

The Alumnidae

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Greetings from Stillwater.

Thank you for taking the time to read our 2023 newsletter. We had an excellent year in the Integrative Biology Department. I hope you can take a few minutes and celebrate some of our successes.

Undergraduate education is a huge part of our mission. We rank towards the very top in the College of Arts and Sciences in both the number of students majoring in our degrees and the number of students taking our courses. I am proud of our faculty and graduate students whose diverse interests and talents allow us to offer degrees in Biology, Physiology, and Zoology. We added three new faculty this year (page 2), who will help us in our teaching and research.

We enjoy a huge number of talented students in our department. This spring we returned to having an in-person awards banquet. The brilliance of our award-winning students was awesome in both their academic success and the extent of their involvement in research, service, and professional development. Our undergraduate awards and scholarship recipients are listed on page 3. Graduate students are not only core to our research programs, but most are also active teachers. Recipients of our graduate awards are listed on page 3. These scholarships would not be possible without our supportive alumni and friends. We appreciate each of them greatly. This year we are so fortunate to have two new scholarship funds. More information about these scholarships is provided in the section below.

As part of an undergraduate education, we believe that research is incredibly important for all students whether it be in preparation of future scientists or as a life experience for those who pursue careers in other fields. The Karen L. Smith Symposium for Undergraduate Research is held each semester and gives our students a chance to present their work in a professional setting. Highlights of this event are on page 4. A new program this year (ON-RaMP) is an opportunity for students who have finished a bachelor's degree to gain additional research training to prepare themselves for future employment or research. Details are on page 5.

Research in our department is a vital part of our mission. Our scientists (from undergrad to regent's professor) are learning about our world through both pure and applied research. Active research not only helps society progress, but it also ensures that courses are taught by scientists who are at the forefront of their field. Some highlights of recently funded and ongoing projects are on page 5.

I hope all is well with each of our alumni and friends. Please feel free to contact me if you have ideas that will help us in our mission or otherwise want to be more connected or involved. Go Pokes.

Jason Belden, Professor and Department Head
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New Scholarships Endowed for IB Students

We are very fortunate to have two new scholarships for Integrative Biology Students.

The Lyle Family endowed scholarship was made possible by Robert Cliff Lyle III and Amelia F. Lyle and will fund scholarships for deserving undergraduates. Amelia and Cliff live in Edmond, Oklahoma. Cliff graduated with a B.S. in Zoology in 1980.

The Ann Dugan scholarship was made possible through an estate gift and will fund several new scholarships starting in 2024. Ann graduated from OSU in 1976 and went on to do master's work in Marine Biology at OU. She began her career as a biology teacher where she taught both middle and upper school students. After 15 years of teaching, she changed her career path to concentrate on pharmaceutical research. She traveled internationally to help in the process of developing the drug Embrel, a biologic medication used to treat rheumatoid arthritis. She was a true nature lover and thoroughly enjoyed continuing to expand her knowledge of plants and animals.

Department Welcomes New Faculty

Dr. Desiré Buckley joined the department as an Assistant Professor in August of 2022. Desiré earned her Ph.D. from the University of Missouri – Columbia, and was a postdoc in the Department of Molecular Biosciences at the University of Texas at Austin. Her research focuses on neurodevelopmental defects associated with fetal alcohol exposure. In addition to identifying neuronal subpopulations that are most sensitive to prenatal alcohol exposure during embryonic development, she is also interested identifying genetic factors that interact with alcohol during critical periods in brain development. For her research studies, she uses zebrafish as a model organism to investigate these effects and will establish the first zebrafish research facility on the OSU campus (May 2023). This will be a useful resource for many other research avenues both on campus and collaboratively across many universities for the study of toxicology, developmental biology/embryology, gene regulation, neurobiology, physiology and many other fields of study.



Dr. Zachary Emberts joined the department as an Assistant Professor in August of 2022. Zachary earned his Ph.D. from the Department of Biology at the University of Florida in 2019 and, before starting at OSU, was a Postdoctoral Research Fellow in the Department of Ecology and Evolutionary Biology at the University of Arizona. Zachary’s research program broadly investigates why animals look and behave the way that they do. For example, many animals often fight with other members of their species. Zachary studies how such fights can promote the evolution of weaponry and defensive shields. He also studies how the size, shape, and biomechanical properties of these traits influence how individuals behave during a fight.

Dr. Fabio A. Machado joined the department as an Assistant Professor and Curator of Vertebrates in January 2023. He received his Doctorate in Science (D.Sc.) in 2017 from the Universidade de São Paulo (Brazil) and has conducted postdoctoral research at the natural history museum of Argentina, the University of Massachusetts (Boston), and Virginia Tech. Fabio is an evolutionary biologist and zoologist focused on the study of evolutionary morphology. His lab integrates information from anatomy, function, genetics, phylogenetics, paleontology, and development to understand the rules that govern the evolution of complex traits. His ongoing research evaluates the role of developmental rules in shaping the evolution of the mammalian skull and dentition. In addition to his main line of research, Fabio is the curator for the OSU Collection of Vertebrates and has used collection specimens to study evolution, systematics, and taxonomy of mammals and reptiles.



Undergraduate Student Awards



Left to Right: Jentry Lemons, Mason Miller, Margaret New, Carldon Deniega, Shahd Al-Mur, Brianna Maguire, Sabrina Milam, Dustin Meadows, Grace Baldwin, Elena Lawson, Beth Brandt, Aubrey Sumner, Akram Aldaerwish, Tyler Nettles

- Delta Dental of Oklahoma Pre-Dentistry Scholarship: Beth Brandt
- Dr. G. Michael Steelman Scholarship: Elena Lawson
- Dr. Raymond Dixon Scholarship: Carldon Deniega
- Dr. Raymond Dixon Scholarship in Rural Health: Aubrey Sumner
- Hepner Family Scholarship: Akram Aldaerwish
- Lyle Family Scholarships: Shahd Al-Mur, Dustin Meadows, Tyler Nettles
- Dr. Ron & Sharion Austin Family Scholarship in Rural Dentistry: Jentry Lemons
- Outstanding Sophomore: Sabrina Milam
- Outstanding Junior: Grace Baldwin
- Outstanding Biology Senior: Margaret New
- Outstanding Physiology Senior: Brianna Maguire
- Outstanding Zoology Senior: Mason Miller

Graduate Student Awards



Left to Right: Jamaal Jacobs, Sabiha Alam, Jesse Hurd, Sneha Dharwadkar, Mitchell Nagel, Desi Wilson, Sam Miess, Kiley Penwell, Luberson Joseph, Neil Balchan, Owen Edwards, Ryan Koch

- Dr. Bryan P. Glass Student Awards: Neil Balchan, Desi Wilson
- S. L. "Bud" Burks Memorial Graduate Research Award: Sam Miess
- Outstanding Integrative Biology Masters Student: Kiley Penwell
- Outstanding Integrative Biology Doctoral Student: Ryan Koch
- Waters Grant-in-Aid of Research: Mitchell Nagel
- Wilhm Teaching Assistant, Masters Student: Owen Edwards
- Wilhm Teaching Associate, Doctoral Student: Jesse Hurd
- Wilhm Graduate Student Travel Awards: Sabiha Alam, Sneha Dharwadkar, Jamaal Jacobs, Luberson Joseph, Desi Wilson

Graduate Students Recognized by NSF

Olivia Aguiar and Sam Miess, recently received the reputable National Science Foundation Graduate Research Fellowship, and Hailey Freeman received an honorable mention. Our department accounted for all of the NSF GRFPs awarded to OSU this year.



Olivia Aguiar

Olivia Aguiar; Advisor Barney Luttbeg

Title: The impact of life experiences on risk-induced behavioral responses and how it compares to other risk responses

Description: Olivia studies predation risk using Physa snails as a prey and crayfish as a predator. Currently she is investigating how responses to predation risk change throughout the lifespan and how those responses compare to other types of risk responses.



Hailey Freeman

Hailey Freeman; Advisor Jennifer Grindstaff

Title: The effects of the immune response, gut microbiome, and boldness behaviors on pathogen exposure in House Sparrows (*Passer domesticus*)

Description: Hailey studies the interactions among the immune system, gut microbiome, and behavior. She is currently investigating how internal factors like the gut microbiome and boldness and external factors like latitude may influence pathogen exposure in wild House Sparrows.



Sam Miess

Sam Miess; Advisor Andy Dzialowski

Title: "Incorporating community assembly mechanisms into the assessment and management of Oklahoma waterbodies"

Description: Sam's research focuses on how aquatic macroinvertebrate communities (e.g. insects, crayfish, worms) assemble and interact with each other. By understanding these processes, scientists can improve how to assess and manage aquatic ecosystems in Oklahoma.

Karen L. Smith Undergraduate Research Symposium

During the Fall 2022 symposium, nine students presented posters in person. Students were mentored by 5 faculty members and 8 graduate students. 1st place poster winner: "Early Life Adversity and its potential effects on aggressive behavior." **Avery Fortune, Avery McKinney, Anthony Morales**, Kiley Penwell, and Dr. Jennifer Grindstaff.

2nd place poster winner: **David Schrader**, Sierra Williams, Jennifer Grindstaff. "The effect of polyinosinic-polycytidylic acid (poly I:C) on the social behavior of zebra finches."

During the Spring 2023 symposium, 17 posters were presented in person. Students were mentored by 9 faculty members and 8 graduate students. 1st place poster winner: "Projecting mechanical treatment outcomes on invasive grass to improve control efficiency." **Rabeca Richardson**, A. Valdez, L. Zhai, B. Zhang.

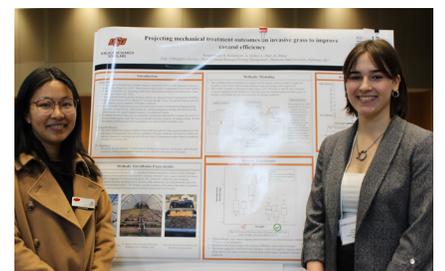
2nd place poster winner: "Evaluation of the toxicity of metal polluted water from Tar Creek Superfund site using fathead minnows and a gill cell line." **Holden Husbands**, Justin Scott, Stacey Herriage, Matteo Minghetti

3rd place poster winner: "Neither weapon size nor body size can explain the mating patterns observed in a wild population of leaf-footed cactus bugs, *Narnia femorata*." **Maya Albert** and Zachary Emberts



Left: Fall 2022 symposium winners, **Avery Fortune, Avery McKinney, Anthony Morales**

Right: Spring 2023 symposium winner **Rabeca Richardson** and faculty mentor Dr. Bo Zhang



ON-RaMP Program

The Oklahoma Network for Research and Mentoring for Postbaccalaureates (ON-RaMP) program is a project supported by a \$2.79 million National Science Foundation grant that was awarded to **Dr. Michael Reichert** and **Dr. Elizabeth McCullagh**. The aim of the program is to provide underserved postbaccalaureate mentees with extensive research experiences and mentorship while offering financial support through salary and research funding. The program is hosted at OSU and includes mentors from across the biological sciences. We are welcoming our first cohort of eight participants in June 2023. The IB department will host four of these mentees in the labs of Dr. Michael Reichert, Dr. Elizabeth McCullagh, Dr. Bo Zhang and Dr. Matteo Minghetti. The program is currently slated to serve an additional ten participants in 2024 and 2025. OSU is one of only 12 universities in the country awarded this grant in 2022.

Research Spotlight

Buffalofish Conservation

The three buffalofish species that inhabit freshwater bodies throughout Oklahoma are nongame fish that currently are not afforded protections under state harvest limits. Little is known about population trends of these species in Oklahoma. Management practices for buffalofish are largely based on the notion that these are fast growing and reproducing fish; however, new data shows that these fish often live over 100 years of age and don't reproduce until much later than previously believed. Through a new grant from Oklahoma Department of Wildlife and Conservation, **Dr. Guin Wogan's** lab is genetically determining individual species identifications, assessing genetic diversity within and among populations, identifying hybrid individuals and the extent of hybridization among the three species, estimating effective population sizes for contemporary populations, and inferring recent demographic trends for each population. These data will help inform management and conservation. As part of this work, graduate student Katarina Mapes is focused on researching the genetic mechanisms that underlie longevity and senescence among these long-lived fish.

Do hormones and the gut microbiome affect body size across latitudes?

Body size increases with latitude in many organisms following an ecographic pattern, called Bergmann's Rule. Larger body size is an adaptation to cold environments facilitated by heat retention or increased fat storage. Despite ongoing adaptations to climate change through body size changes, the mechanisms underlying Bergmann's Rule are poorly understood. Two potential mechanisms that may mediate latitudinal differences in body size are the highly conserved insulin/insulin-like signaling network and the gut microbiome, which may also interact with one another. In collaboration with Dr. Britt Heidinger at North Dakota State University, Dr. Heather Mathewson at Tarleton State University, and Dr. David Westneat at the University of Kentucky, **Dr. Jennifer Grindstaff** and graduate students Victoria Roper and Hailey Freeman are testing the hypothesis that the insulin/insulin-like signaling network is a key intermediary between the gut microbiota and growth trajectories that drives latitudinal variation in body size using data collected across a latitudinal gradient of house sparrow populations. House sparrows were introduced to North America in the mid-1800s and within 100 years displayed body size variation consistent with Bergmann's rule. Understanding the mechanisms that underlie this rapid body size diversification, including to what degree this phenotypic pattern derives from genetic differentiation versus phenotypic plasticity, is essential for predicting long-term evolutionary responses to environmental change.



Northern Bobwhite Conservation

Dr. Barney Luttbeg and colleagues in the Department of Natural Resource Ecology and Management are going to be using decades of population data and banded bird returns to examine how bobwhite populations respond to extreme weather events and hunting pressure. This grant will fund two PhD students, Nguvan Agaigbe and Nikolas Wright, who will be conducting the population modeling and data analyses for the project.

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