



BioNews 2019

Department of Biology
Pittsburg State University



Salvia azurea

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Ashlynn Sinclair holding a milk-snake on the herpetology field trip to Arkansas in April.

From the Chair's Desk

As the year of 2019 ends, I send all friends of the Biology Department greetings. Sadly, Kelly Borden, our long serving Administrative Assistant, left the Department in August for health reasons. Most of you know that Kelly was the heart of the Biology Department. All miss her. Kim Grissom has stepped into Kelly's shoes and she is doing an excellent job. Everyone has pitched in to help fill the void left by Kelly's departure (see next page at bottom).



Dr. Virginia Rider

Biology has enjoyed a productive and busy year. Seven faculty members have garnered external funds to support their research. The Kansas Idea Network of Biomedical Research Excellence (K-INBRE) renewed for another five years. This award is from the National Institutes of Health and includes all of the universities across the State. The funding to the PittState campus has supported close to one hundred undergraduate students to work on a variety of research projects in both Biology and Chemistry.

Biology took more than its share of faculty awards this year. Dr. Christine Brodsky garnered two awards. The first was for *Outstanding Undergraduate Mentor*, a university-wide award and the second was for *Outstanding Teacher* for the College of Arts and Science. I have always said that teaching excellence is the norm for the Department and the College; therefore, winning a teaching award in either is a true honor. Dr. Neil Snow received the award for *Outstanding Scholarship* from the College of Arts and Science.

The Department participated in a number of recruiting events including *Rumble in the Jungle* where over 60 students visited the Biology table. Dr. Hermann Nonnenmacher organizes student recruitment at these events with the support of many of the faculty. Biology also hosted secondary school from PHS, Columbus, Fredonia, Riverton Middle School and others. Science Day, organized by Dr. Peter Chung and the Biology Club, continues to draw a

large number of students from the four State region. Drs. Schmidt and Dawson met with approximately one hundred and twenty secondary school students from the Quapaw Nations in Oklahoma. We are putting out the word that PittState students are prepared to make a difference in their jobs and communities.

Last summer, Biology faculty took students on two medical mission trips. Dr. Dan Zurek took twelve pre-health students to Belize. Dr. Mandy Peak and her husband Dr. Neil Bryan (PittState alum) took twelve pre-health students to Mexico. The impact of these trips on students is difficult to describe other than "transformative". These trips are critically important for students who are interested in health care careers because the students obtain a bird's eye view of what medically underserved regions of the world grapple with daily.

Last year I initiated a request to alumni for support to purchase new bones for the Human Anatomy class. I know, this does not sound very glamorous. However, this course is critically important because it alleviates stress on first year medical students. Human Anatomy has long been a centerpiece of the premedical program. I am delighted to report that donations of ap-

proximately \$15,000 have allowed us to purchase new human bones for the anatomy laboratory. I thank the following alumni for their generous donations: Dr. and Mrs. Brett Dunbar, Dr. Mindi Garner, Dr. Matthew Grounds, Dr. and Mrs. Jesse Niederklein, Niegsch Vision Center, Dr. Lyle Noordhoek, Dr. Pamela Pierce, Dr. Gina Pinamonti and Dr. Kathleen Sandness. The goal of the premedical program is to provide the best possible education for our students and the generation donations received will help us to continue to achieve this goal. Thank you all very much.

I attended the 101st Annual Endocrine Meeting in New Orleans in March. Two students, Ashleigh Elbert (graduate) and Mallory Gibson (undergraduate) presented their research in a poster format. Mallory is attending Oklahoma University Medical School and Ashleigh defended her Master's thesis this fall semester. In collaboration with colleagues in Italy, I published a collection of papers on "Sex hormones and gender differences in immune responses." The collection is an effort by research teams around the world who are working to understand the complex interactions between the immune and endocrine systems. Anyone interested in finding out more about this fascinating area, will find our editorial referenced at the end of this newsletter.



our editorial referenced at the end of this newsletter. I end this newsletter with unhappy news for the Department. Dr. Joe Arruda announced his retirement as of July 2020. Dr. Arruda has been a rudder for the Department in rough seas. His knowledge of the university and his understanding of what it is to be a committed academic are not replaceable. I speak on the behalf of the Department in extending best wishes for a well-earned retirement to a couple (Joe and Suzanne) whose contributions are substantial.

Best wished for the New Year and please stop in and see us when you are in the area.

Greeting to all of our alumni and friends.



Well, this is it. Adios, au revoir, auf wiedersehen, adeus, sayonara, and buh-bye ... my last academic year before retiring.

I've handed all my miscellaneous responsibilities off to new people (most recently the Biology Facebook page). Some courses were picked up by others along the way (Principles of Conservation,

Environmental Health, and Stream Ecology) and some will be dropped (Limnology, Environmental Protection, Water Quality and Assessment). The drops are a bit of a loss, but there is a much larger gain with the new courses being offered by the new field biology faculty. My time here was "ripe" for a combination aquatic/regulatory person, but times change and the new program and new people are building stronger than ever. Sensing change is one reason why I started the land snail projects - something to keep me going that was fun and useful, as well.

I've prospered by my interactions with the great students we've had over the years. They have helped make me better and I hope, in some way, I was a good influence on them. It was a pleasure to provide opportunities for success for so many great students - talented and personally great folks - both undergrad and graduate.

Suzanne and I will continue the journey in this new phase - moving out-of-state to be closer to family.

I've even compiled a list of land snails for where we'll likely be to use should I run across my slimy little friends as we hike around. From the office, a few descriptive aquatic life and natural history books and my snail books with identification keys will come with me (I'm thinking that Arnold Ziffel may make the trip as well [see statue below]), along with special memories of the good times I had here, a place and time that I was truly blessed to experience.

My best to all,

Dr. Joe Arruda



Four Faculty Chairs!



Gathered for Dr. Smith's retirement in May (L to R): Dr. James Triplett, Dr. James Dawson, Dr. Dixie Smith, and current Chair Dr. Virginia Rider.



Dr. Christine Brodsky

Every year when I write this newsletter, I am always surprised how quickly the year is wrapping up. 2019 was a memorable year, filled with exciting research projects, fantastic classes, and engaging students.

One of the most exciting research projects that we were involved in this year was Snapshot USA, a nationwide camera trap study, led by the Smithsonian.

For this collaborative project, at least one research group per state was invited to collect mammal community data by deploying camera traps in September and October. We were invited to represent Kansas in Snapshot USA because of previous camera trap work done by Caleb Durbin, an undergraduate Biology major. The project yielded over 8,000 photographs of mammals across Pittsburg's mined land areas, including some spectacular shots of bobcats, coyotes, deer, and 13 other species. This research project and our students were featured on KOAM, KSN, the Joplin Globe, the Hays Daily News, and more. We look forward to analyzing the nationwide dataset and participating again in the fall of 2020!



Deploying cameras for survey with Peyton Witham, Caleb Durbin, Jacob Bailey, and Alex Perez (L-R).

Once again, our student researchers have done some phenomenal work – Rachel Styers, Caleb Durbin, Jake Wright, Morgan Smith, and Kyle Findley, to name a few! All of these students assisted on research projects spanning bird communities at the Tar Creek Superfund site, birds and herps in mined land areas of southeast Kansas, and mammals for Snapshot USA.

Graduate student research has also been incredibly impressive. Amy Hammesfahr successfully captured and tracked tricolored bats this summer for her research pro-

ject, much to the delight of the Missouri Department of Conservation. She is also conducting novel research on the use of acoustic lures to attract this species into mist nets, and getting interesting results. She anticipates finishing up in the Fall of 2020. Other successes from the lab include the May graduation of Katie McMurry with her MS degree, studying the impacts of residential garden practices.

Dr. George and I received a grant to expand our mined land ecology research. We look forward to welcoming new graduate students in the Fall for that project.

Classes included many great field trips and exciting research projects. Urban Ecology students visited Pittsburg's city council, the Tar Creek Superfund site, and a variety of locations in Kansas City to meet with the city's Sustainably Director, a nature center, and a non-profit that teaches urban farming. Many of my students from this class also conducted independent research projects and presented them during the Research Colloquium in the Spring.



Vegetation sampling at the Snapshot USA sites with Ximena Bogarín, Jacob Bailey, and Sol Corvalán (L-R). Ximena and Sol are exchange students visiting us this semester from Paraguay.

I continue to serve on the international Urban Biodiversity Network (UrBioNet) steering committee. We have two papers currently in review on our research about global patterns in the traits of urban species. This year, I was also invited to serve on the international Urban Biodiversity and Design Network (URBIO) advisory board. On a personal note, I enjoyed my travels during this summer on my way to the American Society of Mining and Reclamation annual meeting. My husband and I drove out to the meeting in Big Sky, Montana and made a few pitstops along the way to camp at the Grand Tetons and Yellowstone National Park. It was a fun week spent hiking, bird-watching, and relaxing.

I hope everyone had a great year! Here's to a happy and healthy 2020!



Dr. Mandy Peak Bryan

Hello Gorillas! I am pleased to report we had a successful year for students applying to professional schools. Kiralyn Mosier was accepted into UMKC dental school and Ethan Powell was accepted into University of Missouri-St. Louis optometry school. Students started their first

year of medical school in 2019 include Blake Burrows (Oklahoma State), Mallory Gibson (University of Oklahoma), Jessica Jewell (KU), Tucker Morrey (KU), Joe Morris (AT Stills), Wyatt Osterhage (KU), and Sierra Schupbach (Oklahoma State). Benjamin Kelm and Lacy Lam Ford were accepted to Cleveland College of Chiropractic Medicine. Those accepted into Physician Assistant programs include Garrett Harmon (Missouri State), Lauren Tapp Diskin (Arkansas), Katlin Jurgling (Wichita State), and Hayley Hansford (Wichita State). And finally, the students that were accepted into physical therapy schools include Emily Argotsinger (St. Marys), Kris Bird (Missouri State), Tyler Drisdell (KU), Colton Erikson (SBU), and Jordan Puvogel (SBU).

This year I taught Genetics Lecture and Lab, Immunology, Multiculturalism in Medicine-Mexico, Epidemiology, Pre-Health Orientation, and led a study abroad

trip to Mexico. In the Spring, Pitt State changed their general education requirements for graduation. The new curriculum led to the development of a new course entitled Gorilla Gateway, which is an updated version of Freshman Experience. This class is associated with Dr. Harries' Principles of Biology I course and is populated with Biology students. Overall, it was a great experience! I am grateful to Kate Dreiling for her assistance in Gorilla Gateway as a peer mentor to the class.

In May, I led a medical mission study abroad trip to Puerto Escondido, Mexico (see below) with fourteen pre-health students. To prepare for this trip, students attended a required preparation class during the spring semester that covered clinic operations, physical exams, cultural diversity, and Mexican culture and history. We also gathered medical supplies, diagnostic equipment, and medications for our clinics. We organized health clinics in communities surrounding Puerto Escondido and the students assisted physicians with routine health and well child check-ups. Four physicians participated in our trip, including Dr. Mike Schneeberger and Dr. Jerry Flaming. Additionally, two of our PSU Biology alumni, Dr. Neil Bryan and Dr. Miles Crowley, traveled to Mexico and mentored our students at the clinics.

The team triaged and treated 506 patients in 5 days. You can read more about our trip here (<https://magazine.pittstate.edu/2019/study-abroad-2/>)





Dr. Peter Chung

Greetings and Happy Holidays from the Biology Department! Another year has come and gone, so quickly! It has been a busy and productive year. Lab classes continue to keep Kim and I busy in the Prep Lab. That and the flock of students that are working in the prep

lab and assisting in the microbiology labs keep us on our toes. It is hard to imagine how busy we get upstairs, but like I say, the prep lab is the heart of the Department! Thanks for a great year, Kim!

Microbiology continues to keep me busy, along with Pathogenic Microbiology and Immunology. Mandy has joined Neal and I in team-teaching Immunology lecture; year two of this collaborative effort is upon us. The students had a great experience last year. We are pleased with the level of preparation they are receiving in anticipation of graduate school. Thanks Neal and Mandy for getting our grads well-prepared.

Kiralyn Mosier completed her Problems in Microbiology, received her MS in Biology and just now wrapped up her first year at UMKC School of Dentistry. We welcome Kayla Howard to our graduate student fold as she embarks on her journey towards a MS in Biology. She was instrumental this year in helping out with media and culture making in the prep lab and microbiology lab. We will be welcoming a couple undergraduate scholars to our research lab, Hannah and Marina, and look forward to mentoring them with their research projects.

The number of prospective students interested in professional school continues to increase, not only in the traditional pre-health sciences (medical, dental, etc.), but also in medical technology and pre-physical therapy Biology majors. Aside from the many prospective student visits and university wide recruitment events (Junior and Senior Rumbles), we have also been busy with advising and other service opportunities. Our Science Day in April, following a weather delay from February, successfully came and went. It goes without saying Science Day will be permanently moved to April! Many thanks to the stu-

dents and the Biology faculty who helped judge the Biology Bowl; special thanks to Dr. Neal Schmidt and his student TAs for their time and patience with the countless cadaver tours given! We held our annual PT Open House in April; and following another successful outing, I am pleased to inform everyone that we will be hosting a combined PT and OT Open House at Pitt on April 9, 2020. Great news : every one of our Biology PT applicants got accepted into PT school!



Exciting new events that occurred this year:

1) 2019 PHS PSU Science Tour Day (60 PHS students visited the Biology, Chemistry, and Physics Departments) and 2) PSU Physical Therapy Success Organization field trip to visit KU School of Physical Therapy.

I am still meeting with prospective students interested in our Department. Contact me if there is someone you would like us to meet with.

I am still marshalling at graduation ceremonies, so if you ever make it back. Some dates to keep an eye on:

April 9, 2020- PT/OT Open House

April 16, 2020- Science Day

April 23, 2020- Department end of the year picnic, sponsored by the PreMed Club

May 15 and 16, 2020- Spring Commencement

August 27, 2020- Department Welcome Back picnic, sponsored by the Biology Club

There is always more to be said, but I leave you with my usual farewell: To all our graduates, colleagues and friends, do not be strangers; stay in contact, keep in touch, and do stop by and visit if and when you are in town.



Dr. Andrew George

Hello, Everyone. This has once again been a fun and exciting year. First and foremost, grad students David Hollie and Michael Barnes successfully defended their theses. After graduation David took a job with the Massachusetts Division of Fisheries and Wildlife working with

threatened seabird colonies, and Michael is studying mammal disease ecology in New Mexico with the U.S. Geological Survey (USGS). David and Michael each earned several awards for their outstanding research and teaching accomplishments at PSU.



Herpetology field trip in Arkansas looking at a North-eastern Watersnake.

In April, Dr. Snow joined me and my herpetology class for our 4-day field trip to southwest Arkansas. We had fantastic weather and several collecting-adventures to remote areas in the Ouachita Mountains. Days were followed by communal meals and music around the campfire. The Ouachita herpetology trip has become one of the most memorable experiences for our field biology students.

The PSU Wildlife and Fisheries Society has continued to be one of the most active groups on campus. The students are gaining valuable experience nearly every month as they work alongside professional biologists

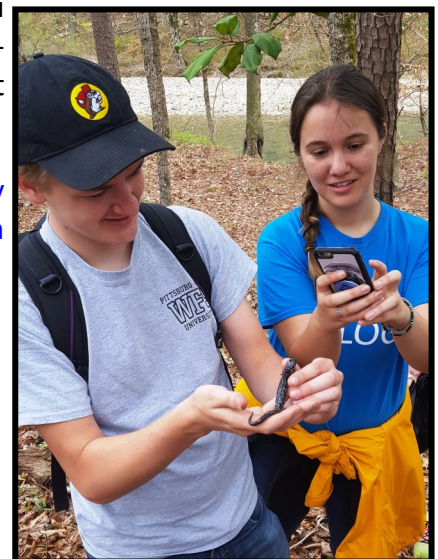
on diverse projects. The club has assisted with chronic-wasting disease sampling, prescribed fires, amphibian surveys, deer spotlight surveys, bat-sampling, habitat restoration projects, and more.

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The Pittsburg gray bat project has also continued to grow. Recent graduate Jake Wright (now a MS student at Wichita State) spent the summer monitoring the colony using our infrared video system. In addition we are testing the bats for white-nose syndrome by collecting samples directly from hibernating bats, and from guano. So far our Pittsburg samples have been negative. Undergrad Ryan McGinty is working on a project to determine whether the microclimate of the roost is suitable for the fungus that causes white-nose syndrome. Ryan was awarded the best student poster award by the Kansas Chapter of The Wildlife Society at the 2019 Kansas Natural Resources Conference. Most of the gray bat work is being supported by grants from the Kansas Department of Wildlife (KDWPT).

Other highlights from 2019 include overnight field trips to central and southwest Kansas, the annual meetings of the Kansas Ornithological Society and Kansas Herpetological Society, and our ongoing work with the Missouri Ozark Forest Ecosystem Project (MOFEP).

Right: Kyle Findley and Maddie Gay on field trip.





Dr. Anu Ghosh

GREETINGS TO EVERYONE!

Another great year! A year of being recognized for whatever small things we do! I am feeling very proud of all my co-workers and students.

The year started off by judging iPosters at KINBRE Annual Meeting at Overland Park, KS. Three students Ms. Leah Cuthill, Ms. Elena Olson and Mr. Nicholas Burnett from our laboratory presented iPosters at this KINBRE meeting and were appreciated for their presentations.

In the research colloquium at PSU, my graduate student did an oral presentation and there were four undergraduate poster presenters from our lab. This year, a new project initiated in the lab on mosquito surveillance for West Nile viruses - it is a timely addition to our research front. Our project on surveillance of ticks and tickborne illnesses received some attention from local media lately, including PSU news release, local newspaper articles, and TV channels. Please see the following links:

<https://www.koamnewsnow.com/news/psu-students-and-staff-stay-one-step-ahead-of-local-ticks/1111972320>

<https://www.fourstateshomepage.com/news/pitt-state-wildlife-research-centers-around-four-state-ticks/>

<https://www.morningsun.net/news/20190809/local-officials-researchers-aim-to-increase-awareness-of-disease-carrying-pests>

<https://www.leavenworthtimes.com/special/20190120/health-care-kansas-universities-involved-in-wide-ranging-medical-research>

We received an NSF EPSCoR RII Track-2 Federal Funding under lead collaboration with KU this year. This is a great opportunity to boost undergraduate research in the department.

My previous Masters student Ms. Abrar Alzahrani received the *Distinguished Thesis Award* at the Graduate Banquet. She was the one who initiated the tick project in our lab in 2016.

The graduate thesis work by Mr. Brady Steinbock got accepted in a peer-reviewed journal *Microbial Resource Announcement*. I am hopeful to see more in the coming year!!

In addition to vector-borne diseases, I still harness my interest in the field of food microbiology/ foodborne pathogens. My other Masters student Ms. Elena Olson (below) won the 1st prize in poster presentation at the Annual Arkansas Association for Food Protection (AAFP) Conference held at Fayetteville, AR (2019) and her topic of presentation was "*Characterization of bacterial isolates obtained from poultry, poultry feed, and retail food using whole genome sequence analysis and selected biochemical tests*". This work was also selected for presentation at the 16th Annual Capitol Graduate Research Summit, Topeka, KS



(2019). She successfully defended her thesis in the spring semester and is on her way to pursue a Ph.D. program at University of Arkansas.

A little bit about myself: Based on my expertise and interest in environmental and public health, I was invited to serve on committees for DNP candidates in our School of Nursing.

These scholarly projects dealt with antibiotic resistance stewardship, maternal immunization for Pertussis, provider knowledge on tickborne diseases, and enhancing knowledge of contraception. Serving on these committees helped me immensely in networking as well as in keeping myself up-to-date on the progressive research in these areas.

On a side note: Along with other Biology and Chemistry faculties, we offered hands-on activities for kids (6-8 grade) to foster interest in science. This event called *'The Small Science, Big Ideas Academy'* was organized by Greenbush and a total of 12 students attended the camp in July (2019). It was held on PSU campus in the hopes if they have a good time they will give us a look when they select a college.

Lastly, this year ended with a new addition to our biology family. Welcome Abbott (Whitney Jr.)!!!

You all have a WONDERFUL holiday break and a PROSPEROUS new year!



Dr. Phillip 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, Biology of Cancer, Bioethics, and Virology. Since Dr. Rider moved into the Chair position, I have also started teaching the Pre-Health Orientation I class

that introduces new students to various healthcare careers. It has been fun getting to meet some of the healthcare professionals in the area who have been kind enough to donate their time to speak to the class.

In the lab I've been working with former PSU undergrad turned Masters student, Abbi Morgan on a project related to synthetic biology. Our lab is a member the iGEM (International Genetically Engineered Machine) foundation. This organization takes an

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 presented her research at the Annual K-INBRE in January with a poster titled: "Optimization of a lead biosensor in *E. coli*." I also have a new graduate student, Devapriya Segaran, who has joined us from India. She is interested in examining the effect of several plant compounds on the growth of immune cells. I am excited to see where her project takes us!

Speaking of graduate students, Dr. Ghosh and I are continuing in our role as the department's graduate coordinators (this 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.

On a personal note, my oldest son graduated high school this year and is currently studying mechanical engineering at K-State. His younger brother is a junior in High school who has been very involved in music both in and out of school. He has even gotten me to dust off the old guitar and start playing again which has been a lot of fun.

I've still been running a lot the last year and am looking forward to getting some races in this coming spring.

I hope everyone is doing well and best wishes to all for a healthy and happy 2020!



Delia Lister

Well, it is safe to say I never stop being busy around here! As far as teaching goes, I continue to teach ELS on a regular basis. Spring 2019 I taught Natural History Interpretation to 10 students who all received a National Certification (Certified Interpretive Guide) from the Na-

tional Association for Interpretation. Four of the students were able to attend the Region 6 conference in Wichita in February, of which I was the Conference Co-Chair. This Fall I also taught Gorilla Gateway which replaces the Freshman Experience Class which I have taught for the last 12 or so Fall Semesters. This Spring I will teach a Care and Management of Captive Animal Workshop which I think will be an exciting new offering in the Department.



First to third graders learning bird identification at Day Camp.

This new class is the result of my own experience at the University of Minnesota Raptor Center recently. Individuals from around the country can train with top notch raptor experts at their Care and Management Workshop. I cannot say enough wonderful things about the staff and avian ambassadors. They are just next level amazing!

For three weeks in May, I was fortunate enough to teach Environmental Life Science in Asuncion, Para-

guay. These students take PSU credit hours, taught by PSU faculty, and most will eventually take their studies to Kansas. It was a great learning experience for both the students and me! I certainly appreciated all the hospitality offered to me by my new Paraguayan friends and colleagues.

The highlight of Summer at Nature Reach is always our Summer Day Camp. As always, I am very grateful for the help of Bob Mangile and Donna Smith with the Sperry-Galligar Audubon Society. They, along with help from previous years' camp kids, make the camp possible!



Environmental Life Science students learning how to extract DNA in Asuncion, Paraguay.

I continue to serve on the board of the Kansas Association for Conservation and Environmental Education (KACEE). Along with Executive Director, Dr. Laura Downey, I am currently working on an Environmental Education certificate program for teachers and non-formal educators. We hope this will really be a huge benefit to those who teach environmental education on a regular basis.

Finally, I am always on the hunt for grants and outside funding to keep Nature Reach going. I hope you will consider donating to the program. For more information you can visit our website: www.pittstate.edu/naturereach. This program would not have existed for the past 35 years without the generosity of donors!



Dr. Hermann Nonnenmacher

In the spring I attended three meetings and presented research posters about continuing lab and field work alone or with undergraduate students, on studies of the *Promethes* silk moth, and native floral foragers on tall thistle in south-east Kansas. The meetings

were the 12th Annual Kansas Natural Resources Conference (KNRC), in February, in Manhattan, KS, then the Joint Annual Meeting of the 95th Kansas Entomological Society, and the 151st Kansas Academy of Science, held in March, at Johnson County Community College, in Overland Park, KS.



Our students' success remains a top priority. In recruiting efforts, we have had many opportunities to

those considering PSU as their choice for a quality higher education. In the fall semester alone, several of us in the department assisted by meeting good numbers of visitors through the Student Success Majors Fair (20 students visited our table) as well as PSU's Rumble event (over 65 prospective students and their families visited with us) plus many individualized meetings between prospective students and faculty advisors. In spring semesters, we support our popular Biology Bowl/Science Day effort for high school team and individual student competitions.

In my fall General Entomology course, students observed, and then later collected, a nice example of a full-sized, end of season paper "nest" of the bald-faced hornet (photo at left). Unusual for our area but not unheard of, it was built about 3 meters, or ten feet, above the driveway and sidewalk, where it hung in a tree with twigs and leaves enclosed in it as the structure was enlarged, by the wasps, over the warm months. The structure is a combination of tiers of downward-facing papery combs surrounded by a papery envelope, usually with one main entrance and maybe a few secondary openings. This one appeared to support about 400 to 500 adult workers in August.

This is a larger-bodied version of a yellow jacket that looks black and white instead of yellowish, and it is a vigorously defensive species which actively convinces intruders to leave in a hurry, so we waited until the week before Thanksgiving to collect it after verifying that most of the workers had died. One of our students had a bee suit, another had a ladder, and someone brought pruners. I drove us to the site. The students did a great job keeping their cool in the face of the potential response by the wasps.



PTSO trip to KU (left).



Dr. Neil Snow

2019 was a thumbs-up year as a Gorilla, and time to reflect as another year winds down.

My teaching included a few independent study or graduate readings courses, and the regular offerings such as Plant Taxonomy, Evolution, Invasive Species Management,

and Grass Taxonomy. Plant taxonomy students Amy Hammesfahr, Claire Campbell and Peyton Witham found a plant species growing in Kansas for the first time as part of their plant collections.

Other highlights with students included a trip to St. Louis in January for a volunteer work project and insider's tour at the Missouri Botanical Garden, and a tour of the Hellbenders recovery program at the St. Louis Zoo. In early November 10 students and I attended an NSF-sponsored workshop on career development in biology and graduate school in Albuquerque (field trip shown below) at their Natural History Museum, with side tours to the University of New Mexico. It also was fun to visit the Ouachita Mountains on a 3-day herpetological field trip with Dr. George and a group of enthusiastic students. Lectures may be forgotten soon enough, but never so a good field trip. That is true for students and faculty.

Curatorial duties at the Sperry Herbarium — funded through 2020 by the National Science Foundation — were significant, and we take satisfaction seeing the goals of that infrastructure support grant coming to

fruition. By year's end we will have data based approximately 29,500 specimens, with over 40% geo-referenced (= having coordinates of latitude and longitude, added "post facto" if necessary). Nearly 5600 specimens have been digitally imaged. We added nearly 400 specimens to the Kansas and Regional Reference collection for a total of 1742, and another 1150 specimens have been mounted. Curatorial accomplishments were due in large measure to the work of students, including Jiawei Xu, Andrew Ortolani, Ximena Bogarín, and Dr. Dixie Smith, to whom I express my sincere thanks.

Collections data from the Sperry Herbarium are now a part of the Global Biodiversity Information Facility (<https://www.gbif.org/dataset/a92f4b3c-ae5c-45af-8dac-4a6a88d35ddd>). The process of moving into the renovated space in Hartman Hall commenced. A huge thanks to Kim Grissom and Dr. James Dawson for overseeing the placement of the 77 new herbarium cabinets during my absence. As specimens are moved to Hartman they first must be deep-frozen to avoid accidental importation of pests; thus the process of moving fully will not be completed until the end of 2020.

I replied to requests for plant identifications from Pittsburg, South Africa, Israel, Jamaica, and Nevada. Approximately a dozen leaf tissue samples were sent to colleagues at the Royal Botanic Gardens, Kew (UK) for DNA analysis.

Before I forget, my thanks to Dr. Joe Arruda for being able to co-teach POBII with him for several years, and for his good humor and sage counsel. We'll miss Joe after he retires.



L to R: Ximena Bogarín, Kyle Findley, Ryan McGinty, Rachel Styers, Leif Hey; Maddie Gay, Claire Campbell, Ashton McManis, and Adam Pistorius

My research program continues steadily. Former student Samantha Young Pryer's MS research was published; she is now a doctoral student at the University of Florida. I organized a national colloquium at BOTANY 2019 entitled *Floristics in the 21st Century: Challenges, Opportunities and Priorities*, which included ten invited guest speakers. A paper with project lead Dr. Elizabeth Stacy (Univ. NV-Las Vegas) on Hawaiian ohia lehua – the dominant tree species of the islands – was published in the *Journal of Heredity*. Two other papers are in press, one with two coauthors. I annotated nearly 600 plant specimens while visiting herbaria in New Mexico and Missouri, and over 400 specimens on loan were returned to herbaria in AZ, CA, MA, MO, NM, OH, TX, and France. Finally, I provided preliminary Coefficients of Conservation assessments for four species of grass at the request of the Colorado Natural Heritage Program.

I continue as a PSU reviewer for the University Press of Kansas, as well being an Associate Editor for *Systematic Botany*. I also coordinate the Department of Biology's Friday-an-Noon seminar series, which included over a dozen speakers from KS, OK, AR, MO and CO. I gave presentations to the Sperry-Galligar Audubon Society, the Kansas Nature Conservancy, BOTANY 2019, and hosted or helped host at least two or three groups of visiting school groups. Organizing and editing this newsletter also is something I do for the Department.

In the summers I have been helping to check the spread of musk thistle in the South Hills of Helena, Montana, including organizing weed-pulls through the Prickly Pear Land Trust.

Personal highlights always include reconnecting with people and meeting new ones. It was a pleasure to meet PSU alumnus Mike Robinson on two different occasions, as well as crossing paths with recent PSU alum Jacob Barnes.

It is an honor to work with colleagues so dedicated to student success. Check out the list of professional activity starting on page 16. Our Department's level of student productivity is laudable: Keep on rocking, everybody!

Be in touch. Here's to clear skies and smooth trails for 2020.



Dr. James Whitney

2019 was by far my busiest year yet at PSU in terms of research, as I was involved in four different projects that required field work.

The most extensive project sought to determine if improving water quality in the Spring River of southeastern Kansas is promoting greater prevalence

of the Neosho Madtom, a federally-threatened species. This project is funded by the US Fish and Wildlife Service and the Kansas Department of Wildlife, Parks and Tourism (KDWPT), and is the primary focus of Kali Boroughs' Master's thesis.



[A Neosho Madtom captured from the Spring River of Kansas on September 19, 2019. This species is listed as threatened under the Endangered Species Act \(1973\), and is a major focus of Kali Boroughs' Master's thesis project.](#)

For this project myself, Kali, and the two research technicians supported by the project (PSU alumni Alex King and PSU undergrad Josh Holloway) traveled to 40 sites in the Neosho and Spring River basins to assess fish and macroinvertebrate communities, in addition to quantifying habitat characteristics. Sites in the Neosho River basin ranged from west of Emporia in Chase County down to the Oklahoma border (Chetopa), and in the Spring River basin spanned from the Missouri border down to Oklahoma (Baxter Springs). Most of the sampling for this project had to be done during the fall semester, as heavy rain and

Springs). Most of the sampling for this project had to be done during the fall semester, as heavy rain and high river flows throughout the summer prevented us from getting much work done. So far we have captured 129 Neosho Madtoms, which is pretty impressive for such a rare species. Furthermore, this project received a fair amount of media attention during 2019, as articles about it appeared in the Joplin Globe and the Pittsburg Morning Sun, and as a news story on ABC KODE 12. This is a two year project, so we'll be doing the sampling for it all over again in 2020. Kali will be presenting the preliminary results from this research at the Kansas Natural Resources Conference (KNRC) in Manhattan, KS during January 2020 and at Catfish 2020: The Third International Catfish Symposium in Little Rock, AR during February 2020. Kali has already won a travel award from the Kansas Chapter of the American Fisheries Society that will cover her travel expenses for Catfish 2020.



Alex King (left) and Kali Borouhgs (right) quantifying depth and water velocity in the Spring River of Kansas as part of Kali's Master's thesis project.

Assessing the current distribution and abundance of the Blackside Darter in Kansas was another major research focus during 2019. This is a threatened species in Kansas with limited information on its range, so the KDWPT awarded us a grant via their Chickadee Checkoff program to try and increase knowledge on the species. The Blackside Darter at present only occurs in two stream systems near Manhattan, KS, so Kali, Josh, Alex and I spent a couple weeks in Manhattan in pursuit of this species. Similar to our Neosho Madtom project, our search for the Blackside Darter was hampered by thunderstorms and high stream flows. In spite of these meteorological setbacks, fish sampling conducted as part of our quest

for the Blackside Darter yielded 6,392 individuals across 39 different fish species, including 26 individuals of the federally-endangered Topeka Shiner. Unfortunately, not a single captured individual was a Blackside Darter. As such, this species remains elusive in Kansas, and may be even rarer than we previously thought. I will be presenting the findings from this project at KNRC in Manhattan, KS, in January 2020.



Some representatives of Kansas' Ozarkian fish fauna, including (from top to bottom): Banded Sculpin, Northern Hog Sucker, and Sunburst Darter. These fishes are the focus of an independent research project developed by PSU alumni Alex King.

Other research conducted during 2019 involved independent project ideas developed by Josh Holloway and Alex King. Josh was interested in comparing body shapes and dimensions of the Orangethroat Darter from streams draining the Cherokee Lowlands to those from streams originating in the Ozark Plateau. Streams from these two regions differ quite a bit in terms of water velocity, water clarity, gradient, and substrate, so Josh was interested in determining if these physical differences in streams manifested as different body forms in the Orangethroat Darter. The objective of Alex's research project was to evaluate the current status of Kansas' Ozarkian fish fauna,

different body forms in the Orangethroat Darter. The objective of Alex's research project was to evaluate the current status of Kansas' Ozarkian fish fauna, which are the 10 fish species whose Kansas distributions only include the Spring River basin in the far southeastern corner of the state. Some extremely charismatic fishes are part of this group, including the Banded Sculpin, Northern Hog Sucker, and the Sunburst Darter. Alex will be presenting her findings at KNRC in Manhattan, KS during January 2020.

2019 also involved presenting and completing research projects from previous years. For instance, in February my student co-authors and I presented at the KNRC in Manhattan, KS. These presentations included a poster over the threat posed by the nonnative Redear Sunfish in the Spring River basin, and an oral presentation concerning the status of threatened Hornyhead Chub and Redspot Chub in Kansas. Josh Holloway presented the poster, and won an award for best student poster from the Kansas Chapter of the American Fisheries Society. Furthermore, I attended and presented an oral presentation over my Hornyhead and Redspot Chub research at the annual meeting of the Society for Freshwater Science, which was held in Salt Lake City, UT in May.

Ecology, and Environmental Life Sciences during the fall semester. It was the first time I've offered Marine Biology, so I learned quite a bit prepping for that course. Stream Ecology included several field trips to local rivers and streams to sample fishes and macroinvertebrates. During the spring 2020 semester I will be teaching Biometry, Ichthyology, and Principles of Ecology.

In conclusion, 2019 was a great one! Hopefully 2020 will be as well.



Stream Ecology students processing macroinvertebrate samples from the Spring River of Kansas during a September field trip. (From left to right: Lakynne McElroy, Colby Manley, Brady Taylor, and Peyton Witham).



Stream Ecology students quantifying water quality in the Marmaton River in September 2019. (Front to back: Aliyah Clemens, Colby Manley, and Peyton Witham).

In terms of teaching in 2019, I taught Biometry, Marine Biology, and Principles of Ecology during the spring semester, and Stream Ecology, Principles of



Dr. James Dawson

I spend most of July in Austin at the University of Texas algal culture center.

I was able to re-isolate 180 strains so they could be re-introduced to the collection. In October I was named Campus Contributor of the

Month by SGA.

PROFESSIONAL ACTIVITY (PSU faculty in bold; student authors underlined).

Publications

Birt, J. A., Khajeloo, M., **C. C. Rega-Brodsky**, C. C., Siegel, M. A., Hancock, T. S., Cummings, K. S., and Nguyen, P. D. 2019. Fostering agency to overcome barriers in college science teaching: Going against the grain to enact reform-based ideas. *Science Education* 103:770-798.

George, Andrew D., Paul A. Porneluzi, Janet M. Haslerig, John Faaborg. 2019. Response of shrubland birds to regenerating clearcut area and shape. *Journal of Wildlife Management* 83: <https://doi.org/10.1002/jwmg.21733>.

George, A. D., Hammesfahr, A. M., Barnes, M. W., **C. C. Rega-Brodsky**. *Accepted*. Patterns of herpetofaunal species richness along environmental gradients in Kansas. *Collinsorum*.

Gido, K. B., D.L. Propst, **J.E. Whitney**, S.C. Hedden, T.F. Turner, T. J. Pilger. 2019. Pockets of resistance: response of arid-land fish communities to climate, hydrology, and wildfire. *Freshwater Biology* 64: 761–777.



Wildlife Management students Maggie Murray, Morgan Scott, and Ximena Bogarin practice radio-telemetry on an icy day at the Monahan.

Kellner, K.F., **Andrew D. George**, et al. 2019. Effects of forest management on vertebrate communities: Synthesizing two decades of data. *Ecological Applications* 29: <https://doi.org/10.1002/eap.1993>

Pryer, S.Y., **N. Snow**, J. Kartesz. 2019. Floristic survey of vascular plants in Crawford and Cherokee counties in southeastern Kansas. *J. Bot. Research Institute of Texas* 13: 545–591.

Stacy, E., T. Sakishima, H. Tharp, **N. Snow**. 2020. Isolation of *Metrosideros* ('Ohi'ia) taxa on O'ahu increases with elevation and extreme environments. *Journal of Heredity* 2019 (electronically) doi:10.1093/jhered/esz069. Pp. 1–16.

Steinbock, B., R. Bechtold, J. L. Seigny, D. Thomas, W. K. Thomas, **A. Ghosh**. 2019. Draft genome sequences of ten bacterial strains isolated from an abandoned coal mine land in southeast Kansas. *Microbial Resource Announcement*, 8:e01001-19. DOI: 10.1128/MRA.01001-19

Whitney, J.E., J.A. Holloway, D.T. Scholes, A. D. King. 2019. Long-term change of fish communities in a polluted watershed: does cleaner water “act” on fishes. *Transactions of the American Fisheries Society* 148: 191–206.

Oral Presentations

Barnes, Michael W., **Andrew D. George**. 2019. Effects of Vegetation Structure and Experimental Forest Management on Densities of Breeding Birds in Upland Hardwood Forests. Kansas Natural Resources Conference, Manhattan, KS.

Barnes, Michael W., **Andrew D. George**. 2019. Avian Response to Habitat Structure and Experimental Forest Management in Upland Hardwood Ecosystems. PSU Research Colloquium.



Elbert, A. and Gibson, M. Spatial distribution and regulation of CCL19 and CCL21 expression in rat uteri in preparation for embryo implantation. 17th Annual K-INBRE Symposium, Overland Park, KS.

Elbert, A., Gibson, M., V. Rider. Maternal Immunity: Preimplantation Preparation" 101st Annual Meeting Endocrine Society, New Orleans, Louisiana, 2019

George, Andrew D., Amy M. Hammesfahr, Michael W. Barnes, Christine C. Rega-Brodsky. 2019. Patterns of Herpetofaunal Species Richness Along Environmental Gradients in Kansas. Kansas Herpetological Society 46th Annual Meeting, Hays, KS.

Hollie, David R., Andrew D. George. 2019. Bird Community Response to Experimental Forest Management in Upland Hardwood Forests. Kansas Natural Resources Conference, Manhattan, KS.

Hollie, David R., Andrew D. George. Bird Community Response to Experimental Forest Management in Upland Hardwood Forests. PSU Research Colloquium.

Ortona, E., Pierdominici, M., **V. Rider.** 2019. Editorial: Sex Hormones and Gender Differences in Immune Responses. *Front Immunol.* 10 1076. doi: 10.3389/fimmu.2019.01076.

Rega-Brodsky, C. C., King, S. R., & Mallatt, K. Remediation of Tar Creek: Shifts in bird community composition over time. National Meeting of the American Society of Mining and Reclamation, Big Sky, Montana.

Rega-Brodsky, C. C., King, S. R., Mallatt, K., & Smith, M. 2019. Bird community response to remediation at Tar Creek. LEAD National Environmental Conference at Tar Creek. Miami, Oklahoma.

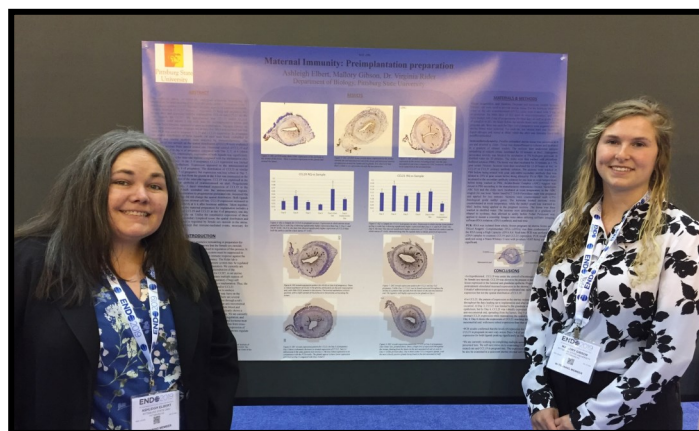
Snow, N. Upgrades and recent activity in the T.M. Sperry Herbarium. Sperry-Galligar Audubon Society, Pittsburg, December.

Snow, N. Plant biodiversity locally, nationally, and internationally: The role of the T.M. Sperry Herbarium at Pittsburg State University. Kansas Chapter of the Nature Conservancy 30th Anniversary Celebration, Pittsburg, KS, September 25.

Snow, N., J. Munzinger, J. Byng, M. W. Callmander. Thirteen additional new species of *Eugenia* from

New Caledonia. Invited paper: Colloquium on the Evolution, Ecology, and Biogeography of Pacific Plants. BOTANY 2019, Tucson

Snow, N., J. Lendemer. Floristics as a foundation for training students broadly in plant and fungal diversity. Oral presentation as part of Colloquium *Floristics in the 21st Century: Challenges, Opportunities and Priorities.* Oral presentation, BOTANY 2019, Tucson



Ashleigh Elbert (L) and Mallory Gibson at poster presentation in Louisiana.

Whitney, J.E., J. A. Holloway. 2019. Population status of the hornyhead chub and redspot chub in Kansas. Kansas Natural Resources Conference, Manhattan, KS, January 31 – February 01.

Whitney JE, J.A. Holloway JA. 2019. The environmental niche of two imperiled stream ecosystem engineers: hornyhead chub and redspot chub. Society for Freshwater Science Annual Meeting, Salt Lake City, UT, May 19 – 23.

Whitney, J.E. 2019. Responses of fishes to improving water quality in SE Kansas streams: mission accomplished or unfinished business? Kansas Chapter of the Nature Conservancy 30th Anniversary Celebration, Pittsburg, KS, September 25.

Posters

- Burnett N. A., A. Alzahrani, L. Cuthill, **A. Ghosh**. 2019. Ecology and prevalence of ticks and tick-borne bacterial pathogens in southeast Kansas. *KINBRE Annual Meeting*, Overland Park, KS.
- Byng, J., **N. Snow**. 2019. A visual representation of the floral and fruiting diversity of Malesian *Syzygium* (Myrtaceae) to aid identification. Flora Malesiana Symposium, Universiti Brunei Darussalam.
- Byng, J., V. Hequet, J. Xu, **N. Snow**. 2019. A visual representation of New Caledonian *Syzygium* (Myrtaceae) to aid identification. BOTANY 2019, Tucson.
- Durbin, C., **C.C. Rega-Brodsky**. 2019. Camera trap study of the mammal communities across an urbanization gradient. Pittsburg State University Research Colloquium. Pittsburg, Kansas.
- Findley, K. A., J. Wright, **C.C. Rega-Brodsky**, **A. D. George**. 2019. Monitoring herpetofauna on reclaimed mined lands in southeast Kansas. Kansas Herpetological Society Annual Meeting. Hayes, Kansas.
- Goodreau, R., K. Mallatt, **C. C. Rega-Brodsky**. 2019. Remediation of Tar Creek: Ecological diversity and potential human health impacts. Kansas IDEa Network of Biomedical Research Excellence (K-INBRE). Overland Park, Kansas.
- Hammesfahr, A., **C. C. Rega-Brodsky**, K. Womack-Bulliner. 2019. Habitat ecology, species occupancy, and public perception of three declining bat species in southeastern Missouri. Pittsburg State University Research Colloquium. Pittsburg, Kansas. 2nd Place Poster Award.
- Hammesfahr, A., **C. C. Rega-Brodsky**, K. Womack-Bulliner. 2019. Habitat ecology, species presence and public perception of three declining bat species in southeastern Missouri. Western Bat Working Group Biannual Meeting. Tulsa, Oklahoma.
- Holloway, J.A., **J. E. Whitney**, J. Wright, K.L. Borroughs, R. E. Goodreau, A. L. McManis, A. Pistorius, D. K. Puritty, M.A. Ramirez, R.A. Styers. 2019. Historical and contemporary distribution of the nonnative redear sunfish (*Lepomis microlophus*) in the Spring River subbasin of Kansas. Kansas Natural Resources Conference, Manhattan, KS, January 31 – February 01.
- Holloway, J.A., **J. E. Whitney**, J. Wright, K.L. Borroughs, R. E. Goodreau, A. L. McManis, A. Pistorius, D. K. Puritty, M.A. Ramirez, R.A. Styers. 2019. Historical and contemporary distribution of the nonnative redear sunfish (*Lepomis microlophus*) in the Spring River subbasin of Kansas. Pittsburg State University Research Colloquium, Pittsburg, KS, April 10.
- McGinty, Ryan W., **Andrew D. George**. 2019. Microclimate Use by the Gray Bat Colony in Pittsburg, Kansas. Kansas Natural Resources Conference, Manhattan, KS.
- Olson E., A. Minicce, S. Ricke, **A. Ghosh**. 2019. Characterization of bacterial isolates obtained from poultry, poultry feed, and retail food using whole genome sequence analysis and selected biochemical tests. *Annual Arkansas Association for Food Protection (AAFP) Conference*, Fayetteville, AR. (Best Poster Award)
- Smith, M., **C.C. Rega-Brodsky**. 2019. Pittsburg State University goes native: A study on the resources and wildlife attraction of a native pollinator garden on college campus. Pittsburg State University Research Colloquium. Pittsburg, Kansas.



Maggie Murray, Morgan Smith, and Ximena Bogarín working with remote sensing equipment.

Styers, Rachel, Jake Wright, C. C. Rega-Brodsky, Andrew George. 2019. Establishing Long-Term Monitoring of Birds, Herpetofauna, and Vegetation in Mined Land Wildlife Areas in Crawford and Cherokee Counties. Kansas Natural Resources Conference, Manhattan, KS.

Styers, R., Wright, J., C. C. Rega-Brodsky, A. George. 2019. Establishing long-term monitoring of birds, herpetofauna, and vegetation in mined land wildlife areas in Crawford and Cherokee Counties. Pittsburg State University Research Colloquium. Pittsburg, Kansas.



Animal Behavior students observing captive raptor behavior at the Research Reserve.



National Association for Interpretation Region 6 Meeting, L to R: Katlin Dunsing, Claire Campbell, Delia Lister, Bec Timmermeyer, and LaKynne McElroy.

Styers, R., Wright, J., A. George, C. C. Rega-Brodsky. 2019. Establishing long-term monitoring of birds, herpetofauna, and vegetation in mined land wildlife areas in Southeast Kansas. Capitol Research Summit. Topeka, Kansas. Best Undergraduate Poster Award.

Styers, R., Wright, J., A. George, C.C. Rega-Brodsky. 2019. Establishing long-term monitoring of birds, herpetofauna, and vegetation in mined land wildlife areas in Southeast Kansas. Kansas Natural Resources Conference. Manhattan, Kansas.

Williams, L., C. C. Rega-Brodsky. 2019. Climate change impacts on bird communities vary throughout cities in Kansas. Pittsburg State University Research Colloquium. Pittsburg, Kansas.

Wright, Jake, Joshua Holloway, Andrew George. 2019. Status and Population Trends of the Gray Bat Colony in Pittsburg, Kansas. Kansas Natural Resources Conference, Manhattan, KS.

Wright, Jake, Andrew D. George. Status and Population Trends of the Gray Bat Colony in Pittsburg, Kansas. PSU Research Colloquium



Leah Cuthill and Dr. Ghosh doing research locally on ticks as part of Leah's MS research.



Students and faculty at the Kansas Natural Resources Conference. Back row (L-R): Josh Holloway, Jacob Wright, Michael Barnes, Dr. Whitney, Dr. George, Ryan McGinty, Dr. Triplett. Front row: Dr. Nonnenmacher, Rachel Styers, Kali Boroughs, Dr. Brodsky.



Students learning how to prepare museum specimens with Dr. Brodsky. L-R: Caleb Durbin, Claire Campbell, Maddie Gay, and Ned Curfman.



Left: Amy Hammesfahr (graduate student) shows Ryan McGinty a captured red bat. Above: An Endangered Indiana Bat in the Missouri Ozarks .

Below: Urban Ecology students visiting Lakeside Nature Center in Kansas City, meeting baby opossums. L-R: Ailie Foresman, Ramie Unruh, Caleb Durbin, Katlin Dunsing, and Charlie Beetch.

Below: Dr. Snow reviews some basics of bryophytes growing at a limestone seep along the Little Missouri River in the Ouachita Mountains on Dr. George's herpetology field trip in April.

Below right: A Smooth Earthsnake seen on the same trip.





Left: 2019 Ecology and Field Biology Orientation students. Welcome to Pitt State!

Below: Urban Ecology students visiting chat piles at the Tar Creek Superfund site. L-R: Bec Timmermeyer, Ashlyn Sinclair, Aliyah Clemens, Brady Taylor, Caleb Durbin, Cody Kranz, Morgan Smith, Ailie Foresman, and Summer King (Quapaw Nation Environmental Scientist).

Below left: Urban Ecology students meeting with Jay Byers, the Deputy City Manager, to discuss city planning and green infrastructure in Pittsburg. L-R: Cody Oliphant, Caleb Durbin, Jared Simon, Lindsey Williams, Jay Byers, and Dr. Triplett.

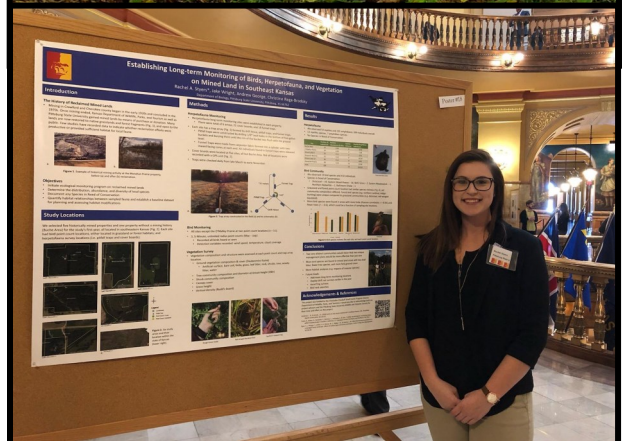


Below right: Bobcat captured on Snapshot USA camera, located in Wilderness Park as part of Dr. Brodsky's monitoring.



Left: Morgan Smith with a captured bank swallow at the Tar Creek Superfund site.

Right: Rachel Styers presenting her Mined Land ecology research at the Undergraduate Research Day at the Capitol (Best Undergraduate Poster Award).





Biology bluegrass as Spring semester winds down. L-R: Ashlynn Henderson, Dr. Snow (bass), Maddie Gay (mandolin), Edith Sigler (fiddle), Glenn Sigler (mandolin), Michael Barnes (banjo), and Dr. George (guitar).



Left: Some of the invited speakers for the *Floristics* colloquium at BOTANY 2019 in Tucson (L to R): Drs. Christina Alba, Barbara Ertter, Neil Snow, Lynn Gillespie, Wendy Zomlefer and John Kartesz.

Right: Day campers learning about trees and having a good time!

