

SCHOLARSHIP



SU students and faculty from the Biology department traveled to Boston to attend the joint meeting of the American Society for Biochemistry and Molecular Biology and the Experimental Biology conference.

Shown above: Dr. Patti Erickson, Rachel Keuls, April DeMell, Heather Yerecic, Andrea Korell, Brittney Lozzi, Dr. Eugene Williams, Alex Stuffer and Mike Robben (not shown).

ANNOUNCEMENTS

Thomas (Tré) Williams, Dual Degree Major in Biological Sciences and Communications Arts will be the May 2015 Commencement Speaker.

Tré and his advisor Dr. Kimberly Hunter, shown right.



Salisbury University Student Research Conference

The Salisbury University Student Research Conference will be held on Friday, April 24, 2015. Presentations are organized into themed sessions, ranging from molecular biology to music composition, from education to economics. The conference culminates in a poster reception where we will have the Provost's Welcome, a performance by Squawkappella and the Outstanding Research Mentor Award presentation to a faculty member for excellence in guiding student research. The conference is free and the public is invited. For more information visit <http://www.salisbury.edu/susrc/>



March 12 seminar speaker **Jake Goodwin** explained his research on oyster restoration and identification of larvae using cutting edge tools and a cool sword.

2015 WICOMICO CREEKWATCHERS' SEASON IS UNDERWAY!

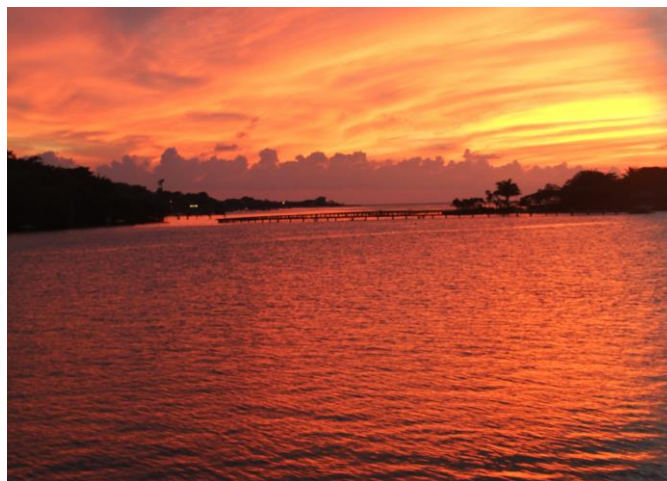
Sampling and water quality analysis of 22 sites along the entire Wicomico River, ponds and tributaries, has begun for 2015. We continue through the summer, and if you are interested in helping out with lab analysis of water samples, please contact Dr. Judith Stribling. Work involves about 2 hours every other Tuesday evening beginning at 6 pm. We especially need people after school ends.



OPPORTUNITIES

BIOL 399 - International Field Studies: Coral Reef Biology in Honduras – Winter 2016

We scuba dive and snorkel around the island of Roatan which is a small island off the coast of Honduras in the Caribbean Sea. The class is 3 credits and limited to 12 students. You will interact with coral, reef fishes, and other invertebrates associated with a coral reef. You will also have the opportunity to interact with the captive population of bottlenose dolphins housed in open pens at the Roatan Institute for Marine Sciences. Students are housed in bungalows on a key right on or even over the water. It is pretty amazing and you will learn heaps about the coral reef ecosystem. If you are interested, please contact Dr. Barse though email (AMBARSE@salisbury.edu) or stop by her office in Henson Hall 233.



Biodiversity Studies in Costa Rica – Winter 2016

Two course options:

BIOL 105- 901 The Economics of Biodiversity
(Gunther)

BIOL 299-901 Tropical Biodiversity and Ecology
(Liebgold)

Follow the link below to register.

<http://salisbury.abroadoffice.net/internal-program-description-Salisbury-Global-Seminar-Costa-Rica-Biodiversity-Studies-151665-60.html>

Enrollment is limited to 20 students total for both courses. Deadline to apply is May 1, 2015. For more information contact Mary Gunther (mrgunther@salisbury.edu) or Dr. Eric Liebgold (ebliebgold@salisbury.edu)



FEATURED FACULTY

DR. JESSICA CLARK

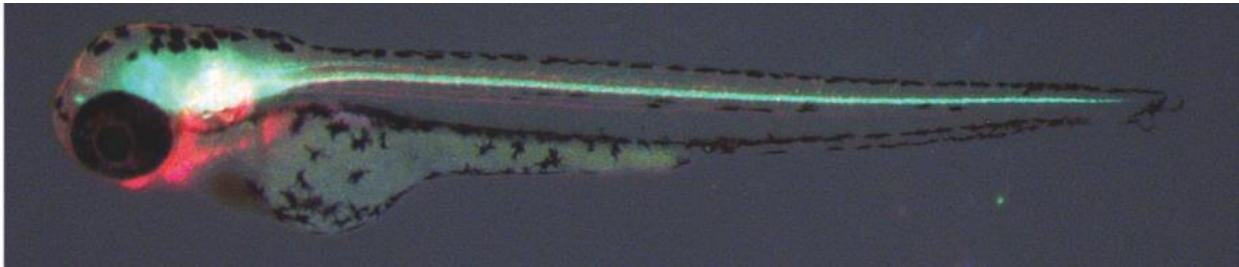
Courses taught: I am currently teaching Anatomy and Physiology II (BIOL216). I will be teaching Vertebrate Physiology in the fall and am hoping to teach Neurobiology and Developmental Biology in the future.



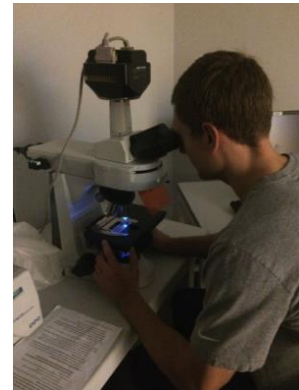
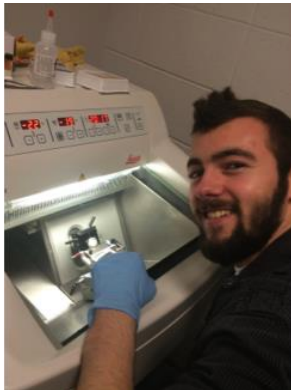
When I was five years old, my mother found me with a pair of scissors trying to transplant my teddy bear's brain to my stuffed monkey. Over the next thirty years, my interest in the brain hasn't changed much, but my animal model has. I earned my Ph.D. in the Dept. of Biological Sciences (Program of Neuroscience) at Florida State University where I studied the interplay between the circadian and hormonal controls of reproduction. I was fascinated by how changes in neural activity in two distinct brain regions, the suprachiasmatic nucleus and the hypothalamus, could integrate and determine the fecundity of a mammal. To dive deeper into this, I received a postdoctoral fellowship at the University of Virginia's Center for Research and Reproduction. I spent the next year studying the electrophysiology of neurons believed to be responsible for the initiation of puberty, fertility and menopause. I then transferred to another neuroscience lab at the University of Virginia, where I studied the development of the peripheral nervous system in mice and zebrafish.

At home, my four-year-old daughter (Alexa) keeps me busy while my husband (Matt) keeps me sane. We spend as much time near the water as we can and during the few moments of quiet that I get, I love reading, spending time with friends and cooking.





Research interests: Currently, I am very interested in the structural and molecular changes of the peripheral nerve in hyperglycemic zebrafish. Diabetes is a growing epidemic with an estimated affliction rate of 1 in 9 Americans. Chronic hyperglycemia leads to a number of complications including vascular disease, nephropathy, retinopathy, and the most common complication, diabetic peripheral neuropathy. Axonal degradation of the peripheral nerve is responsible for the associated symptoms. However, there is a great deal of debate on why the axon is degrading. Morphological changes in the protective blood-nerve barrier, the perineurium, have been implicated in mammals and humans. Following the onset of diabetes, perineurial cells die and permeability is increased allowing toxins to infiltrate the nerve. Unfortunately, this research hasn't been expanded past morphological data, because there was no known molecular marker for perineurial cells in mammals.



Students in the lab: Alex Stuffer, Tré Williams, Derrick Miller, and Brian Krahl (not pictured)

My postdoctoral advisor found a unique molecular marker (*nkx2.2a*) for the zebrafish perineurium during her postdoctoral work. In order to see if this was conserved in mice (and potentially relevant for humans), I made a transgenic line of mice that express GFP under the control of the *nkx2.2* gene regulatory region. Using these mice, I was able to characterize mammalian perineurial cells. I found that these important cells also express *nkx2.2* and are derived from the central nervous system. These cells migrate into the periphery to ensheath peripheral nerves and deletion of the *nkx2.2* gene has a detrimental affect on the other components of the peripheral nerve; axons are defasciculated and Schwann cells improperly myelinate. Additionally, unusual migration of motor neurons from the spinal cord into the periphery has been observed in these mutant mice, suggesting that *nkx2.2*⁺ perineurial cells are not only responsible for establishing the blood-nerve barrier, but are also involved in maintaining the barrier between the central and peripheral nervous system. Therefore, these *nkx2.2*⁺ perineurial cells have at least three overarching responsibilities in mice: (1) establishing the boundary between the central nervous system and the peripheral nervous system (2) allowing the proper development of the peripheral nerve and (3) maintaining the blood-nerve barrier of the peripheral nerve. This work supported our hypothesis that the origin and function of *nkx2.2*⁺ perineurial cells are conserved between mice and zebrafish.

Because my postdoctoral work has shown that the fundamental physiology of the perineurium in zebrafish is conserved in mammals, I am able to return to zebrafish to continue this work. Zebrafish are a powerful vertebrate model system. They are cost effective to maintain, easy to breed and are transparent. Their transparency allows direct visualization of development and mutant lines allow visualization of genetic principles, while fluorescent transgenes allow visualization of interactions between different cell types. Using a hyperglycemic induction model in zebrafish, I have found some really interesting things. In response to hyperglycemia, perineurial cells wrap fewer motor nerves, the sensory neurons of the dorsal root ganglion tend to migrate away (Fig.1) and lastly, motor axons and sensory axons appear defasciculated (Fig.2). We are currently pursuing these lines of research in my lab.

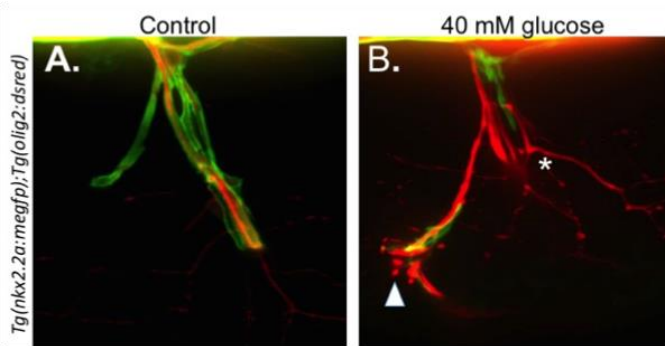


Fig. 1. Peripheral nerves appear defasciculated in hyperglycemic zebrafish larvae by 7dpf. The green transgene, *Tg(nkx2.2a:megfp)* indicates the perineurium of the motor nerve. This blood-nerve-barrier is not wrapping properly in the hyperglycemic fish (B), but appears normal in the control fish (A). The red transgene, *Tg(olig2:dsred)* indicates the motor axons. (A) In the control zebrafish, the motor axons are wrapped tightly by the perineurium. In the hyperglycemic fish (B), the axons are defasciculated (asterisk) and are blebbing (white arrow) an indicator of axonal death.

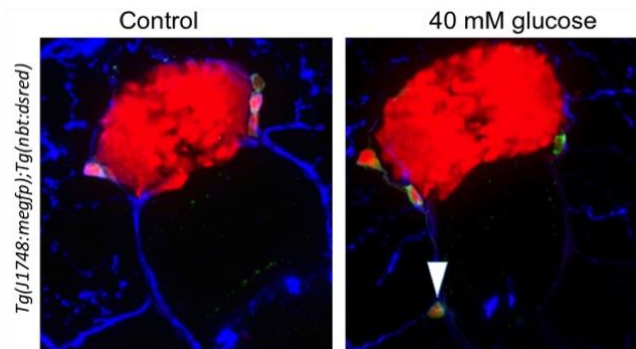


Fig. 2. Sensory neurons migrate away from the DRG in hyperglycemic zebrafish larvae by 8dpf. The green transgene, *Tg(J1748:megfp)* indicates the sensory neurons, which are clustered appropriately around the spinal cord in the control zebrafish (A) but have migrated along an axon (TUB; blue; arrowhead) in the hyperglycemic fish in (B). *Tg(nbt:dsred)* is a non-specific neuronal marker.

Recent Publications:

Clark, J. K., O'keefe, A., Mastracci, T. L., Sussel, L., Matisse, M. P. and Kucenas, S. (2014), Mammalian *Nkx2.2⁺* perineurial glia are essential for motor nerve development. *Dev. Dyn.*, 243: 1116–1129. doi: 10.1002/dvdy.24158

Kennett, J. E. and McKee, D. T. (2012), Oxytocin: An Emerging Regulator of Prolactin Secretion in the Female Rat. *Journal of Neuroendocrinology*, 24: 403–412. doi: 10.1111/j.1365-2826.2011.02263.x

Meet Some of the Graduate Students in the Applied Biology Program



Jackie Darrow

The carpenter frog (*Lithobates virgatipes*) is a “S3 Watchlist” species in Maryland and is due for population status reassessment. In collaboration with the Maryland Department of Natural Resources, we revisited all known carpenter frog localities to determine if populations persist at these sites. We also measured habitat variables at each site, including surface water pH, canopy cover, hydroperiod, and vegetation structure. After two field seasons (summer 2013 and 2014) carpenter frogs were detected in only 16 out of the 84 locations, suggesting that carpenter frog populations are declining, though more studies should be conducted to verify this. Our data also support a strong correlation between carpenter frogs and the presence of Walter’s Sedge (*Carex striata*) and Sphagnum Moss (*Sphagnum flexuosum*). I will be graduating in May 2015 and plan to attend Ross University School of Veterinary Medicine.

I started working with Dr. Liebgold and red-backed salamanders as an undergraduate here at Salisbury University in 2013. This species contains two common color morphs, one with a red dorsal stripe and one that lacks a stripe. I am interested in predation pressures on these different color morphs and started a project as an undergraduate using clay models to measure predation rates. I am continuing this work as a graduate student and have placed clay models at different locations across the Delmarva Peninsula to determine if predation pressures differ in populations of red-backed salamanders where color morph frequencies vary. I am also using mark-recapture data to look at survival between morphs as well as movements and home range sizes.



Alexa Grant



Mallory Hagadorn

The focus of my thesis research is to analyze dung beetle biodiversity and distribution, as well as the gut microbial composition of *Onthophagus taurus*, on organic and conventionally managed cattle farms throughout Maryland. All my microbial genomics work is done in collaboration with the Institute of Genome Sciences (UMD Medical School) using Next-Generation Sequencing technology. Summer 2015, I will conduct another field season for the ecology portion of my project and continue my *O. taurus* gut microbiome data analysis. I plan to graduate Spring 2016, after which I hope to pursue my research interests and earn my Ph.D.

SU Applied Biology Graduate Students (continued)

Krispen Laird successfully defended her MS Thesis, Female Preference and Multimodal Signaling in the Green Treefrog, *Hyla cinerea* on March 5, 2015. She completed her MS in the Taylor-Hunter Lab. In addition to producing an outstanding MS Thesis, Krispen and her husband just welcomed a new member to their family, Brody Laird. Brody is the cutest lab mascot, EVER, with a frog on his shirt!



Hunter Mann

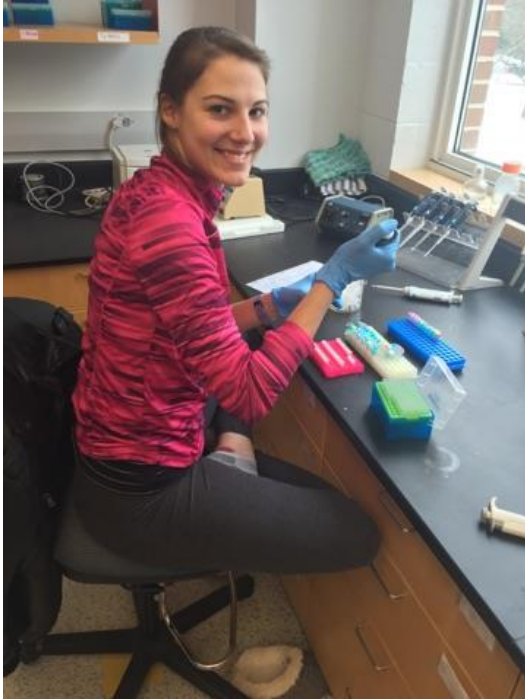
I am studying ant biodiversity, leaf litter composition and tree foraging preference in E.A. Vaughn Wildlife Management Area (Worcester Co., MD). Ants are important indicator taxa and exist in many habitats around the world. Studies in Maryland have been restricted to the Western Shore or dry dune type habitats on the Eastern Shore of Maryland. In collaboration with Dr. Dana Price, Emily Rowe, Dr. Eric Liebgold, and Jennifer Frye, my research will begin in May 2015. We will collect ants along 24, 100m transects to examine ant ecology in a temperate forest of the Mid-Atlantic.

For two years now I have studied the habitat preferences of local bat species across the Delmarva Peninsula using a car based transect approach. In total we confirmed the presence of at least 7 species: *Lasiurus borealis*, *Eptesicus fuscus*, *Nycticeius humeralis*, *Lasionycteris noctivagans*, *Lasiurus cinereus*, *Perimyotis subflavus*, and bats in the genus *Myotis*. Of the species we documented, *L. borealis*, *E. fuscus*, and *N. humeralis* all had significantly higher activity along tree and forest edges, while *Lasiurus cinereus*, and *L. noctivagans* utilized open environments more than the forest edge. Understanding the habitat preferences of local bat species is important, especially as two new threats, White-Nose Syndrome, and wind turbine facilities, are slated to impact this area soon. Our study therefore represents crucial baseline data prior to the damage caused by either of these threats. I am finishing up my thesis work on bats this semester, and plan to graduate in May!



Andrew McGowan

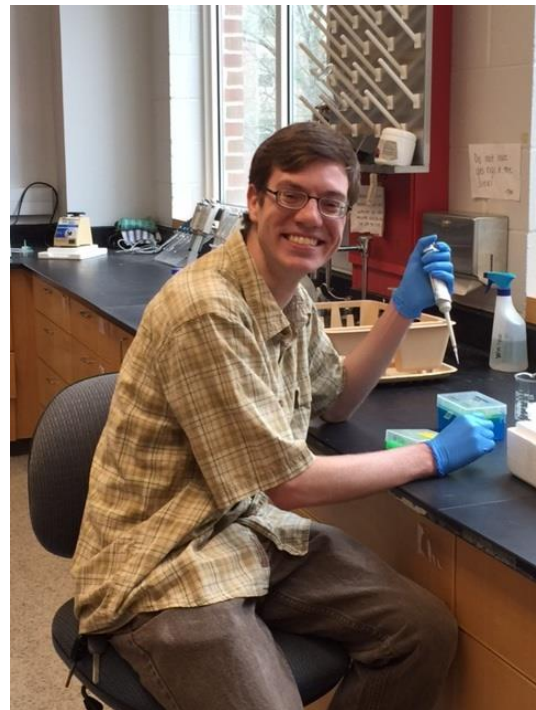
SU Applied Biology Graduate Students (continued)



Kelsey Mitchell

On a broad level, I use integrative techniques to answer questions in animal communication. I've worked with several frog species to investigate female mate choice and its role as a mechanism driving the evolution of male signals. For my Master's thesis, I am particularly interested in the variation often observed among females in their preferences for male traits and potential mechanisms contributing to this variation. Using túngara frogs as a model system, I'm evaluating inter-individual variation in females' strength of preference for specific male mating signals. I'm also developing genetic markers for the túngara frog system using double digest restriction site associated DNA (ddRAD) sequencing. These markers will provide us with high-resolution genetic information for each individual we conduct behavioral tests with. I aim to identify possible correlations between females' behavioral and genetic variation at the individual level. I will be defending my thesis project on April 30th.

I am excited to be a part of a developing field, which uses robotic models and next-gen sequencing to answer questions about the evolution of animal behavior. My research concerns the ecology and evolution of multi-component signaling. As part of the Taylor-Hunter Lab, I am focusing on the signaling behaviors of the green treefrog (*Hyla cinerea*), a common species that advertises in noisy aggregations. I will conduct field research to determine whether females use males' inflatable vocal sacs in a manner similar to that of a human lip-reader, to single out an individual "speaker" from background noise, and if ecological light pollution impacts females' use of the visual signaling channel while evaluating signaling males. Finally, this fall I will determine the extent to which fixed genetic and epigenetic factors are responsible for any potential differences in signaling behavior.



Matthew Murphy

CONFERENCES and TRAVEL

Two research students from the Erickson lab, Heather Yerecic and Andrea Korell, presented their research during both the American Society for Biochemistry and Molecular Biology (ASBMB) undergraduate poster competition and during the general session of the Experimental Biology conference in Boston, MA, March 28-April 1, 2015.

Heather's Title: Identification and Characterization of Mutant Related to *LRS1* in *Arabidopsis thaliana*

Andrea's Title: Anti-oxidant Effects of Nordihydroguaiaretic Acid on Oxidative Stress in *Caenorhabditis elegans*

Among many fascinating talks, we heard three Nobel Laureates speak: Drs. Stanley Prusiner (1997 Nobel Prize in Physiology or Medicine for discovering prions) Eric Kandell (2000 Nobel Prize in Physiology or Medicine for nervous system signal transduction), and Robert Lefkowitz (2012 Nobel Prize in Chemistry for G-protein coupled-receptors).



BIOLOGY OF FISHES (BIOL 407)

The Biology of Fishes class went to Horn Point Laboratory in Cambridge, MD to observe the Atlantic sturgeon restoration facility as well as the oyster hatchery. Officially called UMCES Finfish Aquaculture Program at Horn Point Laboratory (HPL), the sturgeon restoration work and tour of the facility was lead by Ph.D. Candidate, Erin Markin. Sturgeon, prized for their roe (or caviar), once supported an important commercial fishery on the US East Coast. But their populations declined throughout the 20th century due to overfishing, and a moratorium was put in place in 1997. UMCES is working with several state and federal agencies to try and restore sturgeon populations to this region.



BIOLOGY OF FISHES (BIOL 407) continued

It was also a bonus to have an opportunity to visit the hatchery for Eastern oysters. We saw every aspect of this operation - one of the largest on the US East Coast - that produces hundreds of millions of live spat (juvenile oysters) each year. They released over 1.2 billion spat in 2013! HPL's oyster hatchery employs several SU graduates including Stephanie Tobash Alexander, Oyster Hatchery Manager, and Lisa Guy (pictured), the Algologist. The tour was excellent - we all learned a great deal about fish and shellfish.



Alumni Lisa Guy



PUBLICATIONS

Quillin, K., and S. Thomas. 2015. Drawing-to-Learn: A framework for using drawings to promote model-based reasoning in biology. *CBE-Life Sciences Education* 14: 1-16.

<http://www.lifescied.org/content/14/1/es2.full>

Do you draw phylogenetic trees in biology class? Mitosis and meiosis diagrams? Punnet squares? Graphs? Life cycles? These are all examples of visual models that students can use to understand ideas and solve problems---and that biology researchers can use to do science. Borrowing from insights learned from physics, chemistry, math, cognitive science, and elsewhere, this paper argues that drawing visual models is a science process skill that should be explicitly incorporated into the biology curriculum and amended to the Vision and Change core competency on Modeling and Simulation.

ALUMNI NEWS

One of our alumni, **Meghan Sochowski**, who is an Assateague State Park Ranger, just won (together with another ranger) the state's Valor Award. In Oct. 2104, they assisted with an unconscious diabetic camper at the park and after talking with the woman's boyfriend, determined she needed oral glucose. By administering that they prevented her from going into diabetic coma. The article stated that it is rare for the Valor Award to be given to park service personnel.

<http://www.delmarvanow.com/story/news/local/maryland/2015/03/17/assateague-rangers-honored-valor-medal/24927677/>

Editor: Dr. Dana L. Price

Coeditor: Dr. Judith Stribling

If you have announcements to add or general comments regarding the Newsletter, please email dlprice@salisbury.edu.