July 2017

THE OPEN READING FRAME

News and Recent Events from
the Biology Graduate Program at the University of Kentucky

Thoughts from the DGS

The ultimate goal of any graduate program is to see students mature into professionals, acquire their degree, and obtain fulfilling positions commensurate with their new professionalism. By any measure, in the first 6 months of 2017, our program did very well. Eleven students successfully defended their PhD dissertations earlier this year, and all are onto new challenges, either as post-docs at an impressive array of places, in positions in industry, or tenure-track faculty positions. Some of us are undoubtedly exhausted from all the dissertation reading and exit exams (the Weisrock/Linnen labs in particular), but pride in these students' accomplishments has carried everyone through. Our hallways and labs feel different without them, but a cohort of excellent new students has just arrived, so our strange little cycle of academic life begins anew. I am happy to say that our new students enter an incredibly active program even without our new fledglings. In the 6 months ending June 30, students have published 13 papers (most as first authors), gave 10 presentations at regional or national meetings, and received a bunch of University and external awards, including a prestigious 2-year pre-doctoral fellowship from the American Heart Association to **Chelsea Weaver**. Most of this activity was by continuing students, so while we will miss our recently departed colleagues (née students), I am quite pleased our program remains a vibrant and productive place! Kudos to all!

Dave Westneat,
Director of Graduate Studies
Department of Biology

Welcome to our new Biology Graduate Students

Alexandra Cones (Westneat Lab): BS and MS from University of Exeter, UK

Mariah Donohue (Weisrock Lab): BS and MS from State University of New York, Stony Brook, NY

Derek Filepek (Weisrock Lab): BS and MS from University of Central Arkansas, Maumelle, AR

Julia Howell (Santollo Lab): BS from Salisbury University, Salisbury, MD

Laura Krueger (Morris Lab): MD/PhD Program; BS from Miami University, Oxford, OH

Zachary Stanley (McLetchie Lab): BS from The University of Tennessee, Knoxville, TN

Megan Thomas (Linnen Lab): BS from Centre College, Danville, KY and MS from University of Louisville, Louisville, KY

Meghan Dougherty (MSB Program): BS from University of Central Florida, Orlando, Florida

Christen Wanstrath (MSB Program): BS from University of Kentucky, Lexington, KY

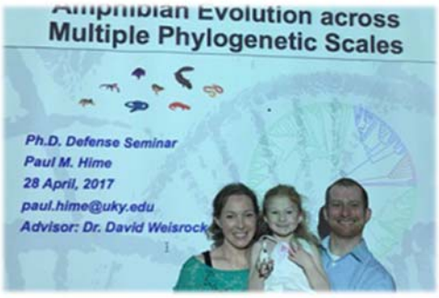
Yuxuan Xie (MSB Program): BS from Wuhan University of Technology, Wuhan, China

Getting it done!

PhD Defenses

Robin Bagley (Linnen Lab) has accepted a post-doc in the Department of Biology at the University of Iowa.

Brandon Franklin (Osborn Lab) has accepted a position as postdoctoral research fellow in the laboratory of Dr. Douglas Andres, Department of Molecular & Cellular Biochemistry, University of Kentucky, College of Medicine. He is expanding upon his graduate work on the role of chloride channels in cellular proliferation to understanding how Ras-related GTP binding proteins function as "switches" in response to extracellular stimuli that result of cardiac and other cardiovascular diseases.



Paul Hime (Weisrock lab) is now a Biodiversity Institute Postdoctoral Fellow at the University of Kansas. This fellowship give him flexibility in the postdoctoral projects that he will pursue, and could range from collaborations in the use of genomic data to understand evolutionary radiations of species, to the development of computational methods for phylogenetic analysis.

Scott Hotaling (Weisrock Lab) has accepted a position as a postdoctoral at Washington State University with Joanna Kelley. In the Kelley Lab, Scott's primary focus will be on using comparative genomic tools to understand how polar fishes have adapted to live in extreme environments, with a particular focus on genes associated with cold tolerance (e.g., the evolution of antifreeze proteins).

Shreyas Joshi (O'Hara Lab) has accepted a Postdoctoral Associate position with Dr. Daniel Weinberger at Yale University.

Justin Kratovil (Weisrock lab) is a postdoctoral researcher with Dr. Jennifer White in the Department of Entomology here at the University of Kentucky. Justin is working on projects that use transcriptomic data from aphids to study genes that may be differentially regulated, evolving, and/or potentially interacting with symbionts to confer resistance during pesticide exposure. Justin will also be working on whole genome sequencing of bacterial symbionts, and possibly a project involving the bacterial communities of spiders.

Cole Malloy (Cooper Lab) has accepted a post-doctoral position at the National Institutes of Health in Bethesda, MD. Cole will be working with Dr. Dax Hoffman in the Molecular Neurophysiology and Biophysics in the National Institute of Child Health and Human Development and will be studying hippocampal plasticity in rodent models.

Jonathan Moore (McLetchie lab) has accepted a tenure-track position at Campbellsville University, KY as 50% teaching faculty and 50% director of Clay Hill Memorial Forest to begin in July 2018. In the immediate future, he is finalizing plans for postdoctoral research with faculty in Plant and Soil Science at UK.

Schyler Nunziata (Weisrock lab) is a postdoctoral researcher with Dr. Megan Fritz in the Department of Entomology at the University of Maryland. Schyler is using genomic data to understand how human-mediated forces have shaped the population and evolutionary history (e.g., selection and demography) of insects that use important commercial agricultural crops, such as corn and cotton.

Todd Rounsaville (Arthur Lab) has taken a position as Curator at the Poly Hill Arboretum, West Tisbury, MA.

Yuchen Zhu (Cooper lab) is investigating positions with biomedical companies.

Getting it done! (continued)

Masters

Grant Austin (Plan B)

Malak Barayan (Plan B)

Nadera Dabbain (Plan B) has accepted the Instructional Lab Coordinator Position with UK Department of Biology.

Qualifying Exams

Emily Bendall (Linnen Lab) April 17

Cagney Coomer (Morris Lab) April 19

Kat Sasser (Westneat Lab) April 11

Jim Shaffer (Gleeson Lab) May 3

Ren Guerriero (O'Hara Lab) July 11

Congrats to our new PhD candidates!

Awards, Fellowships, Grants and Honors

Awards

Biology's Outstanding TAs for 2016-2017

Brandon Franklin

Justin Kratovil*

Schyler Nunziata

Megan Rhoads

Jim Shaffer

Chanung Wang*

Chelsea Weaver*

A&S Outstanding TA Award Recipients

Justin Kratovil and Chanung Wang

Nick Carrara (Famulski Lab) was awarded: *"The Sherwood and Janet Roberts Blue Memorial Scholarship"* From the **Foundation Chapter of Theta Chi Fraternity**.

Cagney "CC" Coomer (Morris Lab) received a **University of Kentucky Inclusive Excellence award** and the **Sullivan Medallion**.

The **Inclusive Excellence Award** "recognizes the accomplishments of individuals and teams that demonstrate a sustained commitment to diversity and inclusion through exemplary leadership and campus and community involvement," and the **Sullivan Award** is "the highest award the university presents for humanitarian efforts." Both awards recognize Cagney's involvement with **NERD Squad**, an organization that she founded, which seeks to expose underrepresented students in elementary, middle, and high school to STEM fields and careers, while also offering tutoring and peer mentoring services.

Awards, Fellowships, Grants and Honors (continued)

Awards (continued)

Varun Dwaraka (Voss Lab) received the **AAAS/Science Program for Excellence in Science** Award - This program rewards deserving graduate students and postdocs working in the life sciences with a one-year sponsored membership in AAAS/Science, July 2017 - August 2018.

Megan Rhoads (Osborn Lab) received the **American Physiological Society Teaching of Physiology Research Recognition Award** and $500 for her abstract titled "*Problem-based learning increases motivation and learning strategy use in both low- and high- achieving students in an upper-level undergraduate physiology course.*"

Fellowships

Chelsea Weaver (Osborn Lab) received 2 year pre-doctoral fellowship from the **American Heart Association** based on her grant, ***The African Green Monkey: A Novel Model of Spontaneous Hypertensive Pregnancy Disorders.*** This award will allow Chelsea to study renal function and circadian rhythmicity of blood pressure during hypertensive pregnancy disorders such as gestational hypertension, chronic hypertension, and hypertension with pathophysiological characteristics of pre-eclampsia in the African Green Monkey.

Biology Merit Fellowship - The Biology Merit Fellowship is awarded to a PhD student in their 1st or 2nd year who has demonstrated exceptional promise. The fellowship provides a stipend commensurate with a TA salary for a pre-quals student and tuition. This year we awarded a fellowship to:

Varun Dwaraka (Voss Lab) fall 2017

Allyssa Kilanowski (Westneat Lab) fall 2017

Morgan Graduate Fellowship - The Morgan Graduate Fellowship is awarded to a PhD student who has passed their qualifying exam, has demonstrated meritorious progress toward their degree, and has clear plans for enhancing their dissertation. The fellowship provides a stipend commensurate with a TA salary and tuition for either 1 or 2 terms. This year we awarded a fellowship to:

Emily Bendall (Linnen Lab) spring 2018

Rose Marks (McLetchie Lab) 2017-18 Academic Year

Lyman T. Johnson Diversity Fellowship– Awarded to Graduate Students who contribute to the University of Kentucky's student diversity.

Kayla Titialii (Morris Lab) fall 2017

Grants

Allyssa Kilanowski (Westneat Lab) received a $500 Research Grant from the **Kentucky Society of Natural History**. *Water strider dispersal, personality and population dynamics: Linking personality to metapopulation dynamics*- Funds are to conduct preliminary experiments on water striders to 1) determine if they exhibit behavioral phenotypes, and 2) quantify dispersal distance daily and monthly. This research is to evaluate the potential of water striders for a dissertation research species.

Honors

Megan Weaver and **Nick Carrara** (Famulski Lab) both received honorable mention in their applications for the NSF GRFP this spring.

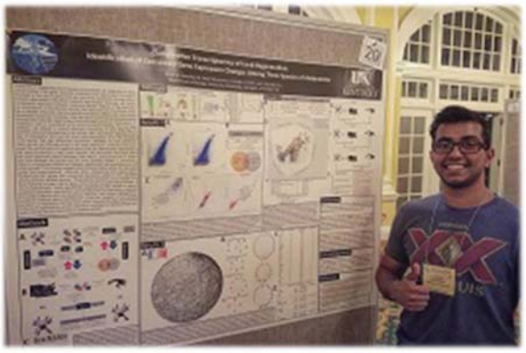
Kaylynne Glover (Crowley Lab) was elected as the Graduate Student Congress President. Kaylynne is also serving on the Provost's Blue-Ribbon Panel for Graduate Education, Chair of the Subcommittee on Graduate Student Experience.

Presentations and Publications

Presentations

Luc Dunoyer (Seifert Lab) presented at the **Society for Freshwater Science** in June where he gave a talk in the crayfish session titled ***"Effects of cheliped loss on crayfish burrowing: energetic costs and changes in burrow construction."*** Luc was awarded travel support from the graduate school and the biology department to attend this conference in Raleigh, NC.

Chelsea Weaver (Osborn Lab) gave an oral and poster presentation at **Experimental Biology** in Chicago, IL April 22-26. She was awarded the Caroline Tum Suden/Frances A. Hellebrandt Professional Opportunity Award ($500) for her abstract, ***"Altered Water Homeostasis in a Novel Non-human Primate Model of Gestational Hypertension."*** The Physiological Genomics Interest Group also supported her travel ($335).



Varun Dwaraka (Voss Lab) presented his poster **"Comparative Transcriptomics of Limb Regeneration: Identification of Conserved Gene Expression Changes Among Three Species of *Ambystoma*"** at the **Gordon Research Conference** (GRC) **and Seminar** (GRS) in Quantitative Genetics and Genomics in Galveston, Texas, February 25-March 3, 2017. The GRC Chair awarded him a $1020 Scholarship for his conference registration and fees. He also presented this poster at the **Annual KBRIN Bioinformatics Summit** in Montgomery Bell State Park, Tennessee, April 21-23, 2017.

Cliff Harpole (Cassone Lab) presented at the **11th International Symposium on Avian Endocrinology** in Niagara-on-the-lake, Ontario, Canada, on October 11-14, 2016 and at the **5th Biannual Conference of Rhythms in the Southeast Region** at Middle Tennessee State in Murfreesboro, TN on May 20th, 2017.

"The effect of melatonin on circadian and seasonal rhythms of vocalizations in oscine passerine birds"

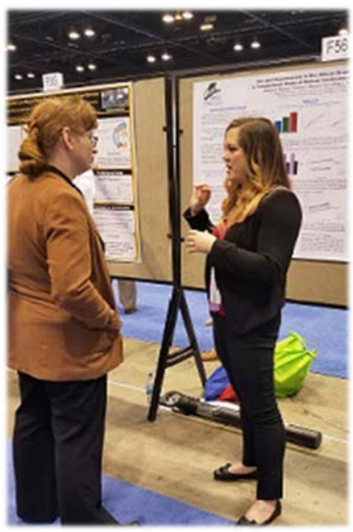
Summary: The Cassone lab has shown that one of the surprisingly few effects of melatonin on photoperiodism in birds is on the seasonal dynamics of vocalizations. This talk expanded on these findings: birds lacking melatonin, but then having it replaced for a short duration each night as they would in the spring, saw their vocalizations develop into more complex ones. However those that received a long, winter-like duration of melatonin had their vocalizations remain more-so in the simple state. These data continue with the lab's narrative that melatonin gates seasonal dynamics in vocalization seen in house sparrows.

Scott Hotaling (Weisrock Lab) presented *"Conservation genomics of an alpine stonefly threatened by climate change"* at the **Society for Freshwater Science Annual Meeting.** Scott was invited to present *"Genes in mountain streams: Perspectives on biodiversity from mostly North American headwaters"* at the **University of Kentucky, Department of Entomology.** He was also invited to present **"***Genes in mountain streams: Perspectives on biodiversity from mostly North American headwaters"* at the **Missouri State University, Department of Biology.**

Presentations and Publications (continued)

Presentations (continued)

Allyssa Kilanowski (Westneat Lab) received a $300 Travel Grant from the **Ecological Society of America Student Chapter to** attend the Ecological Society of America annual meeting and give an oral presentation. The presentation, "*Female-Biased Size Dimorphism in the Cliff Chipmunk: Ontogeny, Seasonality, and Fecundity*", focused on the development of sexual dimorphism of juvenile chipmunks and tested the fecundity hypothesis selection as an explanation for female-biased sexual dimorphism.



Megan Rhoads (Osborn Lab) gave an oral presentation "*Sex and Hypertension in the African Green Monkey, a Translational Model of Human Cardiovascular Disease*" at **Experimental Biology 2017**, Chicago, IL, April 23-26.

Several Biology Graduate Students gave poster presentations at the **Midwest Zebrafish Meeting** in Cincinnati, OH this June 16-18, 2017.

Cagney Coomer (Morris Lab) presented her poster "***Characterization of Capn5 expression and function in the zebrafish retina***". Cagney also presented this poster at the **Association for Research in Vision and Ophthalmology** (ARVO) meeting, Baltimore, MD, May 7-11.

Becky Petersen (Morris Lab) presented "***Characterization of Two Novel Zebrafish Genetic Mutants in sox0a and sox4b***".

Warlen Piedade (Famulski Lab) gave an oral presentation ***"Siah e# ubiquitin ligases regulate optic fissure closure during zebrafish development by a potential control of nlz2 stability"***

Kayla Titialii (Morris Lab) presented her poster ***"Elucidating the effects of hyperglycemia on retinal development in zebrafish"***.

Publications

Bagley, R.K.*, V.C. Sousa, M.L. Niemiller***, and **C.R. Linnen**. 2017. History, geography and host use shape genomewide patterns of genetic differentiation in the redheaded pine sawfly (*Neodiprion lecontei*). ***Molecular Ecology* 26:** 1022-1044.

Summary: In this paper, we used reduced-representation DNA sequencing and diverse population genomic analyses to describe the contributions of historical isolation, limited dispersal over space, and divergent host use to genetic differentiation among populations of the redheaded pine sawfly.

- Selected for journal cover image
- This project was funded by the NSF (DEB-1257739) and, to Robin, a USDA-NIFA predoctoral fellowship and a multi-year fellowship.

Bendall, E.E.*, K.L. Vertacnik*, and **C.R. Linnen**. 2017. Oviposition traits generate extrinsic postzygotic isolation between two pine sawfly species. ***BMC Evolutionary Biology* 17:** 26.

Summary: In this paper, we provide experimental evidence that two sawfly species have diverged in multiple egg-laying traits and that maladaptive combinations of these traits produced host-dependent reductions in fitness in hybrids. This paper represents one of only a handful of examples for which the mechanistic basis of extrinsic postzygotic isolation (a critical ingredient in ecological speciation) has been elucidated.

- Article highlighted in *BMC* series blog (http://blogs.biomedcentral.com/bmcseriesblog/2017/02/13/together-yet-apart-drives-evolution-new-species/)
- This work was funded by the NSF (DEB-1257739)

Presentations and Publications (continued)

Publications (continued)

Beloglazova, NV ;**Graniczkowska**, K ;Ediage, Njumbe ;Averkieva, O ;De Saeger, S "Sensitive Flow-through Immunoassay for Rapid Multiplex Determination of Cereal-borne Mycotoxins in Feed and Feed Ingredients." *Journal of agricultural and food chemistry* 65, 33 (2017): 7131-7137.

Graniczkowska, K ;Pütz, M ;Hauser, FM ;De Saeger, S ;Beloglazova, NV "Capacitive sensing of N-formylamphetamine based on immobilized molecular imprinted polymers." *Biosensors & bioelectronics* 92, (2017): 741-747.

Hotaling S, Hood E, Hamilton TL. Microbial ecology of mountain glacier ecosystems: biodiversity, ecological connections, and implications of a warming climate. *Environmental Microbiology* (Invited). DOI: 10.1111/1462-2920.13766
Summary: In this review, we outlined a modern synthesis of mountain glacier microbial ecology. To date, the focus had largely been on glacier surfaces, beneath glaciers, or streams emanating from glaciers. We improved this framework by linking all three together and discussing how genomic tools have revolutionized the field.

Hotaling S, Finn DS, Giersch JJ, Weisrock DW, Jacobsen D. Climate change and alpine stream biology: progress, challenges, and opportunities for the future. *Biological Reviews.* DOI: 10.1111/brv.12319
Summary: In another review, my co-authors and I gave a 21st century perspective on alpine stream biology broadly. The last major review of the field came in 1994 so this was a much needed update spanning many new avenues of research including microbial ecology, population genomics, and species distribution modeling.

Tronstad LM, **Hotaling S**. Long-term trends in aquatic insect bioassessment metrics are not influenced by sampling method: empirical evidence from the Niobrara River. *Knowledge and Management of Aquatic Ecosystems*. DOI: 10.1051/kmae/2017020

Jessen, T.J., **A. L. Kilanowski**, R. N. Gwinn, M. J. Merrick, and J. L. Koprowski. 2016. *Microsciurus flaviventer* (Rodentia: Sciuridae). Mammalian Species Account. 48:59-65.
Summary: This paper provides a review of our currently knowledge of the Amazon dwarf squirrel, and includes topics such as ecology, reproduction, distribution, and current conservation status.

Kilanowski, A.L., and J.L. Koprowski. 2016. Female-biased sexual dimorphism: Ontogeny, seasonality, and fecundity of a chipmunk (*Tamias dorsalis*). Journal of Mammalogy DOI: http://dx.doi.org/10.1093/jmammal/gyw172
Summary: This paper presents a study of the development of sexual dimorphism in a small mammal with female-biased dimorphism (females are larger than males by about 10%). I followed juveniles for two months after birth to compare the change in mass of males and females over time. I also tracked adult females to monitor the number of offspring and determine their chipmunks support the fecundity hypothesis.

Kilanowski, A.L., and J.L. Koprowski. 2016. Communal denning of cliff chipmunks (*Tamias dorsalis*). Southwestern Naturalist.
Summary: Across the range of cliff chipmunks, they are reported as solitary. However, I observed communal denning during and after dispersal in my study population in southeastern Arizona. This short note documents my observations and postulates future research that could elucidate why this population differs from others.

Rhoads MK, Goleva SB, Beierwaltes BH, & Osborn JL. Renal Vascular and Glomerular Pathologies Associated with Spontaneous Hypertension in the Nonhuman Primate *Chlorocebus aethiops sabaeus. American Journal of Physiology - Regulatory, Integrative and Comparative Physiology* Jun 2017, ajpregu.00026.2017; DOI:10.1152/ajpregu.00026.2017
Summary: Hypertension, or high blood pressure, affects 1 in 3 adults in the United States and is a major risk factor leading to the development of cardiovascular disease, stroke, and chronic kidney disease. In this study, we measured the development of spontaneous hypertension in the African Green Monkey, an Old World primate that is an invasive pest species on the Caribbean islands of St. Kitts and Nevis. We found that 37% (157 of 424) of the adult animals exhibited high blood pressure (systolic blood pressure > 140mmHg) and evidence of renal damage - markedly similar to human patients with essential hypertension. We hope that identification of the factors that contribute to spontaneous hypertension in these animals can lead to new treatments for patients suffering from this disease.

Presentations and Publications (continued)

Publications (continued)

Terbot, J.W.*, R.L. Gaynor**, and C.R. Linnen. 2017. Gregariousness does not vary with geography, developmental stage, or group relatedness in feeding redheaded pine sawfly larvae. ***Ecology and Evolution* 7:** 3689-3702.
Summary: This paper describes a novel quantitative assay for larval aggregative behavior and describes variation in this trait among developmental stages and populations of the redheaded pine sawfly.

- The second author is an undergraduate mentored by John.
- This project was funded by the NSF (DEB-1257739) and several research grants awarded to John, including an Entomological Society of America SysEB Student Research Travel Award, a Society of Systematic Biologists Graduate Student Research Award, and a Ribble award.

Vertacnik, K.L.* and **C.R. Linnen**. 2017. Evolutionary genetics of host shifts in herbivorous insects: insights from the age of genomics. ***Annals of the New York Academy of Sciences* 1389**: 186-212.

- This is an invited review article that describes how recent advances in sequencing, statistics, and molecular technologies are revolutionizing our understanding of how insects adapt to novel host plants.

4th Year Symposium

For the third straight year, the BGSA organized a fantastic lineup of 4th year talks and short presentations from new students.

4th Year Talks

Benjamin Cloud (Westneat Lab) *"Heterospecific extra-pair fertilizations as a mechanism of hybridization in a recently sympatric system of wood warblers"*

Luc Dunoyer (Seifert Lab) *"Between field and laboratory: A tale of ecosystem engineering in streams"*

Rose Marks (McLetchie Lab) *"Persistence in a changing environment"*

Katherine Sasser (Westneat Lab) *"Multiple trade-offs over parental care and the role of pair coordination in breeding house sparrows (Passer domestics)"*

John Terbot (Linnen Lab) *"Aggregation in Pine Sawflies: Simple or Complicated?"*

Chanung Wang (O'Hara Lab) *"Characterizing sleep, circadian rhythms, and eye closure in Acomys cahirinus (Cairo spiny mouse)"*

Short Presentations

Tyler Butsch (Plan B Harrison)

Charles Cassone (Cassone Lab)

Jeff Chalfant (Pendergast Lab)

James Giordano (Voss Lab)

Kinga Graniczkowska (Cassone Lab)

Jacob Gunnell (Cassone Lab)

Kristen LaRue (Osborn Lab)

Sandeep Saxena (Seifert Lab)

Courtney Waterbury (Smith Lab)

Graduate Student Life Events

Luc Dunoyer (Seifert Lab) and **Jacqueline Dillard** (Westneat Lab) were married in their beautiful backyard garden on June 20, 2017.

Mansi Sethi (O'Hara Lab) married her long time love, Raghav Dube, in April. They are now living and working in Denver, Colorado.

Chanung Wang (O'Hara Lab) and his wife Haessal welcomed daughter Luna to their family on July 12, 2017. Big brother Roy looks pretty happy about having a new sister!

.