Integrative Biology

SPRING NEWSLETTER 2022

L-R: Eileen Lacey; tyrone hayes

From the Integrative Biology Co-Chairs

tyrone B. hayes, Ph.D.
Eileen A. Lacey, Ph.D.

As expected, our first year as Co-Chairs was exciting but challenging. The learning curve has been steep and we are grateful to the experienced colleagues and dedicated staff members who have helped us navigate this first year. We are also grateful to the many members of the IB community who have offered their encouragement and support.

Positive elements of the past year include the continuing, outstanding accomplishments of our faculty and students. We have a new cohort of doctoral students who will join the program in September. Our current students remain very successful at securing graduate and postdoctoral fellowships. We will soon be graduating another class of top-notch undergraduates. The past year has seen the launch of several important new initiatives, including programs aimed at improving the diversity of our graduate program, the discovery-based content of our undergraduate curriculum, and our ability to offer field-based learning experiences. The Valley Life Sciences Building is once again open and full of activity and it feels like we have turned a critical corner on the road back to "normal."

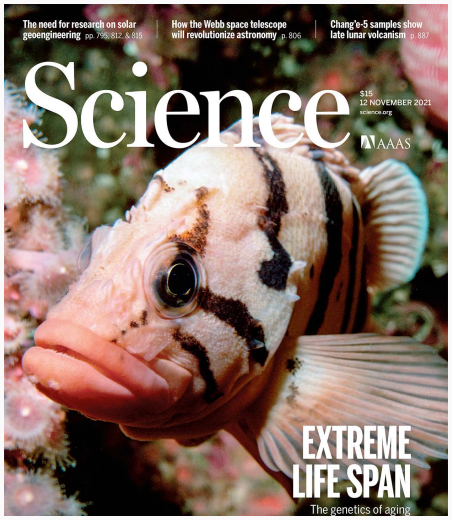
At the same time, we are facing many challenges, in particular a significant financial shortfall resulting from the COVID-induced campus closure. Due to the loss of several key income streams during the pandemic, this shortfall will persist for at least the next few years. The adjustment to remote instruction and, more recently, to combined remote and on-campus instruction has led to important innovations but has also left many of us exhausted and frustrated by our inability to do more to help our students. Returning to in person meetings and events has been a welcome change but has required considerable flexibility in planning and logistics. That said, we held a well-attended in person holiday party in December and during the next few weeks we will host our first "live" departmental retreat-symposium and first "live" commencement ceremony since 2019. Each of these events reminds us of the critical importance of working to resolve the challenges that we face.

In sum, the past year leaves us both encouraged and concerned about the future. We anticipate the emergence of both new challenges and opportunities as we move forward. We are reminded that change rarely comes when things are going well … instead, real change tends to arise from challenges and this leaves us feeling encouraged regarding the future of Integrative Biology. We hope you enjoy reading about the inspiring successes of our faculty, staff and students!

Contents:

Three Science Covers for IB Researchers!

Integrative Biology faculty Dr. Peter Sudmant, Dr. Robert Full and Dr. Charles Marshall have each been featured on the cover of* Science*, the premier general science journal, in the past year.

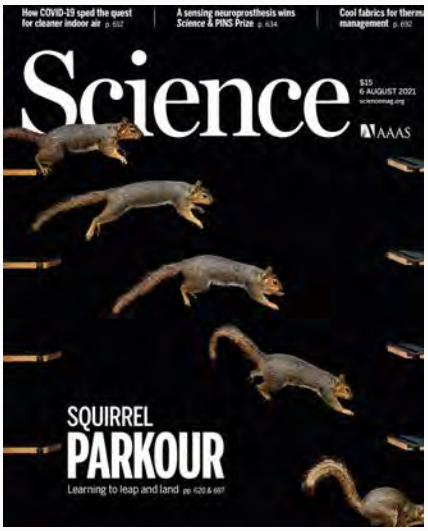


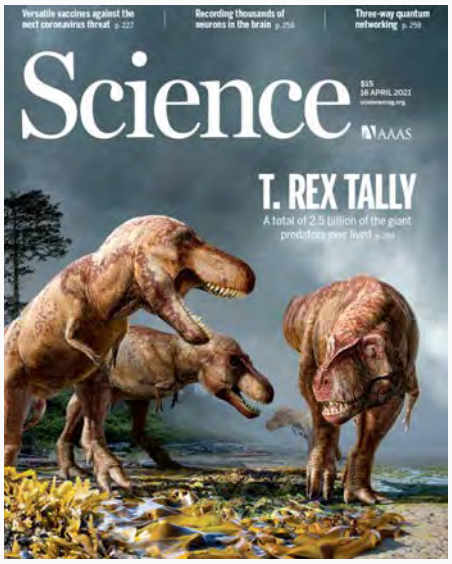
Extreme Life Span

We sought to understand how differences in lifespan evolve over rapid timescales in Pacific Ocean rockfishes which exhibit lifespans ranging from 10 to more than 200 years. We identified several genetic adaptations enabling longevity including gene duplications in the immune modulatory butyrophilin gene family. Remarkably, these immune regulators are associated with several human inflammatory diseases as well as human lifespan. Thus, even by studying the genomes of deep-sea fishes we can identify genes that play functionally relevant roles in human health-span and diseases of aging.

Squirrel Parkour

Life-threatening, predator evasion in animals leaping through complex canopies can depend upon split-second decisions of biomechanical capability, use of acrobatic recovery maneuvers, and learning from past efforts. Free-ranging Fox Squirrels leaping across novel, simulated branches decided where to launch by balancing a trade-off between gap distance and branch-bending compliance. Squirrels quickly learned to modify impulse generation from bendy beams. A repertoire of agile landing maneuvers enabled targeted leaping without falling. Unanticipated parkour behavior revealed an innovative solution for challenging leaps. Squirrels deciding and learning how to launch and land demonstrate the synergistic roles of biomechanics and cognition in robust gap crossing strategies. These discoveries are part of a project inspiring the design of the most agile robot yet built for search-and-rescue and rapid detection of chemical, biological, and nuclear hazards.



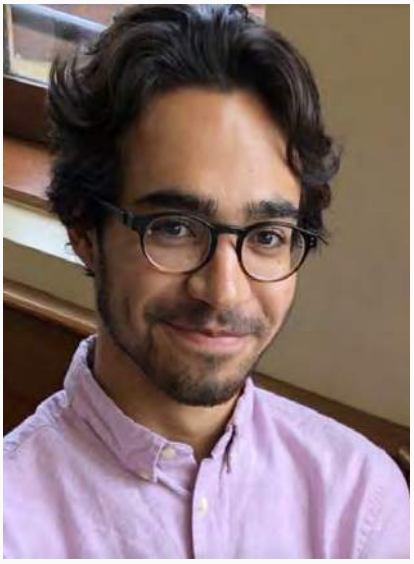


T. REX Tally

The fossil record is famed for its incompleteness, and so we sought to determine just how much can be known (and how well) by trying to determine how many adult *Tyrannosaurus rex* ever lived. This required knowing something about its average body mass (~5.2 tonnes), its longevity (~28 years), when it became sexual mature (14-17 years), its generation time (~19 years), its geological longevity (~2.4 million years), and its geographic range (maybe a third of the US). And then, after making inferences about its physiology, we used data from living species to infer its population density which led to an estimated average standing population size of ~20,000 individuals and total number that ever lived of 2.5 billion (but perhaps as few as 140 million or as many as 42 billion). Frankly, we were surprised at just how much the roughly 30 relatively complete fossils held in public museums enabled us to infer.

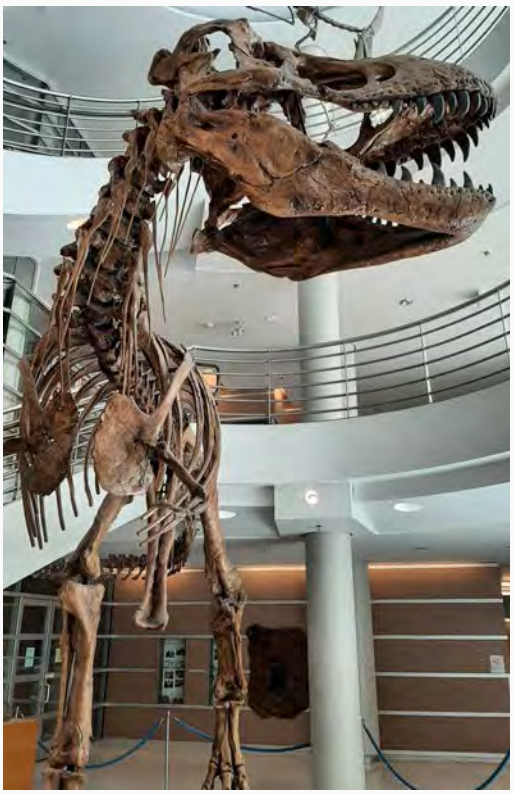
Tyler Douglas, PhD Candidate in Integrative Biology

Story by Rebecca Tarvin, Assistant Professor, Integrative Biology



Poison frogs accumulate neurotoxins from their food to ward off potential predators. The Tarvin lab is using fruit flies (*Drosophila melanogaster*) to model the ecological dynamics that may have led the ancestor of poison frogs to evolve this adaptation. New research led by graduate student Tyler Douglas shows that consuming nicotine provides lab-raised fruit flies with a survival advantage against endoparasitic wasps, which lay their eggs inside fly larvae. A specific genetic strain of fruit fly with more copies of genes that encode enzymes involved in nicotine detoxification were able to consume more nicotine, receiving a larger survival advantage against wasp parasites. Furthermore, flies that fed on nicotine only during the larval stage were shown to accumulate nicotine into adulthood. Thus, our research shows that early stages of toxin accumulation can arise in the context of parasitism, and suggests that many insects -- and perhaps frogs -- may passively accumulate toxins, even without existing sequestration mechanisms.

Link to paper: https://royalsocietypublishing.org/doi/10.1098/rsbl.2021.0579



Tyrannosaurus rex cast in the atrium of Valley Life Sciences Building, home of the Integrative Biology department

Photo by Kevin Padian

Dr. Kevin Padian, Professor Emeritus, Integrative Biology

Over the years that I taught a freshman seminar on dinosaurs, the problem of why the arms of *Tyrannosaurus rex* were so short was literally staring me in the face – each time I took students into the atrium of our building to ponder the mounted skeleton of the beast. A lot of hypotheses had been proposed since its discovery in the early 1900s: grasping the mate during courtship, holding down prey, stabbing, tipping over sleeping *Triceratops*, and so on. But these hypotheses could not have worked because the arms were too short to touch each other, let alone the head and mouth, or anything else. And each proposed function would have worked better if the arms had not been reduced.

Rather than only focusing on the arms, I've proposed considering how the reduction might benefit the whole animal. One possible advantage to reduced arms is during group feeding on a carcass, when the T. rex next to you might turn and bite you if you got too close. This happens among some large predators today, and we now know of sites that preserved adult and juvenile tyrannosaurs together, so they could have hunted in packs. The hypothesis can be partly tested by examining bite wounds on tyrannosaur skulls and other bones: reduced limbs should show less damage.

Read more at https://news.berkeley.edu/2022/04/04/t-rexs-short-arms-may-have-lowered-risk-of-bites-during-feeding-frenzies/.

Dr. Tim White, professor of Integrative Biology, awarded prestigious Japan Prize

Dr. Tim White was recently awarded the prestigious 37th International Japan Prize for Biology in the field of the Biology of Human Evolution. Dr. White has had an enormous influence on our understanding of human evolution through his discovery and analysis of human fossils at various stages and the surrounding faunal specimens and other paleoenvironmental data. Dr. White first played a central role in the detailed analytical study of *Australopithecus afarensis* fossils dated to 3.7 to 3 million years ago. His achievement in showing that *A. afarensis* was recognizable as a single species is highly regarded. The interpretive model for *A. afarensis* fossils that Dr. White provided continues to influence research in the field of paleoanthropology to this day. Since 1990, Dr. White has been co-leader with Ethiopian researchers of the Middle Awash Project in Ethiopia. Thus far, this project has succeeded in discovering an extremely wide variety of fossils including *Ardipithecus kadabba* dated to 5.7 million years ago, *Australopithecus anamensis*, the possible genus *Homo* ancestor *Australopithecus garhi*, *Homo erectus*, and the 160,000-year-old *Homo sapiens idaltu*. Of particular note is the discovery of 4.4 million-year-old *Ardipithecus ramidus* fossils. This discovery, which revealed a pre-*Australopithecus* phase in human evolution that had previously been completely unknown, has taken the study of human evolution as a whole to an entirely new level. Dr. White's research has dramatically advanced our understanding of the different stages of the human evolutionary process by presenting direct evidence of the fossil record, and meticulously interpreting it.

Civil War Journal discovered in UC Berkeley Herbarium

Story by Kelly Agnew, Integrative Biology

I worked in the University Herbaria, where I stumbled on a Civil War journal written by an important early California botanist named John Lemmon. I'm a biologist - I've taught the Genetics and the Evolution courses in the department. But my father is a retired history professor, and I knew the journal was important - John Lemmon was a prisoner of war at the notorious Andersonville prison camp.

My dad and I recently published a biography of John Lemmon. He was a fascinating character who lived against the backdrop of the Civil War, the American Westward Expansion, early California history and the nascent environmental movement. His life also highlights the important contributions made by amateur scientists in 19th century America.

The UC and Jepson Herbaria house the largest public university botanical collection in the world, with more than 2.2 million specimens. Along with the other natural history museums on campus, these specimens are critically important in understanding historical biological diversity and predicting how global changes will impact all life on Earth. The Civil War journal was an unexpected discovery that highlights the value of maintaining these valuable collections.

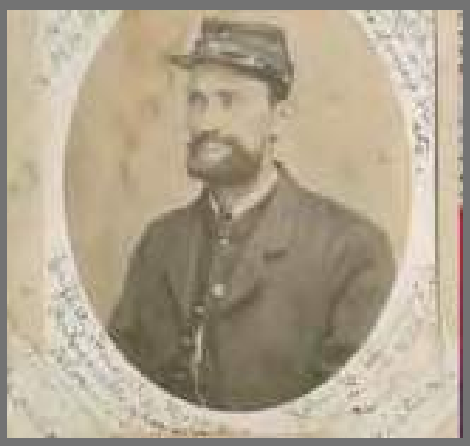


Figure 1. Frontispiece of John Lemmon's "Recollections of Rebel Prisons." His journals recounting his experiences as a Civil War Union cavalryman were discovered in a beer box stashed in a closet of the UC Herbarium. (Photo K. Agnew, journal in UC Herbarium collection)

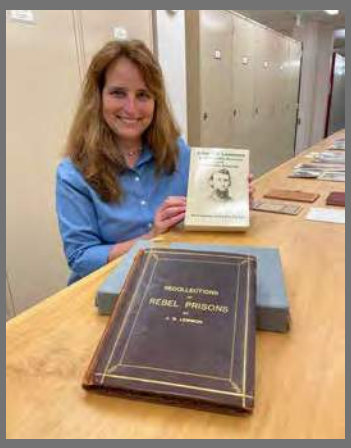


Figure 2. Kelly Agnew in the UC/JEPS Herbaria, with her book about John Lemmon. Lemmon's memoir of his time in Confederate prisoner of war camps is in the foreground. (Photo by Amy Kasameyer)

Figure 3. UC's Herbarium houses more than 2.2 million plant specimens. The dried plants are stored on sheets of paper and kept in museum cabinets in the basement of the Valley Life Sciences Building (across the hall from the T. rex*). (Photo K. Agnew)*

Cal Students Meet the California Condor

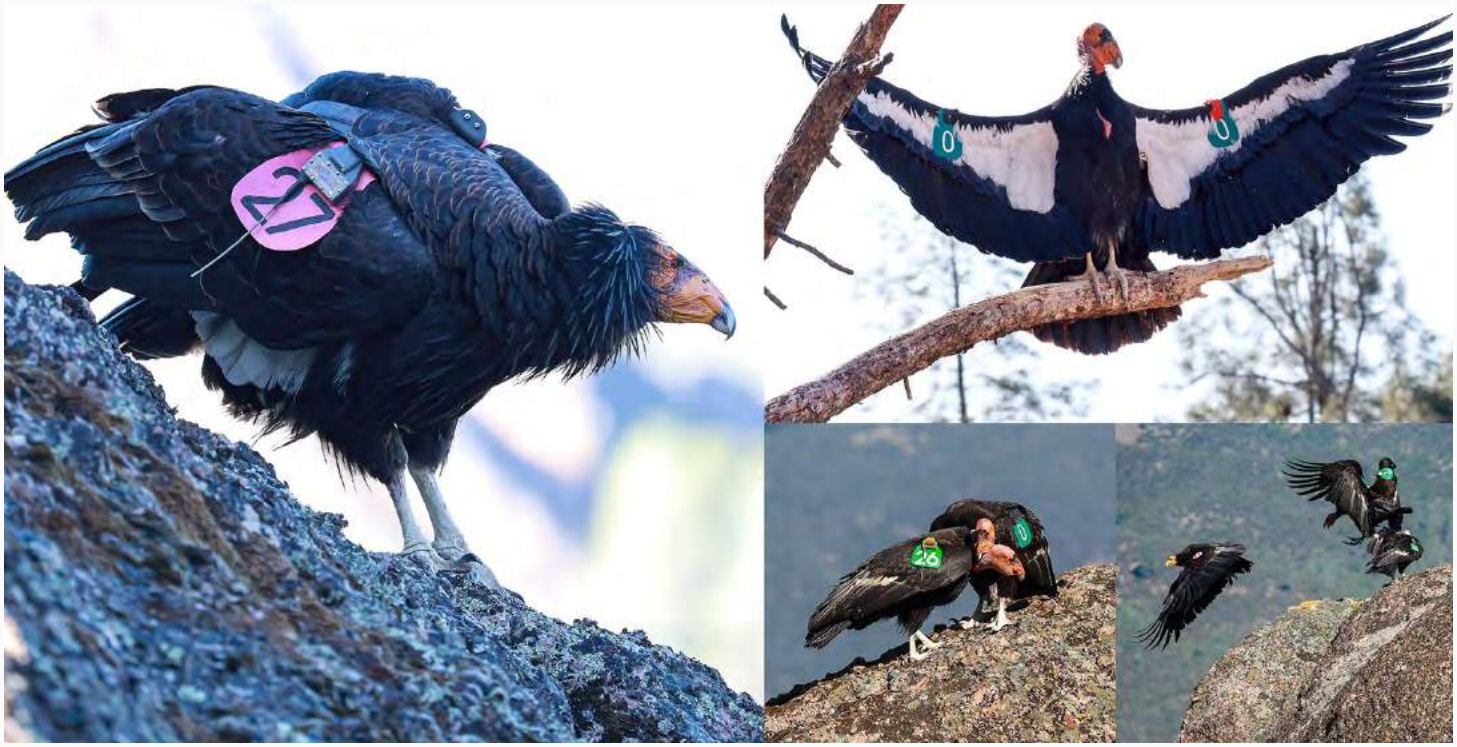
Ornithology's (IB174LF) trip to Pinnacles National Park to experience North America's largest and rarest bird

Story and photos by Jackie Childers

This spring, undergraduate students enrolled in Professor Rauri Bowie's Ornithology course got to experience something new. For the first time since he began teaching the class in 2008, Dr. Bowie led his class of 24 students to Pinnacles National Park, where they got to meet the critically endangered California Condor. According to Dr. Bowie's own teaching philosophy, field trips are an essential part of the IB undergraduate experience, **"Students take field notes, make detailed behavioral observations using scientifically sound sampling techniques, and celebrate the joy of being outdoors."** While Bay Area field trips have always been a part of the course curriculum, this was the first time they made the 120-mile drive south to California's youngest national park. When asked about his decision to take students to Pinnacles this year, Dr. Bowie stated, "What can be more inspiring than seeing North America's largest bird? We often forget, the California Condor remains one of the rarest birds in the world with less than 300 individuals in the wild."

> **"What can be more inspiring than seeing North America's largest bird? We often forget, the California Condor remains one of the rarest birds in the world with less than 300 individuals in the wild."**
>
> **- Dr. Bowie**

Established in 2013, Pinnacles NP lies within Monterey and San Benito counties, just east of Big Sur. The park's namesake is a set of distinctive, mountainous peaks that jut out conspicuously above the surrounding landscape of ranches and vineyards of the Salinas Valley. The eroded remnants of an extinct volcano, today, these 23 million-year-old peaks are a roosting site for one of the few wild condor populations. The decline and subsequent recovery of the California Condor is among the most significant conservation success stories in U.S. history.



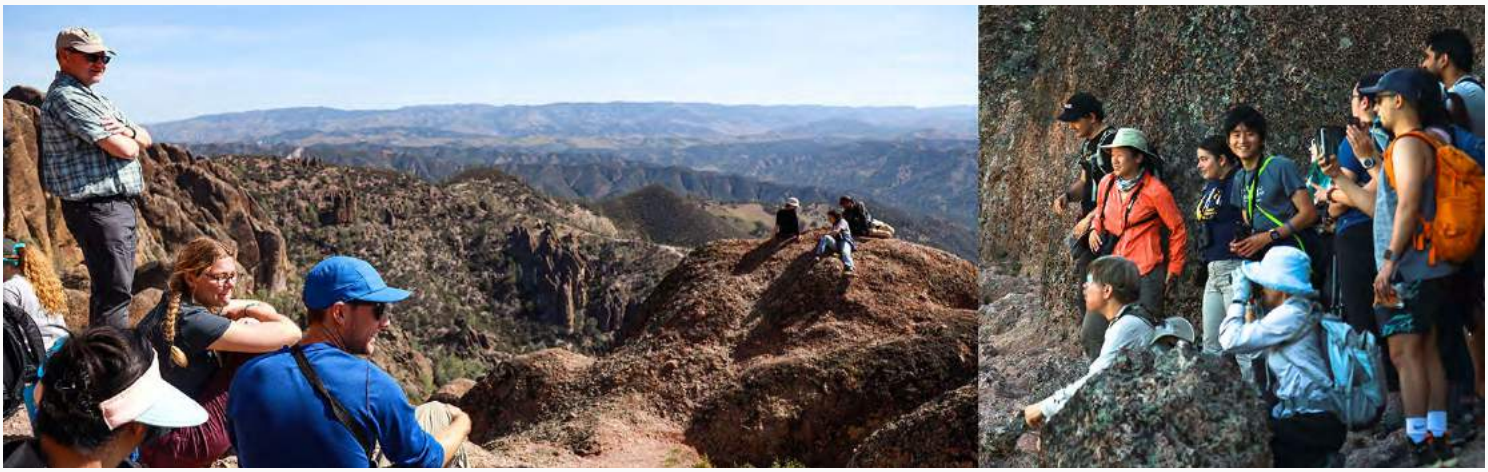
Condors at Pinnacles are individually tagged and equipped with GPS monitoring equipment, allowing researchers to track their movements and activities, and conduct health checks. Condors can be identified by the numbered vinyl tags on their wings, and information about each individual can be looked up using the website Condortspotter.com in real-time. While observing these condors, IB174 accessed the site and learned that Green No.00 (Male 700; top right image) and Green No.26 (Female 726, a.k.a. "Little Stinker") are a mated pair (bottom right). Pink No.27 (Male 827; left image) appeared to be a younger, rival suitor!

Cal Students Meet the California Condor, continued

Beginning in the 20th century, condor population numbers began to decline rapidly due to habitat loss, pesticides such as DDT, and fatal poisoning following the scavenging of animal carcasses filled with lead shot left by hunters. By the 1980s, the species was nearly extinct, causing the U.S. government to put together a conservation plan that led to the capture of all remaining wild condors by 1985. In total, 27 birds were placed into captive breeding programs at several zoos. Over 30 years later, the population has grown, and condors can now be seen in several southwestern states, including Utah, Nevada, Arizona, and Baja California. Since 2003 Pinnacles NP has played a critical role in the Condor Recovery Program, and today the park directly manages over 80 individuals.

> **"Public opinion of vultures tends to be negative. They have always been portrayed in media as harbingers of death, dirty in nature, and disgusting looking. Lately, though, I think people are coming around to them as being very important to the environment, and the California Condor especially has become closely associated with the image of California. Seeing them in person, finally getting a real impression of how huge they are, and observing some of their behaviors and social interactions was an incredible experience. "**
>
> **- Mackenzie Kirchner-Smith, IB Ph.D. Candidate**
>
> *Mackenzie's doctoral work covers the skeletal morphology of vulture species, including the California Condor. You can read more about her research in this Berkeley News article from earlier this year.*

In early April, IB174 students set out to Pinnacles on a Friday, and that first evening, they gathered at campsites within the park. For some students, this was their first-ever camping experience, including their first time setting up a tent and cooking food outdoors independently. The real adventure began the next morning when students awoke before sunrise to begin the several-hour hike up to the top of the High Peaks Trail. The goal was to catch the condors early in the morning before they warmed up and flew away from their roosting sites for the day. After a grueling, steep hike to the top, we were met with a spectacular scene. For over an hour, we observed six condors and watched as they basked in the sun with their massive wings outstretched, flew around the ridge, and in one instance, we got to witness a male and female engage in a full courtship display. **"Sharing the two hours of speechlessness with my classmates and walking back to the first outcrop to see the condor couple made me feel more connected to my classmates. It gave me a glimmer of hope that population restoration and reintroduction could be successful,"** reflected junior undergraduate Tomo Yoshino (MEB, Environmental Eng Sci, GPB).



Rauri and the class gather at the summit of the Pinnacles High Trail. After spending over an hour watching the condors in the morning (right), the group took some time to take in their surroundings (left), "...after seeing the park and the extensive conservation efforts that have led to this whole area being protected, I learned it's not just about the Condor, it's about the whole ecosystem and every individual creature that benefits from this park." – Cindy Pritzker, MEB 2022

Cal Students Meet the California Condor, continued

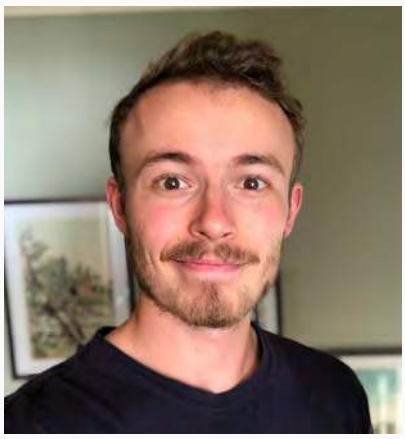
For Professor Bowie, the trip was a vivid demonstration of how invaluable field courses are as a part of the teaching curriculum. At a time when college courses are becoming increasingly specialized, witnessing wildlife in their natural setting provides a unique experience that students will never forget, while imparting a deeper understanding of how different components of biology fit together in the context of the whole organism and the environment it inhabits. Moreover, these experiences provide an opportunity for personal growth and development. Students interviewed after the trip expressed feeling more confident in their independent capabilities, learning better communication and teamwork skills with their peers, feeling excited about future field opportunities, and sensing a deeper personal connection with the natural world.

The group does their best California Condor impression following a successful weekend. Photo courtesy of Cynthia Wang-Claypool

> **"Field lab classes are the best classes I have ever taken. I learn so much about nature, the people in my classes, and about myself through this experience. I love them and wish I could take them again. There is no way to replicate this experience through traditional class settings -- being outside, being with peers, and learning about the outdoors while outdoors is a truly unique experience, and I wish every person got to experience it. I feel very lucky."**
>
> **- Lia Keener, MEB 2022**

NSF Postdoctoral Research Fellowship Awards in IB, 2022

Collated by Elijah Mehlferber, Ph.D. candidate, Integrative Biology



Elijah Mehlferber

PRFB Area: Rules of Life Governing Interactions Between Genomes, Environment and Phenotypes

Throughout school, science had always been my favorite subject, and since I learned that you could make a career out of research, I have dreamed of being the one to contribute to the science books, rather than just read them. I was lucky to gain experience working in a lab as an undergraduate at the University of Georgia, where I studied the reliance of a fruit fly species on its gut microbiome in low nutrient environments. This work inspired me to continue studying the role of the microbiome in graduate school, joining Dr. Britt Koskella's lab in the Integrative Biology department at UC Berkeley. Here, I have been working to better understand the role of the Phyllosphere microbiome (the bacteria associated with the leaves of plants) on plant health, primarily focused on both protection from bacterial pathogens and the promotion of reproductive success. When applying for the PRFB, I wanted to continue my work understanding how bacteria interact with their hosts, now focusing more on the pathogen. In my proposed project I will work with Dr. Sam Brown at Georgia Tech to understand the role of genetic and environmental interactions towards modifying invasion success outcomes across strains of the diverse opportunistic pathogen *Pseudomonas aeruginosa*.

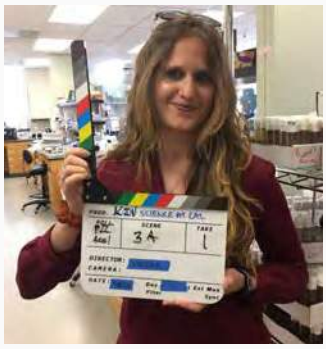
NSF Postdoctoral Research Fellowship Awards, continued

Elisa Visher

PRFB Area: Rules of Life Governing Interactions Between Genomes, Environment and Phenotypes

My favorite part of science is the storytelling - how we use data and observations to weave together a larger understanding of the world around us. When I first started developing my interest in evolution, I was in a biological anthropology class. The idea that evolution was a process that could affect human beings' lived realities excited me. When I started learning about infectious disease evolution, I was even more enthralled by the idea that pathogens are continuously evolving on lightning-fast time scales to shape human, agricultural, and ecosystem health.

After time working on these questions during my undergraduate at Yale and as a research technician at University of Michigan, I decided to pursue a PhD in Integrative Biology here at UC Berkeley with Professor Mike Boots. My dissertation research has focused on exploring trade-offs to virus host range and host resistance in eco-evolutionary contexts. When applying for the PRFB, I wanted to expand my work to better consider the genetic dynamics of these processes, so I applied to work with Professors Gavin Sherlock and Dmitri Petrov at Stanford University. There, I will be using lineage barcoding methods to explore how trade-off shapes change over time, depend on evolutionary history, and determine coevolutionary diversification and to understand how genetic processes determine phenotypic trade-offs.



Kirsten Isabel Verster

PRFB Area: Broadening Participation of Groups Underrepresented in Biology

I grew up in Miami, Florida, a place where we have the privilege of walking into a tropical, humid nature exhibit every time we step outside - iguanas on the road, alligators and manatees in the canals, mosquitoes so thick you can barely breathe, and Monstera plants spilling over in every crack in the pavement. Becoming a 'biologist' didn't sound like a realistic job until I started my undergraduate degree at the University of Florida, when I learned that it was possible to actually get paid to do biology. I worked in several labs at UF and through NSF-funded REUs studying insect behavior and systematics. I knew the whole time, however, I wanted to learn what really makes an animal tick - their genes - and how. At UC Berkeley, I was fortunate to use a functional genomics approach to interrogate the function of a gene that I discovered, which was transferred laterally from bacteria to insects, and appears to have a protective, anti-parasite role. I will be using my PRFB at Stanford University with Dr. Liz Hadly, utilizing next-generation genomics technologies to understand how climate change affects insect populations. Additionally, I will be building on tools I have practiced and developed here at Berkeley to support underrepresented students' inclusion and belonging in the biological sciences.

Lichter-Marck, proud dad of little songbird Wren Annetta Marck, photo by Sophia Winitsky

Isaac Lichter-Marck

PRFB Area: Rules of Life Governing Interactions Between Genomes, Environment and Phenotypes

My interest in science grew out of my love of gardening. As a teenager, I planted edible and medicinal plants to share with my community in Los Angeles. I also learned to forage for wild useful plants and became enamored by the California flora. Many years later, after nearly a decade of living in other places, studying, traveling, doing research, and teaching in a school, I returned home and was horrified to find many of the original native plant habitats that inspired me had disappeared due to habitat loss. I decided to study plant systematics in the Department of Integrative Biology at UC Berkeley to learn to document and describe plant diversity before it is lost forever. To this end, for my PhD I worked with Dr. Bruce Baldwin in the Jepson herbarium on the systematics and evolution of the megadiverse sunflower family (Compositae). My dissertation focused on the rock daisy tribe (Perityleae), a diverse group found throughout arid parts of western North America with many rare species. Rock daisies are remarkable for their extreme ecological specializations for growth on sketchy vertical cliffs on Rocky Mountains and canyons, a lifestyle that has made their diversity difficult to document in the past. My PRFP

project is based on the foundational work I did on rock daisies in my dissertation research and allows me the latitude to explore their evolution in more detail, including the forces underlying their recent radiations onto oceanic islands, sky islands, and, following long distance dispersal, in the Atacama desert in Chile. As part of this project I get to work with and learn from two amazing mentors, Drs. Felipe Zapata (UCLA) and Rosita Scherson (U of Chile). I also get to work on broadening participation in STEM through mentoring students and designing teaching modules in English and Spanish for free dissemination to instructors of undergraduate evolution courses.

Jackie Childers

PRFB Area: Rules of Life Governing Interactions between Genomes, Environment and Phenotypes

My grandmother has this hilarious story she tells time and again of when I was four years old spending a week at a horse ranch in Arizona with my family. One night there was a barnyard dance, and an adult approached me to get me to join in. As I pulled my hands out of my pockets, two fat garter snakes came slithering out to the horror of witnesses, and to my own disappointment, given that I had just spent several hours crawling around a marsh trying to catch them. Growing up in the suburbs outside of Los Angeles, there wasn't a lot of nature surrounding us, but there was a public library filled with zoology encyclopedias and *Ranger Rick* magazines, which I consumed incessantly. I consider myself incredibly lucky, my family has always encouraged me to follow my passions, and I'm certain that this support played a significant role in maintaining my deep curiosity and fascination with nature into adulthood.

In 2009, a year after I began undergrad at UC Berkeley, I landed a curatorial position in the Museum of Vertebrate Zoology, where I spent a lot of time with my first love, snakes, albeit in pickled form. The mentorship I received from Dr. Carol Spencer during that time (MVZ Staff Curator of Herpetology) and my experience taking the IB104 Natural History of the Vertebrates class, were incredibly formative. In 2012, I became the first person in my family to graduate from college and went on to pursue a Master's at Villanova University with Aaron Bauer, where I worked on a phylogeography project on African lizards. While doing fieldwork in Namibia, I found myself completely enthralled by the many species of weaver birds that constructed these football-sized nests that hung from trees like Christmas ornaments. In 2016 I returned to UC Berkeley to begin my doctorate; after spending a lifetime focused on scaly reptiles, I pivoted to the feathered kind, and joined the lab of Rauri Bowie, the MVZ's Faculty Curator of Birds. Here, I have been studying the evolution of nest design in the weaver bird family by combining morphological data from museum nest specimens with DNA sequence data from whole genomes.

Next year I will be pursuing my dream research project studying the evolution of color using weaver birds as a model system, given the vibrant array of feather and eggshell color diversity that different species exhibit. This work will be conducted at the Natural History Museum of Los Angeles County where my primary host will be Dr. Allison Shultz, NHMLAC's Assistant Curator of Ornithology, and I will be co-sponsored by Dr. Linnea Hall (Director, Western Foundation of Vertebrate Zoology). I am excited to build off my dissertation work on weavers by leveraging the complementary egg and study skin collections at the Western Foundation and NHMLAC while working alongside two incredible women scientists!

Kevin Roberts

PRFB Area: Rules of Life Governing Interactions between Genomes, Environment and Phenotypes

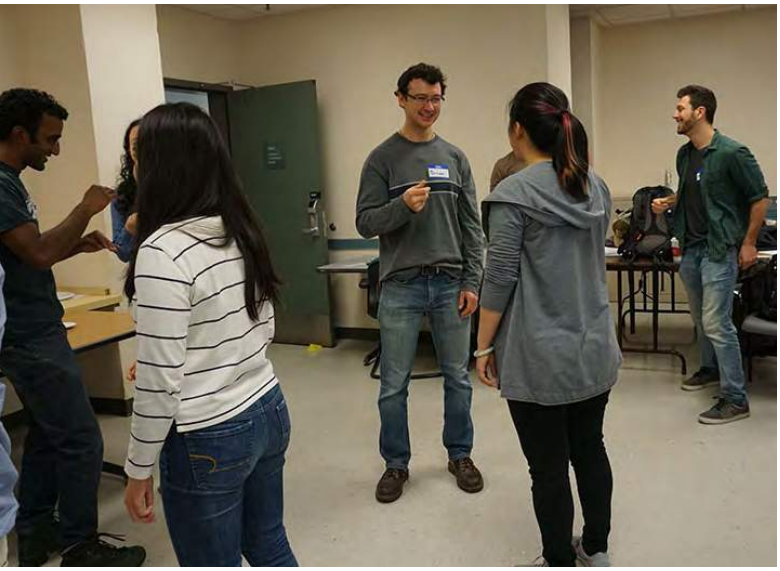
Growing up, I lived in a house full of pets. I spent a lot of time reading about where they came from and what the environments that they would live in naturally. In college, I realized that I spent so much time reading about my pets because I was really interested in environmental biology. This led me to decide to study biology as long as I could. I was lucky as an undergraduate to get to work in a lab studying insect adaptation to high elevation habitats. During this time I decided that I wanted to do research as part of my career, which brought me to do my PhD in Caroline Williams' lab in Berkeley. My PhD focused on how changing snow cover in the Sierra Nevada mountains will impact the overwinter stressors that insects experience. My PRFB will expand on this by looking at how the life stage that a butterfly overwinters as will impact its vulnerability to warming winters, and will be done with Philipp Lehmann at Stockholm University in Sweden.

Science communication is integral to IB's impact on campus and beyond

By Sara ElShafie, IB PhD Candidate

Integrative Biology is a hub for all kinds of fascinating biological research with wide-ranging impacts. But for those impacts to be realized, researchers must communicate their work effectively to broad audiences. Members of IB have long encouraged such efforts, which was one of the major factors that drew me to join IB's doctoral program in 2014. In the time since, science communication has become a formal emphasis of IB's internal activities and wider impact on the UC Berkeley campus. In 2017, I teamed up with fellow IB graduate student and science communicator Aaron Pomerantz to propose an intensive communication workshop for the benefit of the IB community. Former IB Chair Dr. Robert Dudley not only approved our budget but encouraged us to open the workshop to the whole campus.

The weekend-long workshop ran in both 2017 and 2019, attracting both graduate and undergraduate students as well as faculty and staff. The workshops emphasized effective multimedia storytelling and public speaking skills. Guest presenters from across the Bay Area included *National Geographic* photographer and IB alumnus Anand Varma and videographer/producer Josh Cassidy of KQED's *Deep Look*. I continue to hear about the impacts of these events today. One past participant just helped design and implement a Berkeley course on public engagement with science. Another attendee went on to complete a scientific illustration internship with the Innovative Genomics Institute at UC Berkeley, and now works as a freelance illustrator while pursuing her PhD.



Attendees practiced active listening using improv games in the 2017 IB Science Communication Workshop.

Participants in the 2017 IB Science Communication Workshop pose for a group photo.

IB continues to support science communication efforts, especially ones that align with the department's commitment to diversity, equity, inclusion, and belonging. For example, IB now offers a science communication grant to assist IB students with inclusive and accessible outreach, especially to engage communities where students conduct field work abroad. IB students also participated in a recent outreach event with Science at Cal that was conducted in Spanish to broaden engagement with the Bay Area community.

IB science communication initiatives and collaborations also continue to reach across campus. Last year, I helped to launch the Berkeley SciComm (BSC) program with funding provided by Dr. David Ackerly, Professor in IB and Dean of the Rausser College of Natural Resources at UC Berkeley, and his collaborators. The BSC program trains Berkeley grad students to develop and facilitate science communication workshops. The first cohort of twelve BSC Fellows from across campus includes two Ph.D. students from IB. The BSC Fellows have been offering workshops on Science Storytelling and Public Speaking, open to the public and free of charge, both in person and online since Fall 2021. Meanwhile, I was inspired by these activities to start a career as a science communication coach. I look forward to pursuing that work full time after graduating in May 2022!

Alumni Profile: Dr. Richelle Tanner

Photo by Richelle Tanner

Dr. Richelle Tanner completed her PhD in Integrative Biology in 2018, supervised by Dr. Jonathan Stillman and Dr. Wayne Sousa, studying the effects of climate change on thermal tolerance plasticity and population dynamics in the eelgrass sea hare. Richelle recently started her lab group, the SEACR Lab, at Chapman University with a dual appointment in the STEM and humanities colleges as an Assistant Professor of Environmental Science & Policy. She and her colleagues bridge the natural and social sciences in their investigations of the effects of climate change on communities, both ecologically and with respect to environmental advocacy in minoritized communities. Dr. Tanner has just published the first *Mytilus californianus* (mussel) transcriptome and an analysis of the importance of biological variation in stress responses in *Molecular Ecology*, and she also recently won a contract with the Delta Science Council to investigate the applied ecological and sociological best practices of invasive species management alongside four agency and academic collaborators. Her science communication research has been featured in the *Chronicle of Higher Education* and she is an upcoming keynote speaker at the Sustainable Living Fair hosted by Citizens' Climate Lobby, focused on empowering communities with evidence-based climate storytelling tools. Her work also spans investigations of systemic harm in higher education, with a paper in *Science* this month (Burnett et al. 2022) highlighting the importance of inclusive survey design for conference societies.

IB in the News

The spring semester has brought an abundance of newsworthy studies out of the Integrative Biology department. Here is a sampling of some highlights:

Photo courtesy of Keith Barnes

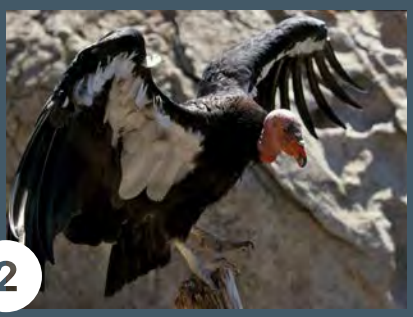


Photo courtesy of San Diego Zoo Wildlife Alliance

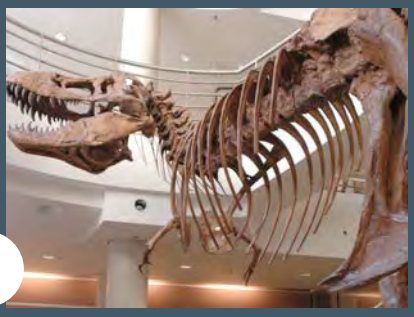


Photo by Peg Skorpinski

Photo by Victoria Weaver/CSUN

Photo by Jaime Culebras/Photo Wildlife Tours

1. https://news.berkeley.edu/2022/01/12/some-birds-sing-the-same-song-for-hundreds-of-thousands-of-years/
2. https://news.berkeley.edu/2021/05/13/high-genomic-diversity-is-good-news-for-california-condor/
3. https://news.berkeley.edu/2022/04/04/t-rexs-short-arms-may-have-lowered-risk-of-bites-during-feeding-frenzies/
4. https://news.berkeley.edu/2022/03/30/monkeys-routinely-eat-fruit-containing-alcohol-shedding-light-on-our-own-taste-for-booze/
5. https://news.berkeley.edu/2022/02/03/losing-amphibian-diversity-also-means-losing-poison-diversity/