanning labs and departments across BioSci and UCI, the Center links virus-based investigations throughout many disciplines under the University's Office of Research.

Two years into the pandemic, what has COVID-19 taught us about viruses?

Professor Lane: It is easy to become complacent. Vaccines against various diseases have been so effective that we don't even think about polio, measles or smallpox anymore. But this COVID-19 pandemic demonstrates that viruses will emerge, continue to change and try to evade our immune systems. It is a sobering reality.

What lies ahead?

Professor Lane: Inevitably, new viruses will be identified that jump from animals to humans. This took place with SARS-CoV-2, HIV, Ebola and others, and it will happen again. Exotic pathogens will appear and threaten human health. We need to be prepared.

How can we change what's coming?

Professor Lane: We need to break down barriers of communication between researchers worldwide. It is essential for solving global health issues rapidly. We must look outward and work together, which ties in with BioSci's tenet of Mind | Body | World. This is also the approach we will be taking at the Center, as we would like to open our doors to greater collaboration on the UCI campus, across the community, California and elsewhere. Cooperating on this scale can make a difference for the future.



IMPACT

THE EVOLUTION OF ACTIVITIES IN RETIREMENT

After 15 years at UCI, Distinguished Professor John C. Avise from the Department of Ecology and Evolutionary Biology decided it was time to retire in 2020. What was supposed to be a lessening of academic activities and a time for world travel with his wife, quickly devolved with the onset of the COVID-19 pandemic.

That said, the pandemic has done little to clip the wings of the avid bird watcher and photographer. While some travel plans were postponed, Professor Avise has made several trips to the Bay Area to visit his daughter, a vascular surgeon and associate professor at Stanford University School of Medicine. And just last summer, Avise and family hit the road to visit Yellowstone and Grand Teton National Parks. "They're fantastic," he said. "The geology and wildlife combine to make it spectacular." Once the pandemic fades, Avise plans to spread his wings and travel more.

Avise, who formerly taught ornithology, among other subjects, has spent much of his free time adding bird photos to his website, Avise's Birds of the World. The site boasts over 10,000 images of birds, from the Great Egrets seen in the waterways of Orange County to the Flightless Steamer Duck of South America, and he's still adding more. "Whenever there's a rare bird spotted in Orange County, I immediately rush out to try to find it and photograph it," said Avise.

Another feather in his cap is the book series he started in 2014 with the release of his book, *"Conceptual Breakthroughs in Evolutionary Genetics,"* published by Elsevier. The *Conceptual Breakthroughs* series, for which he is series editor, summarizes scientific fields in chronological order to give readers an overview of a discipline and its major breakthroughs. Through enlisting others to summarize their own fields of expertise, the series continues to this day. Other books in the series by UCI faculty include *"Conceptual Breakthroughs in Evolutionary Ecology"* by Professor Larry Mueller and *"Conceptual Breakthroughs in the Evolutionary Biology of Aging"* by Distinguished Professor Michael Rose and Graduate Researcher Kenneth Arnold.



And while Avise has written or edited 32 books and over 360 journal articles during his career, what's most surprising to him is that he still spends a lot of time writing in retirement. "One of the jobs that I've found takes up a reasonable amount of time is writing letters of recommendation for past students, postdocs and colleagues," said Avise. "That's one of my activities that has not subsided in retirement and keeps me busy."

When Avise is not photographing birds or writing letters of recommendation, he can be found tending to his garden in University Hills and planning post-pandemic travel.



**FLIGHTLESS
STEAMER DUCK**



GREAT EGRET

BIOSCI'S FOUR ACADEMIC DE

Addressing the grand challenges facing the mind, body and world, pushing the boundaries of exploration through their research and preparing students to become passionate biologists who will help provide a healthier and more prosperous future.

NEUROBIOLOGY AND BEHAVIOR (NBB)

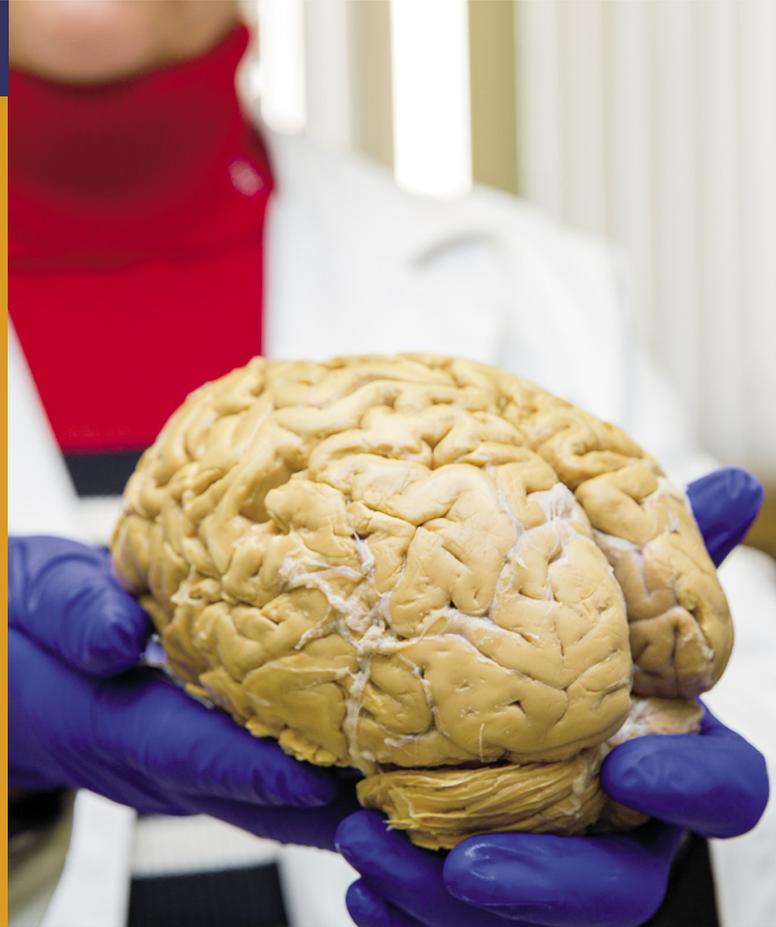


Marcelo Wood, PhD / Chair

Kim Green, PhD / Vice-Chair

Sally Dabiri / Department Administrator

UCI BioSci was the first institution worldwide to establish a department dedicated to the study of the brain and the nervous system. The Department of Neurobiology and Behavior was launched in 1964, five years before the Society for Neuroscience's formation. Our researchers lead the way in probing health and diseases of the brain and the mind's extraordinary capacities. As happened with the school's structure, this model was adopted and is now in place at every university.



DEVELOPMENTAL AND CELL BIOLOGY (DCB)

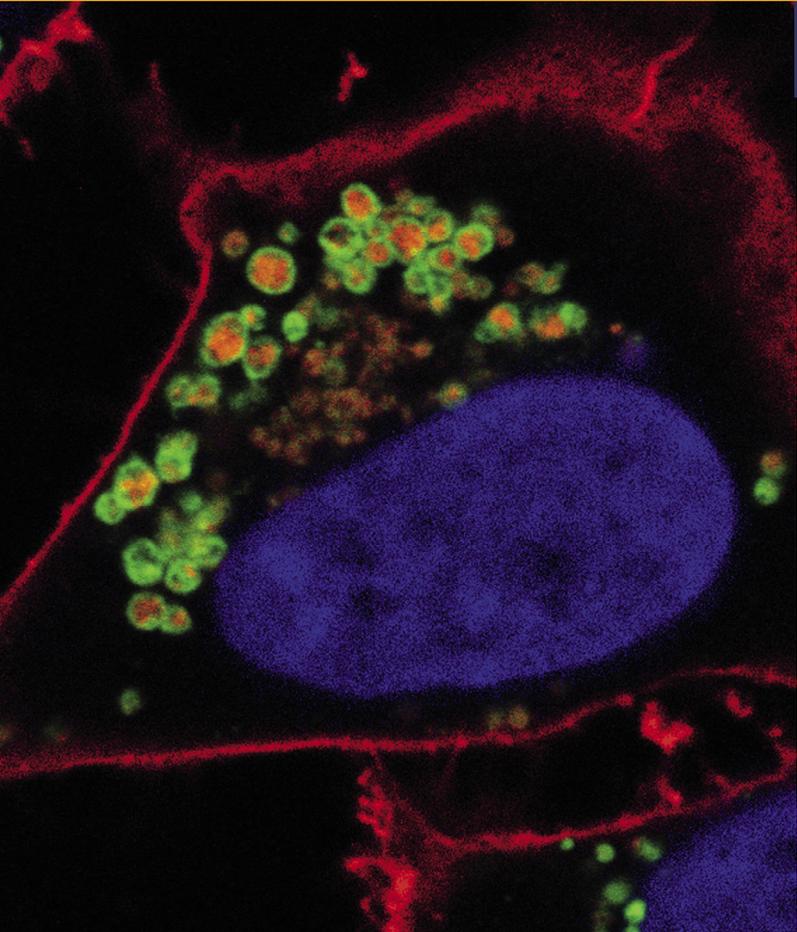


Kavita Arora, PhD / Chair

Lee Bardwell, PhD / Vice-Chair

Andrea Wiley / Department Administrator

Our research programs seek a better understanding of cell differentiation and morphogenesis, as well as the origins of developmental disorders and cancer. Faculty in the Department of Developmental and Cell Biology have expertise in diverse disciplines such as genetics and stem cell biology. As they advance our understanding of the body, they are making discoveries to transform human health.



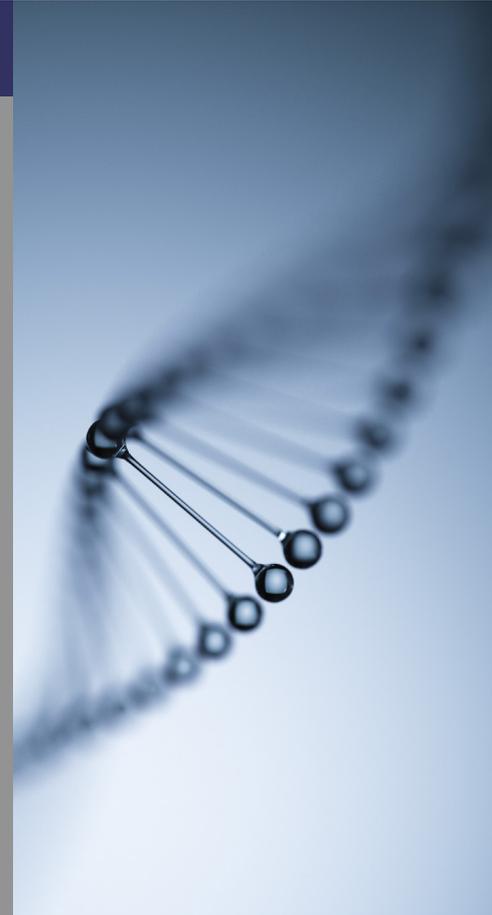
PARTMENTS

MOLECULAR BIOLOGY AND BIOCHEMISTRY (MBB)



Celia Goulding, PhD / Chair
Michael Green, PhD / Vice-Chair
Melissa Lodoen, PhD / Vice-Chair
Bessy Varela / Department Administrator

Faculty in Molecular Biology and Biochemistry work on questions that concern life at the molecular level. Their members consist of immunologists and structural biologists interested in uncovering a deeper understanding of the inanimate molecules that govern life. Research in MBB has uncovered vital knowledge on vector control methods, vascular biology, biofuels, autoimmune disease and drug design, just to name a few.



ECOLOGY AND EVOLUTIONARY BIOLOGY (EEB)



Travis Huxman, PhD / Chair
Catherine Loudon, PhD / Vice-Chair
Marissa Reyes / Department Administrator

This department investigates biological processes crucial for sustaining the planet amid the threat of climate change. Research in Ecology and Evolutionary Biology utilizes a range of methods that span field studies, experimental approaches and theoretical and computer modelling. From the molecular level to the spectrum of ecosystems, our scientists are uncovering the secrets to protecting our world.

2021-2022 NEW FACULTY



Tobin Hammer, PhD
Assistant Professor
Ecology and Evolutionary Biology

Professor Hammer studies the ecology and evolution of symbiosis between hosts and microbes — especially as it relates to bees. These important pollinators are threatened by climate change, lack of flowers and nesting habitat, pesticides, and parasites. The Hammer lab has several ongoing research projects on bee-microbe symbioses, focusing on how gut microbiomes are formed and change over the host lifespan, why symbionts go extinct, *Lactobacillus* bacteria as “bee baby food,” and the interplay between gut microbes and host behavior.



Pablo Lara-Gonzalez, PhD
Assistant Professor
Developmental and Cell Biology

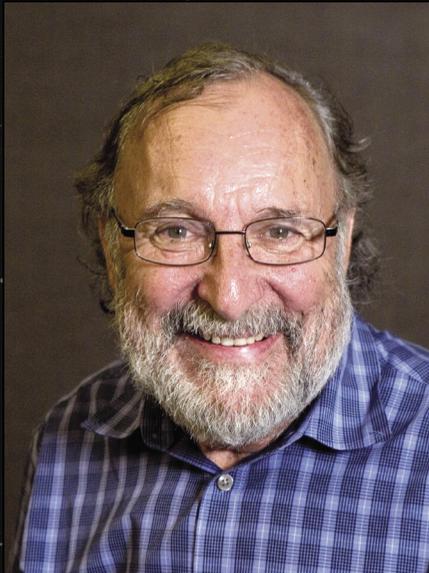
Professor Lara-Gonzalez studies the mechanisms that regulate cell proliferation in development. To proliferate, cells integrate a complex network of inputs that determine whether they divide, differentiate or enter a state of pause known as quiescence. Errors in this decision point can lead to cancer or congenital disorders. Using the nematode *C. elegans* as a model system, the Lara-Gonzalez lab investigates how internal and external signaling pathways during development influence the decision to quiesce and how cell cycle checkpoints ensure that chromosomes are inherited correctly every time a cell divides.



Ana Garcia Vedrenne, PhD
Assistant Professor of Teaching
Ecology and Evolutionary Biology

Professor Ana Garcia Vedrenne’s research centers on how to improve STEM education by incorporating authentic research practices into the teaching and learning of undergraduate biology. She focuses on strategies to improve student engagement, metacognition, scientific comprehension and development of team competencies. Professor Garcia Vedrenne will develop a dry laboratory that emphasizes scientific inquiry skills for introductory biology students and study the program’s impact on student learning and science identity.

2021-2022 FACULTY RETIREMENT



Peter Bowler, PhD
Professor
Ecology and Evolutionary Biology

Professor Peter Bowler first came to UCI as a graduate student in 1970, completing his PhD in 1974. Four years later, he returned to begin his 44-year career at the university. Having been with UCI for the better part of the last five decades, Professor Bowler's influence on habitat restoration can be seen all over campus, as well as at the UCI Ecological Preserve, the San Joaquin Marsh Reserve and the Burns Piñon Ridge Reserve. The marsh, which was once a barren cattle field, now supports flora and fauna — including rare species — native to the area due in large part to the work done by Professor Bowler and his students over the years.

As a biologist and environmental educator, Professor Bowler guided countless students through Southern California's ecosystems, many Earth Day tree-planting events, 16 annual Colorado River canoe trips, and numerous hikes, grunion runs and foraging sessions. He also taught various subjects such as limnology and freshwater biology, restoration ecology, sustainable landscaping, environmental ethics, desert ecosystems, and more.

In his time at UCI, Professor Bowler also ran the Cooperative Outdoor Program, a mix of academics and environmental experiences, and helped build and secure funding for the campus's first solar installation. He also served as director of the UCI Arboretum and Herbarium, faculty co-director of the San Joaquin Marsh Reserve, faculty advisor for the Burns Piñon Ridge Reserve, and director of the Interdisciplinary Minor in Global Sustainability.

In addition to working on writing projects in retirement, Professor Bowler plans to visit national parks, ecological reserves, wilderness areas and restoration sites with his wife, as well as spend time with family and travel to New Zealand and Australia.



2021 FACULTY AWARDS AND HONORS

Ellis Island Medal of Honor

Ellis Island Honors Society
Frank LaFerla, PhD

Academic Senate Better World Award

University of California, Irvine
Dr. Claudia Kawas

Chancellor's Fellow

University of California, Irvine
Christie Fowler, PhD

Chancellor's Fellow

University of California, Irvine
Katrine Whiteson, PhD

Chancellor's Fellow

University of California, Irvine
Aimee Edinger, PhD

Director of the Center for Virus Research

University of California, Irvine
Thomas Lane, PhD

James L. McGaugh Chair

UCI School of Biological Sciences
Michael Yassa, PhD

2021 Elected Fellow

American Association for the Advancement of Science
Steven Allison, PhD

2022 Elected Fellow

Advancing Research Impact in Society
Harinder Singh, PhD

2022 Elected Fellow

American Academy of Microbiology
Anthony James, PhD

2021 Guggenheim Fellow

John Simon Guggenheim Memorial Foundation
Adriana Briscoe, PhD

New Innovator Award

National Institute of Allergy and Infectious Diseases
Travis Wiles, PhD

Early Career Maximizing Investigators' Research Award

National Institutes of Health
Grace Yuh Chwen Lee, PhD

Carol Connor Equity Advisor Impact Award

UCI Office of Inclusive Excellence
Aimee Edinger, PhD

2021 Highly Cited Researcher

Web of Science Group
Steven Allison, PhD

2021 Highly Cited Researcher

Web of Science Group
Kathleen Treseder, PhD

George Mercer Award

The Ecological Society of America
Cascade Sorte, PhD

Director of the Cancer Research Institute

University of California, Irvine
David Fruman, PhD

Maximizing Investigators' Research Award

National Institutes of Health
Shane Gonen, PhD

Graduate Fellowship Award

US Department of Education, Graduate Assistance in Areas of National Need program
Naomi Morrissette, PhD

Co-Director of Institute for Precision Health

University of California, Irvine
Leslie Thompson, PhD



Frances Lynn Carpenter | 1944-2022

Frances Lynn Carpenter, emerita professor and the first female faculty in the Department of Ecology and Evolutionary Biology, was a dedicated ecologist whose research included the foraging patterns of hummingbirds and reforestation, for which she was most known.

Lynn, as she was known, was a pioneer of studying the physiology and ecology of hummingbirds beyond the laboratory, in the complexity of real-world settings. She used field sites that amplified adaptations to the environment, such as high-elevation settings where temperature varies dramatically in time, and locations that allowed her to compare differences among species, such as highly diverse tropical locations. She elucidated the mechanisms by which an interplay of the constraints of the environment and the forces of competition determine the spatial range of species.

While on sabbatical in Costa Rica in 1991, Professor Carpenter was compelled to devote her research efforts toward reforestation after witnessing the relentless logging of the country's rain forests. Her work, which continued after her retirement in 2010, helped uncover effective methods for facilitating reforestation and soil regeneration in eroded lands and pastures that had been logged and drained of their resources. Professor Carpenter's spirit and obligation to conduct meaningful research for the well-being of all life is the driving force behind BioSci and conservation efforts around the globe.

In addition to her decades-long contributions to science, Professor Carpenter was also a longtime donor and supporter of BioSci. Her bequest ensures academic excellence in educating the next generation of biologists and continued research in areas about which she was deeply passionate. Her service and generosity stand as a beacon toward which we can all strive.

DEAN'S LEADERSHIP COUNCIL

The school's Dean's Leadership Council (DLC) is composed of successful alumni, business executives and community leaders who provide counsel to the dean and help ensure that our strategic mission is properly aligned with the needs of society and business.

They provide valuable financial support to advance the mission of the school's priorities of teaching, research and public service. Council members embody the spirit of philanthropy and function as our "eyes and ears" outside the university walls. They offer significant insights to the dean, including industry trends that impact our graduates and our faculty's research. Our DLC members function as ambassadors and advocates, introducing us to key decision makers and industry leaders who support our strategic goals and special initiatives.

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*Director, Gynecologic Oncology
Kaiser Permanente OC*

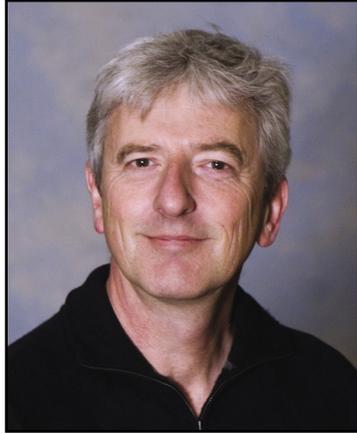
Jeff Volpe

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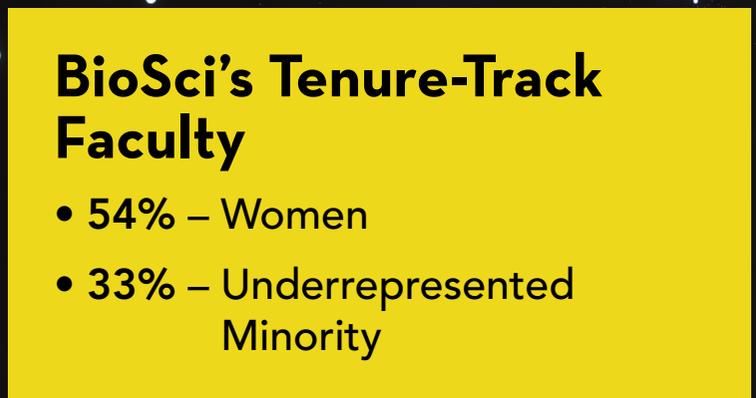
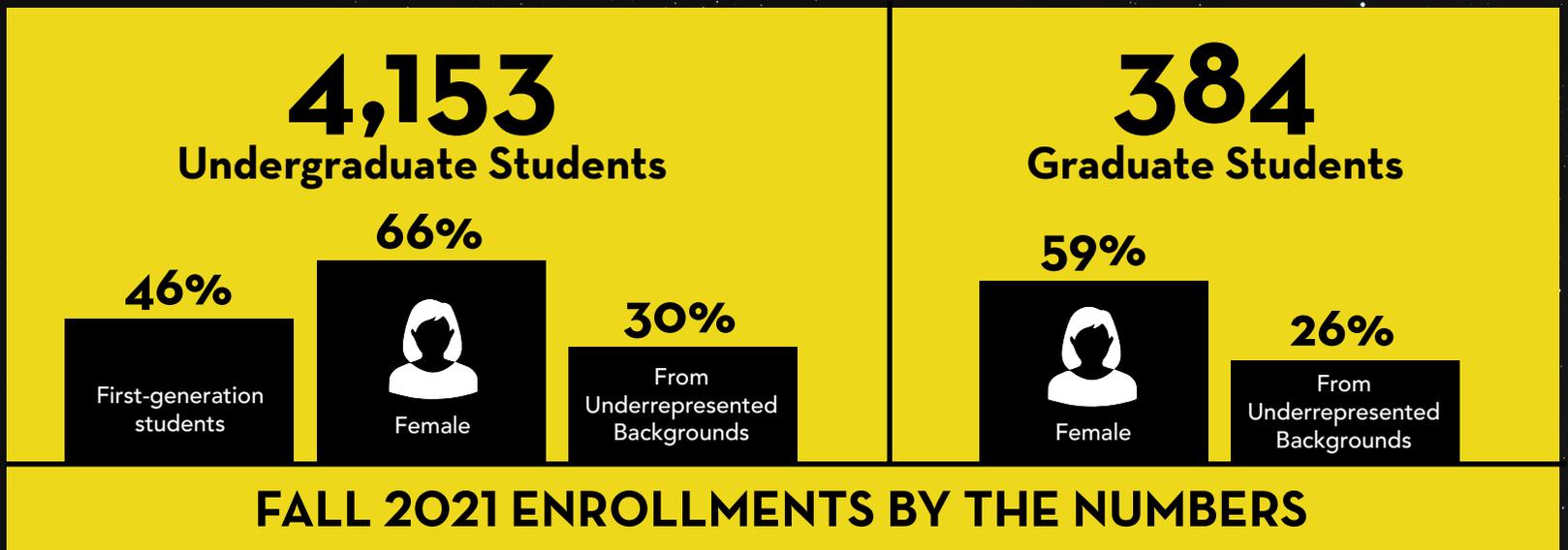


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Principal Communications
Officer



Regina Castleman
Marketing and
Communications Manager

SCHOOL FACTS AND STATS





#1 Doing the Most for the American Dream

UCI is No. 1 on The *New York Times*' College Access Index, which ranks colleges based on their commitment to economic diversity by measuring the number of lower- and middle-income students enrolled and the cost of tuition.



#9

UCI is ranked No. 9 in *Money Magazine's* 2022 list of "Best Colleges"



GIVING BACK TO MOVE STUDENTS FORWARD



Two decades after BioSci propelled David Abiva toward his career as a physician assistant, he is encouraging students to find future professional and personal satisfaction by pursuing the work he loves. Abiva, who received his diploma in 2001, volunteers for the BioSci Mentor Program, which was launched nearly 20 years ago and matches undergraduates with alumni and other professionals for career guidance and networking opportunities.

"I was looking to encourage students toward careers as a physician assistant because it has been so rewarding for me," said Abiva, who began mentoring in 2018. "Mentoring students was something I was always interested in doing and never felt I had the time. But fitting it into my schedule turned out to work very well and the experience has been fantastic."

His first mentee was Amelia Ooi, then a BioSci senior. "I got really lucky," said Ooi, who is now enrolled in a physician assistant training program. "David was easy to approach and open to answering any questions." Besides meeting at quarterly networking events, the pair was in frequent contact by text and email. "He helped me with interview practice, and I got to shadow him at his clinic," she said.

Abiva says he benefited as much or more than his mentee did. "I was over 15 years removed from UCI and had no idea what the undergraduate landscape looked like now. Getting to know Amelia and her aspirations was very meaningful," he said.

Olivia Stroud, the associate director of development for BioSci who oversees the Mentor Program, said: "Mentors like David are the backbone of this program. By connecting mentors and mentees, BioSci offers a unique opportunity for undergraduates to explore career paths, receive personalized guidance, and develop an appreciation for the value of mentorship."

Abiva now volunteers with five students for the 2021-2022 academic year. When the pandemic necessitated a shift to virtual activities, Abiva didn't miss a beat, hosting group discussions on Zoom. He also founded a Facebook group for physician assistant mentees to expand their professional network and support system.

His enthusiasm has ensured a future participant in the program. "Working with David was so great that I plan to become a BioSci mentor myself after I start my career," Ooi said.

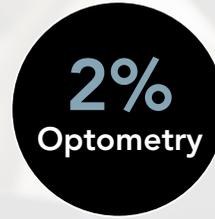
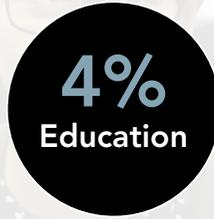
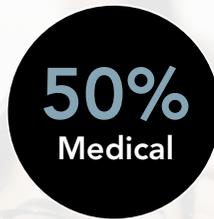
To learn more about volunteering for the BioSci Mentor Program, contact biosci-mentor@uci.edu.



BioSci Mentor
Program 2021-2022



Mentor Professions



Mentor Location



Alumni Status



A GIFT THAT KEEPS ON GIVING

For over 30 years, Professor Emeritus Hung Fan has called the School of Biological Sciences home. He is a distinguished researcher in the field of retroviruses, a longtime patron of the university, and has been a dedicated leader many times over during his time at UCI.

In addition to his work in the Department of Molecular Biology and Biochemistry, Professor Fan was instrumental in establishing the UCI Cancer Research Institute for which he served as director for 30 years. He also served as associate director and co-director of the Chao Family Comprehensive Cancer Center and is currently Associate Vice Chancellor for Strategic Initiatives.

His impact on the UCI community to this point has been immeasurable and just reached new heights with the announcement of a bequest of \$1.5 million that will establish endowments for the Department of Molecular Biology and Biochemistry and the UCI Cancer Research Institute.

This generous gift from Professor Fan and his husband, Michael Feldman, — their largest gift to date — will fund vital research projects and programs for years to come.

On behalf of BioSci and all who may benefit directly and indirectly from this gift, thank you Professor Fan and Michael Feldman.



2021 DONOR HONOR ROLL

UCI School of Biological Sciences is grateful to all our donors. Your gifts truly make a difference in the pursuit of our mission. The honor roll below is reflective of gifts and pledges made between January 1, 2021 - December 31, 2021. Thank you!

We make every effort to list all donors accurately. If, however, you find an error, please contact us at bio-development@uci.edu. To view our longtime donor alumni and friends list, please visit bio.uci.edu/giving

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