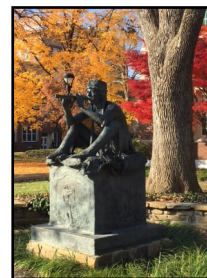




BioNews 2018

Department of Biology
Pittsburg State University



Dr. Virginia Rider, Chair — 1

Dr. Joe Arruda — 3

Dr. Christine Brodsky — 4

Dr. Andrew George — 5

Dr. Anu Ghosh — 7

Dr. Phillip Harries — 8

Delia Lister — 9

Dr. Hermann

Nonnenmacher — 10

Dr. Mandy Peak Bryan — 11

Dr. Dixie Smith — 12

Dr. Neil Snow — 13

Dr. James Whitney — 14

Alumni Updates — 15

Professional Activities — 15

In the Lab and Field — 18



Goldenrod soldier beetles on goldenrod at the Monahan.
(Photo: A. George)

From The Chair's Desk

Greetings to all friends of the Biology Department.

Another year of success for students who applied to a variety of professional schools, including: John Allen (UMKC Dental School), Wesley Brantly (OSU, medical school), Andreas Brestel (ARCOM, medical school), Gage Davies (KUMC, medical school), Savannah Dennett, (KUMC, Rural Scholars), Zachary Denton (KUMC, medical school), Kylie Gafford (PA school, Wichita),

Carlín Green (ARCOM, medical school), Lacey Greve (KUMC, medical school), Nate Grimaldi (KCU, medical school), Huang Haerdtle (University of Pecs, Hungary, medical school) Arli Hendrix (PA program, St. Louis), Alex Hill (KUMC, medical school), Brandy Lawrence (OSU, Vet School), Katelyn Main (ARCOM, medical school), Rosa Mendez (KUMC, medical school), Elias Mitchell (KUMC, medical school) Morgan Needham (ARCOM, medical school), Haley Northcutt (PA, Wichita), Oleksandra Pashchenko (Dartmouth, medical school) Ginger Pond (PA, UT San Antonio), Sierra Schupbach (OSU, medical school), Leslie VanLoenen, PA, Wichita), Dylan York (AT Stills, medical school) Congratulations to all. If I have overlooked anyone, please let me know as we enjoy following you and your career successes.

It has been my privilege to serve as the lead premedical advisor since I joined the Faculty in Biology in the year 2000. This fall semester, I agreed to step into the position of Chair. I know this may surprise many of you, but I think in this time of shrinking budgets and limited resources, my skill sets seem perfect for the job. I knew that decision would require stepping down as the lead premedical advisor. I would have found this very difficult to do but the two volunteers who agreed to step up, Dr. Mandy Peak and Dr. Phil Harris, made it easy for me to step down. Dr. Peak will assume responsibility for pre-health II/III in the spring and Dr. Harries for prehealth I in the fall. I am excited to see these two excellent mentors grow the program and retain its reputation for excellence. Drs. Peak and Harries will assume tracking responsibilities and in the next newsletter, they will report on student success.

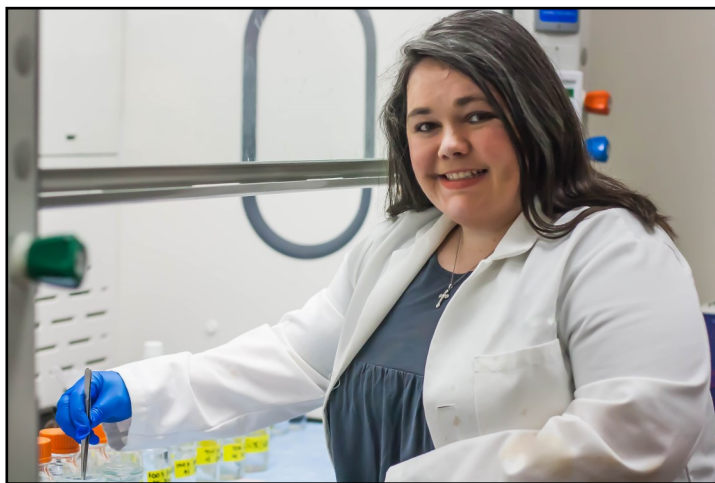


The Department is very grateful to Dr. Dixie Smith, who served as Chair for the last 7 years. Dr. Smith gave up a lot of her own interests to take care of all of the faculty. We are most appreciative of her service.

Dr. Neil Snow garnered a sizeable grant from the National Science Foundation. He will be digitizing plant specimens in the Sperry Herbarium. Dr. Snow's work in this area will provide a historical record of the plants found in our local area. The Herbarium will be moving from Heckert Wells to Hartman. It is a large undertaking but will increase space for Herbarium samples and allow plants to be prepared in a separate room. Delia Lister received an award from Westar Energy to support Nature Reach. I want to highlight a few points about Nature Reach that may be new information for you. Pre-veterinary students are learning how to handle exotic animals by volunteering to be animal caretakers. We have enjoyed a sizeable increase in the number of pre-veterinary students and Dr. Ghosh has agreed to serve as the lead advisor to accommodate their needs. To my surprise, I discovered that Delia presents more than 100 programs per year to young people in the surrounding communities. Her outreach programs are wonderful public relations for the Department and for raising awareness about biology.

The Biology faculty have been productive this year and their publications are on display in the cabinet outside of the Dean's office. Authors with 2017- 2018 publications included Drs. Arruda, Brodsky, George, Ghosh, Nonnenmacher, Rider, Snow and Whitney. Dr. Arruda's publication was highlighted at the annual author's reception for university publications in November. The 16th Annual K-INBRE Symposium was held at the Overland Park Sheraton Hotel. There was a total of 156 posters and several Pittstate students garnered awards for their presentations. There were 42 attendees from PittState at the meeting. President Steve Scott, Provost Lynette Olson, and Deans Mary Carol Pomatto and Pawan Kahol were able to attend the symposium this year. Dr. Kahol set up a table that highlighted graduate programs at Pitt State. Saturday evening, Dr. Scott thanked the K-INBRE for its support of research on the Pitt State campus. He then introduced me as the recipient of the Joan S. Hunt distinguished mentoring Award. It was indeed one of the most memorable honors of my career. Thanks to all

of the K-INBRE students for presenting their research and to the faculty mentors who supervised the research and attended the meeting. We are excited to report that the K-INBRE renewal will be funded by National Institutes of Health for another 5 years.



Ashleigh Elbert working in Dr. Rider's lab.

For the first time this year, faculty and student publications, presentations, posters, and abstracts are listed towards the end of the newsletter (pp. 14–16). Importantly, active research projects across the field and cell/molecular areas provide increased opportunities for student in Biology to explore and develop skills that are important regardless of their long term goals. We are very lucky to have an outstanding number of students come to the Biology Department for their higher education. The faculty in the field programs, Drs. Arruda, Brodsky, George, Nonnenmacher, Smith, Snow and Whitney are attracting both undergraduate and graduate students to campus. Please check out the revised field curriculum on the Biology website. The changes in course offerings benefit all of the biology students. The cell/molecular faculty in the Department, Drs. Chung, Dawson, Ghosh, Harries, Peak, Schmidt and Zurek have helped prepare hundreds of student for professional schools. More than 17 health care professionals have returned to the Pittsburg-Joplin area to practice since I have been tracking students (2001). I was asked the other day what I thought about the Biology Department and my response was "Biology rocks". We do because the faculty and students are simply the best.

Please stop by and visit anytime you are in the area.



K-INBRE awards reception. L→R: Drs. Christine Brodsky-Rega, Peter Chung, Mandy Peak Bryan, Phil Harries, Dean Mary Carol Pomatto, Dean Pawan Kahol, Virginia Rider (recipient of the Joan S. Hunt Distinguished Mentor Award), Tuhina Banejee (Dept of Chemistry), PSU President Steve Scott, Provost Lynette Olson, Anu Ghosh, and Santimukul Santra (Dept of Chemistry).

From Dr. Joe Arruda



Greeting to all of our alumni and friends.

Changes coming...

I'll soon be joined by Dr. Hermann Nonnenmacher in Principles of Biology II. I'll get to teach the entire course, rather than just the animal half and I am looking forward to that - a truly "integrated" or-

ganismic biology.

Anticipating retirement soon, my departmental assessment data-gathering work has been delegated (with some arm-twisting) to Dr. James Whitney. The data will be in good hands. I continue to wrangle our Facebook page, now with valuable contributions

from Dr. Peak.

I have wrapped up the Kansas land snail survey. The two new species - the Bladetooth Wedge (*Xolotrema fosteri*) and the Perforate Dome (*Ventridens demissus*) - were reported in the *Transactions of the Kansas Academy of Science* in a paper entitled "Two new land snail species in Kansas", Vol. 121, no. 1-2, p. 98 - 102 (2018). There are at least 3 other newbies, but they are represented by single specimens not in the best condition.

Best of all, the snail work was put into a publication of the Great Plains Nature Center - *A Pocket Guide to Kansas Land Snails*. Find out about it <http://gpnc.org/gift-shop/publications/>.

I spent most of the summer 2018 going through the entire land snail collection and sent it all - 1,565 accessions with 8,840 specimens - to two large museums for permanent care - the Carnegie Museum of

of Natural History (Pittsburgh) and the Field Museum of Natural History (Chicago).

I am teaching Limnology this Fall (2018) for the last time. Spring 2019 will be Environmental Protection for the last time and Fall 2019, probably Water Quality Monitoring (if it makes enrollment) for the last time. I've already passed other courses I initiated on to new faculty (Stream Ecology to Dr. Whitney and Environmental Health to Dr. Gosh). Tick tock.

But, the field program is stronger than ever with the new field faculty. They are busy taking care of business - new and interesting courses and strong research focus using undergraduates and graduates. There is even a field student organization now and a revised curriculum.

My best to all,

Dr. Joe Arruda

few! I am especially lucky to have worked with Kelly, Robin, Emily and Kylie, three of whom graduated last spring and nominated me for the university's Outstanding Undergraduate Research Mentor award. I was incredibly touched to receive that award, yet I miss having all of them in my classes and doing research in my lab.



Dr. Brodsky at the Cape of Good Hope during the International Network for Urban Biodiversity and Design in Cape Town, South Africa

From Dr. Christine Brodsky



Hello everyone!

Wow, I can't believe the year is drawing to a close because it feels just like yesterday when we rang in 2018. This year has flown by for me, quite

literally, with the amount of traveling I did these past two semesters - 6 conferences in 6 cities, 15 conference presentations by myself and my students, and 24 hours in the air on my flights to Cape Town.

The year has been jam-packed with really interesting and fun research projects that I've been working on with a number of Biology and SSRM students. From an international urban biodiversity collaboration group to a study on mined land ecology in Pittsburg, my research has spanned a number of different taxa and geographical locations this year. Our undergraduate student researchers have done some phenomenal work - Rachel Wood, Jake Wright, Kelly Mallatt, Robin Goodreau, Emily Fry, and Kylie Carnahan to name a

I welcomed a new graduate student to my lab, Amy Hammesfahr. She'll be working with the Missouri Department of Conservation to determine habitat requirements for three threatened bat species in southern Missouri. She had her preliminary field season this past summer and will be looking for some student field assistance this summer. I had a blast visiting her on site back in June to help her mist net some bats! My other graduate student, Katie McMurry, is wrapping up her Master's research and will present her thesis next semester - keep an eye out for her presentation in the spring!

I've been having a ball with my courses this year. Last spring, I offered Human Dimensions of Natural Resource Management for the first time. In that class, we worked with the director of the Southeast Kansas Nature Center to conduct a survey on park visitors and their perception of nature. Students in the class conducted the survey and presented the results to the nature center's director, which was a nice way to tie in what we were learning in class to a real-world hands-on experience. This semester, I'm teaching the second year of field orientation and Mammalogy. Both classes have been really great - I love meeting our new field biology students and our Mammalogy class has been a lot of fun.

We have spent the semester trapping small mammals in our field properties and analyzing the data. Another great hands-on research project in class!

On a personal note, my husband and I are continuing to settle into our new house in Joplin, finishing off home improvement projects here and there. We welcomed a new member to our family back in May, our now-9 month-old hound/black lab puppy, Molly. She's been quite the energetic, shoe-eating dog.



Robin Goodreau, Christine Brodsky, Summer King, and Kylie Carnahan surveying birds at Tar Creek Superfund Site

We had a very busy summer and year with traveling to eight weddings of friends and family, so we are looking forward to a quiet and relaxing Winter Break.

I hope everyone has a great academic year and successful semester!

From Dr. Andrew George



Hello, Everyone.

Once again, this year has been full of activities - more, in fact, than could possibly fit into this newsletter! Here are a few highlights:

In late March, I took my ornithology class to south-central Nebraska to observe sandhill

cranes staging on the Platte River. The crane migration has been described as one of North America's greatest wildlife spectacles. Each spring, approximately 500,000 cranes (80% of the world population) converge on a relatively small stretch of river, where they rest and refuel before heading to their breeding grounds farther north. The air temperature was 11°F

when we arrived at the viewing platform before sunrise on the first day, but the experience was well worth the cold. The students appreciated the sights and sounds of being in such close proximity to thousands of cranes as they took flight against the dawn sky. During the days we visited several other wildlife areas, including an active greater prairie chicken lek.

The PSU Wildlife and Fisheries Society was formed in late 2017 under the guidance of grad student Michael Barnes, and has quickly become one of the most active groups on campus. The students are gaining valuable experience nearly every month as they work alongside professional biologists on diverse projects. In April and July, members joined me to participate in the spring and summer field trips of the Kansas Herpetological Society. A late winter storm cut the spring trip short, but not before we had a good morning of collecting reptiles and amphibians in the bitter cold!



Michael Barnes, Rachel Wood, Andrew George, David Hollie, Deaundre Puritty, Maggie Murray, Jake Wright, and Madeline Gay at the Kansas Ornithological Society meeting in Lawrence.

In September, seven members assisted me and a group of bat researchers with a multi-year bat banding project in eastern Oklahoma. The club has assisted agency biologists with chronic-wasting disease sampling, prescribed fires, amphibian surveys, deer spotlight surveys, bat-sampling, habitat restoration projects, and more.

The Pittsburg gray bat project has continued to grow. Undergrads Jake Wright and Josh Holloway spent the summer monitoring the colony using the infrared video system that we developed last year. In addition we are testing the bats for white-nose syndrome by collecting samples directly from hibernating bats, and

from guano. White-nose syndrome was detected elsewhere in Kansas for the first time in 2018, but so far our Pittsburg samples have been negative. Undergrad Ryan McGinty is taking the lead on a new project to determine whether the microclimate of the roost is suitable for the fungus that causes white-nose syndrome. Our gray bat research was recently featured on KOAM, and in the Joplin Globe, and shared to many regional outlets via the Associated Press. For more info and photos, check out those sources or the PSU news release. Most of the gray bat work is being supported by grants from the Kansas Department of Wildlife (KDWPT).



Robin Goodreau and Michael Barnes study gray bats near Pittsburg.

Grad students David Hollie and Michael Barnes completed the second field season of their thesis research with the Missouri Ozark Forest Ecosystem Project (MOFEP). Established in 1989, MOFEP is a long-term, landscape-scale experiment aimed at understanding the effects of forest management on upland hardwood ecosystems. David and Michael are using advanced statistical models to evaluate how silvicultural treatments affect bird densities and community composition at different spatial and temporal scales. They anticipate finishing up in 2019.

Other student research highlights that I will only mention briefly: undergrads Rachel Wood and Jake Wright spent the summer working on a new long-term bird- and herpetofauna-monitoring project that Dr. Brodsky and I began in 2018. We hope that the data can be used to inform future restoration efforts on reclaimed mined lands. Students working on this

and the aforementioned projects gave several talks and poster presentations this year at the Kansas Natural Resource Conference, and annual meetings of the Kansas Herpetological Society and Kansas Ornithological Society, in Manhattan, Lawrence, and Emporia, respectively.

Southeast Kansas Biological Station

In March of this year, members of the PSU Wildlife and Fisheries Society, with help from local firefighters, conducted a prescribed burn on the Monahan Outdoor Education Center. The Monahan had not been burned in several years. We are in the early stages of implementing a management plan for the Monahan and other field sites that includes prescribed fire, haying, and mowing. The sites are increasingly being used for research and teaching activities. Nearly every “field” class in 2018 made visits to the sites.



A prescribed burn at the Monahan Outdoor Education Center in early March.

Curriculum overhaul

Fall 2018 saw the implementation of several major changes to our biology curricula. Our “field biology” students now have the option to earn their degrees with one of four emphasis areas: *Ecology and Field Biology*, *Botany*, *Fisheries and Aquatic Sciences*, or *Wildlife Ecology and Conservation*. These new programs are tailored specifically to offer flexibility as they prepare our students to meet the rigorous demands of their respective professions. The latter two programs also will facilitate professional certifications from the American Fisheries Society and The Wildlife Society.

From Dr. Anu Ghosh



Heartiest Greetings!

Another eventful year passed. Thoroughly enjoyed. It is the time to look back and share.

Research front: John Hey presented at the 15th Annual Capitol Undergraduate Research Summit (Topeka, KS) and received **Best Poster Award**. The

title of our collaborative project with PSU Polymer Chemistry was *“Screening of polyacrylonitrile nanofibers infused with silver and other allied nanoparticles for antimicrobial applications”*.

Nicholas Burnett continued working on the project *“Ecology and prevalence of ticks and tick-borne bacterial pathogens in southeast Kansas”* as a K-INBRE Summer/Semester Scholar this year in my lab.

Our collaboration with Food Science Department of University of Arkansas was very productive. We had Prof. Steven Ricke as a guest lecturer on campus in February. He spoke to our pre-health orientation class and shared information on opportunities available in the food industry in terms of academia and profession. My graduate student Elena Olson presented poster titled *“Understanding the characteristics of bacterial isolates obtained from commercial poultry feed using whole genome sequencing approach”* at the 10th Annual Arkansas Association of Food Protection (AAFP) conference held at Fayetteville, AR and won **runner-up award** in the category of “Food Safety Including Fundamental Understanding of Pathogens”. My two Masters students defended successfully this year: Abrar Alzahrani [**Thesis title:** Ecology and prevalence of ticks and tick-borne bacterial pathogens in southeast Kansas]; and Brady Steinbock [**Research report title:** [Assessing the bioremediation potential of bacterial strains isolated from an abandoned coal mine following the whole genome sequence analysis approach](#)]. Our tick research project is now being followed up by my new Masters student Leah Cuthill. She is interested in investigating the metagenome of ticks and find clues on how tick bite could relate to alpha-gal meat allergy.

Teaching front: I taught a new course on “Introduction to Bioinformatics Tools” past Spring and had a very enthusiastic group of students. Hopefully, this course will be well received by our graduate students in future. The online General Biology lecture course was evaluated by institutional internal review team and met the Quality Matters Standards. This was a lengthy process and took almost nine months to complete; however, I believe that it was a worthwhile investment of time.

Some of my advisees and undergrad researchers (Mikaleigh Woodward, Savannah Dennett, John Hey) got admission to professional schools, very proud of them. Way to go!

Professional development: I attended a workshop on whole genome sequence analysis in Salt Lake City, UT and that was an eye opener. Due to massive advancement in the world of sequencing, the sequence data pool is brimming; there is a dire need of experts in this field of science.

We managed a family trip to Padre Island National Seashore over the Thanksgiving break. This pristine beach calls us time and again...with that I will draw to an end.

Wishing all our friends of the Biology department a very prosperous and peaceful 2019!

Cheers,
Anu



Spring peeper (*Pseudacris crucifer*).

Photo: Andrew George

Below: Ornithology students observe a greater prairie chicken lek near Kearney, Nebraska.



From Dr. Phil Harries



Greetings from Heckert-Wells.

It's definitely been another busy year! In the classroom, I've been continuing to teach Principles of Biology I, Introduction to Research, Senior Seminar, Biology of Cancer, Bioethics, and Virology. I've been lucky to have an outstanding bunch of students this year that have made the time in the class-

room a real pleasure!

In the lab I've been working with former PSU undergrad turned Masters student, Abbi Morgan, on a new project related to synthetic biology. Our lab recently joined the iGEM (International Genetically Engineered Machine) foundation. This organization takes an engineering style approach to genetic modification (primarily in bacteria) with the goal of making biological machines that can perform useful functions. Genetic "parts" that all adhere to the same basic structural standard are synthesized by researchers around the world and distributed to participating labs. These parts, called biobricks, can then be combined in novel ways to create living cells that can perform new and useful functions. At the moment we are embarking on a project to try to optimize a lead biosensor that

was constructed using biobricks. This sensor utilizes living *E. coli* bacteria that will fluoresce green if they are grown in the presence of lead. This method of detection is cheaper and arguably substantially easier than other existing methods and our goal is to optimize this system in order to make it more sensitive.



Abbi Morgan working on DNA gel purification in the lab of Dr. Harries.

Speaking of graduate students, Dr. Anu Ghosh and I have taken over responsibilities as the department's graduate coordinators which primarily involves facilitating the screening of applications. If you know anyone considering a graduate degree in biology please encourage them to get in touch with Dr. Ghosh or myself.

Also new this year, I am helping to coordinate the department's pre-health program with Dr. Mandy Peak. This was a role long held by Dr. Rider but since she has stepped into the department chair position and now has many other responsibilities, she has passed this on to us. She has left very big shoes to fill indeed but Dr. Peak and I will do our best! Dr. Peak and I also traveled to Washington D.C. with undergrad Mallory Gibson (pictured above (right)) to attend the national INBRE biomedical research conference. We even managed to squeeze in a little sight-seeing!

On a personal note, my two sons are both cruising through High school, with the oldest set to graduate in the spring. This has of course meant college applications and visits and all the excitement that goes along with this big life change. Both boys have been very involved in music and theatre at the high school which keeps them (and my wife and I) very busy. In my free time, I've been running a lot the last year and completed two 50K (31 mile) trail races. These were a huge challenge but extremely satisfying to have finished. I hope everyone is doing well and best wishes to all for a healthy and happy 2019!



Above: Dr. Mandy Peak, Mallory Gibson, and Dr. Phil Harries at the Lincoln Memorial. Below: Lunch at Glacier Bay, Alaska, on trip with Delia Lister.



Nature Reach – Delia Lister

Greetings from Nature Reach!

As usual, my summer was quite busy with the usual Teacher Workshop, Day Camp for 1st-3rd graders and Summer Reading program for Pre-K, but the big highlight was all the traveling I was able to do. In part of May and June, I was able to take two personal trips-- Washington D.C. as well as Yellowstone National Park. Two very different places, but oh so wonderful in their own unique ways. The best experience by far, though, was taking my second group of students to Glacier Bay National Park. We had a group of 10 who ate up every second possible while in Alaska. Many thanks to our hosts, Bio Department Alums Dan Van Leeuwen and Dr. Sonya Culver for being so wonderful to us! I would also like to mention that without a great group of student animal keepers there is no way I can “get away” from the office. Many thanks to my student intern, Abbey Mendenhall, who learned how to give outreach programs this summer as well as take really excellent care of our raptors. Graduate student, Katie McMurry also helped run the Pre-K Reading program.



This fall has been full of programming and teaching. In early September, we hosted an Open House for Nature Reach where we unveiled the new logo. We have also worked quite a bit with PSU Marketing and Communications to redesign the website. I hope you will take a look at www.pittstate.edu/naturereach. As for our regular school programming, this last year we were again generously funded by a donor to help cover the cost of programming for local schools. We were able to provide 142 programs to a little over 3700 students in 14 communities in the region. I cannot stress enough how appreciative we are of all the generous donations that come our way. Every dollar is appreciated and we work hard to make the most out of every penny.

I am co-chairing a 6 state regional conference in February for the National Association for Interpretation. I

was also part of the EE360 Environmental Leadership group that focused on capacity building at the state and national level for the North American Association for Environmental Education.



Dr. Richard Peterson, long-time veterinarian who assisted at Nature Reach, with Delia Lister.

I am also starting my second year as a Board Member for the Kansas Association for Conservation and Environmental Education. I was fortunate to receive funding to attend the NAAEE Conference in Spokane, WA. Continuing on with service in the profession, I am the Co-Chair for the 2019 National Association for Interpretation Regional (6 State) Conference in Wichita, KS. It has proven to be a challenging workshop to put together among all my other responsibilities, but I think we will see some great work coming out of the conference.

I am still teaching several sections of Environmental Life Science each semester as well as Freshman Experience in the Fall, and I am currently really looking forward to the Spring 2019 Semester as I will be teaching a Natural History Interpretation course. This will be my second time around, and I hope to have 10 new Certified Interpretive Guides at the end of the Spring Semester.

Lastly, I want to say a special thanks to our now retired veterinarian, Dr. Richard Peterson. He was honored this last spring with a service award to the University. I am quite pleased to say Dr. Heather Wallace

with Broadway Animal Hospital has stepped into the new role, and is doing a great job so far. I look forward to working with her in the years to come!

From Dr. Hermann Nonnenmacher

In the spring, 2018 semester I attended three meetings and presented research posters about current and future work on studies of the *Promethes* silk moth, and also native floral foragers on tall thistle. The meetings were the Kansas Natural Resources Conference (KNRC), in February, in Manhattan, KS, then the Kansas Entomological Society, and the Kansas



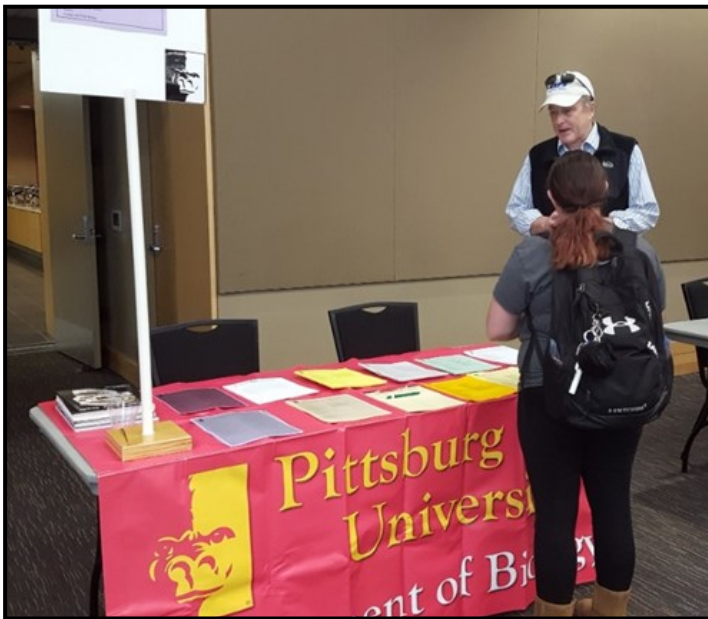
Academy of Science meetings, both held in April at Washburn University, in Topeka, KS. At KNRC, my graduate student, Mr. Jared Simon, attended numerous talks and read research posters. Having students attend meetings is a great opportunity for them to meet new contacts and get a feel for various approaches to current research in biology.



Drs. Mandy Peak Bryan, Hermann Nonnenmacher and Phil Harries at PSU Crimson and Gold Day.

In early December, I assisted Brenda Smith-Patten from the Oklahoma Biological Survey during her visit to examine our insect collections. On my travels, I was hosted by Mr. Jeff Vickers (MS Biology, 1989) and his family, and given an extensive tour of a well-developed outdoor education wildlife area associated with a school district. A winter storm was approaching and we observed whitetail deer moving into cover areas on the urban site. We also identified many native woody plants in their winter condition and looked for signs of wildlife activity and animal tracks. The site is a wonderful resource and asset for natural history and ecology education.

In addition to providing research opportunities to our students, recruiting future ones, and serving those enrolled, remains a top priority. In addition to our courses and student interactions, we have had many opportunities to help those considering PSU as their choice for a quality higher education. Several of us in



Dr. Neil Snow meets with a student at PSU Majors' Fair during Fall semester.

the department assisted by meeting good numbers of visitors through our Majors Fair (50 students visited our table) and also the second fall of the popular PSU Crimson and Gold Days events (50-60 registered high school seniors have visited our tables so far), as well as our Rumble events (over 50 prospective students and their families visited with us) and many individualized meetings between prospective students and faculty advisors.

From Dr. Mandy Peak Bryan

The Biology Department participated in numerous recruitment and advisement events, including Crimson and Gold Days, Rumble in the Jungle, Physical Therapy Open House, and summer sessions of enrollment during Pitt C.A.R.E.S. This was my second year to teach a Learning Living Community Freshman Experience class. This class is associated with Dr. Harries' Principle of Biology I course and is populated with Biology students. These students live in clusters in either Nation or Dellinger Halls. Overall, it was a great experience! I am grateful to Orion Battaglia for his assistance in Freshman Experience as a peer mentor to the class.



In June, I attended the 7th Biennial National IDeA Symposium of Biomedical Research Excellence (NISBRE) in Washington DC with Phil Harries and undergraduate student Mallory Gibson. Also, my lab attended the K-INBRE conference in Kansas City and presented a poster at the Research Symposium at Pitt.

In May, I attended the 2018 Hooding Ceremony for the University of Kansas School of Medicine. The following PSU alumni moved on to their residency programs this summer (listed next to their name). A huge congrats to Drs. Ann Hutchison, (Surgery; Michigan), Carly Twarog (Psychiatry; KU), Sierra Foster (Peds; UT Southwestern), Miles Crowley (Family Med; MU), Jason Zoglman (Internal Med; St. Louis U), Ryan Woodruff (Family Med; KU-Wichita), Ryan Weir (Family Med; Salina), and Tyler Egbert (Emergency Medicine; MU).

Finally, the Pitt State pre-health study abroad program is traveling back to Puerto Escondido in [May 2019](#). I have an eager group of pre-med and pre-dental students excited for this fantastic experience!

From Dr. Dixie Smith



2018 has been a good year for me and with only a month to go, I am cautiously optimistic that it will continue in the same way. The big change for me was that I stepped down from the position of Biology Department Chair at the end of June last summer. I am back in my

old office down the hall, and yes, it is much quieter and peaceful there. I am happy to pass those responsibilities to Dr. Rider. She was already a terrific leader in our department, and now it is official. Thank you, Virginia!

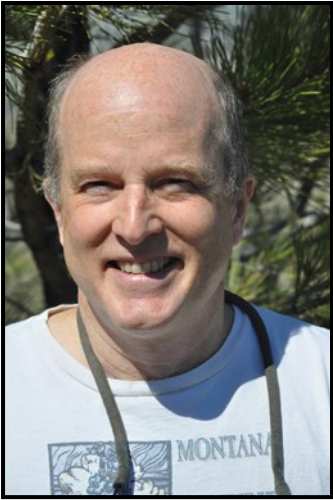
I have had my Soil Ecology class once again this fall, with a great group of students. They are Biology and Sustainability majors, and together they are one of the most lively and articulate groups that I get to teach. I have enjoyed their questions, their active interest, and getting to know the young people that are very soon going to be “in charge” of our agencies, conservation projects, and natural resources. As I get to know them, I find that I am relieved to see and grateful for their energy and dedication, because persistence and commitment are the qualities that get work done. This fall, I have had the great privilege of seeing the first of all of my former soil ecology students, Rachel Bechtold, nearing completion of her Ph.D. at the University of Arkansas in a soil related field. She was not my graduate student here (she worked with Dr. Anu Ghosh on her MS degree), but Rachel and I talked a great deal about soil, attended a conference together, she was in my class, and so I am going to take a modicum of credit for showing her that path. It has also been fun this fall to have an undergraduate student that has made working for the Natural Resources Conservation Service (NRCS) his

career goal. It is always a privilege to teach students, but those students that we have so much in common with are truly gifts.

Similarly, my General Biology students are from across campus. I haven't really thought about it before, but I guess that I really do enjoy have a mixture of student's with a variety of majors in my classes. I say this because I happily remember music majors that have invited me to concerts, art majors that have been fascinated by drawing and recording natural subjects, and many others. Of course, I always have nursing majors in General Biology, and I find them to be some of the most serious and studious students. They always have a great deal depending on their grade in that course, and so they ask good questions and study hard. While there is an ease to having classes with all Biology majors, there is energy in the mixture of majors that I have always enjoyed.

The program review document for the Biology Education Program was due in early December, and it is good to have that piece of work done. There will be a follow-up committee question and answer session next semester, but that will not be too difficult. It is the writing and the data collection that takes so much time. My students have been waiting patiently for me to catch up on their grading, and that is my goal for this week. Whenever there is a report like this one to work on, I cannot help thinking of Dr. Harvard Riches and Dr. Jim Triplett, colleagues that spent so many years doing the same kind of work I have been doing most of my time here on campus. I clearly remember Dr. Riches telling me once that he was very happy not to have to worry about those reports after he retired, and Dr. Triplett has been saying the same thing the entire time I was Department Chair. There is another element of satisfaction in completing this particular report in that it the last program review I will have to complete because retirement is on the horizon for me, as well. So, I'll sign off here, and send out my best wishes for all of you in 2019! Dixie

From Dr. Neil Snow



This year saw high levels of productivity in the Sperry Herbarium. Student participation in various aspects of curation was greater than ever before. Many thanks to the following students for their excellent curatorial assistance in 2018: Karisa Boyer, Alexandra Perez, Jiawei Xu, Ramie Unruh, Morgan Smith, Madeline Gay, and Rachel Styers-Wood.

Samantha Young Pryer defender her MS thesis, entitled *Floristic Survey of Crawford and Cherokee Counties in Southeast Kansas: An Evaluation of Change over Five Decades*. A paper presently is in review, with another one nearing submission. Sam presented the results of her thesis at the Kansas Natural Resources Conference. She and I also presented (separately and together) posters at BOTANY 2018 in Rochester, MN, in July. My poster focused on a number species of *Gossia* from New Caledonia.

Jiawei Xu is a new MS student who graduated from Soochow University, Jiangsu, China earlier this year. She spent Fall of 2017 at PSU on an exchange. Her MS thesis project is studying leaf anatomical variation among species of *Syzygium* in the



A member of *Syzygium* from New Caledonia, most likely an undescribed species.

biologically rich country of New Caledonia. *Syzygium* is native only to the Paleotropics, but is the world's largest exclusively woody genus, with 1200 or more species.

A great boost to the infrastructure and long-term viability of the T.M. Sperry Herbarium came from the National Science Foundation (NSF) funding (through 2020) a grant entitled *Expansion and Curation of the T.M. Sperry Herbarium at Pittsburg State University to Enhance Teaching, Research and Outreach in the 21st Century*. Its will support data basing, digitizing, and nearly all aspects of curation, including processing a large backlog, and the purchase of new cabinets. Six students presently are assisting with data basing and other curatorial tasks.

Tied to herbarium data basing was the WeDigBio event, Oct 18 and 19th here at Pitt. Twenty students, working either night for two hours, data-based 1107 specimens from Kansas, primarily from the Vervain and Mint families. WeDigBio is a community (volunteer) outreach program sponsored by NSF, and held once an year to increase the rate at which the data from herbarium and museum specimens are put into digital format online. A Gorilla-sized thanks to all participants for their help.

Two other students began working in the Herbarium the latter half of Fall semester on independent study projects. Claire Cook is helping research the background of Sperry's work in the Democratic Republic of the Congo in the early 1950s while he was on leave as part of the Marshall Plan. Sada Kernodle, an art major, has commenced black and white illustrations for some new species of *Eugenia*.

This year I reconfigured BIOL 538, which is now 3 credits and known as Wetland Plants. Three students learned about the legal definitions of wetland plants and how to identify some of the more common species regionally. The intent is to offer this in the fall semester of even years, alternating in the fall of odd years with Grass Taxonomy (BIOL 642).

In the Spring we had a visit from Michael Kelting, son of Dr. Ralph Kelting, who taught at PSU and served as the Chair of the Biology Department.

Look soon for the 6th annual report of the Sperry Herbarium's activities for 2018.

I enjoyed playing with the SEK Orchestra in one of its concerts (including *The Planets*) and hosting some bluegrass jams with Dr. George, Michael Barnes, Edith Sigler, and Maddie Gay. Fun stuff!



WeDigBio event in October. L→R: Michael Barnes, Adam Sewell, Jake Wright, Ashton McManis, Ryan McGinty, Alex Perez, Adam Pistorius, Maggie Murray, Michael Ramirez, Rachel Wood, Rebecca Wilson, Claire Campbell, Lindsey Williams, Jiawei Xu, Ramie Unruh, Ivy Unruh, and Michelle Unruh.

If there is any doubt whether our students enjoy the various activities in the Biology Department, just look at the images sprinkled throughout the newsletter and in the photo gallery at the end, and notice all of the smiles. To potential undergrad and graduate students: Why not join us?.... we'd love to have you!

All the best to our colleagues, alumni, and friends.

See you on the trail...

From Dr. James Whitney



2018 was a fun year filled with teaching and research. In terms of teaching, I taught Biometry, Ichthyology, and Principles of Ecology during the spring semester, and Fisheries Management, Principles of Ecology, and Environmental Life

Sciences during the fall semester. Ichthyology and Fisheries Management included several trips to local streams and reservoirs catching, identifying, and measuring fish. Fisheries Management also included

a group project examining the nonnative Redear Sunfish in the Spring River watershed of southeastern Kansas. We hope to develop this project into a manuscript, and plan to present this work at the upcoming Kansas Natural Resources Conference (KNRC) in 2019. Additionally, I took on my first graduate student (Kali Boroughs) in the fall of 2018. She plans to research stream fish ecology and imperiled species. Finally, I will be teaching Marine Biology for the first time during spring 2019, in addition to Biometry and Principles of Ecology.



Redspot chub (*Nocomis asper*). NANFA Photo gallery

My biggest research focus was examining changes in the distribution and abundance of the Hornyhead Chub and Redspot Chub in Kansas, which was funded by a grant from the Kansas Department of Wildlife, Parks and Tourism (KDWPT). With the help of 14 undergraduate volunteers, I was able to travel to 35 sites in eastern Kansas searching for the two species.

This work will be developed into a species recovery plan submitted to the KDWPT that will help with the conservation of these threatened species.



Hornyhead chub (*Nocomis biguttatus*)

2018 also involved presenting and completing research projects from previous years. For instance, in February 2018 my undergraduate co-authors (Josh Holloway, Derek Scholes, and Alex King) and I presented at the KNRC in Manhattan, KS. These presentations included a poster over the discovery of the threatened Arkansas Darter in Cow Creek, and an oral presentation concerning the response of fish to improvements in water quality. Both of these presentations won awards from the Kansas Chapter of the American Fisheries Society (<http://www.ksfisheries.org/2018/02/2018-paper-poster-winners.html>). Additionally, these presentations were published in Transactions of the Kansas Academy of Science (<http://www.bioone.org/doi/abs/10.1660/062.121.0418>) and Transactions of the American Fisheries Society (<https://afspubs.onlinelibrary.wiley.com/doi/full/10.1002/tafs.10130>), respectively.

In conclusion, 2018 was a great one. Hopefully 2019 will be as well.

Alumni Updates

This new section reports on various activities of our graduates. We salute them all for their professional successes!

Derek Scholes is now working as a fulltime wildlife biologist for Stantec, an environmental consulting company.

Josiah Rhodes and **Jessica Schaaf** both earned their doctoral degrees in Physical Therapy from KU.

Kate Wildeman earned her doctoral degree in Physical Therapy from Wichita State University.

Thomas Meyers has been working for the Fort Worth Zoo.

Alex King worked at the Farlington Fish Hatchery.

Nathan Elliot is working nearby in Labette.

Professional Activities

Another addition to this year's newsletter is a summary of the professional activities of students and the faculty. These exemplify how the Department of Biology contributes to the core missions of PSU in terms of education, research and hands-on work opportunities for our students.

Main categories in bolded small caps. Student authors are underlined; those giving the oral or poster presentations are in bold.

MASTERS DEGREES AWARDED

Kaitlin Albright. The efficiency of using lytic bacteriophage therapy on pathogenic *E. coli* as an alternative form of treatment in gastrointestinal infections. (Advisor: Dr. Chung)

Allahyani, A. Comparison of soil development in reclaimed and unreclaimed grassland soil. (Advisor: Dr. Smith)

Abrar Alzahrani. Ecology and prevalence of ticks and tick-borne bacterial pathogens in southeast Kansas. (Advisor: Dr. Ghosh)

Karisa Boyer. The importance and social impacts of the curation and digitization of natural history collections. (Advisor: Dr. Smith)

Samantha Young Pryer. Floristic survey of Crawford and Cherokee counties in southeast Kansas: An evaluation of change over five decades. (Advisor: Dr. Snow)

Brady Steinbock. Assessing the bioremediation potential of bacterial strains isolated from an abandoned coalmine following whole genome sequence analysis. (Advisor: Dr. Ghosh)

POSTERS AND ABSTRACTS

Arruda, J. A. Update on the land snails of Kansas. Kansas Natural Resources Conference, Manhattan, KS

Daniel, J., D. Smith, H. Nonnenmacher, A. Jayawardhana. The effects of clipping on the biomass production of native warm season grasses on reclaimed abandoned coal mine soils. Kansas Natural Resources Conference, Manhattan, KS

Fry, E., Carnahan, K., and Rega-Brodsky, C. C. Campus tree ecosystem services: Carbon sequestration and student cognition. Research Colloquium. Pittsburg State University

Gibson, M., V. Rider. The role of wingless4 (WNT4) in uterine decidualization. The 16th Annual K-INBRE Symposium, Overland Park, KS

Goodreau, R., Skinner, N., Wright, J., and Rega-Brodsky, C. C. Park visitor perceptions of nature in Southeast Kansas. Research Colloquium. Pittsburg State University

Hey, J., S. Bhojate, R. K. Gupta, A. Ghosh. Screening of polyacrylonitrile nanofibers infused with silver and other allied nanoparticles for antimicrobial applications. 15th Annual Capitol Undergraduate Research Summit (Topeka)

Mallatt, K., and Rega-Brodsky, C. C. Remediation of Tar Creek: Impacts on bird and plant community diversity. **4th Place Undergraduate Poster Award**. Research Colloquium. Pittsburg State University

Mallatt, K. and Rega-Brodsky, C. C. Remediation of Tar Creek: Impacts on bird and plant community diversity. 15th Annual Capitol Undergraduate Research Summit (Topeka).

Mallatt, K. and Rega-Brodsky, C. C. Remediation of Tar Creek: Ecological diversity and potential human health impacts. Kansas IDEa Network of Biomedical Research Excellence (K-INBRE). Overland Park, KS

McMurry, K. and Rega-Brodsky, C. C. Impacts of residential gardening practices on bird and butterfly diversity in Southeast Kansas. Kansas Natural Resources Conference, Manhattan, KS

McMurry, K. and Rega-Brodsky, C. C. Impacts of residential gardening practices on bird and butterfly diversity in Southeast Kansas. Ecological Society of America Annual Meeting, New Orleans, LA

McMurry, K. and Rega-Brodsky, C. C. Impacts of residential gardening practices on bird and butterfly diversity in Southeast Kansas. Research Colloquium. Pittsburg State University

Nonnenmacher, H. A preliminary study of the floral ecology of tall thistle, *Cirsium altissimum* (L.) Spreng. in southeast Kansas. Kansas Academy of Sciences/Kansas Entomological Societies, Washburn University.

Nonnenmacher, H. A Study of *Callosamia promethea* (Drury) at the western edge of its range in and near Crawford and Cherokee Counties, KS. Kansas Academy of Sciences/Kansas Entomological Societies, Washburn University.

Olson, E., A. Micciche, S. Ricke, A. Ghosh. Understanding the characteristics of bacterial isolates obtained from commercial poultry feed using whole genome sequencing approach. 10th Annual Arkansas Association of Food Protection (AAFP), Fayetteville. **2nd Place Award** in the category of Food Safety Including Fundamental Understanding of Pathogens

Pryer, S.Y., H. Nonnenmacher. A preliminary study of the floral ecology of tall thistle, *Cirsium altissimum* (L.) Spreng. in southeast Kansas. Kansas Natural Resources Conference, Manhattan, KS

Pryer, S.Y., N. Snow. Numerous new state records of vascular plants for Kansas. BOTANY 2018, Rochester, MN

Pryer, S.Y., N. Snow. Floristic survey of Crawford and Cherokee Counties, Kansas: A report of known taxa, including 49 state records. Kansas Natural Resources Conference, Manhattan, KS

Sholes, D. T., N. K. Skinner, A. D. George. Status and population trends of the gray bat colony in Pittsburg, KS. Kansas Natural Resources Conference, Manhattan, KS

Snow, N. Systematics of *Gossia* (Myrtaceae) in New Caledonia. BOTANY 2018, Rochester, MN

Snow, N. The Kansas and Regional Reference Collection: A community-wide tool at Pittsburg State University to expedite and authenticate identifications of vascular plants. Kansas Natural Resources Conference, Manhattan, KS

Walker, R., B. Keim, M. Peters, T. Abudu, M.M. Peak. Analyzing the gut microbiome of human populations in southeast Kansas and Southwest Missouri. PSU Research Colloquium

Whitney, J.E., J.A. Holloway, D.T. Scholes, and A.D. King. Long-term change of fish communities in a polluted watershed: does cleaner water “act” on fishes? Kansas Natural Resources Conference, Manhattan, KS

Whitney, J.E., J.A. Holloway, D.T. Scholes, and A.D. King. Discovery of the Arkansas Darter (*Etheostoma cragini*) in the Cow Creek watershed, Cherokee county, southeastern Kansas. Kansas Natural Resources Conference, Manhattan, KS

Wright, J., Styers-Wood, R., Rega-Brodsky, C.C., and George, A. Establishing long-term herpetofauna monitoring sites in southeast Kansas. Kansas Herpetological Society Annual Meeting. Emporia, KS

BOOK

Arruda, J. A. (2018). In Jim Mason (Ed.), *Pocket Guide to the Land Snails of Kansas* (pp. 69). Wichita, KS. Great Plains Nature Center.

ORAL PRESENTATIONS

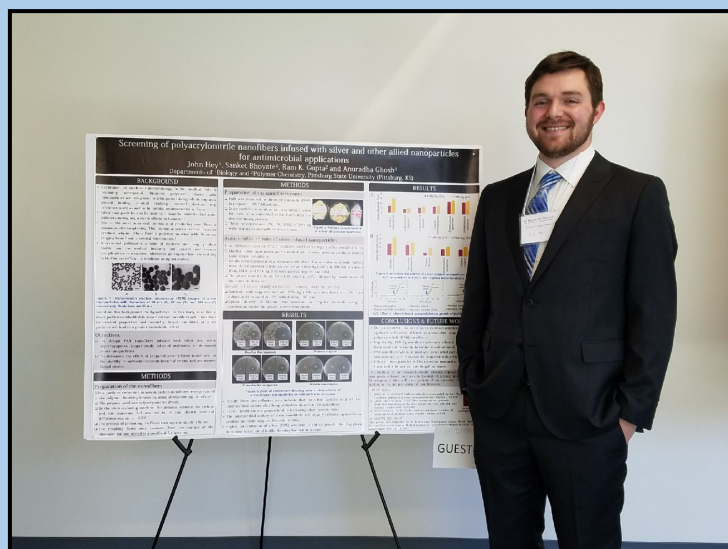
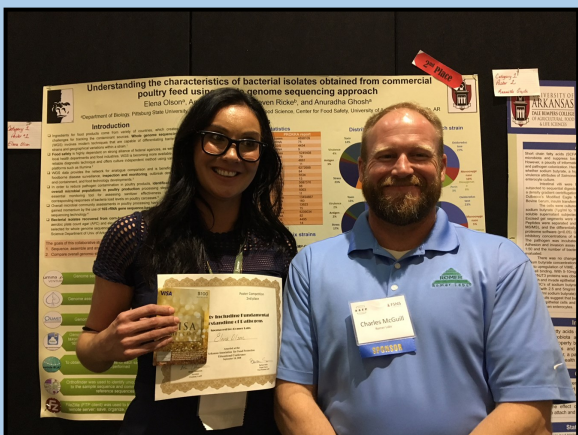
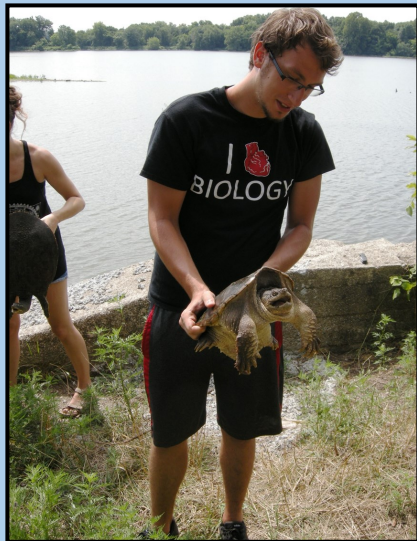
Barnes, M., A. George. Stand-level density and nesting success of birds in response to experimental forest management in the Missouri Ozarks. PSU Research Colloquium

- Barnes, M. W.,** A. D. George. Stand-level density and nesting success of birds in response to experimental forest management in upland hardwood forests. Kansas Natural Resources Conference. Manhattan, KS
- Burnett, N.,** A. Ghosh. Ecology and prevalence of ticks and tick-borne bacterial pathogens in a peri-urban landscape of the Midwestern U.S. PSU Research Colloquium
- Carnahan, K.,** C.C. Rega-Brodsky. Campus tree ecosystem services: Carbon sequestration and student cognition. PSU Research Colloquium
- Daniel, J.,** D. Smith. The effects of clipping on the biomass production of native warm season grasses on reclaimed abandoned coal mine sites. PSU Research Colloquium
- Elbert, A.,** V. Rider. Expression of ligand CCL19 in Dawley Rat uterine tissue and the possible action to prepare for implantation and placentalations in the uterus. PSU Research Colloquium
- Elbert, A., M. Gibson,** and V. Rider. Maternal Immunity: Preimplantation Preparation. The 101st Annual Meeting Endocrine Society, New Orleans, March 23-26, 2019. (Abstract)
- Fry, E., C.C. Rega-Brodsky.** Campus tree ecosystem services: Carbon sequestration and student cognition. Kansas IDeA Network of Biomedical Research Excellence (K-INBRE). Overland Park, KS
- Goodreau, R.,** N. Skinner, J. Wright, C.C. Rega-Brodsky. Park visitor perceptions of nature in southeast Kansas. PSU Research Colloquium
- Hey, J.,** A. Ghosh. Screening of polyacrylonitrile nonfibers infused with silver and other allied nanoparticles for antimicrobial applications. PSU Research Colloquium
- Hollie, D.R.,** A. George. Avian community response to experimental forest management in the Missouri Ozarks. P PSU Research Colloquium
- Hollie, D. R.,** A. D. George. Avian community response to experimental forest management in the Missouri Ozarks. Kansas Natural Resources Conference. Manhattan, KS
- Mallet, K.,** C.C. Rega-Brodsky. Remediation of Tar Creek: Impacts on bird and plant community diversity. PSU Research Colloquium
- McMurry, K.,** C.C. Rega-Brodsky. Bird and butterfly species richness increase in residential yards managed for vegetation complexity in southeast Kansas. PSU Research Colloquium
- Moran, A.,** P. Harries. Construction of a bacterial biosensor for detection of lead in environmental samples. PSU Research Colloquium
- Olsen, E.,** A. Gosh. Application of whole genome sequencing and food safety to food quality control. PSU Research Colloquium
- Pryer, S.Y.,** N. Snow. Floristic survey of Crawford and Cherokee counties Kansas: A report of known taxa. PSU Research Colloquium
- Scholes, D.,** N. Skinner, A. George. Status and population trends of the gray bat colony in Pittsburg, KS. PSU Research Colloquium
- Skinner, N.,** A. George. Seasonal population trends of the gray bat colony in Pittsburg, Kansas. PSU Research Colloquium
- Snow, N. Rapid rates of biodiversity discovery in the Myrtle family (Myrtaceae) and implications for conservation. Department of Biology, Wichita State University
- Snow, N. New species from Muddling through the Myrtles. Ozark Gateway Audubon Society. November. Joplin, MO
- Styers-Wood, R., Rega-Brodsky, C.C.,** and George, A. Establishing long-term monitoring of birds and vegetation in mined land wildlife areas in Crawford and Cherokee counties. Kansas Ornithological Society Annual Meeting, Lawrence, KS
- Walker, R.,** M. Peak. Analyzing the gut microbiome of human populations in southeast Kansas. PSU Research Colloquium

PEER-REVIEWED RESEARCH ARTICLES

- Arruda, J. A. Two New Land Snail Species in Kansas. *Transactions of the Kansas Academy of Science* 121(1-2):98–102.
- Byng, J.W., N. Snow. An annotated checklist and key to *Eugenia* (Myrtaceae) from Congo (Brazzaville). *Phytotaxa* 357: 159–163.
- Gâteblé, G., L. Barrabé, G. McPherson, J. Munzinger, N. Snow, and U. Swenson. One new endemic plant species on average per month in New Caledonia, including eight more new species from Île Art (Belep Islands), a major micro-hotspot in need of protection. *Australian Systematic Botany* 31: 448–480.
- Rider, V., Abdou, N. I., Kimler, B.F., Lu, N., Brown, S., and Fridley B. L. Gender bias in human systemic Lupus Erythematosus: A problem of steroid receptor action? *Frontiers in Immunology* 9: 611.
- Snow, N., P.M. Peterson, K. Romaschenko, and B.K. Simon. Monograph of *Diplachne* (Poaceae). *PhytoKeys*: 1–102.
- Snow, N., M.W. Callmander, and J.W. Byng. Studies in Malagasy *Eugenia* (Myrtaceae) – VI: A new species with large leaves and verrucose fruits. *Systematic Botany*: In press.
- Sur, G.,** R. Keating, N. Snow, and E.A. Stacy. Leaf micromorphology aids taxonomic delineation within the hypervariable tree species *Metrosideros polymorpha* (Myrtaceae) in Hawaii. *Pacific Science* 72(3): 345–361.
- Thomson, S.A, + 183 others [incl. N. Snow]. Taxonomy based on science is necessary for global conservation. *PLoS Biology* 16(3): 1–12. <http://journals.plos.org/plosbiology/article?id=10.1371/journal.pbio.2005075>
- Whitney, J.E., **J.A. Holloway, D.T. Scholes,** and **A.D. King.** Discovery of the Arkansas Darter (*Etheostoma cragini*) in the Cow Creek watershed, Cherokee county, southeastern Kansas. *Transactions of the Kansas Academy of Science* 121: 411–416.

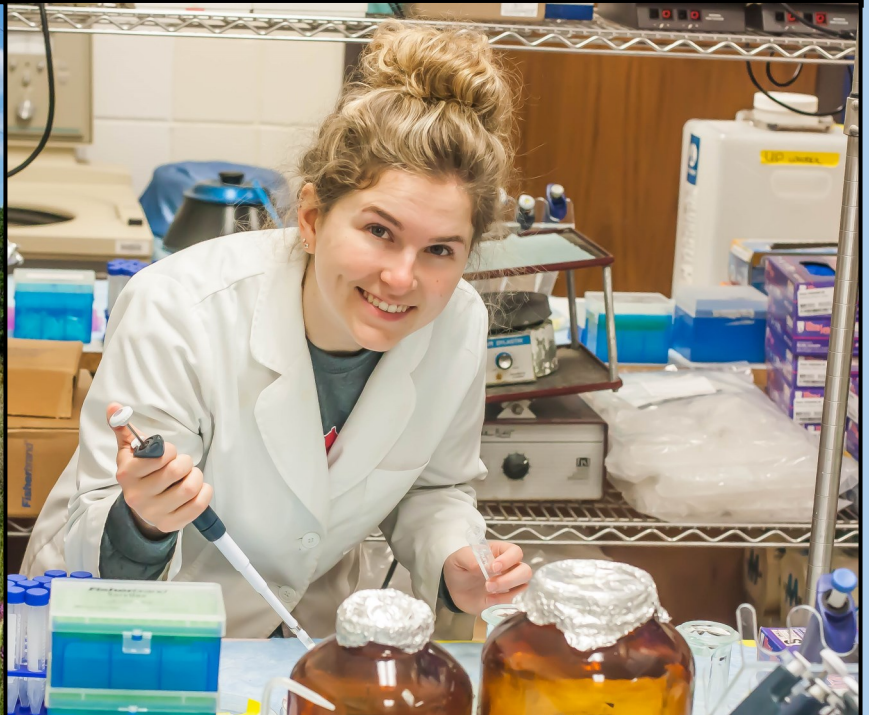
In the lab and field in 2018



Clockwise from top left: Jake Wright with snapping turtle. PSU alumnus Dr. Holly Cranston with biology faculty and seniors at PSU Honors College banquet. Robin Goodreau and Michael Barnes study bats near Pittsburg. John Hay, who received the “best poster” award, in Topeka. Young students at the Camp Garden hosted by Nature Reach. Elena Olson (left) at the Annual Arkansas Association of Food Protection conference held at Fayetteville.



Top: Students, faculty and friends enjoying Alaska's Glacier Bay. Center: Students build herpetofaunal monitoring array at the O'Malley Prairie, one of several parts of PSU's Southeast Kansas Field Station. Right: Karisa Boyer mounting plants in the T. M. Sperry Herbarium.



Top: Students in the Human Dimensions of Natural Resource Management course with their poster presenting data collected on park visitor's perception of nature at the Pittsburg State University Research Colloquium. Lower left: Jake Wright and Rachel Wood surveying plant communities at mined land areas in Pittsburg. Right: Mallory Gibson working in Dr. Rider's lab.



Clockwise from top left: Alex Perez (L) and Jiawei Xu at the Missouri Botanical Garden in St Louis. Westar Energy presents a generous check in support of Nature Reach. Maddie Gay working with herbarium specimens. Kylie Carnahan (L) and Emily Fry at the Pittsburg State University Research Colloquium. Robin Goodreau, Christine Brodsky, Summer King, and Kylie Carnahan surveying birds at Tar Creek Superfund Site. Katie McMurry with her poster at the Kansas Natural Resources Conference.