January 2017

THE OPEN READING FRAME

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

Thoughts from the DGS

This issue of the *Open Reading Frame* comes out just as we have prospective students visiting. The Newsletter provides an interesting perspective in conjunction with this process of recruitment. It is fascinating to see the accomplishments of our current students gracing these pages and realize that not so long ago they too were prospects. Most also had only a vague idea of what they were about to experience. Many of our more senior students will soon be finishing their dissertations and graduating. My conversations with them are now about their ambitions for publications and funding, the latter usually regarding post-doctoral opportunities with rich new research opportunities. They all have their heads down and a harried look in their eyes, but they speak and act like full colleagues now. The Newsletter thus provides a reminder of the processes involved in transitioning from student into a colleague. In general, this is what our program seeks to accomplish with our incoming students, and the Newsletter provides the reassuring view that it is working, sometimes spectacularly well. Naturally, the hard work put in by each student year after year is the main cause of these successes, but the program (mentors, fellow students, and the BGP office) surely has helped. We will keep trying to do that better in the years to ahead, and we hope some of our visitors will be the beneficiaries, providing many entries for future newsletters!

Dave Westneat,
Director of Graduate Studies
Department of Biology

Biology Graduate Student Association (BGSA)

The BGSA held an election in December, below are the newly-elected positions.

President**: Shishir Biswas**

Vice-President: **Allyssa Kilanowski**

Treasurer: **Varun Dwaraka**

Secretary: **Chelsea Weaver**

Graduate Student Congress: **John Terbot and Tom Maigret**

Seminar Committee Representative: **Rose Marks**

Graduate Affairs Committee Rep: **Tim Salzman**

July 1st – **Megan Rhoads

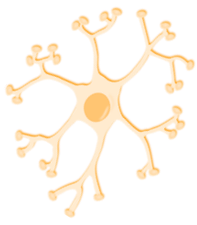
BGSA Outreach Coordinator: **Chelsea Weaver**

July 1st – **Emily Bendall

Seminar Committee Rep: **Rose Marks**

BGSA Coffee & Tea: **Stephen Zumdick**

July 1st – **Kim Vertacnik



Getting it done!

PhD Defenses

Mansi Sethi (O'Hara Lab) November 9, 2016

Mansi's dissertation explored several links between sleep and disease. She investigated sleep-wake alterations a double transgenic mouse model of AD which displays an early onset of AD pathology and cognitive impairments. She found that these mice have shorter sleep bout lengths under baseline conditions. This was true for both sexes, however, the effect was more prominent in females. Inadequate sleep is also associated with increased risk for metabolic disorders such as diabetes. She studied a combined mouse model of AD and diabetes (db/AD) which was generated by crossing of db/db (diabetic obese mice) and APP-PS1 (knock-in AD mouse model). The resulting mice showed profound cerebrovascular as well as AD pathology. Both females and males, diabetic AD animals had longer sleep duration compared to non-diabetic AD animals. They also exhibited attenuated sleep-wake rhythms. In addition, significant two way interactions were found for the age and db/AD genotype. The findings suggest that db genotype and not cerebrovascular pathologies affect sleep in our mouse model. Finally, Mansi analyzed over 300 single gene knock out mouse lines generated on a C57BL6/NJ background, monitored at The Jackson Laboratory. With this unbiased approach where the knockouts were chosen at random, she identified 55 novel genes affecting various sleep traits, utilizing a variety of statistical approaches. Sex differences were found for a number of knockouts as well as controls. Control females were found to have shorter bout lengths and less sleep duration compared to male littermates.

Mansi began a post-doctoral fellowship on January 1st, with Dr. Moumita Ghosh, at National Jewish Health, with research focused primarily on lung cancer. National Jewish Health is an academic medical research facility located in Denver, Colorado specializing in respiratory and cardiac disorders.

Swagata Ghosh (Rymond Lab) November 22, 2016

Swagata Ghosh defended her PhD dissertation entitled "Genetic analysis of *Serf* gene function in *Drosophila melanogaster* and its contribution to a fly model of spinal muscular atrophy (SMA)." Swagata provided the first detailed characterization of the *Serf* gene in any organism and established that the loss of Serf activity exacerbates the SMA disease state modeled in the fruit fly. This results, at least in part, through Serf-dependent changes in the synthesis or stability of the phylogenetically conserved survival of motor neuron protein. In addition, Swagata demonstrated that simple overexpression of *Serf* in *Drosophila* greatly extends the lifespan of this model organism.

Swagata has moved from the Rymond lab at UK to start a postdoc at the University of Virginia in the Department of Medicine, Infectious Diseases and International Health Division, under the supervision of Shannon Moonah, MD, ScM. The Moonah group uses tissue culture, in vivo mouse models and human studies to seek means to improve the clinical outcome of amebic colitis, a leading cause of severe diarrhea. Swagata's postdoctoral research will examine the role of the parasite-encoded cytokine, MIF, in the pathogenesis of amebiasis and investigate the evolutionary benefit of MIF to the parasite.

Qualifying Exams

Sruthi Purushothaman (Seifert Lab) October 14, 2016

Shishir Biswas (Seifert Lab) November 21, 2016

Qingchao Qiu (Voss Lab) December 1, 2016

Congrats to our new PhD candidates!

Awards, Fellowships, Grants and Honors

Awards

Paul Hime (Weisrock Lab) received a University of Kentucky Myrle E. and Verle D. Nietzel Outstanding Dissertation Award. Through this award, Paul will have the opportunity to bring in Dr. Scott V. Edwards as a distinguished external examiner for his PhD dissertation defense. Dr. Edwards is a leader in the fields of evolutionary biology, phylogenetics, and genome evolution, and is an elected member of the National Academy of Sciences. During his visit, UK Biology will host a colloquium featuring a seminar by Dr. Edwards.

Brittany Slabach (Crowley Lab) attended the Summer Institute in Statistics and Modeling Infectious Disease (SISMID), at the University of Washington from July 10-22nd. She received a scholarship ($1800) that allowed her to attend three courses and helped cover travel.

Chanung Wang and **Mansi Sethi** (O'Hara Lab) were accepted into the Short Course on Systems Genetics at the Jackson Laboratory in Maine. Both Mansi and Chanung were awarded $1600 from the Jackson Lab through NIH to cover the cost of the class! This course occurred October 16-21 and covered computational and experimental approaches to genetic studies using whole genome approaches.

Chelsea Weaver (Osborn Lab) attended the Computational and Comparative Genomics Course at Cold Spring Harbor Laboratory in New York. She received $1450 from National Human Genome Research Institute and $1500 from Helmsley Charitable Trust for course, room, and board. This was a 9 day course covering everything from protein evolution to RNAseq, SNP discovery, and so much more.

Grants

Paul Hime (Weisrock Lab) received a grant of $3,577 from the North Carolina Wildlife Resources Commission to study the "Fine-scale population genomics of North Carolina hellbender salamanders." This grant will allow Paul and his co-authors to conduct a detailed assessment of phylogenetic relationships and patterns of genetic variation in one of the last remaining strongholds of this endangered salamander complex.

Scott Hotaling (Weisrock Lab) and two collaborators received a $10,000 grant from the Wyoming Fish & Wildlife Service and Governor's Office to use genomics to assess the conservation status (specifically species boundaries) of alpine stoneflies threatened by glacier recession in Grand Teton and Glacier National Parks.

Melissa Keinath (Smith Lab) was recently awarded a University of Kentucky Woman's Endowed Fellowship.

Rose Marks and her advisor Nick McLetchie had their project entitled "Sex differences in desiccation tolerance, a novel approach for explaining abiotic stress tolerance in plants" funded by the Kentucky Science & Engineering Foundation for $29,999. The study addresses the genetic mechanisms of desiccation tolerance in plants. We are capitalizing on an identified sex difference in desiccation tolerance to identify fine scale genetic differences in desiccation responses. Briefly, female and male plants with differences in desiccation tolerance have been targeted for gene expression profiling by RNAseq. The resulting data will be analyzed to identify candidate genes that contribute to increased desiccation tolerance. We hope that this study will not only provide fundamental knowledge of desiccation tolerance in plants, but that it lead to better management strategies for minimizing drought-induced crop failure.

Presentations and Publications

Presentations

Nour Al Haj Baddar (Voss Lab) presented a poster entitled "Inhibition of amputation-induced reactive oxygen species blocks salamander tail regeneration" at the Society of Redox Biology and Medicine conference in San Francisco, California on Nov, 2016. Nour also presented this poster at the Mechanisms of Regeneration and Therapeutic Intervention Symposium at IUPUI, Indiana on Sep, 2016.

Ren Guerriero (O'Hara Lab), along with coauthors Wang, C., Brooks, T.C., Ajwad, A.A., Sunderam, S., Seifert, A.W., and O'Hara, B.F. presented a poster entitled "Characterizing sleep, circadian rhythms, and eye closure in *Acomys cahirinus* (Cairo spiny mouse) using EEG, EMG, piezoelectric sensors and video" at the Society of Neuroscience Annual Meeting in San Diego, CA.

Paul Hime (Weisrock Lab) gave invited talk at the Purdue University Hellbender Working Group Meeting. West Lafayette, IN. October, 2016. Title: "Varied approaches to hellbender conservation in Kentucky and beyond: Field surveys, genetic sex determination, and species boundaries." Paul also presented a talk entitled "Resolving the amphibian tree of life with complex and highly parameterized Bayesian models of molecular evolution" at the 2016 Blue Waters Supercomputing Fellows Symposium. Urbana-Champaign, IL. September, 2016.

Shreyas Joshi (O'Hara Lab) and coauthors Patel, A., Agarwal, A., and O'Hara, B.F. gave a poster entitled "EEG and reaction time profiling in novice meditators" at the Society of Neuroscience Annual Meeting in San Diego, CA.

Mansi Sethi (O'Hara Lab) and coauthors Guerriero, L.E., Wang, C., Bernat, R., Helman, A.M., Macheda, T., Agarwal, A., Murphy, M.P., Duncan, M.J., O'Hara, B.F. Presented the poster "Altered sleep-wake behavior in a novel murine model of type 2 diabetes and Alzheimer's disease (db/AD mice)" at the Society of Neuroscience Annual Meeting in San Diego, CA.

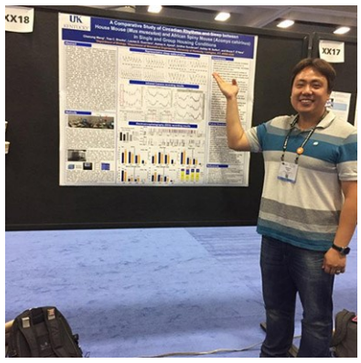
Jacqueline Dillard (Westneat Lab) gave a talk entitled, "The correlated evolution of monogamy and cooperation in Birds at the meeting of the International Society of Behavioural Ecology, Exeter, U.K. in August.

Kat Sasser (Westneat Lab) attended the International Society of Behavioural Ecology in Exeter, U.K and gave a talk on her dissertation entitled, "Intraspecific competition leads to tradeoffs with parental care, affecting fitness."

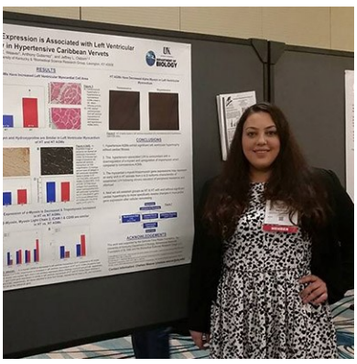
Both Kat and Jacqueline met many famous people, including Richard Dawkins !

Brittany Slabach (Crowley Lab) presented a part of her dissertation research at the The Wildlife Society Meeting in Raleigh, NC in October. Her talk was entitled, "All in the family? Linking sociality and relatedness to group dynamics of large mammals"

Presentations (continued)



Chanung Wang (O'Hara Lab) attended the 2016 Annual Neuroscience conference in San Diego, CA. He presented a poster with coauthors Brooks, T.C., Guerriero, L.E., Ajward, A.A., Sunderam, S., Seifert, A.W., and O'Hara, B.F. entitled 'A comparative study of sleep and circadian rhythms between the house mouse (*Mus musculus*) and African spiny mouse (*Acomys cahirinus*)'.



Chelsea Weaver (Osborn Lab) presented a poster entitled "Decreased α-Myosin Expression is Associated with Left Ventricular Hypertrophy in Hypertensive Caribbean Vervets" at the American Heart Association Council on Hypertension 2016 Scientific Sessions in Orlando Florida on September 14, 2016.

Publications

Bagley RK, Sousa VC, Niemiller ML, and Linnen CR. (2016), History, geography, and host use shape genome-wide patterns of genetic variation in the redheaded pine sawfly (*Neodiprion lecontei*). Mol Ecol. Accepted Author Manuscript. doi:10.1111/mec.13972. *A major goal of Robin's dissertation is to understand what role (if any) host use has on insect speciation. More specifically, she is investigating if divergent host use leads to ecological and/or genetic divergence in* Neodiprion lecontei. *This paper represents a ¦first pass¦ to answering this question, and examines broad, range-wide patterns of genetic differentiation. Using ddRAD sequencing, we identify three genetic clusters, date the divergence of these clusters to the late Pleistocene, and find evidence that both geography and host use contribute to genetic differentiation within* N. lecontei.

Adam B. Cook and Ashley W. Seifert (2016). Beryllium nitrate inhibits fibroblast migration to disrupt epimorphic regeneration. *Development* 143, 19: 3491-3505.

This paper revisited the longstanding question of how beryllium nitrate was able to completely block limb regeneration in salamanders. Our paper showed that beryllium nitrate inhibits cell migration and this disrupts tissue regeneration in a wound specific context. When a blastema is required for regeneration as it is during limb regeneration, beryllium disrupts blastema formation and organogenesis. When a blastema is not required as occurs during skin regeneration, beryllium exposure only delays regeneration. More generally, our paper underscored the important role that cell migration and cell-cell interactions play during limb regeneration.

Dillard, J. High rates of extra-pair paternity in a socially monogamous beetle with biparental care. *Ecological Entomology*. DOI: 10.1111/een.12346, *In press. This study used shotgun sequencing data that shows that despite apparent social monogamy in a log-dwelling beetle, offspring are frequently sired by a different male. The results have implications for the evolution of biparental care as well as incipient forms of cooperation.*

Murphy MO, Price SJ, **Hime PM**, Drayer AN & Weisrock DW. 2016. A review of common mudpuppy (*Necturus maculosus*) capture methods and a description of a revised trap design. *Herpetological Review*. 47(4):575-578. *Have you ever wanted to go out to a bunch of rivers and find big, slimy aquatic salamanders which can be tricky to catch just by floating around in a wetsuit? If so, this paper is for you and it details a new design for a trap which you can build and deploy to do exactly that. It kind of works. Enjoy.*

Hime PM*, Hotaling S*, Shaffer HB, Voss SR, O'Neill EM, Weisrock DW (2016) The influence of locus number and information content on species delimitation: an empirical test case in an endangered Mexican salamander. *Molecular Ecology*, 25, 5959-5974. *In this study, we compared two data sets, one with many loci and few individuals and another with few loci but many individuals, to assess how information content and number of loci influences species delimitation methods. We performed this empirical test for an endangered Mexican salamander, and showed that in general relatively few loci are required to recover species-level splits. Moreover, we found support for a new species of salamander that remains to be fully described (hopefully in a future publication).*

Publications (continued)

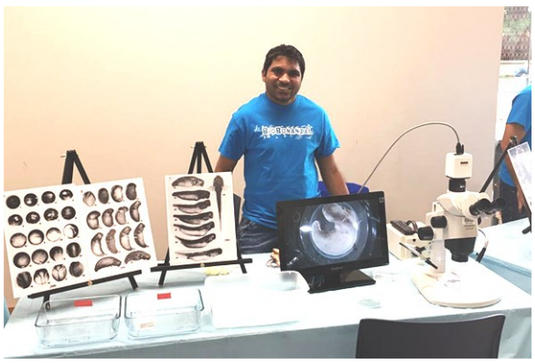
Giersch JJ, **Hotaling S**, Kovach RP, Jones LA, Muhlfeld CC (2016) Climate-induced glacier and snow loss imperils alpine stream insects. *Global Change Biology.* doi: 10.1111/gcb.13565.

In this paper, we incorporated 20 years of alpine monitoring data, population genetics, and habitat modeling to provide the clearest evidence yet that two alpine stoneflies, Lednia tumana and Zapada glacier, are highly-threatened by climate-induced loss of alpine glaciers and snowfields. This study was also used to directly inform listing decisions under the US Endangered Species Act and resulted in "Recommended for Listing" decisions for both species.

J.J. Cox, **B. L. Slabach**, J. T. Hast, S. Murphy, O. Kwok, and J. Dubey. High seroprevalence of Toxoplasma gondii in elk (*Cervus canadensis*) of the central appalachians, USA. *Parasitology Research.* Toxoplasma gondii *is an important protozoan parasite of mammals that impacts animal health and behavior. Although this parasite has been documented in several cervid species, little is known about how* T. gondii *impacts elk (wapiti,* Cervus canadensis*), which has increased in number and expanded in range during the past century. We found that 57% of sampled elk (N = 142) were seropositive, with no differences between the sexes. We suggest wildlife agency personnel incorporate warnings about proper elk meat preparation into their hunter education outreach programs and literature to reduce the chances for human infection from consuming contaminated venison.*

Outreach Efforts

This fall (October 1st), the Department of Biology hosted BioBonanza, a one-day open house festival which showcased interactive displays on research taking place in the department. More than **430** people attended and were able to interact with **23** hands-on displays which featured how human hearts work, butterflies and other insects, crawfish, zebrafish, plants, *etc.* led by a little bit more than 80 volunteers from the biology department. This would not have been possible without the tireless work of **Jacqueline Dillard** who developed all the graphic design of the event, **Jennifer Simkin** who took care of all the advertisement part, **John Terbot** who coordinated the volunteers during the event, and **Tim Salzman** who organized the activities and displays.



The Osborn lab also organized an APS physiology PhUn week event on November 22 2016 at Dixie Elementary. Dr. Osborn, Dr. Santollo, **Brandon Franklin, Megan Rhoads** and **Chelsea Weaver** all participated. The students learned how to measure their heart rate and then learned about experimental design. They formed hypotheses regarding which type of exercise would increase the heart rate the most and then had a blast testing their hypothesis.