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Life Line - The Biology Department Newsletter

Biology and Earth Science

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Life Line March 2016

Otterbein Biology and Earth Science Department
biologyearthscidept@otterbein.edu

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Life Line

Volume 17

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March 2016

Welcome Spring 2016

Wow! What a time to start my tenure as department chair. There are so many exciting things happening that I can hardly keep up. Enrollment is up in all of our majors, and we are attracting more and more students from across the country. As chair, I am responsible for making the course schedule each year, and I had my work cut out for me making sure to have enough sections to accommodate our growing numbers. I am also so impressed with all the energy and excitement these students are bringing to Otterbein. Every time I turn around, I bump into someone who has just interviewed for another great internship or just returned from a conference where they presented their latest re-

search. Someone is always coming and going, whether it be traveling abroad with an Otterbein course, a semester exchange program, or as part of a research project. I feel proud to be part of such a vibrant community of learners.

Biology and Earth Science faculty have also been busy at work. We recently revised our curriculum to provide more flexibility for students and to ensure that they can seamlessly spend a semester away from campus for study abroad, internships or research. Plans are also in the works to begin a new Biology Club, which should help foster an even stronger sense of community among us, providing both social and intellectual activities. As you

peruse the newsletter, you'll note that people are developing innovative labs, publishing scientific articles with students, traveling abroad and making great achievements. Finally, we are so happy to welcome Dr. Beaux Berkeley as the newest faculty member of the department. She has been teaching in our Introductory Biology sequence as well as courses designed to serve our Zoo and Conservation Science majors. I'm particularly excited about her arrival because I finally have a colleague who finds feces as fascinating as I do!

*Dr. Sarah Bouchard,
Professor and Chairperson*

The Department of Biology and Earth Science Welcomes Dr. Elizabeth (Beaux) Berkeley

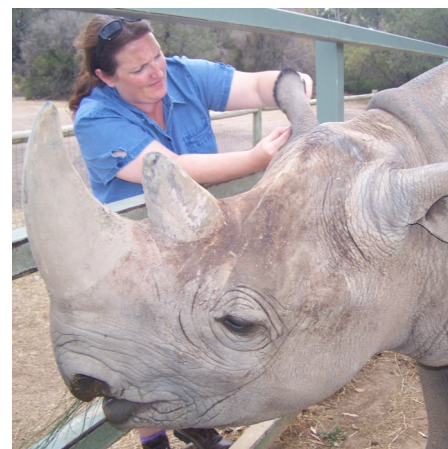
Elizabeth (Beaux) V. Berkeley joined the faculty in the Fall of 2015 as an Assistant Professor. Beaux (as she is known) teaches courses in Introductory Biology, Animal Reproduction, Wildlife Rehabilitation and Husbandry, Wildlife Veterinary Medicine, Conservation Biology and the Integrative Studies Program. Beaux received her B.S. in Biology from Hiram College, an M.S. in Veterinary Clinical Sciences from The Ohio State University then worked for several years before completing her Ph.D. in Evolutionary Ecology at Victoria University of Well-

ington in New Zealand.

She is a reproductive biologist with an interest in comparative reproductive physiology and endocrinology as applied to wildlife management and conservation. Her primary focus at Otterbein will be on non-invasive methodology for monitoring wildlife health and reproduction.

This coming summer, Beaux and several other department members will be traveling to South Africa to develop education and research opportunities for Otterbein students.

She is enjoying being back in



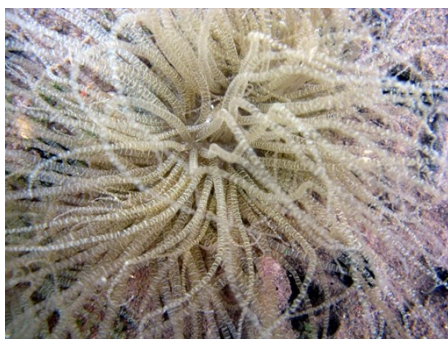
Ohio after not living in the state for 22 years, though she thinks Otterbein would be absolutely perfect if it was situated on the New Zealand coast.

She lives with two cats, Henry No! and a yet to be named fuzzy black cat.

Ben Titus '08 Receives NSF Dissertation Improvement Award

Ben Titus '08 came to Otterbein to play baseball, and not to become the marine scientist he is today. In the end though, both were important parts of his time at Otterbein. As the shortstop for three OAC championship teams, he held school records for the most hits and runs all-time, and was just a couple outs shy of reaching the Division 3 World Series in 2006. Along the way he also gravitated towards biology and had his appetite whetted for research by completing his Distinction thesis with Professor Hal Lescinsky on the coral reefs of Belize and the Dominican Republic. Little did he know when he arrived on the dock of Wee Wee Cay, Belize with his fellow Otterbein students that within seconds of hitting the water for his first snorkel that he would spy, inside a discarded conch shell, the focus of his PhD research.

Ben, after a Masters at Auburn, is now a PhD candidate at OSU, and is focusing on the corkscrew sea anemone that lives symbiotically



The corkscrew anemone (*Bartholomea annulata*)

with several species of shrimp on reefs. Think Nemo, except in the Caribbean and with cleaner shrimp instead of Clown Fish. The fascinating aspect of the anemone/shrimp bond to Titus is not the basic ecology, but rather whether the symbiotic bonds that link species together ecologically also link them

together evolutionarily. Using DNA analysis, he is exploring the genetic population structure of the anemone and the 5 species of shrimp- some of which live only with the corkscrew anemone while others use a number of anemone hosts, or no hosts at all. If physical changes such as shifting ocean currents and fluctuating sea level are the primary driving forces in the species evolution, then all species should diversify in parallel and have similar genetic structures.

Conversely, if ecological ties are driving evolution, then similarities in genetic structure among the various species should reflect the intensity of their symbiotic bonds.

Ben has now completed 10 research trips around the Caribbean to map the regional genetic make-up of the various species. At each tropical site he takes tissue samples for DNA analysis and then back in the lab of Meg Daly (Dept. EE0B, at OSU) he sequences the DNA and builds phylogenetic trees to establish how the species are diverging in different locations. For his Bermuda fieldwork, Ben provided a great opportunity for an Otterbein student as he took Eric Witt, to collect data for his Senior Project, while also serving as Ben's field assistant and dive buddy. To complete his work, Ben has just received a very prestigious NSF Dissertation Improvement Award that will allow him to sample at Flower Garden Bank in the Gulf of Mexico, and then complete next generation DNA sequencing on his samples to increase the genomic scope of his project. This is the only NSF research grant where a graduate student can serve as the principle investigator. The award comes at just the right time to help ease the stresses of graduate school life for him and his wife Jill (née Clark '08), who just greeted their



Ben and Jill Titus

second son several weeks ago.

For a fun look at Ben's work, check out his YouTube post: Reef Fish Cleaning Interactions, Bay Islands, Honduras (<https://www.youtube.com/watch?v=MejVf-2Yvik>). By hiding underwater Go-Pros near anemones, Ben was able to collect fascinating video of the shrimp as they swim out from their host anemones to clean parasites and dead scales from large fish. In addition to the great footage, the project also documented just how sensitive cleaning interactions are to the presence of divers (even ones who think they are inconspicuously hiding). This points out an unexpected consequence of diving tourism- visitors have many indirect effects on the behavior and ecology of the organisms they have come to watch and some of these may be important to the health and conservation of reefs.



Fieldwork in Bermuda

Neptune Travels to Panama for Research

Traveling to another country was always a dream for Troy Neptune, but it was not until recently that their dreams became their reality. After assisting in Dr. Sarah Bouchard's lab for a few semesters, Troy was finally asked if they would want to travel to Gamboa, Panama, to study red-eyed treefrogs. Their initial reaction was disbelief, but they soon found themselves waking up to the vocalizations of tropical birds in their cozy apartment.

This six-week journey was a life-changing experience for Troy, who had barely been off their family's cattle farm growing up in rural Ohio. The primary objective of the trip was to gather data on the nutritional ecology of red-eyed treefrogs and begin part of their Honors research. The study looked at the digestive physiology of this tropical anuran and how it changed with different environmental pressures, namely food availability and predation risk.

Although the trip focused on this research, Troy learned so much more about biology, people, and life. Their

roommates and friends studied a variety of animals, and they filled them in on the details each night at the dinner table. This had become one of the best parts of the trip. Troy's interactions with animals did not stop at frogs, as they saw animals ranging from tamanduas and sloths to turtle-eating spiders and people-chasing white-faced capuchins.

Despite the extreme heat and biting insects, the trip was incredibly rewarding to Troy. They kept a journal to reflect upon their days and a sketchbook to capture any bursts of



creativity. They developed close relationships with their friends that they met in Panama and were able to reunite with some of them when attending the 2016 Society for Integrative and Comparative Biology (SICB) conference in Portland, Oregon, in January.

Ever since traveling, Troy has been yearning to go somewhere else, and Graduate School may provide that experience once they graduate from Otterbein. Panama has most certainly changed Troy and touched their heart. Their passion for animals and conservation will continue to drive their future.

Editor's note: Troy identifies outside the gender binary and prefers they/their pronouns.



Troy Neptune and Caitlyn Rahe in Panama

Teaching Science with Art

In Comparative Vertebrate Anatomy this Spring, students were asked to *find their inner animals*. This was an exercise in anthropomorphism – where certain animals are given specific human personality traits. The goal of this artistic, introspective exercise was to combine the anatomical structures on a head of the bones and the skin of 2 – 3 animals with whom the student shared personality characteristics.

Students produced an assortment of chimeras – a lion/deer, a cheetah/bear, and an eagle/mouse, as well as many other interesting and improbable combinations. With these sculptures, the students explored how the animals' boney and integument features, like teeth, develop structurally and why they look the way they do. The students answered a multitude of questions through this exercise including: how do feathers



grow?, why is Cardy the Cardinal red and black?, how do chameleons change their color?, how do deer antlers grow?, why are polar bears white?, and is that

a "horn" on the narwhal? Perhaps some of these biology students should consider a double major in art.

Dr. David Sheridan

Todd Cooper is a *Fungi*

Gary "Todd" Cooper '05 finished a Ph.D. in plant pathology from the University of Florida. The title of Todd's thesis was "*Morphological and Molecular Characterization of Novel Poclum Fungi Isolated from Turfgrass in Florida*". His thesis focused on characterizing a sterile fungal species and included both a morphological description of the fungal cultural characteristics, as well as a synthesis of taxonomic sequence data for phylogenetic analyses. Todd appreciates his broad-based, rigorous preparation in the biology department. He states that "students were continuously challenged to perform at a level beyond

undergraduate expectations. It wasn't enough to regurgitate information... we had to demonstrate competency in concepts....the way [the curriculum] was taught prepared us for entering graduate school." Currently, Todd is a research and development scientist for Sygenta Inc. where he develops and evaluates products for disease and weed control. Todd lives in Florida with his wife Aimee ('05) who also graduated from the department. Aimee worked for 10 years for the University of Florida on invasive plant studies in the 10,000 islands area and the Everglades of south Florida. Currently, Aimee is working with a lab on novel propagation methods for



Todd and Aimee (Zarbaugh) Cooper at Otterbein graduation ceremony 2005.

plants. She also volunteers with aquarium Smithsonian Institute (Ft. Pierce) and has an intense passion for marine biology.

Valuable Summer Research Opportunities Lead to Significant Student Success

Summer provides the opportunity for valuable undergraduate research experience. Uninterrupted research means significant learning gains, time to finish a challenging project and the opening of doors for future opportunities. Immediately following his freshman year, Biochemistry and Molecular Biology (BMB) major Sean Kirk conducted research this past summer at Duquesne University. Through a collaboration between Otterbein and Duquesne, Sean committed to ten weeks of full-time research alongside graduate students, post-doctoral fellows and other undergraduates from around the country. Sean was exposed to weekly seminars, safety and ethics training, and a service-learning project during his 10-week stay. Sean presented his research at the end of the summer in a multi-disciplinary STEM poster session in Pittsburgh. He returned to the Bennett lab this fall to continue this research on characterizing the developmental genes that he was able to identify during the summer. Sean stated "Research at Duquesne last summer was such a great opportunity. Participating in summer research is the best way to really see what it's like to have a career in research."

Senior BMB and Equine/Pre-vet major Morgan Stark was awarded a prestigious American Society for Microbiology (ASM) Undergraduate Research Fellowship to pursue ten weeks of full-time research this past

summer in the Bennett Lab. Morgan was also awarded an American Society for Biochemistry and Molecular Biology (ASBMB) Summer Undergraduate Research Award for Research Supplies as well as an Otterbein Student Research Fund Award. Through these awards, Morgan was able to perform techniques that are rarely available to undergraduates. She performed a Next Generation Sequencing technique referred to as RNA sequencing, or RNA-seq, which allows scientists to examine the global gene expression patterns of a particular organism. In this case, Morgan was able to study the levels of gene expression for the nearly 8,000 genes of the pharmacologically relevant soil bacterium, *Streptomyces coelicolor*. She compared gene expression patterns for three strains, the wild type (normal) strain and two mutant strains. The data set she was able to generate for this project is enormous and has revealed numerous novel genes that are likely to be involved in *Streptomyces* cell signaling and have never been characterized. The data is included in her Senior Honors Thesis and will be submitted for publication in an internationally respected scientific journal in the near future. "Participating in summer research allowed me to focus exclusively on my honors thesis research. It gave me the opportunity to advance my project by learning new skills in the lab." Morgan is currently extending her



RNA research to Real Time PCR with Otterbein's newly acquired machine in order to verify the expression levels for some individual genes of interest.

Both Morgan and Sean will present their research at the 2016 ASM Microbe, a national scientific conference to be held in Boston this June. Breanna Brown, a BMB and Equine/Pre-vet major, also spent the summer performing undergraduate research at Otterbein in the Bennett Lab. She will defend a Senior Distinction Thesis in March and will travel to the ASBMB 2016 Annual Meeting in San Diego this April to present her research. BMB majors Grant Snow, Pia Repuyan and Will King have also continued their summer research throughout the academic year and plan to present their data at the ASM Ohio Branch Meeting at the Procter and Gamble Mason Business Center near Cincinnati in April. The opportunity to participate in a summer research experience has been a tremendous advantage to Dr. Bennett's students who will most certainly continue to excel in the future.

Dr. Jennifer Bennett

Eisenbarth Studied in Australia for a Semester

My name is Mara Eisenbarth and I am a Junior Zoo and Conservation Science major at Otterbein University. Last spring semester I had the amazing opportunity to study abroad in Perth, Western Australia along with an internship at the Perth Zoo.

While living in Perth and working with the Perth zookeepers, I learned so many things about myself and my future career path. Here are just a few of those:

One of my discovered passions is formally and informally talking to people. While a keeper was giving a close encounter talk to a couple in the Galapagos Tortoise exhibit, I got to chat to a few five year old's and their mothers about the beautiful creatures and just felt truly happy sharing my love and knowledge of the animals. This was only one instance that repeated itself over the six or seven weeks I was there. You know you're on the right career path when you get that feeling of just pure joy while doing your job.

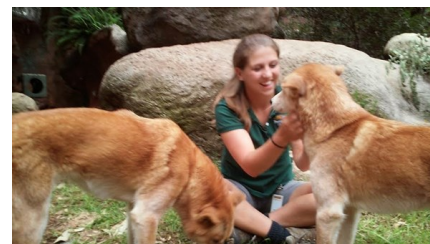
At the end of every day, the keeper that I was working with would

ask me if I had a good day. Of course I always answered with 'absolutely!' even if it had been the most chaotic and stressful day and I went home and crumpled into a heap on my bed. At the end of every day, I had the same feeling in my heart and I discovered that feeling to be satisfaction.

Whether 'doing my job' meant scooping up giraffe poop or getting to pet a rhino, every single second of it put a smile across my face from ear to ear.

After one particularly exciting day, I wrote this next bit in a blog post:

"As the day went on, I was able to give a hyena a good scratch, and a southern white rhino a nice muddy pat, as well as see some painted dogs up close and personal. While those



things are absolutely amazing, it was my keeper who was truly inspiring. She just kept getting more wonderful by the minute. Jess has been in the business for about 8 years, but still has the enthusiasm of us students. Everything fascinated her, including experiences with animals that she has every day. It really made me think and hope that someday, that's how I'll be: showing future generations just how wonderful every animal experience is, and that every moment should be cherished."

Living and working in Perth helped me to fully realize my love of animals, and solidified that my choice to become a zookeeper was the right one. That experience has changed me forever, and I can't wait to go back again someday.

Michael Hoggarth Takes on a New Role: Faculty/Staff Chair of the Comprehensive Campaign for Otterbein

Let's start by saying that anyone who reads this newsletter is off the hook for giving as far as Dr. Hoggarth is concerned. His charge is to help faculty and staff at the University see the value in giving, to make it easy to give, and to make it worthwhile to give. A couple of the conditions given when asked to take on this responsibility was that information would be forthcoming about how we are doing and that the community would have a part in the implementation of the campaign. So let me just provide some data: the national average for giving at 4-year, liberal arts colleges is 26% of faculty/staff (National Education Association) and last year (the first year of the public phase of the campaign) our participation rate was nearly 50%! We nearly doubled the percentage of

faculty and staff who give to their institutions. What that says about our faculty and staff is enormous! These fine people are committed to the university and to each other. We have a wonderful community here, composed of students, administrators, academic staff, and faculty, who live our mission of educating the whole person (even in philanthropy) in a context that fosters the development of humane values. If you are a future student reading this, then we hope this kind of community is what you are looking for. If you are a graduate reading this, then you already know the value of the community on this campus. So, one last comment – and this is for alumni out there – the campaign includes two endowments in the Biology and Earth Science Department: one of them funds faculty

research and the other funds student travel. Anyone can donate to these endowed funds. If you worked on a research project with a faculty member while on campus, you could help make that happen for other students. If you traveled and wondered where the funds were going to come from, then help make that happen for current and future students. Finally, if you do either, let us know. We would love to acknowledge the gift and, if permitted, the giver. The two funds are:

- The Department of Biology and Earth Science Faculty Research Endowed Fund
- The Department of Biology and Earth Science Student Travel Endowed Fund

www.otterbein.edu/stand

Mansfield and Otterbein Universities Collaborate to Assess the Impacts of Fracing on Groundwater in Tioga County, PA

Drs. Paul Wendel, Kevin Svitana (Otterbein) and Michele Conrad (Mansfield) and senior Scott Shipkowsky '16 presented the results of a comprehensive groundwater quality assessment to the Tioga County Board of Commissioners on February 12, 2016. The project was initiated by Dr. Wendel in 2010 to identify potential impacts to groundwater resulting from the hydraulic fracturing (fracing) associated with the enhanced recovery of natural gas from the Devonian Marcellus Shale and the project has grown into a multi-year collaboration between Mansfield University and Otterbein. In 2014 Dr. Svitana added his geologic and groundwater expertise to the project team.

Mansfield University is located in Mansfield Pennsylvania, which is the Tioga county seat. The Marcellus Shale underlies the entire county and drilling for gas production exploded in 2008. Since 2008 more than 700 wells which includes horizontal laterals paralleling the shale bedding, were drilled and fraced to enhance gas production from the Marcellus Shale. In response to public concerns, Dr. Wendel initiated a groundwater sampling effort to identify potential impacts to near-surface groundwater

supplies proximal to the shale gas well head locations. In 2014 an expanded sampling program was proposed to the county commissioners and funding for the program was granted in 2015.

The 2015 study was designed by Drs. Wendel and Svitana in conjunction with chemistry faculty at Mansfield University (Drs. Michele Conrad and Shaker Ramasamy). The expanded study included sampling of the original 98 homeowner wells for 10 metals, three anions, alkalinity and methane. Sampling was completed by a group of Mansfield chemistry students who also assisted Dr. Conrad with the analysis of the water samples. The goal was to bias samples to the homeowners' water wells that were within 400 meters of Marcellus wells that were fraced. The biasing was intended to determine if either brine or methane associated with blow-backwater have affected the homeowner water supplies.

The statistical assessment of the home wells water quality parameters found no valid statistical differences when compared to the 2015 sampling results and historic groundwater results published by the Pennsylvania Geological Survey in 1998. There were more detections of low levels of methane in wells within the 400 meter radius of the gas wells, but these



didn't present a clear statistical trend. Only one well had methane present at concentrations that exceed various agencies and organizations recommended action levels (10 ppm), and this well was known to contain methane at elevated levels prior to the onset of well fracing. To date, the study results suggest that there have been no impacts to groundwater as a result of fracing activities.

At the conclusion of the presentation the county commissioners indicated that they are interested in continuing the study. The Otterbein and Mansfield team are preparing a proposal to repeat the study in the summer of 2017.

Department Featured as Academic Spotlight at Homecoming 2015

The Department of Biology and Earth Science held an open house at Homecoming in September, 2015. On Friday afternoon, 16 of our students shared internship and research experiences with a poster presentation. On Saturday, Alumni, families and friends visited the Science Center to see first hand where our students study and to have some family-friendly fun in the labs. Stations included Aviary Observation, Mussel Show and Tell, Skulls and Fossils, Bones and X-rays, Botanical Surprises, Microscopes, DNA Extraction, and Grip Strength. Alumni Relations helped us host a delicious picnic at noon on the patio. Check out the photos of the fun here and on the back page of this newsletter or at the link below:

<https://flic.kr/s/aHskm78gTP>



Students Intern in China

Last summer, Macie Smith and myself were given the opportunity to intern at the *Chengdu Research Base of Giant Panda Breeding*. Our main task was to devise an ethogram that will be utilized for future years, as part of an ongoing study on panda personalities. After constructing the ethogram, we spent over four weeks watching the one-year-old giant panda cubs and recording their behaviors. Not only did we observe the cubs on a daily basis, but we also built enrichment for them. In addition, we were able to assist in hormonal analyses of the red pandas by collecting their feces, as well as observe several training sessions.

Aside from spending most of our days at the panda base, we did a bit of adventuring around the area. We went to a variety of places in Chengdu, from the Sichuan Radio Tower to the Global Center. The two of us also traveled a bit outside of the city, spending a few days hiking Mt. Emei and visiting Leshan's Giant Buddha.

Exploring the culture of China was one of my favorite parts. We were able to try on Chinese dresses, visit multiple temples, go to the Sichuan Opera, and of course use chopsticks! Many people offered to take us to eat and give us a taste of what the country had to offer. Chengdu is famous for the traditional dish called 'hot pot' which is essentially a large bowl of spicy broth with various meats and vegetables. Not only did I enjoy hot pot, I also loved eating their breakfast dumplings, baozi.

Macie and I would not have had the experience we did if it were not for all the kind people we met. By watching the pandas each day, we were able to interact with people from all over the world. A few students from Southwest Jiatong University spent time with us on the weekends, teaching us Chinese and showing us around the area. The staff at the panda base were also very helpful with overseeing us through the project and enjoying life in Chengdu. Overall, I thoroughly enjoyed my time in China. Every day I



Macie (left) and me (right) posing with one of the red pandas, Xiao Qi.

miss the food, people, and of course the pandas! I am truly grateful to have been given the chance to intern at the panda base and enjoy a whole new world! To read more about the adventures we had, as well as some of our fellow classmates' summer experiences, please visit <http://zooandconservationscienceinternships.blogspot.com/>.

Kelly Jackson, Zoo and Conservation Science '17

A Continuing Story – Big Walnut Creek Mussels

In the summer of 2013, Michael Grumney '14 began a study of the mussel of lower Big Walnut Creek (downstream of Hoover Reservoir) that has kept some of our students and myself pretty busy. What Michael and I discovered was that the distribution and abundance of mussels in the lower creek could be divided into almost equal 12 mile thirds: the upper 12 stream miles had retained in mussel diversity, the middle 12 miles (more or less centered on Three Rivers MetroPark) had lost most of its diversity, and the final 12 stream miles had lost and subsequently regained some of its diversity. Since that original study we have been trying to figure out why the middle section hasn't improved. In the summer of 2014, Jared Ellenbogen '15 looked at land use practices in the watershed as a predictor of mussel community parameters and were unable to find landscape measures that could predict the mussel communities. We concluded that adjacent land use

factors were not currently impacting the water quality of the creek or the mussels in the stream. So – water quality wasn't the problem. This past summer, Trevor Smoot '16, well, he still has a paper to write and a couple presentations to give, but I think he'll make it) and I looked at fish diversity in the lower creek. Ohio EPA had done some fish and invertebrate analysis in 2000 and found most of this section of the creek to meet Exceptional Warmwater Habitat Criteria, but we wanted to see if fish (fish serve as hosts for the larvae of mussels) communities could predict mussel communities, and again it was not the case. Fifteen years after Ohio EPA did their work; the fish communities still meet the same high standards and show excellent diversity throughout the reach. As a side note (for those fish people out there) we even had a couple sites where bluebreast darters were one of the dominant species – and bluebreasts were not found in 2000! So – symbioses (and in this case fish hosts for mussel glochidia) weren't the problem. This

next summer, with a small grant from the Friends of Big Walnut Creek, Drs. Joan Esson (Chemistry), Kevin Svitana (Environmental Science), and I will work with three students (Hadley Quinn, Nate Hess, and Kierra Lathrop) to examine the chemistry (Quinn and Esson) and composition (Hess and Svitana) of sediment related to very localized mussel community structure (Lathrop and Hoggarth). Aquatic organisms, like all organisms, integrate three ecologically important aspects of their environments: the quality of the water they live in (for us it would be the air), the symbioses that occur within a habitat (no insectivorous fish without a healthy insect population), and the quality of the habitats available. I believe we have good data to suggest recovery of the mussel communities in the middle portion of Big Walnut Creek is not hampered by water quality or the fish community: habitat is the next logical piece in this puzzle.

Michael Hoggarth

Alumni News

Congratulations to our recent alumni whose data from their senior theses were published in peer-reviewed journals. Chelsea Jenny O'Leary '13, Lindsay Wargelin '13, Kadeen Jennings '14 and Whitney Rodriguez '14 travelled with Dr. Bouchard to the Smithsonian Tropical Research Institute in Gamboa, Panama to investigate the effects of different environmental conditions on growth and development of tadpoles of red-eyed treefrogs. As part of their explorations with Dr. Bouchard, they collected eggs and reared tadpoles in large outdoor tanks under different environmental conditions. Their ultimate goal was to determine what these differences mean to frogs who ultimately venture into the rainforest. One of their finding was that intense tadpole competition for food induces increases in gut length. For more information, check out the papers below:

Bouchard, S.S., O'Leary, C.J., Wargelin, L.J., Rodriguez, W.B., Jennings, K.X., Warkentin K.M. 2015. Alternative competition-induced digestive strategies yield equal growth, but constrain compensatory growth in red-eyed treefrog larvae. *Journal of Experimental Zoology* 323: 778-788.

Bouchard, S.S., O'Leary, C.J., Wargelin, L.J., Charbonnier, J.F., and K. Warkentin. 2015. Post-metamorphic carry-over effects of larval digestive plasticity. *Functional Ecology* DOI: 10.1111/1365-2435.12501

Danielle O'Callaghan '14 and Stacey Schall '10 worked in Dr. Lehman's lab to address a debilitating condition in horses that occurs due to the consumption of wilted maple leaves (red maple leaf toxicosis). Their objective was to evaluate the protective effect of equine dietary supplementation with the antioxidants vitamin C and E on damage to equine erythrocytes when challenged by extracts of wilted red maple leaves in bioassays. Their results support that the red maple toxin is a strong oxidant whose effect on cellular damage of equine blood cells can be partially reduced by dietary supplementation with vitamin C and E. For more information check out the paper below:

D.K. O'Callaghan, S.A. Schall, S.S.W. Birmingham, and J.S. Lehman- 2015. Protective effects of ascorbic acid and α -tocopherol on the *in vitro* oxidation of equine erythrocytes caused by extracts of wilted red maple leaves. *Journal of Equine Veterinary Science* 35: 940-946

Faculty Forming Partnerships in Africa

This past summer, Drs. Anna Young and Kevin Svitana traveled to Africa to investigate future partnerships. Dr. Young would like to develop an exchange of faculty who work in conservation research. She also arranged internships for two Otterbein students with the Cape Parrot Project this summer. Drs. Beaux Berkeley, Hal Lescinsky, and Sarah Bouchard will join Dr. Young this summer in Africa with the support of the International Faculty Collaborative Grant at Otterbein.

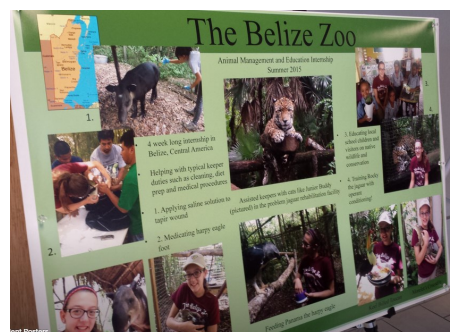


Drs. Gayle Walker (Music), Jaqueline Haverkamp (Nursing), Kevin Svitana, and Anna Young on the Southern Coast of Africa.



African elephant at Addo National Park

Homecoming 2015 Photos (cont'd from page 6)



Future News

The Zoo and Conservation Science Program is hosting a Women of Conservation Summit on campus on Oct. 13 and 14, 2016 featuring women in conservation leadership roles from all over the world talking about their work and their career path.



OTTERBEIN
UNIVERSITY

Department of Biology and Earth Science

1 S. Grove St.

Westerville, OH 43081

Phone: 614-823-1517

E-mail: drhodgeback@otterbein.edu