



# Biology

SPRING 2020 DEPARTMENT NEWSLETTER





# Biology

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## Regular Faculty

Carol Baskin, Professor  
 Ruth Beattie, Professor  
 Bill Burke, Adjunct Faculty  
 Vincent Cassone, Professor and Chair  
 Robin Cooper, Professor  
 Emily Croteau, Lecturer  
 Phil Crowley, Professor  
 Melody Danley, Senior Lecturer  
 Elizabeth Debski, Associate Professor  
 Elizabeth Duncan, Assistant Professor  
 Jakub Famulski, Assistant Professor  
 Scott Gleeson, Associate Professor  
 Douglas Harrison, Associate Professor  
 Seth Jones, Senior Lecturer  
 Chintan Kikani, Assistant Professor  
 James Krupa, Professor  
 Karla Lightfield, Senior Lecturer  
 Catherine Linnen, Associate Professor  
 Nicholas McLetchie, Associate Professor  
 Peter Mirabito, Associate Professor  
 Ann Morris, Associate Professor and Associate Chair  
 Bruce O'Hara, Professor  
 Claire O'Quin, Lecturer  
 Jeffrey Osborn, Professor  
 Jennifer Osterhage, Assistant Professor and Director of Undergraduate Studies  
 Julie Pendergast, Assistant Professor  
 Erin Richard, Lecturer  
 Edmund Rucker, Scientist IV  
 Brian Rymond, Professor  
 Jessica Santollo, Assistant Professor  
 Robert (Craig) Sargent, Professor  
 Eve Schneider, Assistant Professor  
 Ashley Seifert, Associate Professor  
 Kausalya Shenoy, Senior Lecturer  
 Jeramiah Smith, Associate Professor  
 Madhu Srinivasan, Lecturer  
 Jeremy Van Cleve, Assistant Professor  
 David Weisrock, Associate Professor and Director of Graduate Studies  
 David Westneat, Professor

## Staff

Jacqueline Burke, Department Manager Senior  
 Jaclyn Gibson, Department Manager Principal  
 Devin Klaserner, Instructional Lab Coordinator Senior  
 David Nealis, Computer Support Specialist  
 Alex Stanback, Instructional Lab Coordinator

## Postdoctoral Scholars

Ajoy Aloysius, Seifert Lab  
 Kathryn Everson, Weisrock Lab  
 Stephen Ferguson, Cassone Lab  
 Levi Gray, Weisrock Lab  
 Danielle Herring, Linnen Lab  
 Daniel Priego, Van Cleve Lab  
 Nataliya Timoshevskaya, Smith Lab  
 Oliver Voecking, Famulski Lab

## Cover Photo:

The Tunnels on Isabela Island, Galapagos.  
 Photo by Professor Jim Krupa, June 2019

## TABLE OF CONTENTS

Letter from the Chair: Dr. Vincent Cassone	3
Welcome to New Faculty Chintan Kikani, Ph.D.	4
Mark Prendergast Shapes the Minds of Tomorrow with Hands-On Lab Experience	5
Jeremy Van Cleve Receives NSF CAREER Award to Promote Evolutionary Biology, Teaching	6
Oliver Voecking Receives Templar Eye Foundation Career-Starter Grant	7
Ben Farmer Dives into World of Marine Conservation with REED Internship	8
Biology Student Receives Fulbright Scholarship	9
Faculty-Directed Education Abroad for Biology Students	9
Departmental and National Awards for Students	11
Doctoral Degrees Earned in 2018–19	12
Geoffrey Manley Receives Honorary Doctorate	13
Giving Opportunities	13
Doctoral Student's Research on Limb Development Featured in eLife	14
Upcoming Events	16

## Stay Connected...

You can keep track of Department events, the Ribble Seminar Series schedule, other alumni events and our contact information via: [bio.as.uky.edu](http://bio.as.uky.edu)

## And Keep in Touch!

Please let us know if your address or contact information changes. Send a note, email, or call Jaclyn Gibson, Department Manager Principal.



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## Dear Alumni and Friends,

Biology is our collective past. It is also ever present, and it is our destiny. We cannot escape biology. This is both exhilarating and sometimes frightening. Research in the Department of Biology at the University of Kentucky embodies all of these aspects of biology as a

science. We produce extramurally funded, published research in high impact scientific journals, and we translate the fast-paced world of basic research into dynamic educational experiences for our students.

Evolutionary biologists seek to understand the mechanisms and patterns by which life on Earth evolved to its present state and, perhaps, to predict its future. Dr. Jeramiah Smith is interested in understanding how vertebrate genomes evolve and how these changes contribute to the evolution of development, using lampreys and other species as models. Dr. David Weisrock's lab centers on using genomic data from salamanders and lemurs to study the effects of population distribution and gene flow on genetic variation within and between populations, as species evolve over tens to hundreds of millions of years. Dr. Catherine Linnen explores the mechanisms by which organisms form new species over evolutionary time, using a unique animal model system, the pine sawfly.

The department also is home to scientists who focus on development and regeneration. Dr. Elizabeth Duncan studies the genome regulation during stem cell development and regeneration in a planarian worm, while Dr. Chintan Kikani studies stem cell differentiation and regulation in mammalian muscle. Drs. Ann Morris and Jakub Famulski study the genes that signal the proper development of the vertebrate eye, using the zebra fish as their model organism, particularly in mechanisms associated with coloboma, the failure of the eye to close during development and one of the leading causes of congenital blindness in humans. Dr. Ashley Seifert's lab focuses on the role of inflammation in the process of regeneration of body parts and skin in the Mexican salamander, the axolotl, as well as the African spiny mouse.

In addition to the retinal research of Drs. Morris and Famulski, Biology is home to several other exciting neuroscientists. Dr. Eve Schneider explores the development of touch receptors in glabrous skin, such as the skin at the tips of our fingers, only Dr. Schneider studies those same receptors on the bills of dabbling ducks! Dr. Jessica Santollo is interested in the role of estrogens on drinking behavior and cardiovascular disease.

This is especially important for women, who are protected from cardiovascular disease during pre-menopausal years, but as estrogens decline with menopause, cardiovascular risk skyrockets. Dr. Santollo's research complements very well Dr. Jeff Osborn's work on kidney function and hypertension, as well as Dr. Julie Pendergast's work on the role of estrogens on sleep and circadian rhythms. Dr. Pendergast participates in a strong research group interested in biological clocks and sleep that includes Dr. Bruce O'Hara, who studies the genetics of sleep, and myself, interested in circadian rhythms in birdsong and development of language as well as circadian regulation of our microbiome. Of course, neuroscience is directly associated with behavior, and we continue to study animal behavior and ecology at the organismal and population levels, including Dr. David Westneat's research on parental care and behavioral ecology in song birds along with Dr. Jeremy Van Cleve's theoretical research on social behavior.

We have built a very strong research-active faculty, bringing in more than \$5 million in grant funding annually. At the same time, we are deeply committed to our educational role at the University of Kentucky. Biology is home to the largest major on campus, with some 1500 majors, as well as more than 400 interdisciplinary neuroscience majors, the third largest major at UK, ably led by Drs. Mark Prendergast in Psychology and Robin Cooper in Biology. You'd think that successful researchers might be too busy to teach the young minds of UK. That could not be further from the truth! 100% of all biology faculty are actively involved in our teaching program at all levels from freshmen to doctoral students. We are proud of the integration of our research and teaching missions and proud of our award-winning instructional faculty. Incoming freshmen are exposed to research and STEM careers through our STEMcats program in which students participate in real research projects in their first year. Our data show that participation in STEMcats increases the likelihood of graduating in STEM in four years by 10%! And we are also committed to constantly reforming and revising our curriculum.

Building such a great department is expensive, though, and we need your help. We need the resources to continually hire new and exciting faculty, to continue to modernize our research and teaching facilities, and to provide financial support for our undergraduate and graduate students. So, as you read this newsletter, please think how you might be able to help. Any amount will be vastly appreciated. Thank you for your support.

Sincerely,

**Vincent M. Cassone, Ph.D.**



# Welcome to New Faculty

## Chintan Kikani, Ph.D.



Dr. Chintan Kikani joined the Biology Department faculty as an assistant professor in July 2019. He is a cell biologist/biochemist broadly interested in understanding how cell-to-cell communication patterns vary stem cell fates. As dysregulated cellular signaling contributes to many human diseases such as cancer, diabetes, and neurological disorders, the study of cellular communication has obvious therapeutic significance.

As a graduate student, Dr. Kikani investigated how aberrant insulin signaling pathway can result in oncogenesis, in addition to type II diabetes. As a postdoctoral fellow at the University of Utah School of Medicine, he discovered a new signaling pathway that connects nutrient signaling with epigenetic processes to control stem cell fate.

Having secured a major NIH research award, Dr. Kikani moved his independent research program to UK to join a world-class group of scientists interested in regenerative biology. Dr. Kikani aims to continue to investigate how metabolic and hormonal signaling controls the transcriptional and epigenetic landscape to control stem cell fate, and ultimately if that can be exploited to develop the next generation of therapeutic approaches for regenerative medicine.

His other interests include landscape and macro photography, birding, and promoting organic gardening and sustainable living efforts.

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## 2019 Biology Graduation Reception

**Congratulations to the 2019 Biology graduating class!**



# Neuroscience Professor Mark Prendergast Shapes the Minds of Tomorrow with Hands-On Lab Experience

By Madison Dymant



A neuroscience student works in Mark Prendergast's lab.

One of the most rewarding aspects of higher education is the chance to train the next generation of leaders and workers. Every so often, students are lucky enough to find opportunities that go above and beyond to give them practical experience in preparing them for their futures. Mark Prendergast's BIO 199 class is one of those opportunities.

Prendergast's class is designed for freshmen neuroscience majors. The course is part of the STEMcats Living Learning Program at the University of Kentucky in the College of Arts and Sciences, with its students either in that program or the Lewis Honors College. There are many existing sections of the course, each being taught by a different faculty member who conducts different types of research related to biology.

The STEMcats Living Learning Program was founded in 2014 with a Howard Hughes Medical Institute grant awarded to Vincent Cassone, Chair of the Department of Biology. Through this grant, the program initiated the offering of BIO 199.

Although it is part of the BIO 199 Authentic Research Experience in Biology class, Prendergast's class is an independent section incorporating animal brain study.

"I created this unique version of BIO 199 in 2017, and I teach the class as a laboratory-based class with informal small group discussions," Prendergast said.

Prendergast comes with a plethora of experience that inspired the creation of his class. He is a neuroscientist with a primary appointment in the Department of Psychology and is also the director of the neuroscience program in the College of Arts and Sciences. Prendergast came to UK in 1997, accepting a post-doctoral research fellowship in the Department of Pharmacology. He joined the faculty in the psychology department in 1999.

Prendergast felt that his BIO 199 class should have an interactive approach to an introduction to research.

"It's actually the most beneficial part of this class," Prendergast said. "My students, who are all freshmen, work directly with myself and graduate students in my laboratory to develop the critical thinking skills we target."

Aside from critical thinking skills such as rational thinking, forming hypotheses, and executing hypothetical tests, students are given the chance to gain practical experience geared toward solving real-life problems. One of these scenarios is on the topic of drug and alcohol addiction. "Students are introduced to this concept and how plasticity of the brain contributes to the development of addiction," Prendergast said. "After that, I work with them closely to develop a hypothesis that can be tested in an animal brain cell culture."

This approach helps students learn more about the development of substance dependence from a practical and accessible standpoint.

In the future, Prendergast hopes absolutely nothing about the class changes.

"The class is wonderful as it is," Prendergast said. "Many students who take BIO 199 develop a love of research and expand their participation in other labs by enrolling in 300-level independent research courses."

Above all else, Prendergast is grateful to Cassone for enabling him to create and run the class.

"I am indebted to Dr. Cassone for giving me the opportunity to work with this many outstanding young 'scientists in training,'" Prendergast said. "In addition, I am indebted to my many graduate students, who have served as co-mentors to the BIO 199 students."



Neuroscience Professor Mark Prendergast.



# Professor Jeremy Van Cleve

## Receives NSF CAREER Award to Promote Evolutionary Biology, Teaching

By Jenny Wells



Jeremy Van Cleve, assistant professor of biology, will use his NSF CAREER award to develop new mathematical and computational tools to study the history and function of genes that affect social behavior and group living in organisms.

Jeremy Van Cleve, an assistant professor of biology, is the recipient of the National Science Foundation's (NSF) prestigious Faculty Early Career Development (CAREER) award. The program will provide Van Cleve with \$780,000 over five years to conduct research in evolutionary biology and develop a teaching program to promote scientific research to students of all ages. The two projects will be integrated to support the core goals of the grant.

With the CAREER award, Van Cleve will develop new mathematical and computational tools to study the history and function of genes that affect social behavior and group living in organisms.

Animals, plants, and microbes that live in groups can accomplish tasks together that individuals cannot do alone (think ants, bees, hyenas, and humans). By leveraging the recent abundance of DNA sequence data, which has revolutionized how scientists understand the influence of genes on human disease and social behavior, Van Cleve hopes to not only shed light on the evolutionary origins of cooperation and conflict, but to help biologists dissect the genetic basis of group living. This is important for understanding the mechanisms by which changes in the social environment might negatively impact human health. "Stress has a big impact on health, and since humans are

innately social, changes to our social environment can reduce or increase stress," Van Cleve said. "A core part of this grant is developing tools to help find genes that may be involved in shaping our social environment."

Additionally, students of all ages will be supported by this research and gain important mathematical and computational training.

"The grant will enable me to develop resources for teaching the tools of data science and computational biology to local high school students and to UK undergrads," Van Cleve said. "Students can then use these tools to dissect variation in genetic data or to predict how these variations might evolve over time."

Van Cleve, originally from Santa Fe, New Mexico, received his doctorate from Stanford University. He then worked as a fellow at the Santa Fe Institute and was a postdoctoral fellow at the National Evolutionary Synthesis Center at Duke University. He came to UK in 2015.

The grant contributes to a long-term research direction for Van Cleve centered on building mathematical and computational theory to understand evolution in complex populations and environments. The field emerging out of the intersection of genetics and the study of social interactions (like social networks), sometimes called "sociogenomics," has a pressing need for this kind of theory, according to Van Cleve.

"Specifically, we lack insights about how genetic architecture, in the form of linkage, recombination, and epistasis, shapes the evolution of genomic variation when genes affect social behavior," Van Cleve said.

He hopes his CAREER award will bridge social evolutionary theory with population genomics by allowing him to create necessary tools that will specifically address these areas.

The CAREER program is a foundation-wide initiative that offers NSF's most prestigious awards in support of early-career faculty who have the potential to serve as academic role models in research and education and to lead advances in the mission of their department or organization. This award was co-funded by Evolutionary Processes in the Division of Environmental Biology, Behavioral Systems in the Division of Integrative Organismal Systems, and the Established Program to Stimulate Competitive Research (EPSCoR).

# Postdoctoral Researcher Oliver Voecking Receives Templar Eye Foundation Career-Starter Grant

By Jennifer T. Allen



UK postdoctoral biology researcher Oliver Voecking (center) was joined by biology professor Jakub Famulski (far left), and Biology chair Vincent Cassone (far right), for a check presentation by the Knights Templar. Photo by Shaan Azeem.

Oliver Voecking, a postdoctoral researcher in the University of Kentucky Department of Biology, recently received a Knights Templar Eye Foundation Career-Starter Grant for his retinal research with zebrafish. The Knights Templar presented Voecking with a check on campus in April.

The Knights Templar Eye Foundation is committed to support research that can help launch the careers of clinical or basic researchers committed to the understanding, prevention, and cure of vision-threatening diseases in infants and children. With the grant, Voecking will focus his research on analyzing the development of pericocular mesenchyme (POM) cells in zebrafish, which are a group of cells that form in the front part of the eye. Voecking hopes to drastically increase the understanding of POM development, ultimately developing screening for anterior segment associated diseases, such as corneal dystrophy, cataracts, and Axenfeld-Rieger syndrome.

“I am very grateful to the Knights Templar Eye Foundation for supporting my research,” Voecking said. “This financial help is giving me a great opportunity to continue my work on eye development.”

Voecking is part of UK Biology Professor Jakub Famulski’s Zebrafish Retinal Development Lab, which focuses on the use of zebrafish to analyze the mechanisms of epithelial sheet fusion during retinal development.

“This is a new and exciting direction for the lab and I am very proud and happy to see Oliver’s efforts recognized through this award,” Famulski said. “I am sure this will be a launching point for Oliver’s very promising career.”

The Knights Templar Eye Foundation Career-Starter Grants are awarded each year to support clinical or basic research on conditions that can or may eventually be treated or prevented.



# Ben Farmer '19

## Dives into World of Marine Conservation with REEF Internship

By Whitney Hale



Ben Farmer traveled to Key Largo, Florida, for a summer internship in marine conservation.

Ben Farmer, who graduated with a degree in biology in May 2019, was awarded the Reef Environmental Education Foundation (REEF) Dr. Jamie L. King Marine Conservation Internship from Our World-Underwater Scholarship Society. Farmer traveled to Key Largo, Florida for the summer program.

REEF conserves marine environments worldwide. Their mission is to protect biodiversity and ocean life by actively engaging and inspiring the public through citizen science, education, and partnerships with the scientific community.

The Dr. Jamie L. King Marine Conservation Internship provides undergraduates and recent graduates the opportunity to experience working at a nonprofit marine conservation organization. Interns give group presentations, work with local marine conservation entities, and conduct marine life surveys during local dives. They also get the chance to assist with lionfish research, outreach, and control programs in Florida, and help with the recording and reporting of exotic species reports and the development of outreach materials, among other duties.

The son of Sara Farmer of Lexington, Ben Farmer found his passion for the underwater world at a young age. From days vacationing with family in South Carolina and New Hampshire, he has long found the wetlands and intertidal communities fascinating. At home in Kentucky, Farmer explored everything from lakes to small creeks and cave systems. And in 2017, he obtained his open water dive certification.

But it was the ocean that continued to call Farmer's name, and during his junior year he pursued a semester of education abroad on the island of Bonaire in the Caribbean Dutch Antilles with the Council on International Educational Exchange Research Station.

"The program offered me intensive experience in research, marine field research methods, tropical marine conservation biology, coral reef ecology, and scientific diving. This, coupled with direction by UK faculty and advisors, provided me with the inspiration and ability to pursue a career in marine science."

At UK, Farmer interned with the International Center as an Education Abroad Peer Ambassador and strengthened his research skills on projects related to marine protected area effectiveness in the Indo-Pacific, biology of karst water systems, and parental behavior of sparrows. Through these research opportunities and his studies, Farmer gleaned valuable advice from mentors Claire O'Quin, lecturer and director of the Biology Learning Center, and biology Professors Jim Krupa and David Westneat in the College of Arts and Sciences.

With that foundation, Farmer was ready to dive into his next adventure with REEF. "It was an exhilarating next step that will give me the chance to become a better communicator and ambassador for the underwater world."

Farmer plans to pursue a master's degree in marine biology/science, with a focus in coral reef ecology.



# Biology Student Receives Fulbright Scholarship

By Madison Dymont



Mariah Donohue

With the 2019 Fulbright Scholarship recipients having been announced by the UK Office of Nationally Competitive Awards, the College of Arts and Sciences is proud to have biology graduate student Mariah Donohue among their ranks. Donohue, from New York, has accepted her offer and intends to use her grant to travel to Madagascar to study the endangered brown lemur hybrids. “I am committed to protecting the rapidly vanishing biological heritage of the world we all share,” Donohue said. “I am especially driven to conserve non-human primates, as they provide insight into our own evolution, exhibit complex social lives and deliver essential ecosystem services.”

Donohue, who holds Bachelor’s and Master’s degrees from Stony Brook University, became interested in the study of primates during her undergraduate years. Her first research, an independent study on red fronted brown lemur vocalizations in Madagascar, was followed by master’s research on the effect of habitat disturbance on the gut microbiome of black-and-white ruffed lemurs, partially funded by a National Geographic Young Explorer’s grant. After completion of her doctorate, Donohue hopes to become a professor at a research university, where she wants to spearhead research programs in Madagascar and build long-term international collaborations. Ultimately, she wants to foster leadership in the Malagasy Republic in conservation initiatives and work toward realistic solutions to the country’s biodiversity crisis.

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## Faculty-Directed Education Abroad for Biology Students

Professors Emily Croteau, James Krupa, and Erin Richard are spearheading three different education abroad opportunities for biology students. Each provides course credit and is awarded through a competitive application process. Faculty-directed education abroad is one of the most affordable ways for biology students to build upon knowledge gained in the classroom through learning experiences in international settings. While these opportunities are financed by tuition and earn course credit, extra expenses such as passport application fees, air travel, and meals can be a barrier for some students. In order to make these opportunities available to all deserving students regardless of their ability to pay, the Arts & Sciences International Education Fund provides scholarships.

### **Off the Beaten Path: Wildlife Survey and Conservation in Belize, June 2–28, 2020**

Belize is a small but biologically diverse country, home to approximately 145 species of mammals, 139 species of reptiles and amphibians, and over 500 species of birds. Many of these animals are threatened with anthropogenic habitat destruction and fragmentation. A Conservation Action Plan for the approximately 300-square-mile Central Belize Corridor is in its infancy, and gathering information to help focus this conservation goal is crucial.

In this course, students will learn:

- 1) basic conservation biology principles and their application to Belize; and
- 2) how to identify Belizean wildlife using established monitoring techniques such as bird mist-netting, camera-trapping, and scat sampling. To cap off the course, students will travel to Tobacco Caye to experience marine diversity in the Caribbean Sea. *Earns 3 credit hours for Bio 355 + 1 credit EAP = 4 total credit hours.*

*Continued on page 10 »*

### **Evolutionary Biology of the Galápagos Archipelago, May–June 2020**

The Galápagos Islands are “ground zero” for Charles Darwin’s grand theory of descent with modification. Led by Jim Krupa, this course will explore key ecological and evolutionary concepts through the reading and review of primary literature on dispersal, niche theory, competition theory, competitive exclusion principle, species abundance, diversity, kleptoparasitism, and speciation. Once the group arrives at the Galápagos Islands, analyses will be performed from observations made directly with aspects of biology that occur on the islands. *Earns 3 credit hours for Bio 580 + 2 hours EAP 599 = 5 total credit hours.*

### **Factors Influencing the Emergence of Infectious Disease: Amsterdam**

Led by Erin Richards, this education abroad program is designed for students pursuing careers in healthcare and will bring them to the Netherlands, a country where, in comparison to the U.S., life expectancy is longer, and a greater percentage of the GDP is spent on the health of its citizens. Counterintuitively, the people of the Netherlands enjoy personal freedoms that are deemed dangerous and unhealthy in the U.S., namely, the tolerated use of “soft” drugs like cannabis and sedatives, support services such as needle-exchanges for users of “hard” drugs, and legal but regulated prostitution. Students will learn how environmental factors, antibiotic resistance, and diagnosis can affect the spread of infectious disease in the Netherlands and the U.S. In addition to learning about factors influencing the emergence of infectious disease, students will also gain perspective on global culture and healthcare in practice. *Earns 3 credit hours for Bio 355.*



UK Biology students on the Galapagos Island of San Cristóbal investigated the 50,000 year old lava flow at Punta Pucuna during an International Education trip there, May–June 2019.



# Departmental and National Awards for Students, 2018–19

Thanks to the generosity of many alumni and friends, the department is able to reward excellence among its students by supporting their future scholarship in a variety of ways. Donating to a departmental award is one of the easiest ways for alumni and friends to make a significant impact on our students' success. Congratulations to the following recipients:

## The Gertrude Flora Ribble Travel Award

*The Gertrude F. Ribble Graduate Travel Award is provided through a generous bequest from Gertrude Flora Ribble, a devoted alumna, to support Biology graduate students presenting research at a scientific conference.*

Nour Al Haj Baddar  
Mary Foley  
Emily Bendall  
Kinga Graniczawska  
Shishir Biswas  
Cliff Harpole  
Jeff Chalfant  
Julia Howell  
Alex Cones

Kara Jones  
Cagney Coomer  
Rose Marks  
Mariah Donohue  
Allison McLaughlin  
Luc Dunoyer  
Rebecca Petersen  
Varun Dwaraka  
Sruthi Purushothaman

Tim Salzman  
Kat Sasser  
Sandeep Saxena  
Megan Thomas  
Kayla Titalii  
Kim Vertacnik  
Courtney Waterbury  
Chelsea Weaver

## The George Scherr Graduate Fellowship for Excellence in Research in Biology

*The Scherr Graduate Fellowship in Research supports graduate students in the University of Kentucky's Department of Biology. They are available to outstanding students who have encountered opportunities to expand their scholarly development through engaging in workshops, short courses, or training opportunities in labs at prestigious institutions elsewhere in the world.*

Allyssa Kilanowski

Kinga Graniczawska

Jessica Bills

## The Arts and Sciences Outstanding TA Award for 2019

*To recognize excellence in undergraduate instruction by Teaching Assistants.*

Luc Dunoyer

Ren Guerriero

## University of Kentucky Provost Award for Outstanding Teaching Assistant 2019

*This award is intended to identify and recognize individuals who demonstrate special dedication to student achievement and who are advancing meritorious success in their teaching. These awards emphasize the University's commitment to the importance of teaching as its vital core mission in the Commonwealth, the nation, and the world.*

Luc Dunoyer

## Morgan Graduate Fellowship

*The Morgan Graduate Fellowship is awarded to a Ph.D. student who has passed their qualifying exam, has demonstrated meritorious progress toward their degree, and has clear plans for enhancing their dissertation.*

Kara Jones

Sruthi Purushothaman

*Continued on page 12 »*

» *Continued from page 11*

### **Biology Merit Fellowship**

*The Biology Merit Fellowship is awarded to a Ph.D. student in their first or second year who has demonstrated exceptional promise.*

Jeffrey Chalfant

Kayla Titalii

Sandeep Saxena

### **Lyman T. Johnson Diversity Fellowship**

*The University of Kentucky believes that recruiting and retaining students from all racial and ethnic groups, including Hispanic or Latino, Black or African American, American Indian, Alaskan Native, Native Hawaiian, other Pacific Islanders, and first-generation college students is central to our success as an institution. Towards that goal, the Lyman T. Johnson Diversity Fellowship is available for students entering one of the many programs at the University of Kentucky Graduate School.*

Omotola Oluwabukola

Kayla Titalii

### **National Science Foundation (NSF) Graduate Research Fellowship**

*NSF Fellows receive a three-year annual stipend of \$34,000 along with a \$12,000 cost of education allowance for tuition and fees for a research-based master's or doctoral degree in a STEM field.*

Kathryn Greene

### **Fulbright U.S. Student Program**

*Provides grants for individually designed study/research projects to take place during one academic year in one of 140 participating countries outside the U.S. Students are selected based on academic or professional achievement, as well as demonstrated leadership potential in their fields.*

Mariah Donohue

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## **Doctoral Degrees Earned in 2018–19**

### **Fall 2018**

**Megan Rhoads, Ph.D.** “Spontaneous Hypertension in the African Green Monkey” (Jeffrey Osborn, faculty advisor)

**Brittany Slabach, Ph.D.** “The Role of Sociality and Disturbance in Shaping Elk (*Cervus canadensis*) Population Structure” (Phillip Crowley, faculty advisor)

### **Spring 2019**

**Jacqueline Dillard, Ph.D.** “Ecology, Monogamy, and the Evolution of Family Living” (David F. Westneat, faculty advisor)

**Rose Marks, Ph.D.** “Intraspecific variation in dehydration tolerance: insights from the tropical plant *Marchantia inflexa*” (Nicholas McLetchie, faculty advisor)

### **Summer 2019**

**Nour Al Haj Baddar, Ph.D.** “Bioinformatic and Experimental Analyses of Axolotl Regeneration” (Randal Voss, faculty advisor)



# '88 Alumnus Geoffrey Manley Receives Honorary Doctorate from UK

Four citizens who have distinguished themselves in their careers and community work received honorary doctorates from the University of Kentucky at the May 2019 Commencement Ceremonies, including 1988 Biology major Geoffrey Manley. Dr. Manley received an Honorary Doctor of Science.

After dropping out of high school, Manley's life took an unlikely turn that eventually led him to become an internationally recognized expert in neurotrauma and a leader in the growing field of advanced neuromonitoring and clinical informatics. While working as a mechanic, Manley's talents were recognized by one of his customers, UK Professor Emeritus Sheldon Steiner, who set him on an academic path that led to Manley earning his Bachelor's degree from UK and medical and doctoral degrees from Cornell University. He is currently Vice Chairman of Neurological Surgery at the University of California, San Francisco, co-director of the school's Brain and Spinal Injury Center, and chief of neurosurgery at San Francisco General Hospital.

Manley has received many awards for his research, published more than 120 manuscripts, mentored numerous physicians and scientists at UCSF, and was instrumental in writing the guidelines that all neurosurgeons use for managing patients with traumatic brain injury.



Sheldon Steiner, a microbiology professor at UK, left, found Dr. Geoffrey Manley working as a mechanic. Manley is now the chief of neurosurgery at San Francisco General Hospital. Photo courtesy of the Lexington Herald-Leader.

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## Giving Opportunities

Please join this special community of supporters with a gift today. Your contribution is an investment in the future of the Department and the next generation of scholars. You can also make your gift in honor of a friend, relative, or faculty member. Please designate your donation to an area of your choice, or you can direct your gift to the Department's greatest needs:

- The **Biology Development Fund** provides critical resources to respond to student needs, attract world-class faculty, and provide innovative opportunities to enable our students to compete in the global marketplace.
- The **Thomas Hunt Morgan Endowment** supports a lecture series that enriches the graduate student experience. When the fund reaches a principal of \$100,000, its income may also be used to support an endowed Professorship of Biology. Upon reaching a principal of \$1 million, it may be used to support an endowed Chair of Biology.

A gift to the Biology Development Fund can be made online at [www.as.uky.edu/givetoas](http://www.as.uky.edu/givetoas) by clicking on the Biology Development Fund button. To make a gift to the Thomas Hunt Morgan Endowment, please use the search box in the upper right corner of the screen and type the name of the fund.

By mail, please send to:

**University of Kentucky Gift Receiving**  
210 Malabu Drive, Suite 200  
Lexington, KY 40502

For questions please contact Teresa Gotthardt ([teresawg@uky.edu](mailto:teresawg@uky.edu)) or (859) 218-5551.

# UK Research on Limb Development Featured in eLife

By Jenny Wells-Hosley



A new study out of UK's Biology Department examines how forelimbs develop in the axolotl, a type of salamander originally from Mexico. The new findings open up questions for evolutionary biologists regarding the evolution of limbs.

A new paper by University of Kentucky researchers was recently published in the journal eLife, offering new insights and implications into the study of limb development and the evolution of vertebrate limbs.

Sruthi Purushothaman, a biology doctoral student and lead author of the study, examined how forelimbs develop in the axolotl, a type of salamander originally from Mexico. The study presents new information showing how salamanders develop limbs in a strikingly different manner compared to frogs, chickens and mice.

Most four-limbed animals (known as tetrapods) develop forelimbs as embryos in response to two major cell-signaling centers. These centers are called "the zone of polarizing activity" (located in what's known as the limb bud mesenchyme) and "the apical ectodermal ridge" (located at the tip of the limb in the overlying ectoderm). Both of these centers release signaling molecules that act on limb bud cells to control growth and patterning as the limb takes shape. The zone of polarizing activity produces a molecule commonly referred to in the science community as "Sonic hedgehog," or Shh for short. The apical ectodermal ridge produces another group of signals called fibroblast growth factors, or Fgfs.



“The cross-talk between these two centers/signaling molecules is what drives limb bud outgrowth,” Purushothaman said.

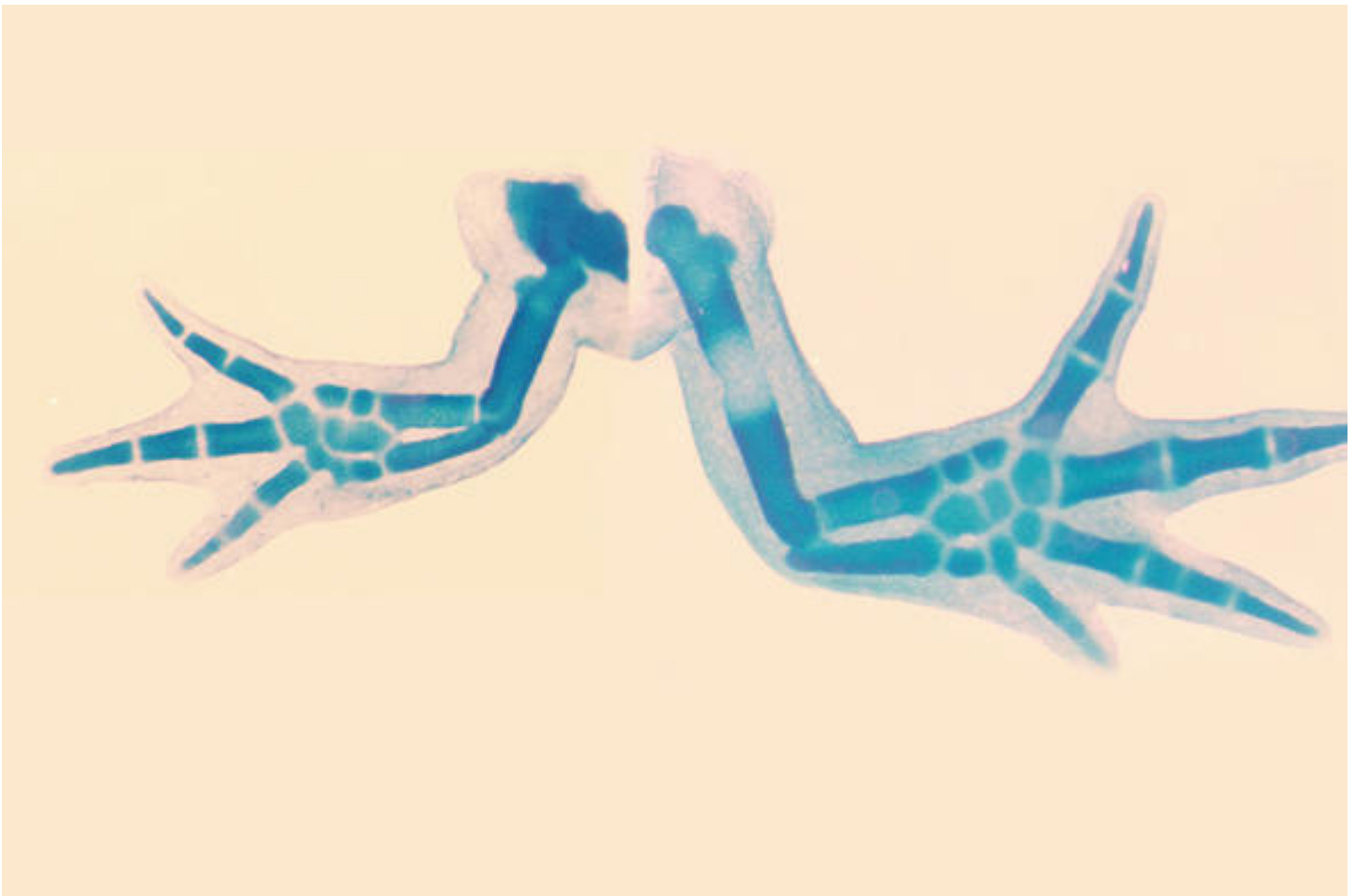
While older studies indicated that salamander embryos did not have an apical ectodermal ridge (suggesting that these amphibians’ limbs may form differently to other tetrapods), contemporary research has treated salamander limbs like those of other tetrapods, such as chicks and mice.

“The integrative model for limb development is based on classic studies in chicken and mice that do not regenerate their limbs,” Purushothaman said. “We asked if this model could be extended to axolotls that not only lack a morphological signaling center but also have the ability to regenerate lost limbs.”

The new experiments by Purushothaman et al. showed that, along with lacking an apical ectodermal ridge, axolotls did not produce Fgfs normally found in this tissue. Instead, Fgfs were only found in the limb bud mesenchyme. The team also found that Fgfs played a different role during salamander limb development than previously reported in other tetrapod embryos. However, the pattern and function of Shh activity in the axolotl limb bud was similar to that previously observed in chicks and mice.

“We found that all the apical ectodermal ridge-specific Fgfs surprisingly reside in the limb mesenchyme during limb development which coincides with previous limb regeneration studies,” Purushothaman said. “Upon functional inhibition we found that these Fgfs were not important for limb bud outgrowth although their role during regeneration awaits functional testing.”

The new findings show that not all limbs develop in the same way and open up questions for evolutionary biologists regarding the evolution of limbs. Future studies that examine limb development in other animals that regenerate tissues, such as other amphibians and lungfish, will help answer these questions.



This image shows two salamanders’ limbs: the one on the right is a normal limb, and the one on the left had its fibroblast growth factor-signaling inhibited. Photo by Sruthi Purushothaman.



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## Upcoming Events

### Gertrude Flora Ribble Seminar Series

Alumni and friends are invited to join our faculty and students at the Ribble Series, which features distinguished scholars covering a range of topics in biology, as well as perspectives on pedagogy and outreach, especially those reflecting the interests of our faculty, students, and postdocs. Lectures take place in the Thomas Hunt Morgan Building, room 116, as follows:

**Thurs., Feb. 20, 3:30 p.m. Cynthia Brame, Vanderbilt University**

**Thurs., Feb. 27, 3:30 p.m. Lee Dugatkin, University of Louisville**

**Thurs., March 5, 3:30 p.m. Wenqin Luo, University of Pennsylvania**

**Thurs., March 12, 3:30 p.m. Cassandra Extavour, Harvard University**

**Thurs., March 26, 3:30 p.m. Misha Ahrens, Howard Hughes Medical Institute, Janelia Farm Research Campus**

**Thurs., April 2, 3:30 p.m. Natalia Komarova, UC Irvine**

**Thurs., April 16, 3:30 p.m., Kelli Duncan, Vassar College**

**Thurs., April 23, 3:30 p.m., Christopher Parkinson, Clemson University**

**Thurs., April 30, 3:30 p.m., Jose Dinneny, Stanford University**