



Photo: Charlie Warden

## Greetings and Welcome

Welcome to the Spring 2020 edition of the Department of Biological Sciences Newsletter. It has been a full calendar year since we last produced a newsletter and the activities have accumulated!

Here are just a few items, further detailed on the pages that follow. The department's new greenhouse is up and running, our Honors-in-Discipline Program continues to flourish, **Dr. Gerardo Arceo-Gomez** received a three-year grant from the National Science Foundation, and we mourned the passing of **Dr. David Benner** who had been a faculty member in Biological Sciences for 28 years, including serving as department chair for 4 years.

The faculty were as busy as always: **Drs. Cecilia McIntosh** and **Dhirendra Kumar** hosted an international scientific conference at ETSU, **Dr. Istvan Karsai** received a Fulbright Fellowship to work with colleagues in Europe,

and **Dr. Leonard Robertson** celebrated a milestone with his long-term participation in the Upper East Tennessee Science Fair. In spring of 2019, we had an outstanding showing at the 2019 *Appalachian Student Research Forum* and *Boland Undergraduate Research Symposium* with a number of undergraduate and graduate students presenting their work and, in many cases, receiving awards for their presentations. We had a successful Advisory Board Meeting and associated Department Awards Ceremony last spring.

Furthermore, we welcomed two new staff members to the department's Main Office. **Ms. Elizabeth Conner** took over as Executive Aide for Biological Sciences. Elizabeth started in fall 2019 and holds a degree in English with a minor in Technical Writing from ETSU's Department of Literature and Language. **Ms. Raven Ragsdale** also



joined us in fall 2019 as interim Laboratory Coordinator. Raven holds an undergraduate degree in Biology with a minor in Psychology and is currently a Master's student in Dr. Moore's laboratory. It has been a real pleasure working with Lizzie and Raven!

As always, thank you to **Dr. Darrell Moore** for taking on the role of editor of our newsletter.

Finally, thank you to all who provided financial support to our student scholarships, research endowments, and the Eagle Cam over this past year. This support is most appreciated and critical for us to continue these

initiatives. If you are interested in becoming a donor, on-line donations can be made through the "Give Now" link on the department webpage (<http://www.etsu.edu/cas/biology/>).

Please remember that we always enjoy hearing from students, alumni, and other friends of the department ([bidwell@etsu.edu](mailto:bidwell@etsu.edu)) and best wishes for 2020!

**Dr. Joe Bidwell**

*Chair of the Department of Biological Sciences*



## Chair's Addendum Concerning COVID-19

As I prepared the Chair's Welcome for the Spring 2020 Newsletter, none of us would have predicted the "new reality" we found ourselves in after Spring Break 2020. The increasing threat of the

COVID-19 virus led campus administrators to announce that all courses would move to online delivery after we returned from Break. Not long after that, local and state "stay at home" orders were released and we found ourselves not only needing to move our classes online, but also working completely from home! I am unable to effectively convey just what a monumental task this was. At the time, the only online classes we offered were Non-majors Biology 1 and 2, which were specifically developed for online delivery over the better part of a year. We had a week to "do something" and many of us, myself included, had never taught a course online. Additionally, there were concerns about students and faculty both having sufficient internet access and computer capacity at home to make this transition. Most of us spent Spring Break learning the technology that would allow us to attempt teaching online. We worked together - first in person, and then by e-mail- asking questions about how to use some software or posting

some new observation about what a program does under some new circumstance. "Zooming" became a verb and our first online faculty meeting looked like the start of a Brady Bunch episode. There were challenges and frustrations, like the time I spent thinking I was recording a lecture and then discovering an hour later that "record" was not on.

Fast forward to the Sunday I am writing this- We are about to start week 4 of classes after Spring Break and I am happy to report, we did it. Not only did we get it done, but some of us have received e-mails from students thanking us for the effort made in converting content to online. The Department of Biological Sciences further established itself as the special place that brought me here six years ago. A place characterized by support and collegiality and a joint interest in celebrating each other's success. Just as it was a difficult task to convey what a monumental task moving courses to online was, it is equally difficult to convey the pride I have in what my colleagues in the department have accomplished over the last four weeks. The same goes for the patience and understanding our students have conveyed throughout this journey. Spring semester 2020 is like none any of us have experienced before and hopefully never will again. However, as we go forward, we can look back on this time as a reminder of who we really are and what we can accomplish.

Best wishes and health and safety to all,

**Dr. Joe Bidwell**

# Ph.D. Student Builds New Apparatus for Recording Salamander Behavior

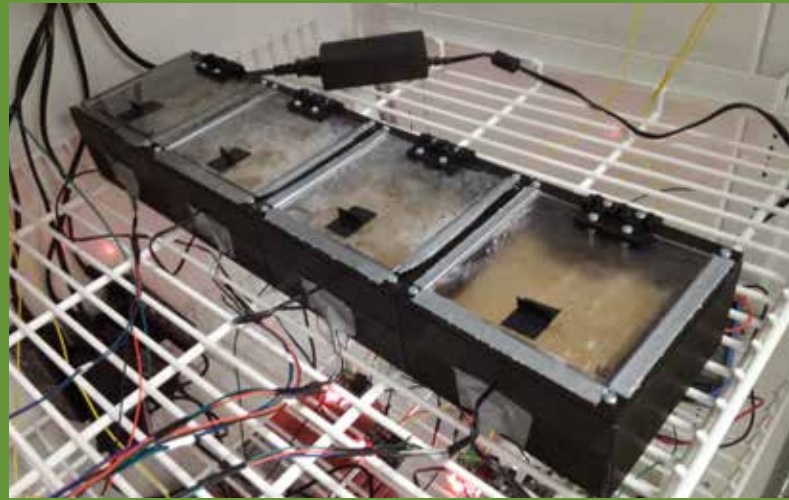
Article by Trevor Chapman, Ph.D. student in the laboratory of Dr. Joe Bidwell



The field-ready apparatus (Photo: C. Warden)

The southern Appalachian Mountains are among the most diverse amphibian hotspots in North America. Specifically, there are more species of terrestrial woodland salamanders in this area than anywhere in the world. This group of salamanders is a part of the Plethodontidae family, which is defined by the shared characteristic of “lunglessness”. They are sensitive to changes in moisture and temperature due to their exclusive reliance on cutaneous respiration (both oxygen and carbon dioxide diffuse across the skin). Despite seemingly identical morphology and physiology, some species in this area are restricted to high elevation habitats while others are widespread. One goal of my research is to compare the behavioral preference for environmental factors between high- and low-elevation woodland salamanders.

Previous methods for measuring behavioral preference for environmental conditions (i.e. temperature) require tedious observation and have been criticized for lack of continuous preference data. In order to address these problems and construct an experimental design for measuring this behavior in small amphibians, I teamed up with Dr. Dan Connors from the engineering department. It took almost 18 months and countless prototypes to complete the experimental setup, but the end product is applicable to a wide range of behavioral research. The contraption, or “behavior arena”, consists



The 4-chambered arena (Photo: T. Chapman)

of four connected compartments in a row which salamanders can move between freely. Relay switches control devices which regulate temperature and humidity within each individual compartment, thus a gradient similar to either high- or low-elevation conditions can be established across the arena.

Although precise environmental control of the arena was not easy to achieve, what makes the device potentially useful in a wide range of amphibian behavior research is the method of data collection. Typically, this would require countless observer hours, during which the researcher either continuously or periodically watches and records the animal’s location and surrounding conditions. Instead, we used a Keithley multimeter that is capable of recording data from almost any instrument that relies on changes in voltage for measurements. By installing load cells underneath false floors inside each compartment, we can set the Keithley to record where a salamander is inside the arena during every second of a trial. Not only does this provide continuous behavioral preference data, but it saves the would-be observer (me) an untold amount of time! Since the arena is designed and 3D printed in-house, we can modify the system to measure other behaviors such as response to chemical cues, territorial cues, and even behavioral changes throughout the day.

# EagleCam 2018-2019 Nesting Season

This marked the 4th year of our EagleCam Bald Eagle live-streaming of two pairs of resident Bald Eagles in Washington and Sullivan counties in Upper East Tennessee. For the first time in two nesting seasons we once more had live cameras on both of our eagle nests. In the previous year, we experienced wildlife difficulties with nest visitation by raccoons causing the Bluff City area nesting pair to abandon their old nest site in favor of a new one a few miles away. That nest was established in a large sycamore tree in the midst of a nesting colony of approximately 12-15 pairs of Great Blue Herons that subsequently abandoned their nest sites to our eagles, Frances and Eugene. Additionally, at the end of the 2018-2019 nesting season, raccoon attacks on the Johnson City nest from below so weakened the structure that it collapsed entirely from within as the fully grown and fledged chicks of the year were leaving it for good. These two eagles returned in September and completely rebuilt their nest using more than 770 sticks and over 125 trips with nest filler materials -- all in full view of our live-streaming cameras. Both nest sites have been fully armored with metal sheeting predator guards around the bases of the nest trees and these are proving effective against climbing mammals.

Despite all of the disturbances that occurred during the long breeding cycles of our parent eagles, the Bluff City pair successfully fledged 2 chicks in their 11th nesting season and the Johnson City birds fledged 3 chicks in this, their 10th, nesting season. That makes a combined total of 42 young birds fledging these two East Tennessee eagle nests since they have been established. Our birds are back on their nests as I write this and the 2019-2020 nesting season has begun with eggs already laid in both nests.

Our live-streaming takes a community of volunteers and is supported by several sponsors and lots of individual donors. Our volunteers range from Biological Sciences faculty and staff, to ITS staff, to Advancement Office staff, to scores of volunteers out in "Eagle Nation" who monitor and operate our cameras day and night. In the most recent nesting season, our viewers scored more than 1.4 million hits on the Johnson City cameras alone and our eagles were viewed in 206 countries and territories around the globe. The ETSU/Biological Sciences brand is seen every time anyone connects with one of our cameras and we are continuously streaming from our nest sites. New partnerships with BrightRidge and BTES companies will bring higher definition images and the ability to bring better equipment on line for the coming nesting season. Activities are underway to bring educators on board with the hopes of establishing a site for teachers on our webpage where we can become a repository for teaching modules with the lives of our National Birds as a focus for classroom education for students of all ages around the world.

You can support us with your tax-deductible donations and you can join us as a viewer by going to the ETSU homepage, clicking on "tools", then click on "A-Z Index" and select the letter "E" to take you to "Eagle Camera" and you are on your way to becoming part of our Buc Eagle Nation.

**Dr. Fred J. Alsop III**

Director, ETSU/Biological Sciences EagleCam Project

## Dr. Arceo-Gomez Awarded NSF Grant

**Dr. Gerardo Arceo-Gomez**, Assistant Professor in the Department of Biological Sciences, has been awarded a three-year grant in the amount of \$699,797 from the National Science Foundation: "Uncovering the mechanisms driving co-flowering community assembly: integrating flowering and floral trait distribution patterns via a novel use of network analysis." The major objective of this grant is to uncover the ecological processes and mechanisms that mediate species co-existence and co-flowering in diverse plant communities.

According to Dr. Arceo-Gomez, "In order to predict how environmental changes will impact the long-term stability and persistence of plant species in a community, it is critical that we understand the forces that shape these communities. Thus, the NSF-funded research will evaluate the combined importance of two key ecological forces that determine plant species' ability to co-exist and co-flower at any given site -- plants that compete for pollinators and plants that help each other to attract pollinators. This will be accomplished by integrating data

on floral characteristics (such as flower color and smell) and flowering time. Once the signals of pollinator competition and facilitation have been uncovered, resulting predictions will be tested experimentally in the field by manipulating plant community composition as well as in the greenhouse via hand pollination experiments. The research will be carried out in plant communities in northern California where my students and I will travel during the summer months to collect the data needed for this project."

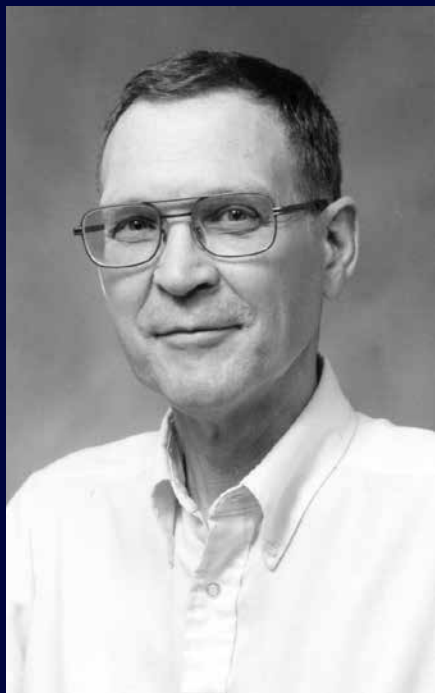
# Dr. Karsai Receives Fulbright Award

Dr. Istvan Karsai, Professor in the Department of Biological Sciences, was a recipient of the prestigious Fulbright U.S. Scholar Program award to conduct research in Budapest, Hungary at Eötvös Loránd University (ELU) during the 2019-2020 academic year. According to the Fulbright U.S. Scholars website, “the Fulbright Scholar Program supports activities and projects that recognize and promote the critical relationship between educational exchange and international understanding, in addition to the intellectual merit of the proposals.” Dr. Karsai’s research, in collaboration with Dr. George Kampis of ELU and Dr. Thomas Schmickl of the University of Graz (Austria), was used to write a new book, *Mathematics of Planet Earth: Interdisciplinary Approach to Environmental Conservation*, in the Mathematics of Planet Earth series published by Springer Verlag. According to Dr. Karsai, “I had a very productive time during my Fulbright grant. Working with my two friends Thomas Schmickl and George Kampis on a book that depicted



Dr. George Kampis (left) and Dr. Istvan Karsai in Hungary (Photo: I. Karsai)

our own research was an enjoyable time in my country of origin. We are very passionate about our research and hopefully the book will reflect this passion. We hope that the Springer production team will be able to manage getting the book out this year. Many thanks to my department for supporting my sabbatical to free up my time to focus on this exciting research project.”



Former Professor and Chair of the Department of Biological Sciences, **Dr. David Benner** passed away on February 1st, 2019. Dr. Benner was

## Passing of Dr. Dave Benner

employed in our department for 28 years, from September 1971 until December 1999, including four years as Chair from 1992 to 1996. He was awarded Emeritus status in December 1999.

Dave was born in a farmhouse in Bainbridge, Ohio, in 1934. He served in the U.S. Army from 1958-1960, taught high school science in Napa, California, and received his Ph.D. in genetics from the University of California, Riverside in 1970. At ETSU, Dave’s research was in *Drosophila* genetics as well as the morphology of the reproductive organs in the fly *Megaselia scalaris*. He taught Genetics and General Biology I for many years. In addition to his work at ETSU, Dave was an avid volunteer in the community and enjoyed a wide array of hobbies and outdoor adventures.

Dave is fondly remembered by the Biology faculty for his civility, his professional approach to teaching, a very dry sense of humor, his wisdom, and a keen scientific curiosity. Here is a sampling of memories from current faculty members... From Dr. McIntosh: “Dave was a really good chairperson for new faculty!” From Dr. Alsop: “He was an early proponent of the importance of promoting critical thinking in the classroom.” From Dr. Moore: “As a young faculty member, I very much appreciated Dave visiting my lab and his enthusiasm for a new project I was starting.” From Dr. Robertson: “He took an interest in helping me as a new faculty member and even loaned me a microscope to study embryos. He was fair, deliberative, and a damn good bass in the Church choir.”

# Biology Honors-in-Discipline Program is Thriving

Article by Dr. Rebecca A. Pyles

Honors at ETSU means more than just a “label.” Students have to be willing to put in extra effort to earn an “Honors Biology” degree. Our Faculty also put in extra effort, especially in providing students with enhanced professional development in science. Our Biology Honors scholars enroll in courses, such as Research Orientation and Seminar in Biology, but also write and present an Honors Thesis that reports on a formal research experience with a faculty mentor. Most of our Honors scholars begin this research during their sophomore or early junior year, which gives them plenty of time to do good science, and (hopefully) produce a publication in a scientific journal. If you are curious—all ETSU Honors theses are available on the university’s “ethesis” website (<https://dc.etsu.edu/honors/>).

Needless to say, these students are busy and they keep our faculty busy, too! Our Honors program is relatively small, usually with 24-32 students. Each year, we graduate some (see below) and select new freshman or current ETSU students who wish to participate. Students have a dedicated faculty academic advisor who works with them for all four years; they receive priority registration; and each semester, they are considered for award of an honors scholarship from the Honors College. Our Biology Honors Scholars tend to be very competitive for these awards—currently, 75% receive honors scholarships from the ETSU Honors College.

Since its re-inception five years ago, we have selected 50 undergraduate students as Biology Honors Scholars—eight of whom have already graduated, and five more will receive their B.S. in Biology (with Honors) in May 2020. As I write this in February 2020, I am in contact with 42 students about joining our program in Fall 2020. We’ll be even busier!

We are very proud of our Biology Honors Scholars and their accomplishments. Wish we could give you details on every single one! But for now, we especially wish to acknowledge our students who finished up and graduated in May 2020:



(Photo: H. Rauhuff)

**Hannah Rauhuff** joined our program as a freshman in 2016 from Kodak, Tennessee, and will receive her degree in the Biology/Biochemistry concentration. Hannah is working with Dr. Russ Brown (Biomedical Sciences) on a project entitled “The effects of an adenosine A(2A) agonist

as an adjunctive treatment to alleviate sensorimotor gating deficits in a rodent model of schizophrenia.”



(Photo: D. Moore)

**Mattea Garmany** is from Sevierville, Tennessee, and joined our program as a freshman in 2016. “Teah” (pronounced Tay-ah) is completing a concentration in Biology and is working with Drs. T.J. Jones and Darrell Moore on her research, entitled “Effects of Non-photic Zeitgebers on the Circadian Clock in the Common House Spider, *Parasteatoda tepidariorum* (Araneae: Theridiidae).”



(Photo: D. Moore)

**Andrew Griffus** joined our program in fall 2018 as a Junior ETSU student. His home is in Thompsons Station, just south of Nashville. “Drew” is a double major in Biology and Chemistry, and is working with Drs. Darrell Moore and T.J. Jones on a research project entitled “Unusual Phase Resetting Properties of the Scorpion Circadian Clock (*Scorpiones: Buthidae*).”



(Photo: S. Fox)

**Sarah Fox** is from Burnsville, North Carolina, and joined our program as a junior in Fall 2018. She is completing her major in Biology with a minor in Statistics. Sarah works with Dr. Cecilia McIntosh on her research, entitled “Modification, Verification of Sequence and Optimization of Expression of P297F an Inactive Mutant of Flavonol Specific Glucosyltransferase from Grapefruit (CP3GT).”



(Photo: B. Vogel)

**Brooke Vogel** attended Science Hill High School, right here in Johnson City. She joined our program her sophomore year beginning Fall 2017. Brooke is working on her Bachelor’s in our Biology/Biochemistry concentration and completing a minor in Family Studies. Since our Biology faculty

encourage students to seek projects in all aspects of life science, Brooke is working with Dr. Stacy Brown in the ETSU Gatton College of Pharmacy. Her research project is “Therapeutic Drug Monitoring of Apixaban Using Chromogenic Kits.”

CONTINUED ON PAGE 7

As the Faculty Coordinator for Honors in Biology, I must share what a privilege it is to work with these students. Oh yes—and a lot of fun, too. It takes work to keep up with them and all they do—I am constantly impressed by how many ways they give back to our department and to ETSU, as a whole. Having also been an honors research mentor, I can also confirm the many ways these scholars contribute to our research through their curiosity, enthusiasm,

determination, and just plain joy of learning. The same experience exists in our classrooms, since these are often the students who will ask “that” question everyone else is afraid to ask! These students help keep faculty members fresh and on our toes in the field, laboratory, and the classroom! I would like to thank each one personally for their many contributions to all we do!

## Biology Department Shines at Appalachian Student Research Forum



The Department of Biological Sciences was extremely well represented at the annual Appalachian Student Research Forum (ASRF) in 2019. The Forum was held at the Millennium Center in Johnson City on April 12th. According to the ASRF website, “The Forum is an annual event in which dual enrollment, undergraduate, graduate, recent graduate and medical students as well as post-doctoral fellows and medical residents present their research in a formal, juried setting. The Forum is open to students from all colleges and universities within the southern Appalachian region.” Undergraduate students from our Department presenting at the meeting (advising professor(s) in parentheses) were **Pearl McQuistion** (Foster), **Mattea Garmany** (Jones, Moore), **Andrew Shields** (Jones, Moore), **Danisha Davis** (Foster), and **Hayley Seaton** (Foster). Our Master’s students presenting at the meeting were **Daniel Barker** (Arceo-Gomez), **Amber Stanley** (Arceo-Gomez), **Shae Crain** (Jones, Moore), **Rebecca Steele** (Jones, Moore), **Rajib Hasan** (Yampolsky), **Michelle Caudill-Osborne** (Bidwell), and **Raven Ragsdale** (Moore, Jones). Also presenting at the research forum were Ph.D. students **Jyoti Ranjan Behera** (Kilaru), **Aaron Birchfield** (McIntosh), **Imdadul Haq** (Kilaru), and **Madeleine Miller** (Moore, Jones). We very much appreciate the efforts of our students and mentors to showcase their research work at this regional research meeting.

### Award Winners from Biological Sciences:

- **Michelle Caudill-Osborne**, one of three recipients of the TVA Environmental Steward Award, Graduate Student-Master’s Biology: *A Comparison of the HGM Approach to the RBP Method of Evaluating Reconstructed Streams on Surface Coal Mines*.
- **Pearl McQuistion**, Second Place, Undergraduate Student-Medicine & Diseases, Poster Presentation: *The Role of the Ataxia Telangiectasia Mutated Kinase on Diastolic and Systolic Function in Diabetic Cardiomyopathy*.
- **Amber Stanley**, First Place, Graduate Student-Master’s, Biological Sciences, Oral Presentation: *The Effects of Urbanization on Avian Seed Dispersal Success of Eastern Poison Ivy (Anacardiaceae.)*.
- **Raven Ragsdale**, First Place, Graduate Student-Master’s Biological Sciences, Poster Presentation: *Circadian Resonance and Entrainment in Three Spider Species (Frontinella communis, Metazygia wittfeldae, and Cyclosa turbinata)*.
- **Madeleine Miller**, First Place, Graduate Student-Doctoral Biological Sciences, Poster Presentation: *Lights, Clock, Action! Circadian Rhythms of Locomotor Activity in Larinioides cornutus Indicate Extreme Photosensitivity*.

# Long-Standing Tradition Continues with Upper East Tennessee Science Fair

Article by Dr. Leonard Robertson



(Photo: D. Moore)

For over 40 years, the Biological Sciences and Physics Departments at ETSU have provided expert help in both administration and judging of the annual middle school level (4th – 8th grade) ETSU-Kiwanis Upper East Tennessee Science Fair. Over those years, most of the expert judges in the Biology division have come from the ETSU Department of Biological Sciences. Additionally, two of the ETSU Biology faculty (**Dr. Dan Johnson** and **Dr. Leonard Robertson**) have served multiple-year stints as President of the Fair. Most recently, **Dr. Gary Henson** of the ETSU Physics Dept. has served as Perpetual President with Dr. Robertson serving as the ongoing Vice President/Judging Chairman. Very lucrative prize money has been awarded each year thanks to the generous support and sponsorship by the Johnson City Kiwanis Club. At the average rate of \$6000 per year over those 4 decades, the Kiwanians have provided a total of approximately \$240,000 in award money for the deserving student prizewinners. The other major sponsor over many of those years has been Eastman Chemical Company, providing generous monetary awards as well as expert judges in the area of physical science. Everyone involved in this long-term project has always worked gratis. The ETSU/Kiwanis Science Fair is a fine example of public service provided by ETSU faculty in our community.



Dr. Cerrone Foster with Science Fair contestant  
(Photo: L. Robertson)



Dr. Karl Joplin with Science Fair contestant  
(Photo: L. Robertson)



# Dr. Foster Joins the 1st Cohort of the Future Faculty of Cardiovascular Sciences Program

**Dr. Cerrone Foster**, Assistant Professor, has been accepted into the University of California, San Diego (UCSD), Future Faculty of Cardiovascular Sciences (FOCUS) program for the 2019-20 academic year. The program is sponsored by the National Institutes of Health, Heart Blood Lung Institute (NIH-NHBLI) with the goal of increasing and improving the long-term success of junior faculty from underrepresented groups in the biomedical workforce. The FOCUS program is one of nine

programs at academic institutions across the country sponsored by the NIH-NHBLI where 8-10 junior faculty are selected to spend a year enhancing research, academic, professional and grant writing skills, in addition to developing mentoring networks. The FOCUS program begins with a 2-week residency on the campus of UCSD, a mid-semester meeting, monthly virtual mentoring meetings, and a final culminating week-long experience at UCSD in July of the following year.



## 2019 Department Awards Ceremony

The Department of Biological Sciences held its Annual Awards Banquet and Awards Ceremony on April 11th at the Doubletree Hotel's Willow Ballroom. **Dr. Joe Bidwell** served as the Master of Ceremonies. The Keynote Address "Student Research In The Natural Sciences...And Why It Matters" was delivered by **Dr. Daniel G. Blackburn**, the Thomas S. Johnson Distinguished Professor of Biology at Trinity College (Hartford, Connecticut).

### The Department of Biological Sciences Award Winners:

- Dr. Denise Pav Scholarship Award: **Daniel Barker** (Advisor: Gerardo Arceo-Gomez) *Congruence and within-season variation in floral visitation and pollen transport networks in Southern Appalachia plant-pollinator communities.*
- Marcia Davis Biological Sciences Research Award: **Travis Watson** (Advisor: Gerardo Arceo-Gomez) *Effects of pesticides and pollination gardens on native plant communities: have we ignored plants when assessing causes and solutions to bee population decline?*
- William H., Fraley and Nina M. Fraley Memorial Research Award: **John Warren Rhoden III** (Advisor: Joe Bidwell) *Determining the Physiological and Behavioral Methods of Salinity Tolerance in the Freshwater Bivalves, Corbicula fluminea, Dreissena polymorpha, and Lampsilis fasciola.*
- Barclay-Moore Undergraduate Research Fellowship: **Baylea Nicole Davenport** (Advisor: Dharendra Kumar)

- ETSU Biological Sciences Outstanding Senior Award: **Cheril Patel** (Advisor: Gerardo Arceo-Gomez)
- Dr. Herman O'Dell Award for Outstanding Junior: **Mattea Ann Garmany** (Advisors: Thomas Jones and Darrell Moore)
- ETSU University Faculty Award in Biological Sciences: **Stephen Duncan**

### The (infamous) Peer Awards

- Best hair: **Rebecca Steele**
- Most helpful: **Shae Crain**
- Most likely to help old ladies reach items on the top shelf in the grocery store: **Brian Dempsey**
- Most likely to start a game of dodgeball in the courtyard: **Imdadul Haq**
- Dirtiest Job Award...because she collects bird poop: **Amber Stanley**
- Most likely to see a dog, exclaim "dog!" so everyone knows, and then go pet the dog: **Daniel Barker**
- Most likely to drink 10 cups of coffee before 10 am: **John Rhoden**
- Most likely to win a Dale Earnhardt look-alike contest: **Trevor Chapman**
- Most likely to actually change the world: **Raven Ragsdale**
- Most likely to become a mad scientist: **Madeleine Miller**
- Most likely to be swarmed by bees: **Dr. Moore**

# Game Theory in Action: Genetics Students Experience Prisoners' Dilemma

Article by Dr. Lev Yampolsky

In the well-known Prisoner's Dilemma, all rational participants would benefit from cooperation, but the fear of someone else defecting (that is, selfishly non-cooperating) influences every participant to choose the sub-optimal, selfish non-cooperating strategy. The classic example has two prisoners being interrogated in separate rooms so that they can't communicate with each other. Each prisoner (let's say George and Ralph) is offered the same deal: If George (G) rats on Ralph (R), G goes free and R gets three years in jail. Likewise, if R rats on G, then R goes free and G gets three years in jail. If neither prisoner snitches, they both spend just one year in jail. If they both snitch on each other, they both get two years in jail.

This is the basis of many self-destructive behaviors in humans and animals, collectively known as the Tragedy of the Commons. These include (apart from criminals "ratting out" each other to investigators) overgrazing, overfishing, emitting greenhouse gases, and selling bad mortgages. One might expect that the likelihood of choosing the selfish strategy should depend on presence of other potentially selfish players. Or, perhaps, it may depend on whether a player is reminded about the presence of such other players.

In two recent semesters, students in Genetics Lecture have been offered extra points for taking an entry quiz. This offer was formulated in two different ways, distributed randomly to students.

- **Version I:** "Mark 'A' if you would like to receive 3 extra points for doing this Intro quiz (only you and all those who mark 'A' will receive it). Mark 'B' if you would like the whole class to receive 6 extra points (which will happen only if nobody in the whole class marks 'A')."
- **Version II:** "Mark 'A' if you would like, personally, to receive 3 extra points for doing this Intro quiz. Mark 'B' or any other letter if you would like the whole class to receive 6 extra points (which will happen only if nobody in the whole class marks 'A')."

Two observations are to be made here. First, as in the classic Prisoner's Dilemma, the payoff is higher for cooperation (6 points) than for selfishness (3 points). Everyone might benefit from cooperation, if everyone cooperates. Second, while students who received Version II are left in the dark about the obvious fact that other students exist and receive the same offer ("you [...] personally"), students who received Version I were explicitly reminded about it ("you and all those who mark A will receive it").

We predicted that students who received Version I will be more likely to make the selfish, non-cooperative choice.

Here are the results! Over two consecutive semesters combined, 36.7% of students chose the selfish option 'A' if they were offered Version I. Among those offered Version II, only 7% of students chose selfish option 'A' (Fig. 1). This result is statistically significant (Fisher's Exact Test  $P < 0.0002$ ).

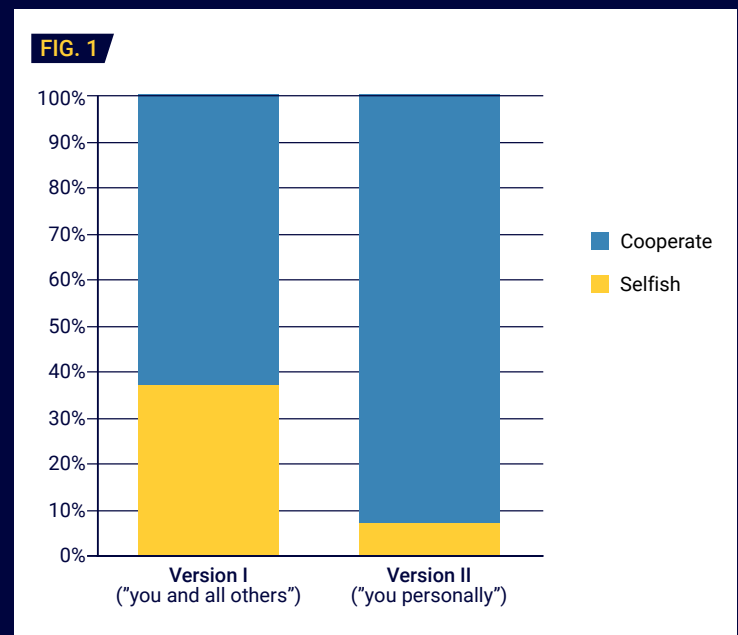


Fig. 1. Frequency of selfish and cooperative choices among students who received two different offers of extra points on a genetics quiz.

# Drs. McIntosh and Kumar Host Phytochemical Society Meeting at ETSU

The 58th Annual Meeting of the *Phytochemical Society of North America* was held at the Carnegie Hotel in Johnson City, Tennessee from July 20-24, 2019. The meeting was organized by **Drs. Cecilia McIntosh** and **Dhirendra Kumar** of the ETSU Department of Biological Sciences with strong support from the Phytochemical Society and from many units at ETSU including the Offices of the President and the Provost, the Office of Research and Sponsored Programs, the Office of the Vice President of Health Affairs, the College of Arts & Sciences, the Quillen College of Medicine, the Gatton College of Pharmacy, and the Departments of Biological Sciences, Health Sciences, and Chemistry.

Attendance was strong with the 110 attendees filling the meeting space. The symposium topics covered a broad range of phytochemistry research including: Natural Product Metabolism: Pathway Discovery and Regulation; Natural Product Enzymology: Bridging the Gap between Bioinformatics and Biochemical Function; Secondary Metabolites of Bryophytes, Ferns, and Lycophytes: Enormous Diversity from Primitive Plants; Advances in Phytochemical Tools and Applications; Chemical Ecology: Interactions of Plants with Other Organisms; Signaling in Development, Stress, and Defense; Translational Phytochemistry: Commercialization of Discoveries; Natural Products in Agriculture: Harnessing the Potential of Secondary Metabolites to Improve Crop Function; Natural Products in Medicine: Drug Development and Discovery; and the Neish New Investigator Award Symposium. The young members of the society held a luncheon to discuss "Improving Writing Skills – How to Get a Scientific Paper Accepted for Publication".

Winning presentation awards for their posters were ETSU undergraduate students **Baylea Davenport** (Davenport B, Lohani S, Kumar, D "Tobacco UDP-Glucosyltransferase SIP68 has a Role in Plant Defense") and **Sarah Fox** (Fox S, Birchfield A, McIntosh C "Structure Elucidation of a Grapefruit Glucosyltransferase Enzyme Mutant P297F").



Banquet and Award Ceremony, 58th Annual Meeting of the *Phytochemical Society of North America* held at the Carnegie Hotel in Johnson City, Tennessee.



Professor Argelia Lorence, President *Phytochemical Society of North America* (center) with the 2019 meeting organizers, Professor Cecilia McIntosh and Professor Dhirendra Kumar.



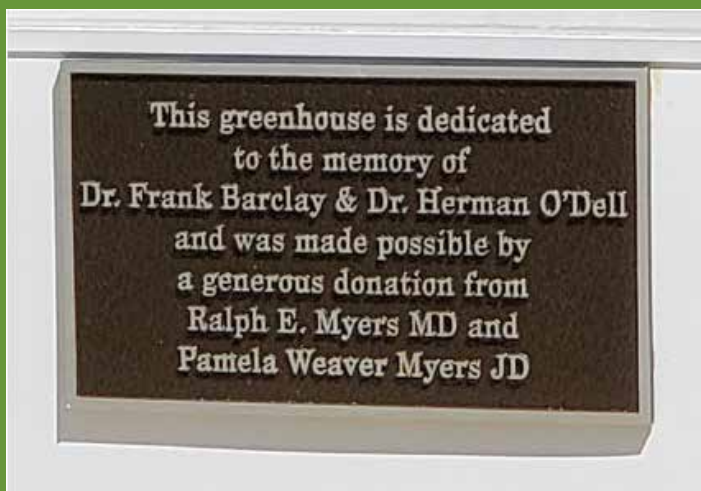
Poster Award Winners in Undergraduate Category: Baylea Davenport, ETSU (first from left); Sara Fox, ETSU (first from right).

# New Greenhouse for Biological Sciences



(Photos: G. Arceo-Gomez)

On March 20th, 2019 the ETSU Department of Biological Sciences proudly dedicated a brand-new greenhouse to the memory of former professors and mentors **Dr. Frank Barclay** and **Dr. Herman O'Dell**. This new 1,180 square foot facility, located near the Northeast corner of the Brown Hall science building, made possible by a generous donation from **Dr. Ralph E. Myers** and **Pamela Weaver Myers**, supports graduate and undergraduate research in plant sciences.



The new facility includes several features and functions that were not available in the existing greenhouse including a multi-stage heating/cooling/ventilation system and high-pressure sodium grow lighting. This new greenhouse is already facilitating graduate and undergraduate research. One project in particular is investigating the impact of pesticides on plant reproductive success. Common field crops (pumpkin, pea, peppers) and wildflowers (Monkey Flower, Foxglove Penstemon) were grown from seed to flower in the greenhouse and used in hand-pollination experiments designed to test whether pesticides contained in pollen can influence pollen tube growth and pollen germination. During the 2019 Fall Semester, students taking the Plant Ecology and Evolution course also used the greenhouse to conduct experiments focused on plant resource allocation and plant competition. In addition to ongoing experiments, plans are currently underway for additional research projects as part of an NSF grant recently awarded to **Dr. Arceo-Gomez** that aims to evaluate the effects of plant-plant interactions via pollen transfer and their importance in shaping natural plant communities.

# Bits and Pieces

**Dr. Joe Bidwell**, with two Australian collaborators, published the following paper: Hays BJ, Bidwell JR, Dittmer DE (2019) An assessment of thermal preference of two species of knob-tailed geckos, *Nephrurus laevissimus* and *Nephrurus levis*, at Uluru Kata-Tjuta National Park. *Northern Territory Naturalist* 29:41-54.

**Dr. Fred Alsop** presented two 30-minute shows for the Knoxville, Tennessee PBS station that aired in 2019: *Winter Birds of the Smokies* and *Spring Birds of the Smokies*.

**Dr. Gerardo Arceo-Gomez** and **Dr. Darrell Moore** participated in the First Annual *Jump Start Seed Swap* and *Pollinator Day*, put on by the Johnson City Parks and Recreation Department and held at Memorial Park Community Center in Johnson City on February 2, 2019. To the surprise of everyone involved, the event drew an estimated 325 visitors, necessitating a bigger venue for future *Seed Swap* and *Pollinator Days*! In addition to the seed swap itself, the event also had a strong educational component, including experts and exhibitors ready to answer questions and provide advice on a variety of subjects including garden pollination, native plants, backyard wildlife habitat, water quality, and citizen science opportunities. **Dr. Moore** was the invited speaker and presented a slide show on the topic “*Pollinators!*” with the goal of introducing people to the wide array of pollinators that exist in our region. **Dr. Arceo-Gomez** and his Master’s students **Amber Stanley** and **Daniel Barker** and undergraduate Honors student **Cheril Patel** provided an informational display on pollination and a fun demonstration on how ultraviolet light reflection from flowers attracts pollinators.

**Dr. Richard Carter** and two colleagues published results of a study that tracked the development of the hyoid apparatus in a species of echolocating bat: Carter RT, Stuckey A, Adams RA (2019) Ontogeny of the hyoid apparatus in Jamaican fruit bats (Chiroptera: Phyllostomidae) in unraveling the evolution of echolocation in bats. *Journal of Zoology (London)*, 308: 301-307. This was the first published data on how the stereotypically bat-like articulation between the hyoid and auditory bulla develops. The developmental patterns were used to test hypotheses on how echolocation evolved in bats.

Dr. Carter’s Master’s student, **Philip Allagas**, presented work from his thesis at the annual Tennessee Bat Working Group meeting held at the Henry Horton State Park in November. Philip’s talk centered around the novel idea of using Deep Learning to identify echolocation call feeding buzzes hidden in big datasets. His talk received a great deal of interest from internationally recognized bat biologists. **Dr. Carter** presented data at the annual North American Symposium on Bat Research from a project that uses micro computed tomography data to assess levels of tracheal and laryngeal reinforcement in echolocating and nonecholocating bats.

## Biology in Action for Women’s History Month.

Biological Sciences Assistant Professor, **Dr. Cerrone Foster**, participated in a daylong STEMposium workshop focused on increasing awareness and interest of young girls in Science, Technology, Engineering, and Math fields. The workshop was organized by **Dr. Michael Cummings**, director of Insight Training and Educational Center, Inc. in Johnson City, Tennessee and **Dr. Keith Johnson**, Vice President for Equity and Inclusion at ETSU. The workshop takes place annually at ETSU during March to celebrate Women’s History Month. This year’s event had over 80 girls ages 12-18 from the Tri Cities region. The workshop included speakers from local businesses such as Nuclear Fuel Services, Eastman Chemical Company, and ETSU STEM departments along with breakout sessions and hands-on STEM activities. Each year Dr. Foster engages students in developing career goals by creating “vision boards” followed by a scientific investigation, then a discussion on the intersection of technology and engineering fields with biomedical research.

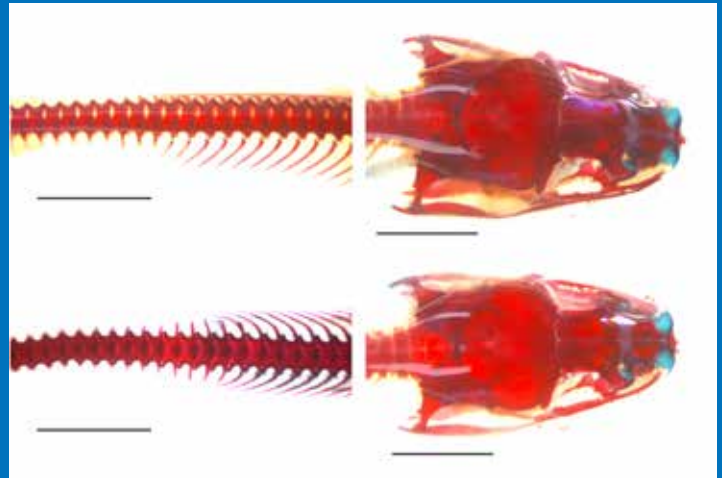


(Photo: Johnnie Mae Swagerty)

# Bits and Pieces

**Jesse Daniels**, former Master's student with **Dr. Arceo-Gomez**, recently published work that evaluated the effects of invasive species on the pollination of Southern Appalachian floral communities: Daniels JD, Arceo-Gómez G (2019) Effects of invasive *Cirsium arvense* on pollination in a southern Appalachian floral community vary with spatial scale and floral symmetry. *Biological Invasions* 22: 783–797. **Amelia Schroeder**, an undergraduate Honors student in Dr. Arceo-Gomez's lab, was a co-author on a paper describing global patterns of pollen transfer among plant species and their potential causes and consequences across plant communities worldwide: Arceo-Gómez G, Schroeder A, Albor C, Ashman TL, Knight TM, Bennett JM, Suarez B, Parra-Tabla V (2019) Global geographic patterns of heterospecific pollen receipt help uncover potential ecological and evolutionary impacts across plant communities worldwide. *Scientific Reports* 9:1-9. Also, from Dr. Arceo-Gomez's lab, Master's students **Daniel Barker** and **Amber Stanley** and undergraduate Honors student **Cheril Patel** presented at the 2019 *Ecological Society of America* meeting in Louisville, Kentucky where their work was very well received!

**Kaitlyn Mathis**, University Honors Student supervised by **Dr. Rebecca Pyles**, contributed part of her senior research project to a paper co-authored with **Dr. James Stewart** and **Dr. Tom W. Ecay**, from the ETSU Department of Biomedical Sciences: Stewart JR, Pyles RA, Mathis KA, Ecay TW (2019) Facultative mobilization of eggshell calcium promotes embryonic growth in an oviparous snake. *Journal of Experimental Biology* 222, jeb193565. doi:10.1242/jeb.193565. **Dr. Stewart** also published two papers with colleagues Dr. Fausto Mendez de la Cruz from the Universidad Nacional Autónoma de México, and Dr. Daniel G. Blackburn from Trinity College (Hartford, Connecticut): Stewart JR, Mendez de la Cruz FR (2019) Novel placental structure in the Mexican gerrhonotine lizard, *Mesaspis viridiflava* (Lacertilia; Anguinae). *Journal of Morphology* 280:35-49 and Stewart JR, Blackburn DG (2019) A developmental synapomorphy of squamate reptiles. *Evolution & Development* 21:342-353. DOI: 10.1111/ede.12317.



Cleared and stained specimens of hatchling corn snakes from **Kaitlyn Mathis'** senior honors thesis. Red color indicates bones, blue color indicates cartilage.

(Photo: K. Mathis)

**Drs. Pyles** and **Stewart** also attended the 12th *International Conference of Vertebrate Morphology*, July 21-25, 2019, Prague, Czech Republic, to participate in a symposium, entitled *Developmental Morphology and Evolution of Amniote Eggs and Embryos*, co-organized by Stewart, Daniel G. Blackburn, from Trinity College, and Matthias Starck from the University of Munich. **Dr. Pyles** presented a poster highlighting the research of graduate student **Amanda Tedder** (Pyles RA, Tedder AC, Stewart JR, Heulin B: "Impact of reproductive mode on skeletal development in a reproductively bimodal squamate"). **Dr. Stewart** gave an oral presentation (Stewart JR "Fetal membranes and intrauterine gestation in viviparous reptiles") and also presented a poster (Ecay TW, Stewart JR, Khambaty M, Griffith OW: "Specializations for calcium uptake from the eggshell of corn snakes: Implications for the evolution of the reptilian egg").

**Mattea Garmany**, undergraduate student working with **Drs. Jones** and **Moore**, was first author on a paper describing circadian rhythms in male common house spiders: Garmany M, Moore D, Jones TC (2019) Diel and circadian rhythms of locomotor activity in male *Parasteatoda tepidariorum* (Araneidae: Theridiidae). *Journal of Arachnology* 47: 310-316. Also working with Drs. Moore and Jones, Master's student **Raven Ragsdale** and PhD. student **Madeleine Miller** presented posters at the *Society for Neuroscience* meeting in Chicago, Illinois in October. Also, Raven Ragsdale, Madeleine Miller,

# Bits and Pieces

and Master's student **Shae Crain** presented posters at the *Rhythms in Southeast Region (RISER)* meeting at Morehouse School of Medicine in Atlanta, Georgia in May and Master's student **Rebecca Steele** presented a poster at the *21st International Congress of Arachnology*, held in Canterbury, New Zealand in February.



The **ETSU SpiderLab and Chronobiology Group** descended upon the *2019 Meeting of the American Arachnological Society* this past summer at Washington and Lee University in Lexington, VA. The group had its own session of seven talks, plus two posters at the meeting. Pictured left to right: Madeleine Miller, Shae Crain, Darrell Moore, Raven Ragsdale, Thomas Jones, Colin Shone, Parker Shields, Andrew Griffus, Mattea Garmany, and Rebecca Steele. (Photo: D. Smith)



In 2019, the Department obtained its very own next-generation sequencing facility: two units of Oxford Nanopore Technologies' MinION machines. They have already been used in two classes, both times for metabiome sequencing – for 16S rRNA (for bacteria) by **Dr. Joplin** in the *Synthetic Biology* class and for 18S rRNA (for protists, fungi, and algae) by **Dr. Yampolsky** in the *Topics in Systematic Biology: Eukaryotes* class. Photo (L. Yampolsky) shows Nanopore MinION blinking its cool lights.

The **ETSU SpiderLab** continued its collaboration with students at local high schools. In 2019, students at Dobyns-Bennett HS (pictured), Cherokee HS, Volunteer HS, and University School helped to answer the question of how circadian rhythms in spiders are temperature compensated.

(Photo: T. Jones)



**Dr. Aruna Kilaru's** lab had a productive year with two major publications and the graduation of M.S. student **Shina Bhatia**, who currently is a Research Associate at the University of Massachusetts. One of the publications was the product of collaborative work with Lihang Xie, a visiting doctoral student from China: Zhang Q, Yu R, Sun D, Rahman MMd, Xie L, Hu J, He L, Kilaru A, Niu L and Zhang Y (2019) Comparative transcriptome analysis reveals an efficient mechanism for  $\alpha$ -linolenic acid synthesis in tree peony seeds. *International Journal of Molecular Sciences* 20(1): 65; doi.org/10.3390/ijms20010065. Their research was focused on identifying an efficient mechanism for  $\alpha$ -linolenic acid synthesis in tree peony seeds, which is an essential oil for humans. The second publication was an invited review on metabolic engineering for enhanced oil in biomass: Vanhercke T, Dyer J, Mullen R, Kilaru A, Rahman MMd, Petrie J, Green A, Yurchenko O and Singh S (2019) Metabolic engineering for enhanced oil in biomass. *Progress in Lipid Research* 74: 103-129; doi.org/10.1016/j.plipres.2019.02.002. This was a collaborative effort of lipid biochemists from other labs in the US as well as from Australia and Canada. Kilaru's lab members also presented their research work at the *American Society for Plant Biologists Southern Section Meeting, Appalachian Student Research Forum, The Gordon Research Conference on Plant Lipids: Structure, Metabolism & Function, Phytochemical Society of North America Annual Meeting, American Society of Plant Biologists, Annual Meeting and the Plant Synthetic Biology Conference*. **Imdadul Haq**, a final-year doctoral student in Kilaru's lab received a highly competitive Sigma Xi-GIAR Award. Lastly, the ETSU School of Graduate Studies honored **Dr. Kilaru** with the **Outstanding Graduate Faculty Mentor Award**.

Three papers were published from **Dr. Lev Yampolsky's** lab in 2019: (1) Martin-Creuzburg D, Coggins BL, Ebert D, Yampolsky LY (2019) Rearing temperature and fatty acid supplementation jointly affect lipid fluorescence polarization and heat tolerance in *Daphnia*. *Physiological and Biochemical Zoology* 92:408-418. This paper stemmed from Dr. Yampolsky's 2016 sabbatical at Basel University in Switzerland. (2) Peshkin L, Boukhali M, Haas W, Kirschner MW, Yampolsky LY (2019) Quantitative proteomics reveals remodeling of

protein repertoire across life phases of *Daphnia pulex*. *Proteomics* 19: e1900155. This paper represents the first product from Dr. Yampolsky's collaboration with Dr. Marc Kirschner's lab at Harvard. (3) Veil M, Yampolsky L, Grüning B, Onichtchouk D (2019) Pou5f3, SoxB1 and Nanog remodel chromatin on high nucleosome affinity regions at zygotic genome activation. *Genome Research*, 29:gr.240572.118. Dr. Yampolsky also attended and presented a poster ("No gene left behind: false and true positives in arthropod thermal adaptation candidate gene lists") at the *Gordon Research Conference on Ecological and Evolutionary Genomics* in July 2019. Dr. Yampolsky and his students **Catherine Pearson** and **Cora Anderson** each gave a talk at the *South-East Population Ecology and Evolutionary Genetics* meeting in October.

The following are two papers from **Dr. Istvan Karsai's** lab, published in 2019: (1) Hilbun A, Karsai I, Perry D (2019). The effect of pain on balancing behavior: Complexity analysis of mediolateral force trajectories. *Gait & Posture* 71: 145–150, <https://doi.org/10.1016/j.gaitpost.2019.04.019>. (2) Karsai I, Schmickl T (2019). Social stomach. In: C. Starr (ed.), *Encyclopedia of Social Insects*. Springer Reference Live. Springer Nature. ISBN 978-3-319-90306-4. Dr. Karsai also presented the following talk at the *Hungarian Ethological Society XXI Meeting* in December in Matrafured, Hungary: Karsai & Schmickl: "A model of the regulation mechanisms of task partitioning."

Three papers were published in 2019 from the laboratory of **Dr. Dharendra Kumar**: (1) Tripathi D, Raikhy G, Kumar D (2019). Chemical Elicitors of Systemic Acquired Resistance–Salicylic Acid and Its Functional Analogs. *Current Plant Biology* <https://doi.org/10.1016/j.cpb.2019.03.002>, (2) Kumar D (2019) Plant-biotic Interactions. *Current Plant Biology* <https://doi.org/10.1016/j.cpb.2019.100133>, and (3) Kumar D (2019) Plant-Pathogen interactions: taking a green approach to control. *Current Plant Biology* <https://doi.org/10.1016/j.cpb.2019.03.003>. Dr. Kumar gave an oral presentation at the Phytochemical Society meeting as well as an invited seminar presented to the Chemistry Department at ETSU. Dr. Kumar's students presented at the *Phytochemical Society* meeting and the *Boland Undergraduate Symposium* at ETSU.



# Where are they now?

**Dr. Mehdi Pourmorteza**, who received his B.S. degree in Biology, graduating Summa Cum Laude, earned his medical degree from Virginia College of Osteopathic Medicine. He started his residency in Internal Medicine at ETSU and completed his training in Hospice and Palliative Care at Duke University. Currently, he is Assistant Professor and Associate Program Director of the General Internal Medicine residency program and Medical Director of Hospice and Palliative Care at Mountain Home Veterans Administration.

**Saroj Chandra Lohani**, who recently earned his M.S. degree with Dr. Kumar, is now pursuing his Ph.D. at the University of Nebraska, Lincoln.

**Dr. Md. Mahbubur Rahman**, who achieved his doctorate working with Dr. Kilaru, is currently a postdoctoral associate in the Department of Biological Systems and Engineering at Virginia Tech.

**Timothy Audam**, who completed his M.S. in Biology (2016) in Dr. Kumar's lab, currently is a doctoral student at the University of Kentucky and was recently awarded an **American Heart Association** Pre-Doctoral Fellowship.

**Dr. Byron Van Nest**, former M.S. student with Dr. Moore, earned his Ph.D. at Wake Forest University, was a post-doc at Case Western University, and since August 2019 has worked as an Assistant Professor of Biology at the University of Manitoba in Winnipeg. (Photo: B. Van Nest)

**Dr. Dylan Shropshire**, former undergraduate student working with Drs. Joplin and Moore, recently earned his Ph.D. in Biology at Vanderbilt University. With the

assistance of an NSF Postdoctoral Research Fellowship, he will soon be joining a research group at the University of Montana and the University of Oregon.

**Shiva Thapa**, recent M.S. student with Dr. Karsai, currently is a Ph.D. student at Kansas State University.

**Dr. Alison Hilbun**, who recently earned her Ph.D. working with Dr. Karsai, is a Senior Lecturer in Biology at Vanderbilt University.

**Dr. Larry Bowman**, M.S. ETSU 2011-2012, with Dr. Yampolsky, received his Ph.D. from Yale University and now works at Hollings Marine Lab in Charleston, SC.

**Bret Coggins**, B.S. ETSU 2016, M.S. ETSU 2016-2018. is now in a Ph.D. program at the University of Notre Dame, continuing to work on ecological genomics of *Daphnia*.

## All of the following are former students of Dr. McIntosh:

**Randy Durren**, M.S. Biology 1998, worked in industry for a time with Bayer Corporation and currently is a lecturer at the Biology Chichester Science Center at Longwood University in Farmville, Virginia. During his career, he has won grants (while at Piedmont Community College) and awards for advising and for innovative approaches to technical education.

**Jala Daniel**, M.S. Biomedical Sciences 2009 (with C. McIntosh), is a faculty member of the science department at Roane State Community College. She has been a recipient of research awards and a 2015 Sarah Ellen Benroth Award for Outstanding Teaching.

**Dr. Christy Strong**, M.S. Biology 2005, completed her Ph.D. at the University of Montana and a post-doctoral position at Arizona State University working on HIV-AIDS research. She is currently Faculty in Residence at the University of Nevada, Las Vegas.

**Dr. Mebrahtu Sibhatu**, M.S. Biology 2003, completed his Ph.D. at Wake Forest University and is a Principal Research Associate at Eli Lilly (formerly with IMClone) and resides in New Jersey.

**Dr. Tapasree Roysarkar**, M.S. Biology 2004, completed her Ph.D. at Purdue University and a postdoctoral fellowship at the M.D. Anderson Cancer Center. She is currently a research assistant professor at Texas A&M University's Center for Statistical Bioinformatics. She has published 19 papers and holds two patents.

**Dr. Daniel Owens** earned his B.S. in Biology with a concentration in Biochemistry in 2001 after which he earned his Ph.D. from Virginia Tech. After postdoctoral positions at ETSU (with McIntosh) and at Mississippi State University, he is currently a tenure track faculty member at the University of Hawaii. He has published numerous papers including 7 co-authored with ETSU faculty. He has received research award recognition as a Neish Young Investigator through the Phytochemical Society of North America.

**Dr. Starla Kiser** earned her B.S. in Biology with a concentration in Biochemistry in the ETSU Honors program and then attended Harvard Medical School. She is currently practicing medicine in Norton, Virginia.

# Where are they now?

**Dr. Olusegun Adebayo Adepaju**, M.A. Biology 2014, completed his Ph.D. at Virginia Tech and is currently working with Molecular Templates in Austin, Texas as a scientist in downstream process development.

**Venkata Siddhu Mallampalli**, M.S. in Biology 2009, is currently working as a research associate in the Dept. of Biochemistry and Molecular Biology at the University of Texas Health Science Center at Houston. He has recently co-authored a

publication "Nobiletin fortifies mitochondrial respiration in skeletal muscle to promote healthy aging against metabolic challenge" in Nature Communications 10:3293 in August 2019.



Georg L. Nichols

# FEE PAYMENT DEADLINE CHANGES COMING FALL 2020



## FALL 2020 FEE PAYMENT DEADLINE: MONDAY, AUGUST 17 6 A.M. ET.

To better serve you, the new deadline for fee payment is now earlier. This allows ETSU offices and staff members to be available to assist you with any issues that might cause disenrollment from classes due to fee non-payment.

Choose a payment option below to remain enrolled in your current class schedule.

### OPTION 1

Pay full amount by **Monday, August 17, 2020, 6 a.m ET.**

To pay in full, follow the steps below:

1. Log into GoldLink
2. Click Student tab
3. On the Task Bar, click Account
4. Open the Account Taskbar
5. Click on Make a Payment button

### OPTION 2

#### 5-Payment Plan

##### Fall Semester Due Dates

- ◆ First payment . . . . . On or before July 31
- ◆ Second payment . . . . . August 31
- ◆ Third payment . . . . . September 30
- ◆ Fourth payment . . . . . October 31
- ◆ Fifth payment . . . . . November 30

### OPTION 3

#### 4-Payment Plan

##### Fall Semester Due Dates

- ◆ First payment . . . . . August 17
- ◆ Second payment . . . . . September 30
- ◆ Third payment . . . . . October 31
- ◆ Fourth payment . . . . . November 30

To enroll in the 5-Payment Plan or the 4-Payment Plan, follow the steps below:

1. Log into GoldLink
2. Click Student tab
3. Open the Account Taskbar
4. Under My Account Profile, click Enroll in Payment Plan



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# Gallery of Organisms

A collection of photographs depicting some of the diversity of organisms/model systems studied in the Department of Biological Sciences. Laboratory affiliation(s) are indicated for each photo.



**CARTER**  
Jamaican  
fruit bat  
(Photo: Rick  
Adams)



**MCINTOSH**  
Grapefruit in greenhouse  
(Photo: D. Moore)



**MOORE/JONES**  
Crab spider stalking sulphur butterfly  
on ironweed  
(Photo: D. Moore)



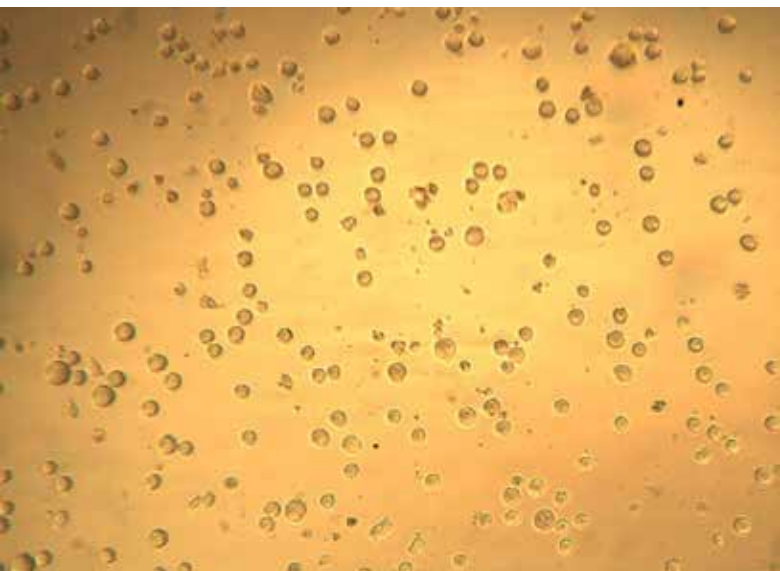
**JOPLIN**  
Flesh flies  
(Photo: D. Moore)

# Gallery of Organisms



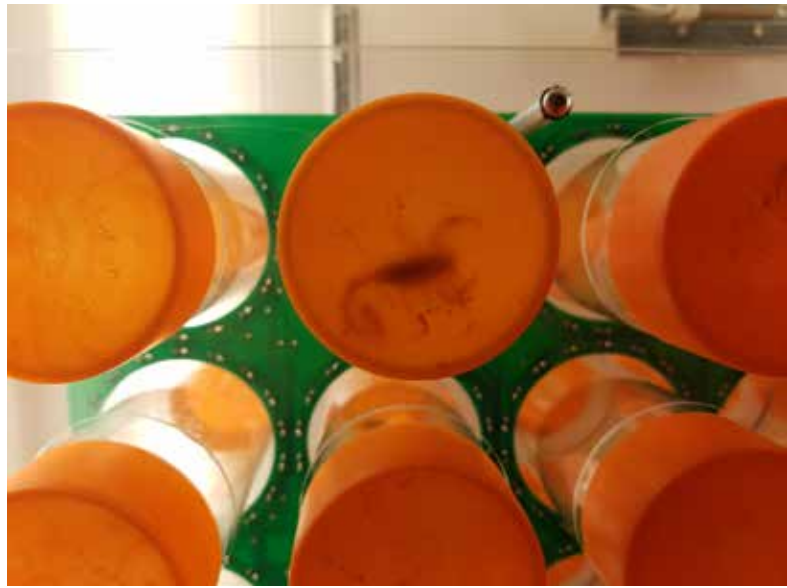
**ALSOP**

Screen capture from Eagle Cam  
(courtesy: F. Alsop)



**MILLER**

Human macrophage cell line U937;  
note wide variation in size  
(Photo: H. Miller)



**JONES/MOORE**

Silhouette of scorpion  
(Photo: T. Jones)



**ARCEO-GOMEZ**

Heavy duty pollinators on thistle  
(Photo: G. Arceo-Gomez)

# Gallery of Organisms



**KUMAR**  
Arabidopsis  
(Photo: D. Kumar)



**MOORE**  
Honey bee with loaded pollen baskets  
landing on trumpet vine flower  
(Photo: D. Moore)



**KILARU**  
Irises  
(Photo: A. Kilaru)



**KARSAI**  
Wasps (*Metapolybia mesoamerica*)  
on nest  
(Photo: I. Karsai)

# Gallery of Organisms



**KUMAR**

**Tobacco**

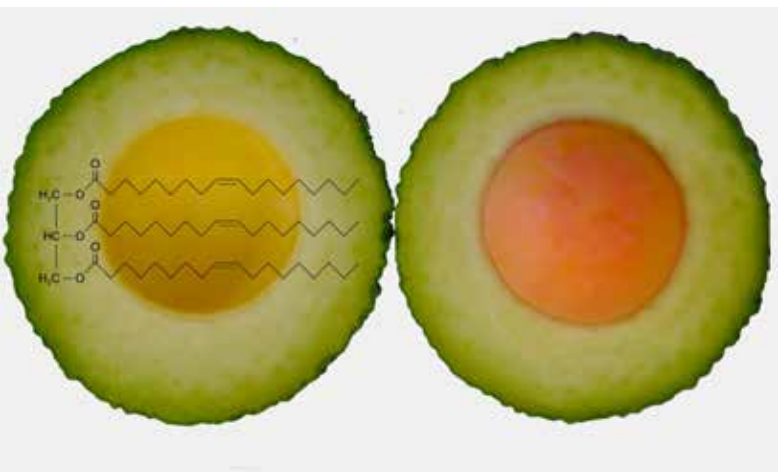
(Photo: D. Kumar)



**KILARU**

**Tree peony**

(Photo: A. Kilaru)



**KILARU**

**Avocado (with oil structure)**

(Photo: A. Kilaru)

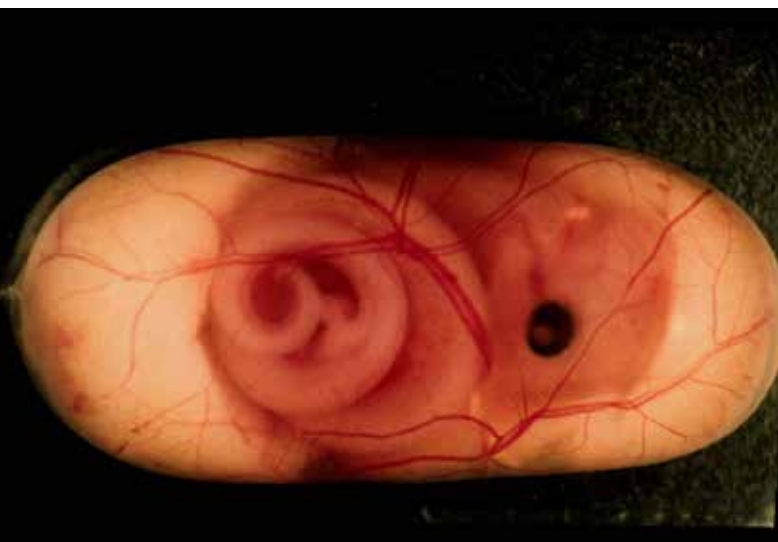


**PYLES**

**Three-toed skink from Australia**

(Photo: R. Pyles)

# Gallery of Organisms



**STEWART**

**Snake embryo**

(Photo: J.R. Stewart)



**PYLES**

**Head of early embryo corn snake**

(Photo: R. Pyles)



**BIDWELL**

**Salamander in test apparatus**

(Photo: T. Chapman)



# Just for Fun



**Doughnuts at Phytochemical Society Meeting**

(Photo: D. Kumar)



**Carpenter bee on Passion Flower**

(Photo: D. Moore)



**Dr. Laughlin's Master's student Maggie Coffey with greenside darter**

(Photo: M. Coffey)



**This food trailer first appeared on the west side of the Brown Hall courtyard during the Summer of 2019 and has resided there ever since.**

(Photo: D. Moore)

# Just for Fun



Banner displayed in the Biology Department at Washington and Lee University (Lexington, Virginia) during the 2019 Annual Meeting of the American Arachnological Society

(Photo: D. Moore)



Ginkgo trees shedding leaves in Brown Hall courtyard, November 2019

(Photo: D. Moore)

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