

# BioUpdate

Department of Biology, Middle Tennessee State

Spring 2019



Lynn Boyd

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## Message from the Chair

It is an exciting time to be a biologist. New discoveries abound. And the need for a deeper understanding of how life works has never been greater. The Biology Department at MTSU is proud to be engaged in training the new generation of biologists. This past year, we had a record 173 students receiving undergraduate degrees in Biology! We are confident that these students are well prepared to go out into the world and do wonderful things.

Faculty and students in the department continue to be engaged in research and outreach efforts. This past year they published 54 peer-reviewed papers and made 59 conference presentations. You can also see in this issue of the *BioUpdate* that many Biology students made presentations at Scholars Day at MTSU.

I do have some personal news. This will be my last year as chair of the Biology Department. I have accepted a position as dean of the College of Sciences and Mathematics at Arkansas State University. I will be leaving MTSU at the end of June. Dennis Mullen will step in as interim chair for the upcoming year. I have truly enjoyed my time at MTSU and will miss my colleagues here. This is a great department and I am sure it will continue on its upward trajectory. Also departing this summer will be Ashley Morris, who has accepted a position at Furman University, and Anna Grinath, who will be going to Idaho State University. Both Ashley and Anna have contributed much to this department, and their work here is appreciated.

The department is currently developing a second Master of Science degree. The new degree will be called Biomedical Sciences M.S. and is a non-thesis degree meant for students who intend to apply to health professional schools. The idea has already been approved by the MTSU Board of Trustees and hopefully will be available to students in 2020.

In August, Jessica Arbour will be joining the department as a new assistant professor. She is an evolutionary biologist who comes to us from her post-doctoral position at the University of Washington. She is doing some very interesting work on the evolution of fish morphologies. We are excited to have her join the department.

I encourage you to look through the pages of *BioUpdate* and learn about the many interesting things going on with our faculty, students, and alumni.



# New Faculty



**Cole G. Easson** is a research assistant professor in the Department of Biology at MTSU. Easson's interdisciplinary research is centered broadly around the ecology and evolution of marine organisms and communities with a focus on host-symbiont interactions. Currently, his lab is researching the contribution of microbial symbionts to the ecological and evolutionary success of co-occurring sponge species on Caribbean coral reefs. This research combines field observations and manipulations with biochemical and metagenome analysis. Sponges are dominant members of coral reef communities in the Caribbean, with important ecological and biogeochemical roles. Easson's current project seeks to tease apart the roles of sponge hosts and their

microbial symbionts in these important ecosystem roles. In addition to this project, Easson also is involved in a diverse array of projects that leverage techniques, such as next-generation sequencing, bioinformatics, and geoinformatics to investigate biogeographic patterns in marine symbioses, explore the onset and transmission of marine diseases, and better understand the natural dynamics of open ocean microbial communities in the Gulf of Mexico after the Deepwater Horizon oil spill.

## In the News ...



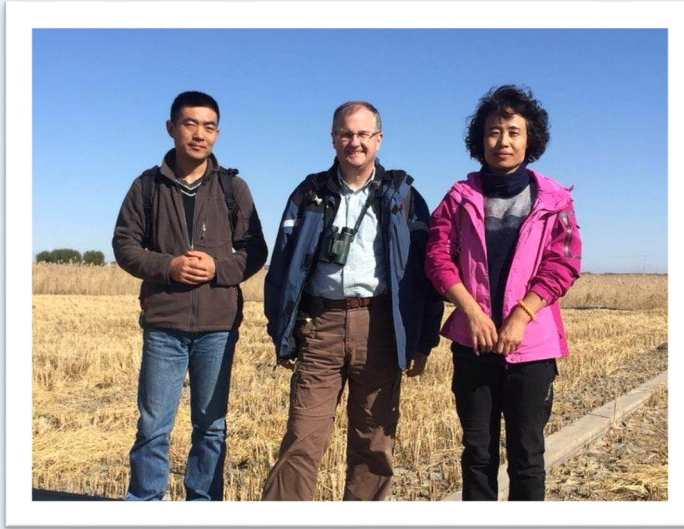
**John DuBois**, a professor in the Department of Biology, and alumna **Aimee Wilson** (December 2017) appeared on the WGNS Radio program *Action Line* with host **Bart Walker** to discuss the published MTSU student-led research on grapes and how it could have applications within the commercial wine industry as the University continues expanding its impact on this field of study.

DuBois mentored alumna **Amanda Uhls** of Hendersonville, **Nathan Jolley** of Pegram, and **Wilson** of Murfreesboro in their published research as part of Undergraduate Research Experience and Creative Activity (URECA) and accompanying grants they received. URECA falls under the Undergraduate Research Center on campus; research is conducted in all MTSU colleges, not just the sciences.

# Biology Lab Updates

## From the lab of Jeffrey Walck

Since the last *BioUpdate*, Walck's lab has produced eight papers and a chapter in the book *Advances in Seed Biology*. Walck spent a week at the University of Regensburg, Germany in September 2018 working on a book with colleagues. In October 2018, he was a Visiting Scientist at the Institute of Northeast Geography and Agroecology of the Chinese Academy of Sciences in Changchun for one week. While there, he worked on a research project and visited the Da'an Sodic Land Experiment Station (in picture) with his colleagues.



## From the lab of Yangseung Jeong

Jeong's lab has received animal carcasses—mostly raccoons, opossums, and skunks—donated from the Nashville Zoo since November 2018. As of February 2019, the total number of donations reached 23. Donations are currently decomposing at the MTSU Outdoor Forensic Facility (MOFF), and their skeletons will constitute Jeong's Animal Skeletal Collection.



Storage (l) and office space (r) of the MTSU Outdoor Forensic Facility (MOFF)

Since March 2018, Jeong's lab has caught 3,278 flies from the Anthropological Research Facility (so-called "Body Farm") of the University of Tennessee. This long-term project began to understand the relationship between insect activities and human decomposition. Various aspects of fly activities such as their species composition and population density in relation to environmental factors will be quantified and utilized to develop new methods for postmortem interval (PMI) estimation. Two undergraduate students, Simon Pergande and Omar Aly, are conducting morphological and biomolecular identification of the flies. Pergande has won the Undergraduate Research Experience and Creative Activity (URECA) Award for Spring 2019.



# Biology Lab Updates

## From the lab of Donald Walker

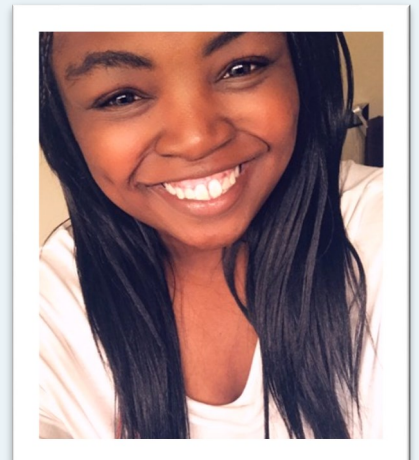
The Walker Lab will grow to four graduate and two undergraduate students during the summer of 2019. Members attended the Tennessee Herpetological Society Meeting in Memphis (pictured) and made three oral and one poster presentation. Matthew Grisnik published an article entitled “Host and Geographic Range of Snake Fungal Disease in Tennessee” and Alejandro Grajal-Puche published a note about alligator nests in *Herpetological Reviews*. Alex Romer was recruited from the SUNY College of Environmental Science and Forestry to work on a grant studying snake fungal disease in Tennessee. He kicked off his field season in early May. Donald Walker, Matthew Grisnik, and Alejandro Grajal-Puche had an article accepted to ISME Nature entitled, “Variability in the snake skin microbiome across spatial scales and disease states.” Walker was funded by the U.S. Fish and Wildlife Service to study the nesting microbiome of an endangered species of darter fish native to Tennessee. He has recruited Olivia Bowers from Tennessee Technological University to work on this project starting during the summer. Walker also was funded by the USDA-NRCS program to study the microbial ecology of remediated wetlands in the Mississippi alluvial valley. He has recruited Reed Alexander to study nutrient retention and microbial structure and function within these wetland systems.



## From the lab of Erin McClelland

Jamila will be graduating in August with her Master’s in Biology. She was accepted into six different Ph.D. programs, but has decided to attend the University of Kentucky to complete her doctorate. Her thesis work describes the identification of a new quorum sensing molecule in *C. neoformans* that is upregulated in the presence of testosterone. These data are incredibly novel and may help to explain why 70% of patients with *C. neoformans* infections are male.

Kevin Bicker (MTSU Chemistry) and McClelland just had a paper published titled “Toward a clinical antifungal peptoid: Investigations into the therapeutic potential of AEC5” in *Biopolymers*. Here is the link: [onlinelibrary.wiley.com/doi/full/10.1002/bip.23276](https://onlinelibrary.wiley.com/doi/full/10.1002/bip.23276).

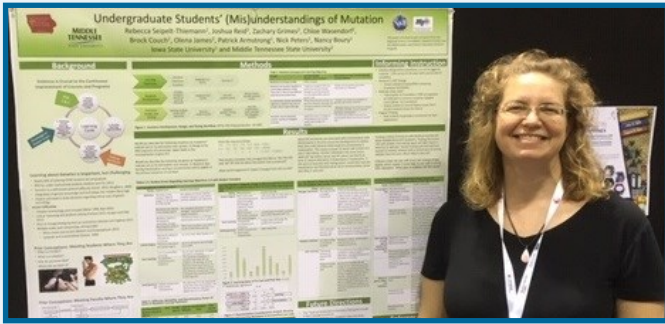


Jamila Tucker

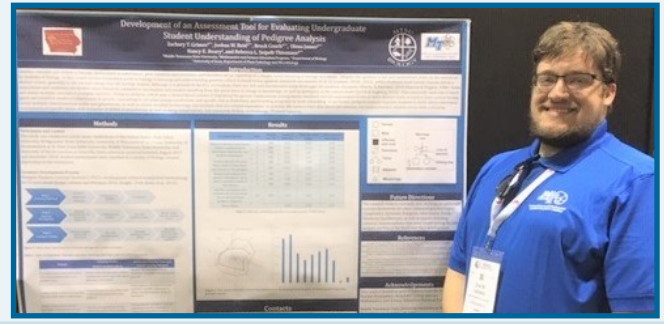


# Biology Lab Updates

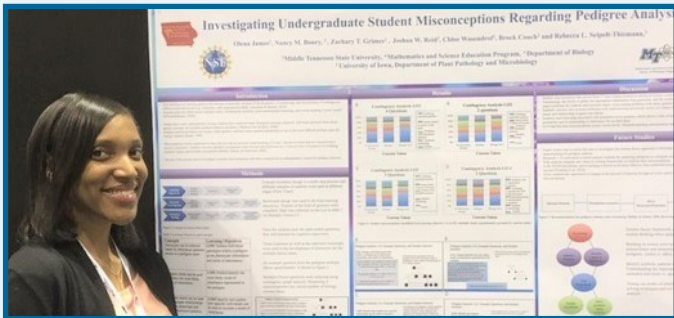
## From the lab of Rebecca Seipelt-Thiemann



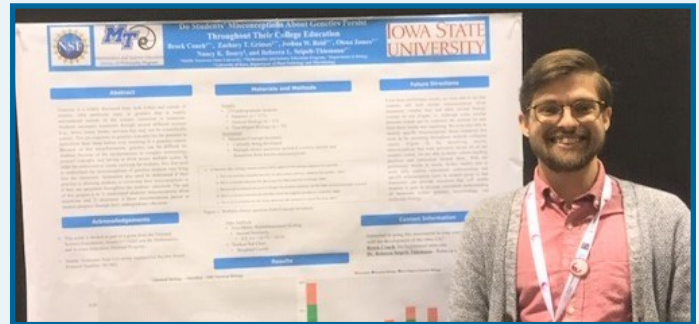
**Rebecca Seipelt-Thiemann**, Joshua Reid\*\*\*, Zachary Grimes\*\*\*, Chloe Wasendorf\*\*\*, Brock Couch\*\*\*, Olena James\*\*\*, Patrick Armstrong, Nick Peters, Nancy Boury. “Undergraduate Students’ (Mis)Understandings of Mutation”



**Zachary T. Grimes\*\*\***, Nancy Boury, Joshua W. Reid\*\*\*, Chloe Wasendorf\*\*\*, Patrick Armstrong, Brock Couch\*\*\*, Olena James\*\*\*, and Rebecca L. Seipelt-Thiemann. “Development of an Assessment Tool for Evaluating Undergraduate Student Understanding of Pedigree Analysis”



**Olena James\*\*\***, Nancy Boury, Zachary T. Grimes\*\*\*, Joshua W. Reid\*\*\*, Chloe Wasendorf\*\*\*, Patrick Armstrong, Brock Couch\*\*\*, and Rebecca L. Seipelt-Thiemann. “Investigating Undergraduate Student Misconceptions Regarding Pedigree Analysis”



**Brock Couch\*\*\***, Rebecca L. Seipelt-Thiemann, Joshua W. Reid\*\*\*, Chloe Wasendorf\*\*\*, Patrick Armstrong, Zachary T. Grimes\*\*\*, Olena James\*\*\*, Nick Peters, Nancy Boury. “Do Students’ Misconceptions About Mutations Persist Throughout College Education?”

### Student Poster Presentations:

#### ASBMB Conference (April 2019)

Olena James\*\*\*, Nancy Boury, Zachary T. Grimes\*\*\*, Joshua W. Reid\*\*\*, Chloe Wasendorf\*\*\*, Patrick Armstrong, Brock Couch\*\*\*, and Rebecca L. Seipelt-Thiemann. “Investigating Undergraduate Student Misconceptions Regarding Pedigree Analysis”

Zachary T. Grimes\*\*\*, Nancy Boury, Joshua W. Reid\*\*\*, Chloe Wasendorf\*\*\*, Patrick Armstrong, Brock Couch\*\*\*, Olena James\*\*\*, and Rebecca L. Seipelt-Thiemann. “Development of an Assessment Tool for Evaluating Undergraduate Student Understanding of Pedigree Analysis”

Brock Couch\*\*\*, Rebecca L. Seipelt-Thiemann, Joshua W. Reid\*\*\*, Chloe Wasendorf\*\*\*, Patrick Armstrong, Zachary T. Grimes\*\*\*, Olena James\*\*\*, Nick Peters, Nancy Boury. “Do Students’ Misconceptions About Mutations Persist Throughout College Education?”

#### University Scholars’ Week (11)

Marissa Turner\*, Madonna Ghobrial\*, Valerie Risk\*, Erin McClelland, and Rebecca Seipelt-Thiemann. “Validation and Annotation of Novel Gender-related *Cryptococcus neoformans* Genes Identified by RNA Sequencing”

Gabriella Morin\*, Jiwoo Park\*, Dave Nelson, and Rebecca Seipelt-Thiemann. “Fluorescent Tagging of Genomic Parkin in Human Osteosarcoma Cells Using CRISPR Technology”

# Biology Lab Updates

## From the lab of Rebecca Seipelt-Thiemann, cont.

Bethany Poff\*, Niah Frantzen\*, Erin McClelland, and Rebecca Seipelt-Thiemann. “CRISPR-based Knock-in of BCAT-deficient *Cryptococcus neoformans*”

Hannah Jones\*, Charles Teeple\*, David Nelson, Rebecca Seipelt-Thiemann. “Fluorescent-Tagging of Genomic PINK I in Human Osteosarcoma Cells Using CRISPR/Cas9 Technology”

Zachary Lay\*, John Dubois, Tony Johnston, and Rebecca Seipelt-Thiemann. “Fungal Endophyte Isolation and Identification from *Vitis aestivalis* Norton/Cynthiana Grapevines from Virginia and New York”

Marina Ibrahim\*, Mary Farone, Tim Miller, and Rebecca Seipelt-Thiemann. “Gene Discovery and Annotation of *Gardnerella vaginalis*, a Bacterium Associated with Bacterial Vaginosis and Pre-term Labor”

Zenar Barwari\*, Erin McClelland, and Rebecca Seipelt-Thiemann. “Identification of Novel Gender-related Virulence Genes in *Cryptococcus neoformans*”

Merna Ghobrial\*, Mary Farone, and Rebecca Seipelt-Thiemann. “Investigating the Ability of Spice Extracts to Inhibit Bacterial Growth and Histamine Accumulation Associated with Scombroid Food Poisoning”

Daviesha Carter\*, Erin McClelland, and Rebecca Seipelt-Thiemann. “Novel Gene Verification and Annotation in Clinically-Associated Strains of *Cryptococcus neoformans*”

Ansley Morgan\*, Steffany Jenkins\*, Brian Robertson, and Rebecca Seipelt-Thiemann. “CRISPR-based Genetic Modification for a Flightless Housefly (*Musca domestica*)”

Alaa Mohammed\*, Chase Burton\*, Pratima Chapagin\*\*\*, Moh Salem, and Rebecca Seipelt-Thiemann. “Using CRISPR to Knock out a Gene Encoding a Virulence-related Non-Coding RNA in Trout Pathogen *Flavobacterium psychrophilum*”

### CBAS Scholars' Week (2)

Hannah Jones\*, Charles Teeple\*, David Nelson, Rebecca Seipelt-Thiemann. “Fluorescent-Tagging of Genomic PINK I in Human Osteosarcoma Cells Using CRISPR/Cas9 Technology”

Gabriella Morin\*, Jiwoo Park\*, Dave Nelson, and Rebecca Seipelt-Thiemann. “Fluorescent Tagging of Genomic Parkin in Human Osteosarcoma Cells Using CRISPR Technology”

### Summer/Fall Research Celebration (1)

Ross Thomas\*, John Dubois, Tony Johnston, and Rebecca Seipelt-Thiemann. “Fungal Endophyte Isolation and Identification from *Vitis aestivalis* Norton/Cynthiana Grapevines from Virginia, Missouri, and Arkansas”

### Seipelt-Thiemann's poster presentations:

#### American Society for Biochemistry and Molecular Biology (Orlando, Florida)

Poster presentation: Rebecca Seipelt-Thiemann, Joshua Reid\*\*\*, Zachary Grimes\*\*\*, Chloe Wasendorf\*\*\*, Brock Couch\*\*\*, Olena James\*\*\*, Patrick Armstrong, Nick Peters, Nancy Boury. “Undergraduate Students' (Mis)Understandings of Mutation”

#### Plant and Animal Genome Conference (San Diego, California)

Poster presentation: Rebecca Seipelt-Thiemann, Ross Thomas III\*, Andrew Jones\*, Rachel Bailey\*, Nolan Jolley\*, Zachary Lay\*, Kayley Stallings\*, Tony Johnston, and John Dubois. “Isolation and Identification of Fungal Endophytes of *Vitis aestivalis* ‘Norton/Cynthiana’ ”

### Seipelt-Thiemann's seminars/talks

#### MSE Seminar

Speaker, Using Students' (Mis)Understandings to Guide Instruction (MTSU, January 2019)

#### CBAS Scholars Day

Women in Science Speaker (MTSU, March 2019)

# Biology Lab Updates

## Mary and Anthony Farone family news

Grace was married on Aug. 11, 2018! She is a dietitian at Vanderbilt University Medical Center and her husband is a cardiac care nurse at Saint Thomas, Midtown. Cate is the captain of her Mock Trial Team in Political Science and won an Outstanding Witness Award. She is minoring in Spanish and is spending this summer in Costa Rica with the Study Abroad Program. Danny earned his Eagle Scout rank, and he is looking at colleges. Mary and Anthony are coaching the St. Rose Science Olympiad Team and Nicky and his team placed second at the MTSU Regional Event. His team and Danny's high school team will be traveling to University of Tennessee for the State meet.

Just a few updates on our students: Eric Vick, M.D., Ph.D., is doing a Heme-Onc Residency at the Cincinnati Veterans Affairs Hospital, and Caleb Sutton, Ph.D., is a Bioscience specialist with Nikon, Seattle. The current Farone Lab Ph.D. students are doing well: Desta Kidane (M) is working on characterizing how Dr. Mary's obligate intranuclear bacterium trafficks to the nucleus, Fatmah Alqahtani (M) is studying a novel antifungal compound, Raj Ghosh (A) is characterizing the immunomodulatory activity of ginseng polysaccharides, Dan Bryant (A) is using CRISPR to study how plant polysaccharides stimulate inflammatory responses in macrophages, and Zahrah Al-ayes' (A) project involves characterizing the anti-inflammatory mechanism of 2 synthetic flavonoids.

Mary Farone has received two external research grants: (with Tony Farone, Sharon Berk, and John Gunderson, Tennessee Technological University as co-PIs) for \$270,000 from the NIH R15 program to study "Trafficking of Two Novel Potential Pathogenic Intranuclear Bacteria in Eukaryotic Cells," and (with Berk co-PI) was awarded \$200,000 from the USDA National Institute for Food and Agriculture to study the "Role of Protozoa Cysts in Protecting Pathogens of the Fresh Produce Industry."

We also have a few recent publications with our students\*:

Bagsby C\*, Saha A, Goodin G, Siddiqi S, Farone M, Farone A, Kline PC. "Stability of pentobarbital in soil." *Journal of Environmental Science and Health, Part B*. 2018 Mar 4;53(3):207-213. doi: 10.1080/03601234.2017.1406714.

Kidane DT\*, Arivett BA, Crigler J, Vick EJ\*, Farone AL, Farone MB.

"Draft Genome Sequence of *Gardnerella vaginalis* Strain ATCC 49145 Associated with Bacterial Vaginosis." *Genome Announcements*. 2017 May 4;5(18). pii: e00286-17. doi: 10.1128/genomeA.00286-17

Sutton CL\*, Taylor ZE, Farone MB, Handy ST. "Antifungal activity of substituted aurones." *Bioorganic & Medical Chemistry Letters*. 2017 Feb 15;27(4):901-903. doi: 10.1016/j.bmcl.2017.01.012. Epub 2017 Jan 6.

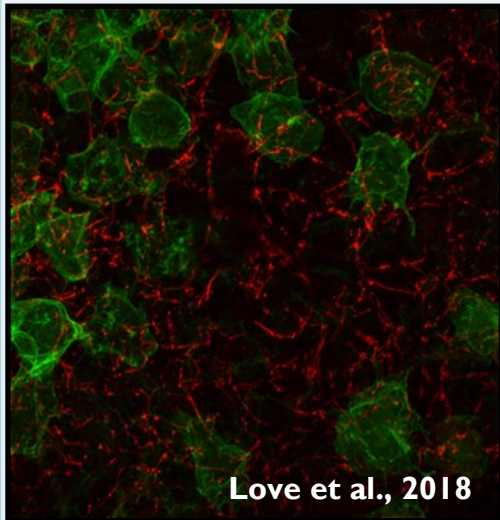
Park HS\*, Nelson DE, Taylor ZE, Hayes JB, Cunningham KD, Arivett BA, Ghosh R\*, Wolf LC, Taylor KM, Farone MB, Handy ST, Farone AL. "Suppression of LPS-induced NF- $\kappa$ B activity in macrophages by the synthetic aurone, (Z)-2-((5-(hydroxymethyl) furan-2-yl) methylene) benzofuran-3(2H)-one." *International Immunopharmacology*. 2017 Feb;43:116-128. doi: 10.1016/j.intimp.2016.12.004. Epub 2016 Dec 16.



# Biology Lab Updates

## From the lab of Jason Jessen

The Jessen lab had a productive year with two manuscripts being accepted for publication. Molecular Biosciences (MOBI) Ph.D. student Anna Love had a first-author paper accepted in the journal *Development* entitled "Vangl2-dependent regulation of membrane protrusions and directed migration requires a fibronectin extracellular matrix" (*Development* 145, dev165472 doi: 10.1242/dev.165472). *Development* is recognized as one of the top and most respected developmental biology journals in our



Love et al., 2018

*Image of zebrafish gastrula cells labeled with green fluorescent protein. They are migrating on top of a fibronectin extracellular matrix (red). Image taken at 630x magnification using a Zeiss LSM700 laser scanning confocal microscope.*

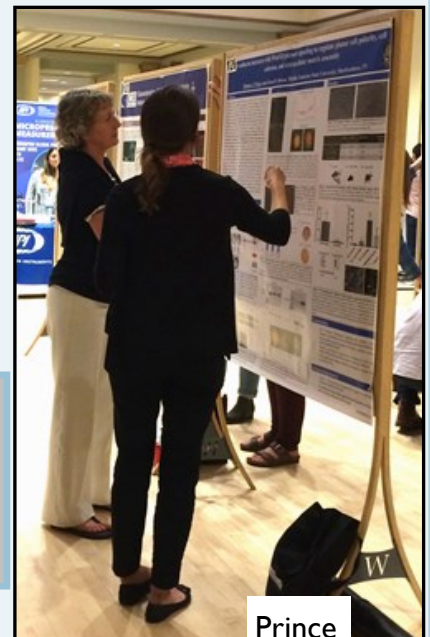
field. After four years in the MOBI program, Love graduated in August 2018 and obtained a

post-doctoral position in the laboratory of Robert Coffey, M.D. Bob Coffey is an Ingram Professor of Cancer Research at Vanderbilt University Medical Center. He is a leader in the fields of epithelial cell biology and colorectal cancer and was recently awarded a multi-million dollar Outstanding Investigator Award from the National Cancer Institute. It is a testament to Love's hard-work, training, and development as a scientist that she was able to obtain such a significant and competitive position.

In addition to being second author on Love's paper, MOBI student Dianna Prince is nearing submission of her own first author manuscript also to the journal *Development*. Prince has some beautiful data demonstrating that one important function of the polarity protein Vangl2 is to suppress inappropriate formation of bleb membrane protrusions. She has shown that excess bleb formation inhibits establishment of planar cell polarity and disrupts directed cell migration. Prince is also actively searching for a post-doctoral position to continue her scientific training. Thus far, she has interviewed with Dr. David Langenau at Harvard Medical School.



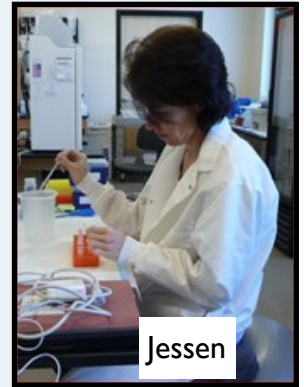
Prince, at the 13th International Conference on Zebrafish Development and Genetics presenting her poster to Lila Solnica-Krezel. Solnica-Krezel is Jessen's former post-doc mentor, the chair of the Department of Developmental Biology at Washington University in St. Louis, and current president of the Society for Developmental Biology. Prince was barely nervous.



# Biology Lab Updates

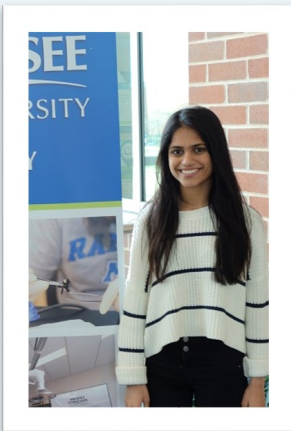
## From the lab of Jason Jessen, cont.

The Jessen lab also published a paper in the journal *Experimental Cell Research* entitled “VANGL2 protein stability is regulated by integrin  $\alpha 5$  and the extracellular matrix” (*Exp. Cell Res.* 374, 128-139). This was the second first-author paper by senior research specialist Tammy Jessen. Her research utilized invasive human cancer cells to explore the relationship between cell adhesion to the extracellular matrix and VANGL2 protein stability. Her findings are significant as they implicate integrin proteins and actin-mediated mechanotransduction as regulators of VANGL2. Lastly, Jason Jessen himself was honored to be invited to speak at a Royal Society-sponsored meeting entitled “Planar cell polarity in development and disease” to be held in Milton Keynes, United Kingdom. He also was invited as a seminar speaker for the Department of Cellular Biology at the University of Georgia.

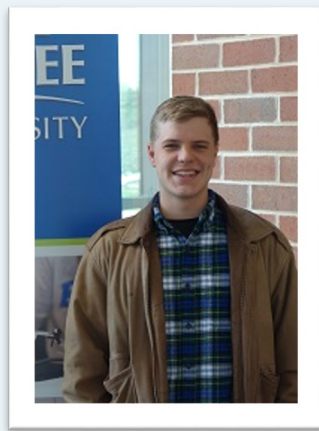


## From the lab of John DuBois

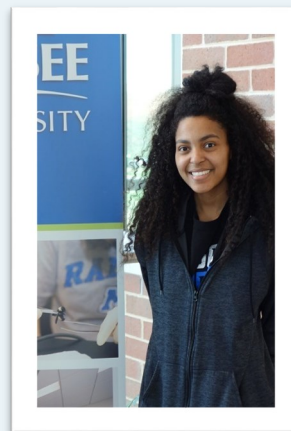
This past year, six undergrad students from the DuBois lab were awarded URECA grants. Fall 2018: **Rebekkah Riley**; Spring 2019: **Payal Patel**, **George Schroeder**, **Tia Shutes**, and not pictured, **Alyssa Walsh** and **Sara Moore**.



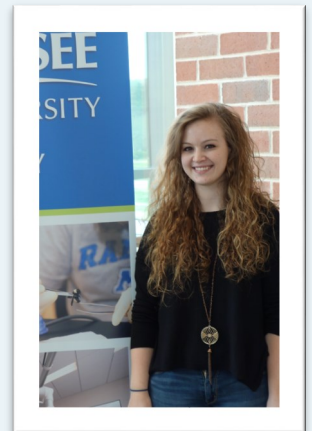
**Payal Patel**



**George Schroeder**



**Tia Shutes**



**Rebekkah Riley**

# Biology Lab Updates

## From the lab of Cindi Smith-Walters



The MTSU Center for Environmental Education (CEE) has been busy this year! One of our star programs, the Tennessee Amphibian Monitoring Program (TAMP)—a joint venture between the Tennessee Wildlife Resources Agency and the CEE has big news. A new online training for volunteer frog loggers is in the works.

There are 21 species of frogs and toads (anurans) in Tennessee. With the data gathered through our Statewide cadre of TAMP volunteers we hope to better understand the distribution and relative abundance of each species. TAMP volunteers are trained to recognize frog and toad calls by sound. They drive specific routes selected by the [North American Amphibian Monitoring Program \(NAAMP\)](#). There are 10 listening stations established along each route placed at least 0.5 miles apart and where wetland habitat exists. Volunteers make four listening runs a year with each beginning at least 30 minutes after sunset and finishing before 1 a.m. When an anuran chorus is heard, it is assigned a calling index

and all data collected is entered into a Tennessee state database in GIS and the national NAAMP database. This data can be searched and queried by route number, date, calling index or other combination of factors. New county records are documented with a digital recording and submitted to the *Tennessee Amphibian Atlas* and *Herpetological Review*. If verified, these records are published and range maps of distribution adjusted to reflect the new information. To date, TAMP has been the source of many new county records being registered.

In the past, the TAMP volunteer frog loggers were trained in day-long workshops infrequently held in various locations across the state. The great news is that a new online certification and training will soon be available so even more volunteers can participate by driving listening routes across the state. If you are interested in a preview of a selected segment of this on-line workshop before it is released via the MTSU CEE TAMP website, go to [www.leaps.ms](http://www.leaps.ms) and make sure your speakers are on! Choose the Tennessee Amphibian Monitoring Program (TAMP) link on the Leaps home page. From the TAMP home page, select the TAMP Online Workshop link on the right. When at the TAMP workshop page, click the PLAY icon on the player below the text. Also click the "full size" icon at the bottom right of the player window. The workshop should play automatically and fill your screen. Be ready for excellent photography and recordings, both taken by Bob English, the TAMP state coordinator and CEE staff person.



Why should we be interested in auran populations? These species face a variety of threats, including urbanization and development, the loss of rural areas, the misuse of herbicides and pesticides, pathogens, and pollution. All are taking their toll. In addition changing climate may threaten some species through rising water temperatures which affect those species which require cooler breeding temperatures.

TAMP provides the opportunity for citizens to become involved in data collection and reporting so that biologists and land managers have the most up-to-date information to determine species occurrence and abundance. This knowledge is invaluable when making land-use decisions to best benefit our amphibian populations, our environment, and ourselves.

We hope you enjoy this sneak peak into the new TAMP online certification training before it is released to the public. In addition to visiting the Leaps website, you can go to the MTSU site [mtsu.edu/mtsucee/tamp.php](http://mtsu.edu/mtsucee/tamp.php) or contact TAMP state coordinator Bob English [renglish@mtsu.edu](mailto:renglish@mtsu.edu) or CEE director and biology department faculty member Cindi Smith-Walters [csmithwa@mtsu.edu](mailto:csmithwa@mtsu.edu) for more information. Happy listening!



# Biology Lab Updates

## Gardner Research Team Update

Our research team has been working hard over the past year. Primary funding for our research currently comes from an NSF RCN-UBE project called the Biology Teaching Assistant Project (BioTAP), which is in its fourth year. With Co-PIs from the University of Tennessee, University of Georgia, Ohio State University, and the University of Maryland, we are developing and analyzing research networks with the goal of increasing the quality of evidence-based teaching professional development for biology graduate students. We also are excited to have received funding to host the National Association of Research in Science Teaching's biennial Sandra K. Abell Institute for Doctoral Students. This is a week-long professional development institute for science education doctoral students that will be implemented in collaboration with Gregory Rushton, Anna Grinath, and Josh Reid from MTSU as well as Julie Luft from the University of Georgia. This takes place in June 2019 and is a huge honor from the premier international science education research association. This institute will bring important recognition to our Mathematics and Science Education Ph.D. program and highlight the excellent research that is coming out of our program. In addition, Gardner has been working hard to disseminate final data related to an NSF-sponsored DRK-12 project that closed recently.

Students in the research team have been busy as well. Biology Education doctoral students Penny Carroll and Reid defended their dissertation proposals this past year. This summer Carroll will be defending her project related to biology faculty motivations to implement evidence-based instructional strategies. Reid is currently collecting data related to graduate student perceptions of the research teaching nexus and plans to defend in Fall 2019. Undergraduate researcher Gina Bishara was able to design her own project with the support of a MTSU URECA grant this past year. She utilized social network analysis and qualitative methodologies to study how undergraduate biology students use in- and out-of-class time to study in small groups. Undergraduate researchers Dhruvi Lad and Dirhat Mohammed have been working on a project related to BioTAP, studying the impacts of teaching professional development on graduate students' beliefs and practice related to teaching. All three students were able to present at MTSU's Scholars' Week, where Dirhat and Dhruvi won third place in the undergraduate research category for the CBAS poster session.



*The Gardner research team at our annual end-of-year lunch celebration in May (l-r): Grant Gardner, Dirhat Mohammed, Josh Reid, Dhruvi Lad, Miranda Moore*

# Biology Lab Updates

## Gardner Research Team, cont.



We currently have two book chapters in press with former MSE doctoral students as well as four additional research manuscripts released during this calendar year thus far. Gardner and many of the student researchers will be headed off to various conferences to present their work this spring. These included the National Association for Research in Science Teaching, ASCN Transforming Institutions, National Science Teachers Association, and the Society for the Advancement of Biology Education Research.

*Graduate student Josh Reid presents a poster at the annual Association for Science Teacher Educators conference in January.*

## From the lab of Ashley Morris

### SmokyMtnU launches with MTSU inaugural class

Biology students are getting a unique learning experience in Great Smoky Mountains National Park (GRSM), thanks to a collaboration between Ashley Morris (associate professor of Biology), Stephanie Sutton (GRSM supervisory park ranger, Division of Resource Education) and Christine Hoyer (GRSM Backcountry Management Specialist). GRSM has dubbed the experience “SmokyMtnU”, while Morris teaches the class at MTSU under BIOL 4330 Biome Analysis. The class offers students a view of the cultural and political history of the park, as well as providing hands-on experiences with different park career paths. Students in the class spent spring break in the park, shadowing wildlife biologists who were sedating elk for biological research, a fisheries biologist who taught them electroschock fishing as a tool for monitoring species diversity and aquatic health, a law enforcement agent who spoke about the challenges of being a federal entity spanning two states (and their respective laws), a research entomologist who spoke about the importance of biological collections, and finally, a wrap-up of the importance of wilderness and how we define it. Students returned to the Smokies during finals week for a backcountry camping trip to cap off the experience. The inaugural offering of the course has received a great deal of media attention, having been picked up by local news outlets in east and middle Tennessee, as well as the Associated Press. Morris and her park partners held a workshop in early summer to coordinate the expansion of the program to other institutions.





# Biology Lab Updates

## From the lab of Ashley Morris, cont.



*MTSU students and GRSM park staff working with an estimated 700-pound bull elk. The elk was “darted” (i.e., sedated with a dart gun) by wildlife biologists, and students assisted in measuring data that would provide insight into the health of the animal.*

*MTSU students Luke Torres (l) and Cody Keck (r) with Dr. Becky Nichols (center), park entomologist. Nichols provided a tour of the biological collections of the park. Here she is showing students specimens of ginseng, which is a species threatened by poaching activities in the park.*



*The inaugural SmokyMtnU class after returning from the spring break trip to GRSM (l-r): back row, Cody Keck, Lee Rumble, and Elman Gonzales; center row, Bekkah Riley, Luke Torres, James Beckner, Dr. Ashley Morris, and Infinity Bristol; and front row, Cyerrha Sengaroun, Haven Poore, and Haley Carter.*





# Biology Lab Updates

## From the lab of Kim Sadler



*Kim Sadler poses with ZooTeens in March at Flat Rock Cedar Glade and Barrens. ZooTeens are high school students that volunteer at the Nashville Zoo and share a passion for conservation. They have been working with Sadler in the classroom and the field this past year learning about the limestone cedar glades.*



*This year Sadler has continued to work with local partners on projects that educate our community about the incredible ecology we have in middle Tennessee.*



*Through the EXL (Experiential Learning Program), Sadler's non-majors Biology classes learn about conservation not only in the classroom but literally through "hands-on" learning experiences. One project was in the wetlands behind Oaklands Mansion. It's hard to believe but the area surrounding us was once shoulder-high Chinese privet and bush honeysuckle. Completing this much work in a few hours was quite an accomplishment for Sadler's Biology 1030 Fall 2019 Honors classes. It was a brisk morning, and they had the pleasant surprise of seeing a small green snake too cold to move.*

# BIOLOGY STUDENT TRAVEL

The Biology Student Travel Award was established to support students invited to present their research at local and national conferences.

**By Andrew Todd**  
**SETAC Sacramento**  
**November 4–8, 2018**

At the 39th annual Society of Environmental Toxicology and Chemistry (SETAC) North America conference, I presented my undergraduate research on the presence of fecal bacteria and associated pathogens at two recreational freshwater beaches located here in middle Tennessee. As of the initiation of this project, no federal criteria have been developed for fecal bacteria in sand, and no regular monitoring of freshwater beach sand occurs in Tennessee. The objective of this study was to assess the abundance of fecal indicators (*E. coli*, coliphages, Bacteroidales) and associated pathogens (Methicillin Resistant *Staphylococcus aureus*, MRSA) in freshwater beach sand and water. Our results were consistent with the literature, which has mostly focused on marine environments up to this point, showing relatively high concentrations of fecal bacteria and associated pathogens in freshwater beach sand. Ultimately, the results from this project that I presented as a poster presentation instigated many enthusiastic discussions about potential sources of the fecal pollution, as well as any potential, adverse human health effects that could be attributed to contact with the fecal bacteria and pathogens present.

As this was my second trip to a SETAC North America annual conference, I was vastly more prepared and excited to share my new research that I had been assisting Frank Bailey with over this past summer. The annual SETAC North America meeting is host to well over 2,000 people from business, government, and academia who all come together to share their research and discuss all topics concerning the environmental toxicology and chemistry world. This time around, my experience at this meeting was even more significant as the role of the conference had changed from past science conferences I have been able to attend. Not only was this SETAC North America conference a chance to present the research I have been working on the past few months, but it also served as a tool for rekindling valuable ties with people from across the country and forming new and important networking opportunities with potential employers, professors, and associates.

Ultimately, attending this conference has left me knowing I am vastly more prepared for future work in environmental toxicology. Being present at this annual meeting also has allowed me to continue to network and practice sharing my scientific research with others in my field on one of the biggest stages available to undergraduate and graduate students alike. Every scientific conference I attend leaves me more well-informed, capable, and enthusiastic about continuing to learn and study various different areas of science, as well as being more able to contribute to the scientific community as a whole. I can't think of a more valuable tool that can be made available to any student or person interested in any field of science, regardless of their age or position, and I look forward to being able to take part in many more conferences such as this one as I progress through my scientific career.



Robin Dixon

Andrew Todd



# BIOLOGY STUDENT TRAVEL

By J. Ashton Reece

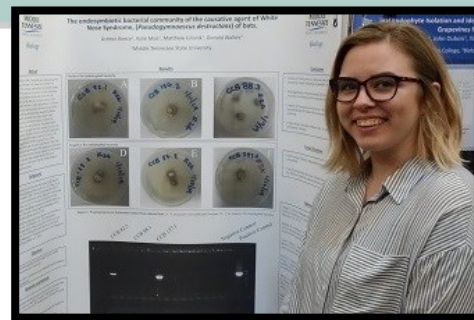
## MASMC 2019 Report

The annual Mid-Atlantic States Mycological Conference (MASMC) was held this past weekend April 12-14. This year's conference was packed with presentations from undergraduate and graduate students, including many diversity studies, phylogenetic analyses, and even multiple presentations on the odorant properties of fungi. I was

fortunate enough to be accepted to present a poster over the research I have focused on the past two semesters. I am currently working to identify endosymbiotic bacteria in the fungal pathogen, *Pseudogymnoascus destructans*. This pathogen is the topic of many studies, though my lab was the only one focused on *P. destructans* at the conference.

Some of the presentations featured included two studies on fungal diversity after the major wildfire that devastated the Great Smoky Mountains National Park in 2016. These reports found that this wildfire not only depleted the plant diversity but also had a major impact on soil fungi and fungi that are symbiotic to plants as well. Another interesting pair of presentations came from John Munafo's lab at the University of Tennessee. Munafo's lab specializes in identifying key components in fungi that give them specific odors. Ph.D. candidate Purni Wickramasinghe worked to identify the key odorants in a common edible mushroom *Ischnoderma resinosum*, and her colleague Jordan Lopez identified odorants to be used in creating a salty flavor for mushroom-based hamburgers.

This year's conference was also heavy in discussions over diversity among many of the major lineages of fungi. One student presented an almost complete list of every genus in the family *Agaricales* while addressing many of the issues mycologists face with taxonomy. This was not part of a thesis or dissertation but was done solely because Jacob Kalichman found himself wanting to see a complete list of these genera which has yet to be created. Many of the conference's speakers had identified multiple new species in their work to examine the phylogenetic trees of many fungal classes as well. Overall, this years MASMC was one for the books!



By Alex Romer

## KY/TN American Society of Microbiology Spring 2019

On April 27, I attended the KY/TN ASM Spring 2019 conference where I presented a version of my M.S. thesis proposal entitled "Effects of Snake Fungal Disease (SFD) on Epidermal Microbiome Community Dynamics." This was my first opportunity to give an oral presentation at a professional conference. Consequently, the feedback on my presentation style and the content of my talk I received from members of the local ASM branch members, many of whom are MTSU faculty, was very beneficial. Overall, the talk seemed to be well received with one of the main comments that I received from judges being that they would like to see how the data from this experiment ultimately turns out. Additionally, another lecture was given entitled "Ecological Interactions within the Cutaneous Microbiome of Plethodontid Salamanders." Several statistical and conceptual methods of analysis for animal microbiomes were discussed in detail in that presentation which may ultimately become relevant to my own my project. Finally, I was able to learn about and discuss several interesting concepts in microbiology with authors of poster presentations at this conference. These poster topics included methods of tracking the parasite *Toxoplasma gondii* on the landscape by looking at its prevalence in mammalian hosts and the potential therapeutic effects of CBD on inflammation and the immune system which may one day translate to pharmaceutical applications.





## Featured Faculty: Kurt Blum, Retired

### FORGOTTEN TREASURE

By Mary Baughman

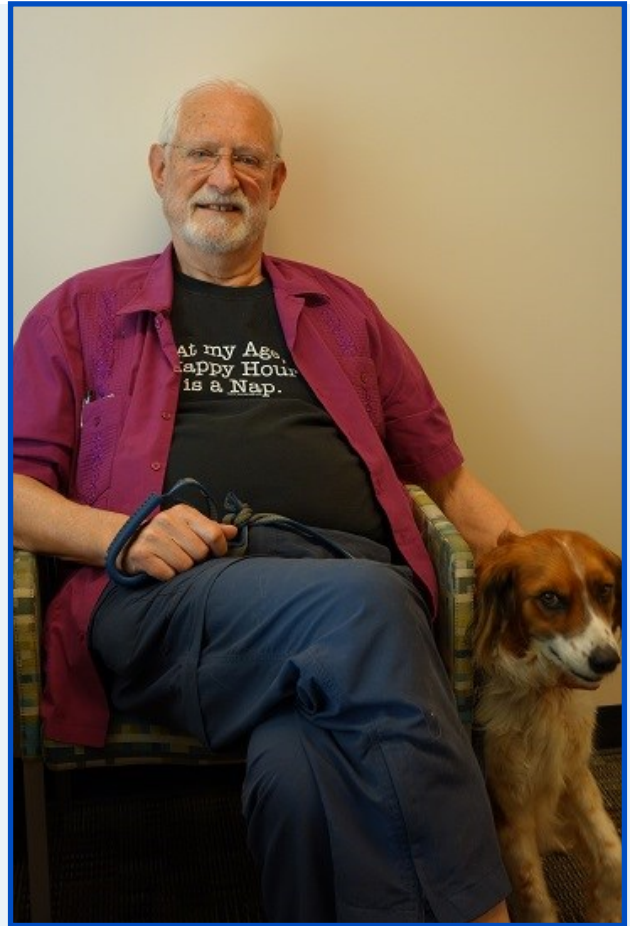
Watching the approaching figure walking his dog, I recognize him as a treasured friend. Our paths have crossed many times in the last 47 years. His tall, lanky frame is now bent with ravages from a long life, and a shuffled gait follows his beautiful shepherd service dog, Maya. His memory is beginning to fade but Kurt Blum still recognized me, and Maya always charms me by extending her paw to shake hands then nudging me to be petted. He and Maya are always a welcome sight.

Previously he had been a beloved Biology professor at MTSU. Although our families were known to one another due to my husband also teaching at MTSU, our friendship remained on a social level. After

these many years, I learned of this professor's great contribution to mankind,

Blum's sister-in-law was recently diagnosed with breast cancer, and treatment choices included using Taxol. She has been healed and revealed her choice to use Taxol was due to the professor finding the elusive plant many years ago to make this cancer-healing drug. In 1962 he was collecting samples in a national forest in the state of Washington for possible different new species of plants to be researched by the National Health Institute. The bright red berries shining in the sunlight caught his attention, prompting his choice to be collected as a sample. Eventually, the sample was found to be the best choice for curing breast cancer because it actually causes cancer cells to die.

As I see my friend trudging on his walks, I see this unassuming elderly saint that has saved so many women from breast cancer and now know the hidden treasure he has given the world.



# Full-Time Temporary and Adjunct Faculty Play Major Roles

The combination of increased enrollment and decreased funding creates a challenge when it comes to assigning instructors to the ever-growing number of course sections. This need is met primarily by full-time temporary and adjunct faculty. This academic year, the department has hired four full-time temporary and two adjunct faculty members.

These faculty are teaching Exploring Life, General Biology II, Human Anatomy and Physiology I and II, Ecology labs, Genetics and Biometry. Considering the expertise of each of these instructors, their students are obviously getting a great education. Their service to the department not only helps fill instructor roles, but, also helps fill in for research faculty who have received grants and/or contracts that include release time. A few of these instructors are using some of their out-of-class time to conduct their own research, often including graduate and undergraduate students. The department is forever grateful for their service.

## ***Full-Time Temporary Faculty***

**Danielle Brown**, B.S., 2001, Cornell University; M.S., 2006 and Ph.D., 2011, University of California—Davis. Teaching: General Biology II lecture and Anatomy and Physiology I labs

**Siti Hidayati**, B.S., 1986, University of Gadjah Mada; M.S. 1993; Ph.D., 2000, University of Kentucky. Teaching: Exploring Life lecture and Ecology labs

**Alicja Lanfear**, B.S., 2006, Cumberland University; M.S., 2008, MTSU; Ph.D., 2012, University of Tennessee - Knoxville. Teaching: Anatomy and Physiology II labs

**Amy Massengill**, B.S., 1993, Stetson University; D.V.M., 1997, University of Florida. Teaching: Anatomy and Physiology I and Anatomy and Physiology II labs

## ***Adjunct Faculty***

**Suzanne Hicks**, B.S., 2009, MTSU; M.S., 2014, MTSU. Teaching: BIOL 1031 labs

**Moses Prabu**, B.S., 1991; M.S., 1993, The American College; Ph.D., 1998 Indian Institute of Science. Teaching: Radiation Biology

# Department Graphic Shirts and More

The department is selling shirts, backpacks, insulated lunch bags, coffee mugs, lanyards, and stadium cups that sport the department graphic. The T-shirts come in short-sleeve or long-sleeve with the Biology logo front and center or on the upper-left front. Several faculty and students have been spotted wearing the shirts. The coffee mugs are white with the graphic in blue on both sides (visible whether you are right- or left-handed). The stadium cups are 16-ounce blue plastic with a white MTSU Biology graphic. The key lanyards are blue ribbed-polyester cord with a white MTSU Biology graphic. Come by and check out the merchandise in SCI 2044. You might even want to add your own personal flair by custom-ordering a T-shirt with your favorite color combination.

T-shirts	Short-Sleeve:	\$14	Insulated lunch bag:	\$8
	Long-Sleeve:	\$18	Drawstring backpack:	\$6
Sweatshirts	Crew Neck:	\$25	Key Lanyards:	\$3
	Pull-over hoodie:	\$30	Coffee Mugs:	\$5
	Stadium Cups:	\$1		

All items can be purchased (cash only) in the department office (SCI 2044)

or by email at [Biology@mtsu.edu](mailto:Biology@mtsu.edu).

Purchases are not tax-deductible.





# 2018-19 Graduate Teaching Assistants

For the 2018-19 academic year, the department is providing support to 24 M.S.-level and 24 Ph.D.-level graduate students who serve as graduate teaching assistants (GTAs). Twenty of these students have received undergraduate degrees from colleges and universities other than MTSU. Eleven hold baccalaureate degrees in subjects other than biology (agriculture, aquatic and fisheries science, biochemistry, biotechnology, environmental science, microbiology, plant and soil science, and zoology). Six of these assistants have received baccalaureate or master's degrees from universities outside the United States. All have the requisite training in biology to serve as departmental teaching assistants. Without these GTAs, the department would be unable to offer the many sections of the non-majors biology course (BIOL 1030) and the majors freshman courses (BIOL 1110/1120), along with some sophomore and junior laboratories. The department is very pleased to have them.

## M.S. Biology

**Marshall Baughman**, B.S., Biology, 2017, Middle Tennessee State University

**Chelsea Campbell**, B.S., Biology, 2017, Middle Tennessee State University

**Mikiyas Daniel**, B.S., Biochemistry, 2017, Middle Tennessee State University

**Josh Evers**, B.S., Biology, 2015, University of Tennessee—Chattanooga

**Nicole Gammons**, B.S., Biology, 2018, Middle Tennessee State University

**Alejandro Grajal-Puche**, B.S., Biology, 2014, University of Arizona

**Lauren Hanberry**, B.S., Biology, 2015, Middle Tennessee State University

**Brady Inman**, B.S., Biology, 2016, Middle Tennessee State University

**Samuel Johnson**, B.S., Biology, 2018, Middle Tennessee State University

**Steven Joseph**, B.S., Biology, 2017, Middle Tennessee State University

**Shelby Lowrie**, B.S., Biology, 2017, Middle Tennessee State University

**Kameron McCullough**, B.S., Biology, 2016, Middle Tennessee State University

**Gary Noel**, B.S., Biology, 2017, Belmont University

**Anna Parnell**, B.S., Biology, 2017, Middle Tennessee State University

**Yasmin Recinos**, B.S., Biology, 2017, Middle Tennessee State University

**Forest Rice**, B.S., Biology, 2016, Middle Tennessee State University

**Wesley Riley**, B.S., Biology/Chemistry, 2017, Middle Tennessee State University

**Alexander Romer**, B.S., Aquatic and Fisheries Science, 2018, State University of New York

**D. Lee Rumble**, B.S., Plant and Soil Science, 2016, Middle Tennessee State University

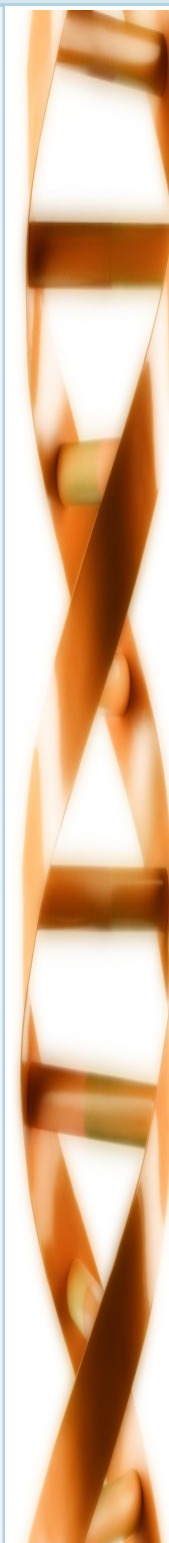
**Kelly Ann Saine**, B.S., Biochemistry/Psychology, 2017, Middle Tennessee State University

**Linda Sircy**, B.S., Biology, 2013, University of Tennessee—Chattanooga

**Mary Catherine Skolfield**, B.S., Biochemistry, 2016, Faulkner University

**Alexander Tate**, B.S., Biology, 2017, Middle Tennessee State University

**Jamila Tucker**, B.S., Biology, 2016 University of Tennessee—Chattanooga



# 2018-19 Graduate Teaching Assistants

## Ph.D. GRADUATE TEACHING ASSISTANTS



### **Molecular Biosciences Program**

**Ali Ali**, B.S., 2003; M.S., 2010, Benha University

**Brock Arivett**, B.S., Biology, 2005; M.S., Biology, 2014, Middle Tennessee State University

**Gale Beaubien**, B.S., Biology, 2014, Middle Tennessee State University

**J. Logan Bowling**, B.S., Biology, 2013, Middle Tennessee State University

**Daniel Bryant**, B.S., Biology, 2014, Middle Tennessee State University

**Pratima Chapagain**, B.S., Microbiology, 2009; M.S., Microbiology, 2012, Tribuwan University Nepal

**Rajarshi Ghosh**, B.S.T., Biotechnology, 2011, West Bengal Univ., M.S., Biology, 2014 Univ. of West Florida

**Matthew Grisnik**, B.S., Biology, 2014, University of Findlay; M.S., Biology, 2016, Marshall University

**Elizabeth Bleu Jackson**, B.S., Biology, 2017, Tennessee Technological University

**Destaaalem Kidane**, B.S., Biology, 2009; M.S., Biology, 2012, Georgia College and State University

**Timothy Lamantia**, B.S., Biology, 2017, Middle Tennessee State University

**Paola Molina**, M.S., Biology, 2012, Middle Tennessee State University

**Dianna Prince**, B.S., Biology, 2013; M.S., Professional Science, 2014, Middle Tennessee State University

**Aarthi Subramani**, B.T., Biotechnology, 2016, Anna University

**Csilla K. Szepe**, B.S., Biology, 2018, Middle Tennessee State University

### **Math and Science Education Program**

**Brock Couch**, B.S., Biology, 2015, Missouri Western State College; M.S., Biology, 2018, University of Maryland

**Chatoria Franklin**, B.S., Biology, 2004; M.S., Professional Science, 2007, Middle Tennessee State University

**Angela Google**, B.S., Biology, 2007; M.Ed., Environmental Science, 2010, University of Tennessee—Chattanooga

**Zachary Grimes**, B.S., Biology, 2015, Middle Tennessee State University

**Olena James**, B.S., Biology, 2009, Tennessee State University; M.S., Biology, 2013, Tennessee State University

**Yhigang Jia**, B.S., Biological Sciences, 2010, Jilin Univ., M.S., Biological Education, 2015, Northeast Normal Univ.

**Joshua Reid**, B.S., Biology, 2014, Athens State University

**Sara Salisbury**, B.S., Environmental Science, 2012, Allegheny College; M.S., Biology, 2018, Texas State University

### **Computational Science Program**

**Ashlin Harris**, B.S., Biology, 2016, Middle Tennessee State University

# Theses and Dissertations Completed 2018-19

## Master's Theses

### Summer 2018

**Gain, Emily G.** 2018. "A Metagenomic Analysis of the Honey Bee Gut Microbiome Following Oral Imidacloprid Exposure" (Frank Bailey, advisor)

**Kerr, Bryce Allen.** 2018. "Predicting the Prevalence and Distribution of *Armillaria mellea* (Physalacriaceae, Basidiomycota) by Ecological Niche Modeling" (Sarah Bergemann, advisor)

**Ouellette, Corbett C.** 2018. "*Gardnerella vaginalis* Strain Dependent Growth and Cytotoxicity in Human Monocytes" (Anthony Farone, advisor)

### Fall 2018

**Myers, Katherine D.** 2018. "Screening of Traditional Chinese Medicine Plant Extracts for Antibacterial Properties" (Mary Farone, advisor)

### Spring 2019

**Inman, Brady J.** 2019. "Determination of Chytridiomycosis in Amphibians at Arnold Air Force Base" (Brian Miller, advisor)

**Rumble, David Lee.** 2019. "Measuring Spatial and Temporal Shifts in Beech Gap Forest Structure and Composition in Response to Beech Bark Disease in Great Smoky Mountains National Park" (Ashley Morris, advisor)

**Skolfield, Mary Catherine.** 2019. "Measuring the Responses of the Mitophagy Pathway to Transient Mitochondrial Stress at the Level of Polyubiquitin and Phospho-Polyubiquitin Chain Formation" (David Nelson, advisor)



# Theses and Dissertations Completed 2018-19

## Doctoral Dissertations

### Summer 2018

**Guess, Tiffany E.** 2018. “Analysis of Sex Bias in *Cryptococcus neoformans* Infections” (Erin McClelland, advisor)

**Love, Anna M.** 2018. “Vangl2-Dependent Plasma Membrane Protrusion Behaviors Require an Intact Fibronectin Extracellular Matrix” (Jason Jessen, advisor)

### Spring 2019

**Molina, Paola A.** 2018. “The Role of Ubiquitination During the Removal of Paternal Organelles in *Caenorhabditis elegans*” (Lynn Boyd, advisor)

**Stallard, Megan A.** 2018. “Factors that Influence the Presence of Fecal Indicator Bacteria from Three Potential Exposure Pathways” (Frank Bailey, advisor)

## BioUpdate

Lynn Boyd, department chair ([Lynn.Boyd@mtsu.edu](mailto:Lynn.Boyd@mtsu.edu))

Produced by MTSU  
Department of Biology

0519-7748 / Middle Tennessee State University does not discriminate against students, employees, or applicants for admission or employment on the basis of race, color, religion, creed, national origin, sex, sexual orientation, gender identity/expression, disability, age, status as a protected veteran, genetic information, or any other legally protected class with respect to all employment, programs, and activities sponsored by MTSU. The Assistant to the President for Institutional Equity and Compliance has been designated to handle inquiries regarding the non-discrimination policies and can be reached at Cope Administration Building 116, 1301 East Main Street, Murfreesboro, TN 37132; [Marian.Wilson@mtsu.edu](mailto:Marian.Wilson@mtsu.edu); or 615-898-2185. The MTSU policy on non-discrimination can be found at [mtsu.edu/iec](http://mtsu.edu/iec).

# Scholars Week Highlights Faculty and Student Research

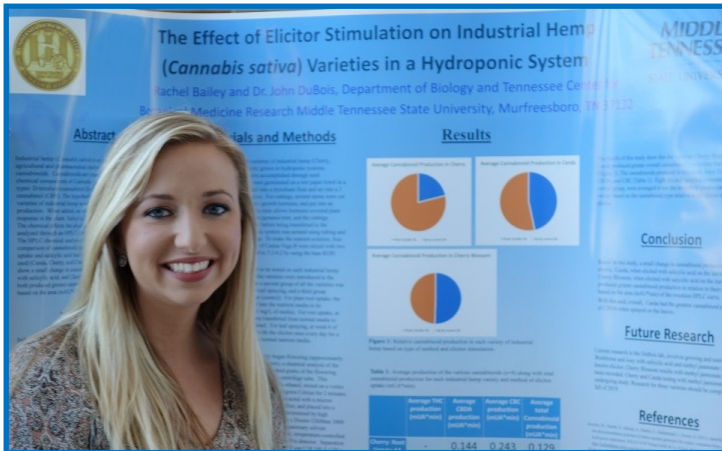
Middle Tennessee State University held its annual Scholars Week March 18-22. The department presented 43 posters. Authors of these posters included 14 faculty members, 16 graduate students, and 42 undergraduate students.

Faculty members involved in mentoring these students deserve credit for their time, effort and expertise in these research projects. Many people from across campus saw the quality of research being conducted in the department.

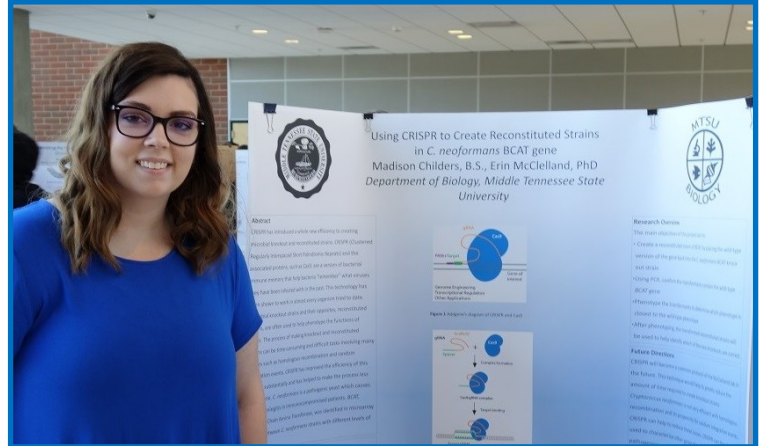
Congratulations to all authors for a job well done!

To see the entire Scholars Week program and abstracts from all posters and presentations, visit [www.mtsu.edu/research/scholarsWeek](http://www.mtsu.edu/research/scholarsWeek). The following are posters from the Department of Biology.

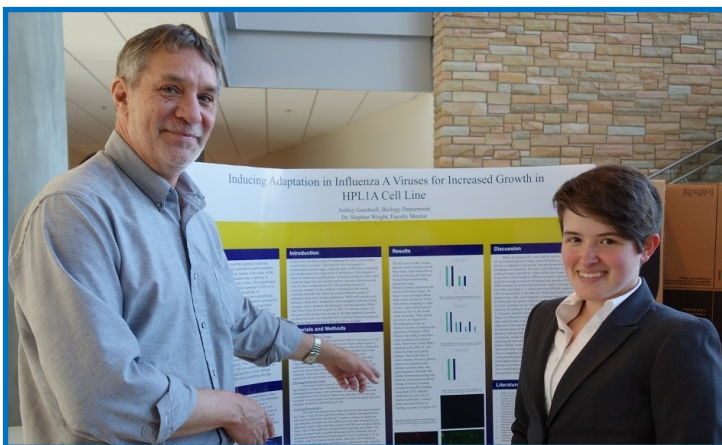
## CBAS Posters in the Atrium March 19, 2019



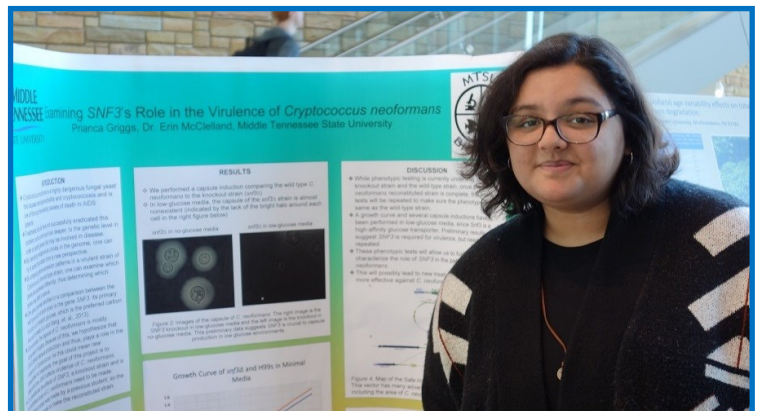
**Rachel Bailey**, undergraduate student, Biology; John DuBois (faculty sponsor), Biology; “The Effect of Elicitor Stimulation on Industrial Hemp (*Cannabis sativa*) Varieties in a Hydroponic System”



**Madison Childers**, undergraduate student, Biology; Erin McClelland (faculty sponsor), Biology; “Using CRISPR to Create Reconstituted Strains in *C. neoformans* BCAT Gene”



Stephen Wright (faculty sponsor), Biology; **Ashley Gambrell**, undergraduate student, Biology; “Inducing Adaptation in Influenza A Viruses for Increased Growth in HPLIA Cell Line”



**Prianka Griggs**, undergraduate student, Biology; Erin McClelland (faculty sponsor), Biology; “Examining SNF3’s Role in the Virulence of *Cryptococcus neoformans*”

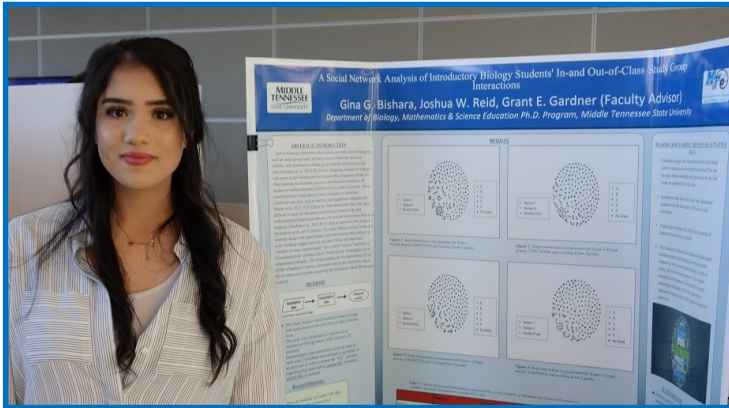
**Ngozi Omatu**, undergraduate student, Biology; Joshua Phillips (faculty sponsor), Computational Science; “Dimensional Attention Learning For Working Memory”



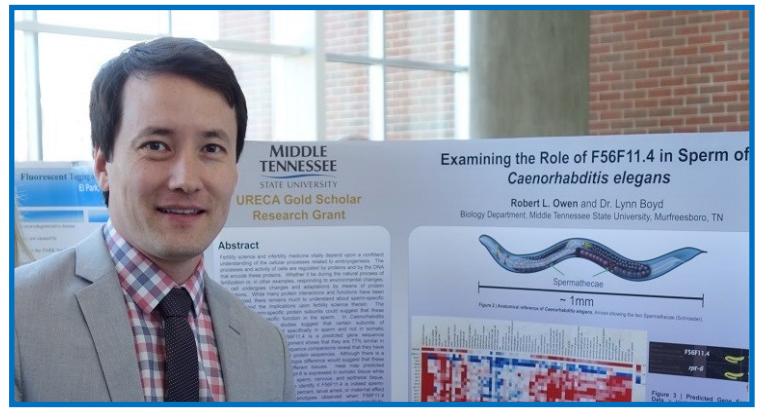


# Scholars Week Highlights Faculty and Student Research

## CBAS Posters in the Atrium March 19, 2019



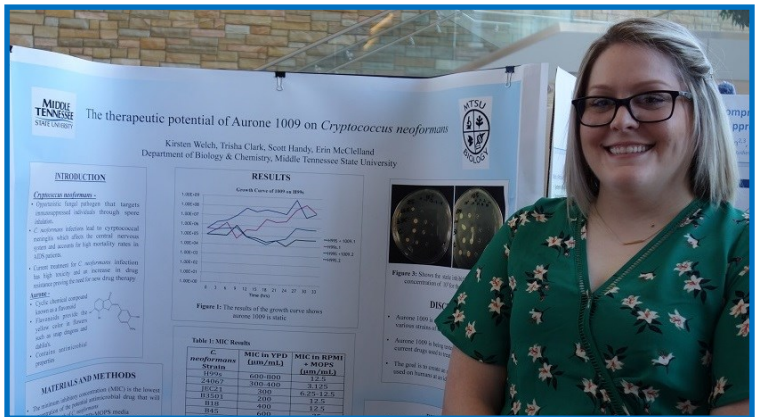
**Gina Bishara**, undergraduate student, Biology; **Joshua Reid**, graduate student, Mathematics and Science Education; **Grant Gardner** (faculty sponsor), Biology; “A Social Network Analysis of Introductory Biology Students' In-and Out-of-Class Study Group Interaction”



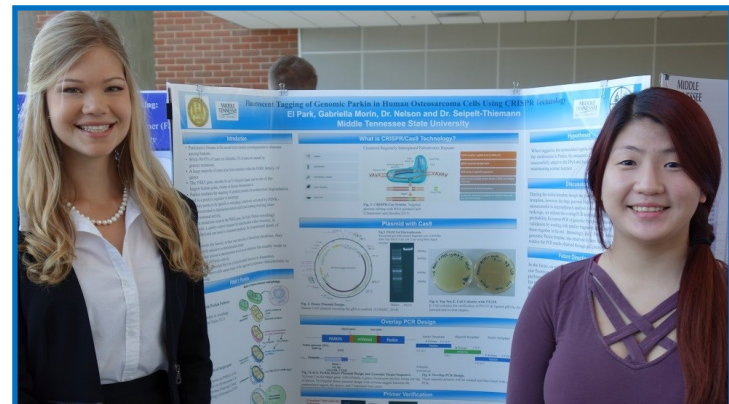
**Robert Owen**, undergraduate student, Biology; **Lynn Boyd**, (faculty sponsor), Biology; “Examining the Role of F56F11.4 in Sperm of *Caenorhabditis elegans*”



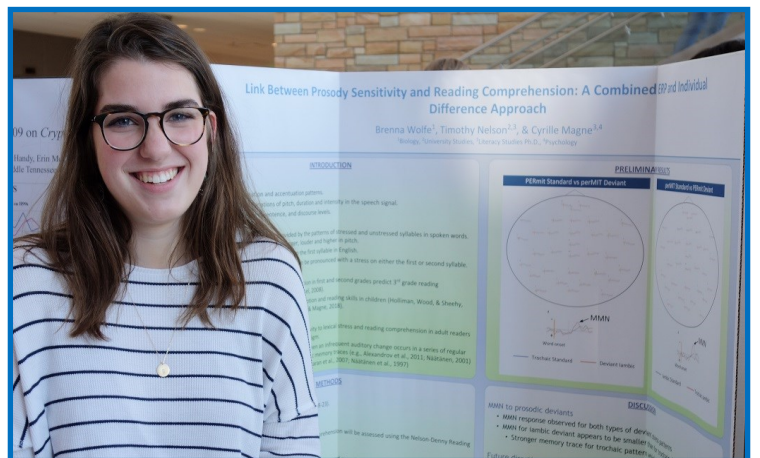
**Dirhat Mohammed**, undergraduate student, Biology; **Dhruvi Lad**, undergraduate student, Biology; **Joshua Reid**, graduate student, Math and Science Education; **Grant Gardner** (faculty sponsor), Biology; “Graduate Teaching Assistants' Cognition Related to Teaching: A Validation of Five Instruments”



**Kirsten Welch**, undergraduate student, Biology; faculty sponsors **Trisha Clark**, **Scott Handy**, Chemistry; **Erin McClelland**, Biology; “The Therapeutic Potential of Aureone 1009 on *Cryptococcus neoformans*”



**Gabiella Morin**, undergraduate student, Biology; **Jiwoo Park**, undergraduate student, Biology; **Rebecca Seipelt-Thiemann** (faculty sponsor), Biology; “Fluorescent Tagging of Genomic ParK in Human Osteosarcoma Cells Using CRISPR Technology”

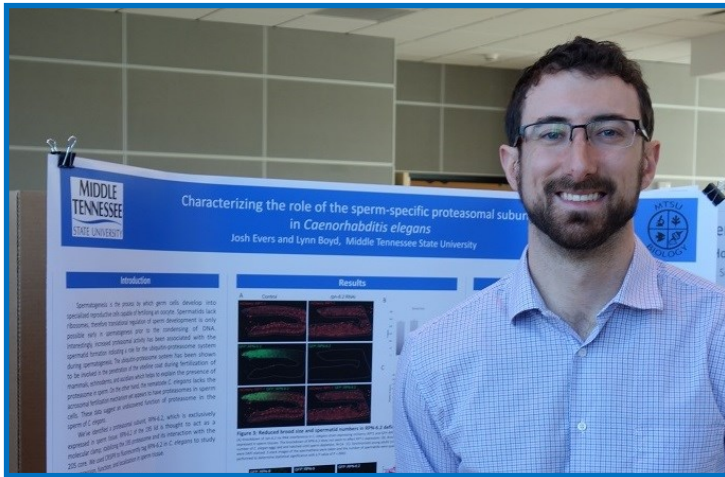


**Brenna Wolfe**, undergraduate student, Biology; **Timothy Nelson**, faculty, Literacy Studies; **Cyrille Magne** (faculty sponsor), Psychology; “Link Between Prosody Sensitivity and Reading Comprehension: A Combined ERP and Individual Difference Approach”

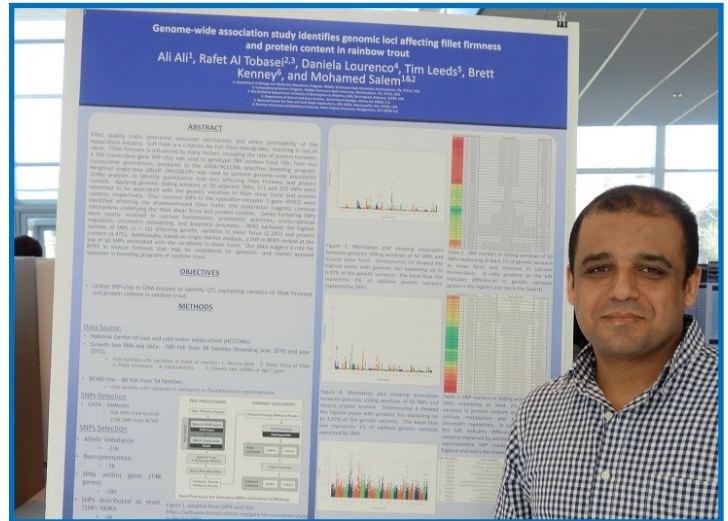


# Scholars Week Highlights Faculty and Student Research

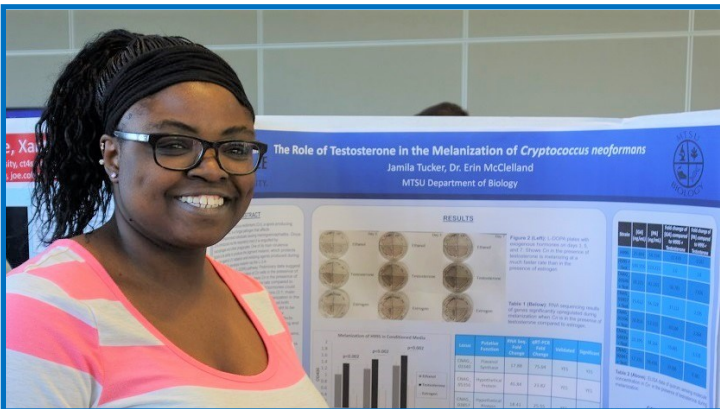
## CBAS Posters in the Atrium March 19, 2019



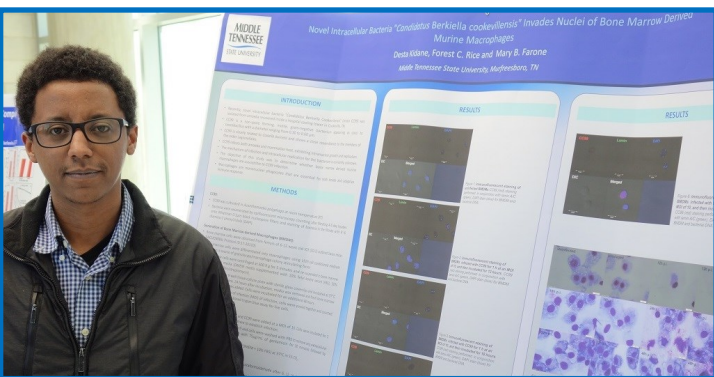
**Joshua Evers**, graduate student, Biology; Lynn Boyd (faculty sponsor), Biology; “Characterizing the Role of the Sperm Specific Proteasomal Subunit RPN-6.2 in *Caenorhabditis elegans*”



**Ali Ali**, graduate student, Molecular Biosciences; Rafet Al To-basei, postdoctoral fellow; Daniela Lourenco; Tim Leeds; Brett Kenney; Mohamed Salem (faculty sponsor), Biology; “Genome-Wide Association Study Identifies Genomic Loci Affecting Fillet Firmness and Protein Content in Rainbow Trout”



**Jamila Tucker**, graduate student, Biology; Erin McClelland, (faculty sponsor), Biology; “The Role of Testosterone in the Melanization of *Cryptococcus neoformans*”



**Desta Kidanemariam**, graduate student, Molecular Biosciences; Mary Farone (faculty sponsor), Biology; “Intracellular Trafficking of the Novel Bacterium “*Candidatus Berkella cookevillensis*”



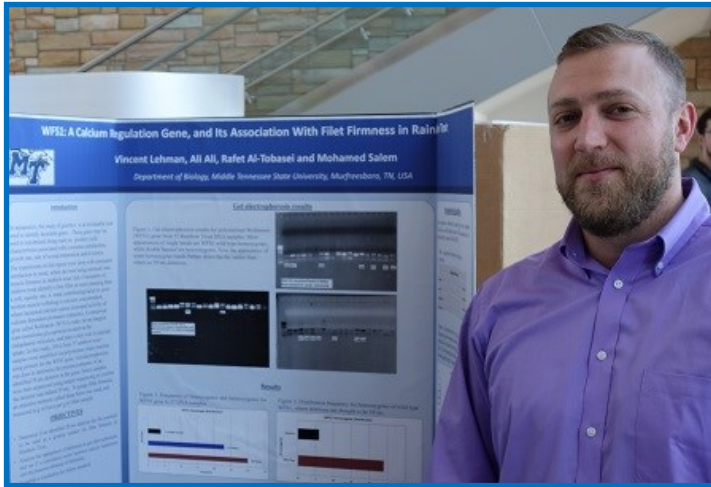
**Pratima Chapagain**, graduate student, Molecular Biosciences; Brock Arivett, graduate student, Molecular Biosciences; Mohamed Salem (faculty sponsor), Biology; “Gut Microbiome Analysis of Fast- and Slow-growing Rainbow trout (*Oncorhynchus mykiss*)”



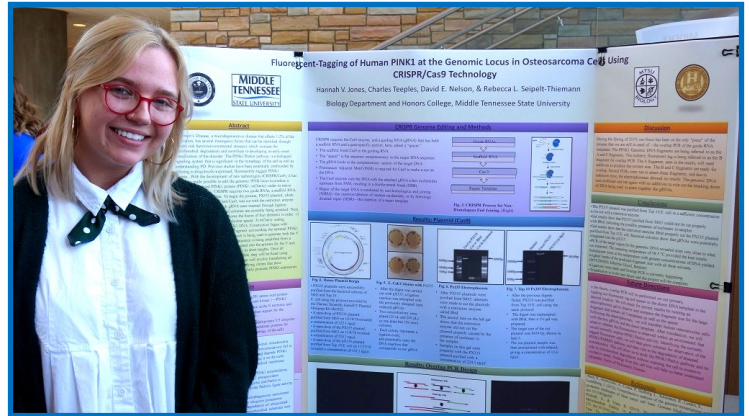


# Scholars Week Highlights Faculty and Student Research

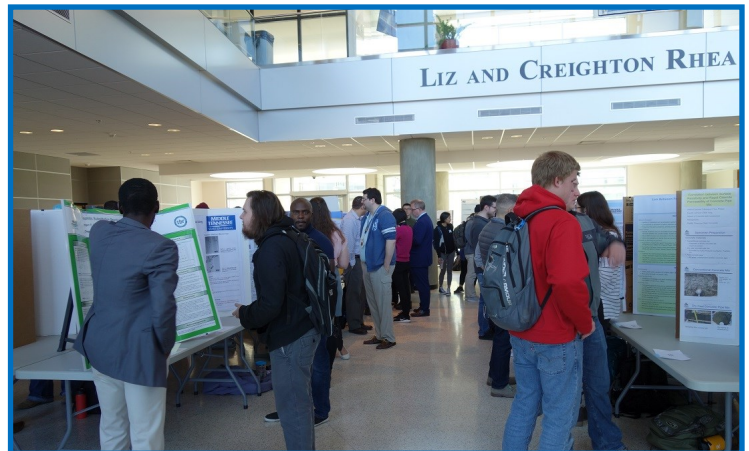
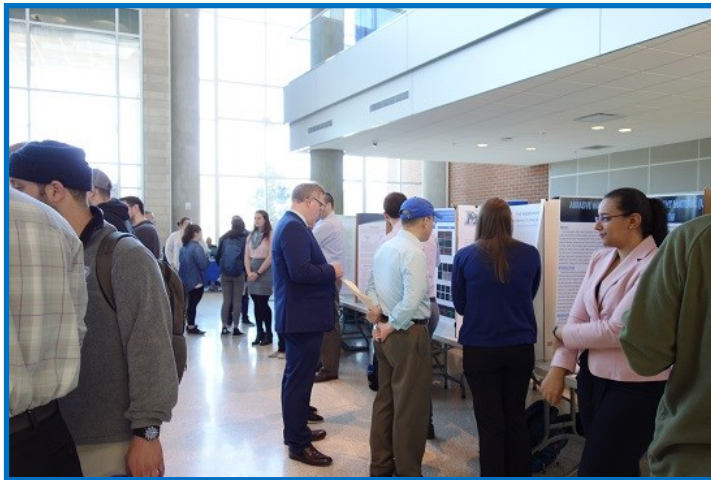
## CBAS Posters in the Atrium March 19, 2019



**Vincent Lehman**, undergraduate student, Biochemistry; **Ali Ali**, graduate student, Molecular Biosciences; **Rafet Al Tobasei**, postdoctoral fellow; **Mohamed Salem** (faculty sponsor), Biology; "WF1: A Calcium Regulation Gene, and Its Association with Filet Firmness in Rainbow Trout"



**Hannah V. Jones and Charles Teeple**, undergraduate students, Chemistry; **David E. Nelson, Rebecca Seipelt-Thiemann**, Biology and Honors College; "Fluorescent-Tagging of Genomic PINK1 in Human Osteosarcoma Cells"

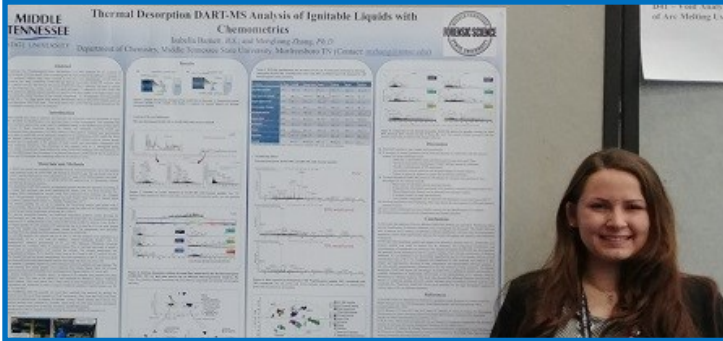




# Scholars Week Highlights Faculty and Student Research

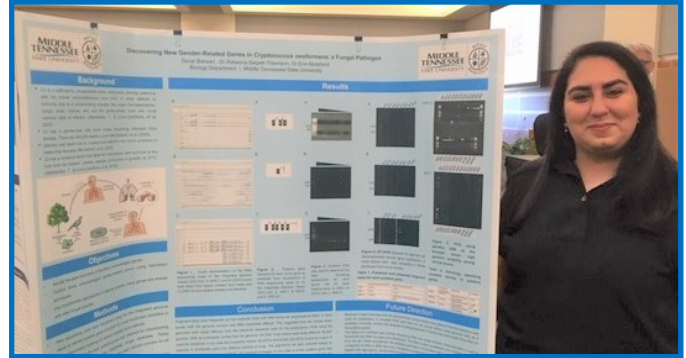
## Scholars Week University-Wide Poster Exposition—March 22, 2019

**Scholars Week 2019**  
**University-Wide Poster Exposition**  
**March 22, 2019**  
**COLLEGE OF BASIC AND APPLIED SCIENCES**  
**Undergraduate 1st Place**

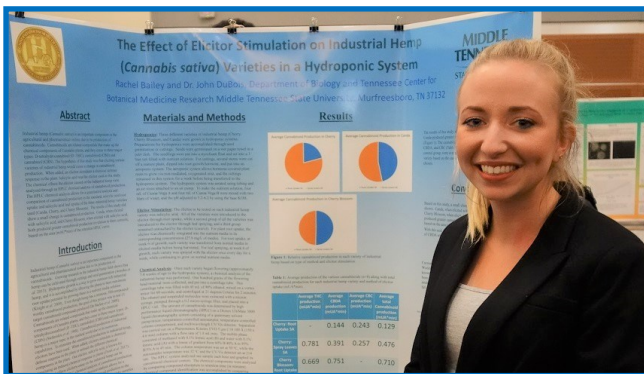


**Isabella Barnett**, Forensic Science; Mengliang Zhang (author/faculty sponsor), Chemistry; Frank Bailey, faculty, Biology; “Thermal Desorption DART-MS Analysis of Ignitable Liquids with Chemometrics”

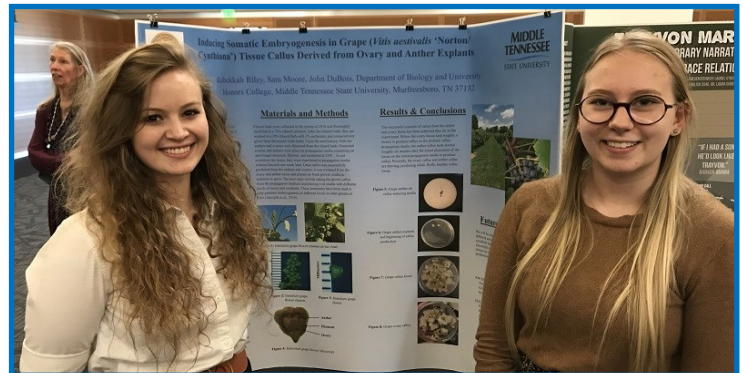
**Scholars Week 2019**  
**University-Wide Poster Exposition**  
**March 22, 2019**  
**COLLEGE OF BASIC AND APPLIED SCIENCES**  
**Undergraduate 3rd Place**



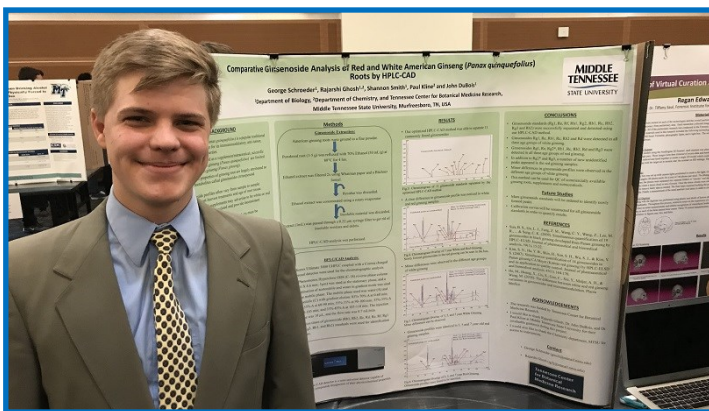
**Marina Ibrahim**, Biology; Rebecca Seipelt-Thiemann (author/faculty sponsor), Biology; Tim Miller, faculty, Computational Science; “Gene Discovery and Annotation of *Gardnerella vaginalis*, a Bacterium Associated with Bacterial Vaginosis and Pre-term Labor”



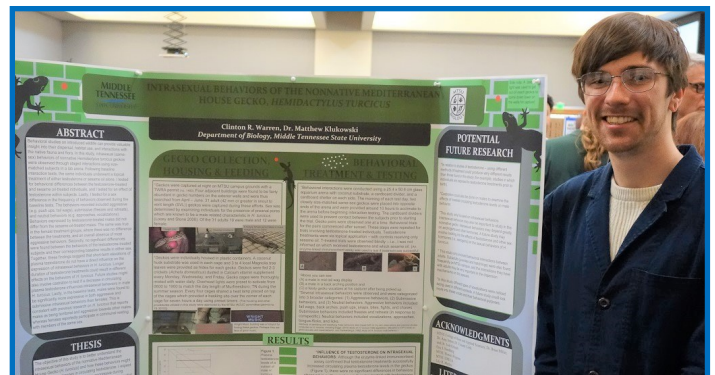
**Rachel Bailey**, Biology; John DuBois (faculty sponsor), Biology; “The Effect of Elicitor Stimulation on Industrial Hemp (*Cannabis sativa*) Varieties in a Hydroponic System”



**Rebekkah Riley and Sara Moore**, Biology; John DuBois (faculty sponsor), Biology; “Somatic Embryogenesis from *Vitis aestivalis* ‘Norton/Cynthiana’ Grape Tissue Callus Derived from Anther and Ovary Explant Tissues”



**George Schroeder**, Biology; Rajarshi Ghosh, graduate student, Molecular Biosciences; John DuBois (faculty sponsor), Biology; “Comparative Ginsenoside Analysis of Red and White American Ginseng (*Panax quinquefolius*) Roots by HPLC-CAD”

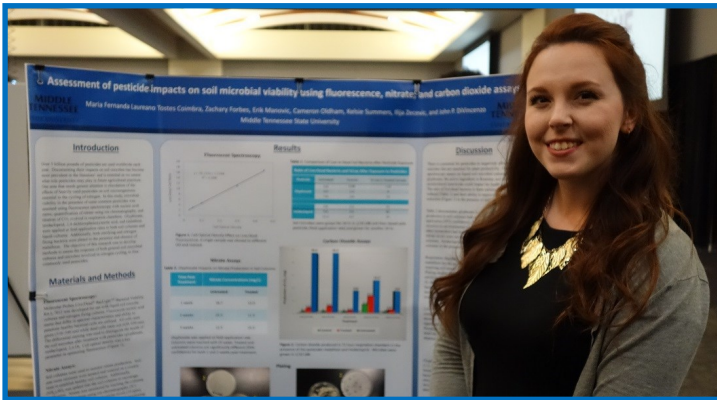


**Clinton Warren**, Biology; Matthew Klukowski (faculty sponsor), Biology; “Intrasexual Behaviors in the Nonnative Mediterranean House Gecko, *Hemidactylus turcicus*”

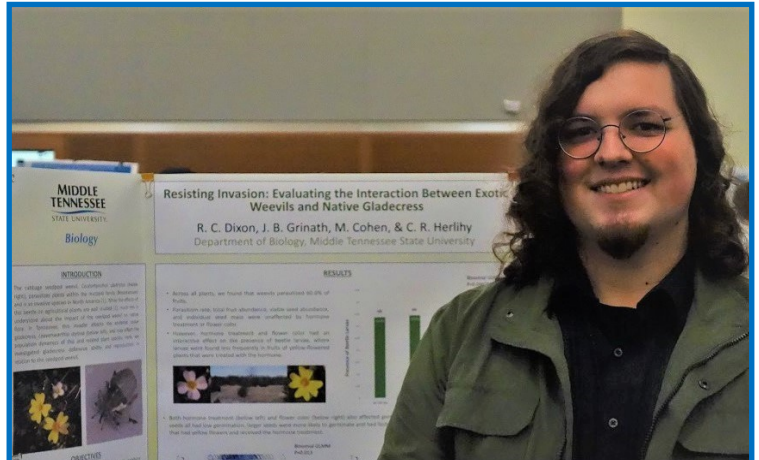


# Scholars Week Highlights Faculty and Student Research

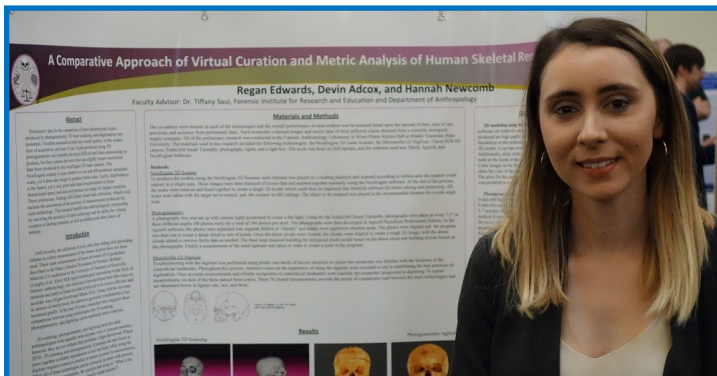
## Scholars Week University-Wide Poster Exposition—March 22, 2019



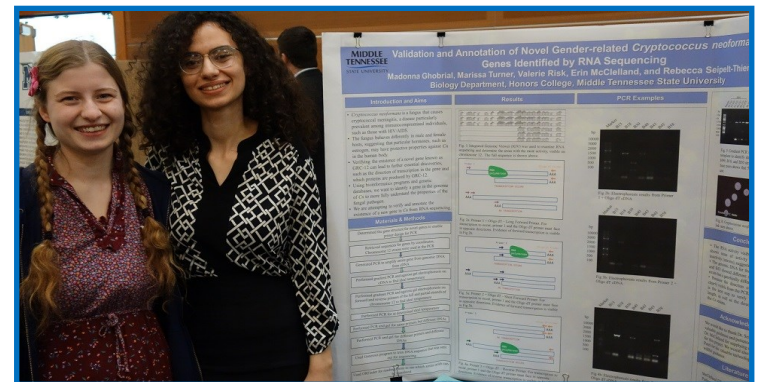
**Maria Fernanda Laureano Tostes Coimbra**-pictured, Chemistry; **Zachary Forbes**, Biology; **Kelsie Summers**, Biology; **Cameron Oldham**, Biology; Erik Manovic, Chemistry; Ilija Zecevic, Chemistry; John DiVincenzo (author/faculty sponsor), Chemistry; “Chemistry Assessment of Pesticide Impacts on Soil Microbial Viability Using Fluorescence, Nitrate, and Carbon Dioxide Assays”



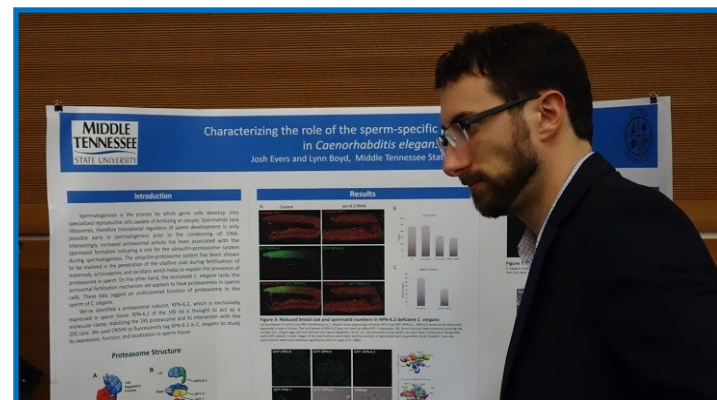
**Robert Dixon**, Biology; Joshua Grinath (author/Faculty Sponsor), Biology; Matthew Cohen, Biology; Chris Herlihy, faculty, Biology; “Resisting Invasion: Evaluating the Interaction between Exotic Weevils and Native Gladecress”



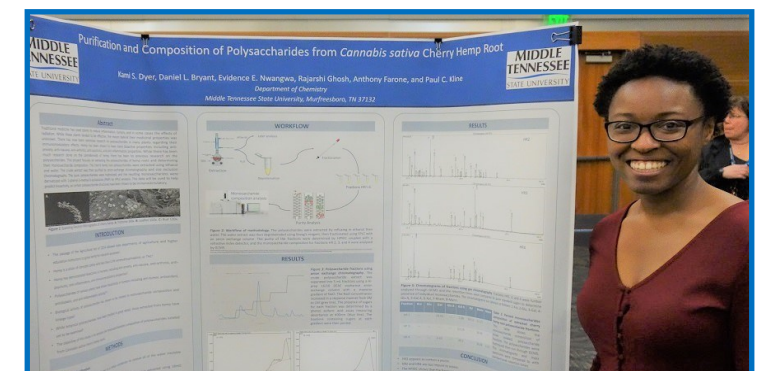
**Regan Edwards**, Biology; Devin Adcox, Sociology and Anthropology; Hannah Newcomb, Sociology and Anthropology; Tiffany Saul (faculty sponsor), Sociology and Anthropology; “A Comparative Approach of Virtual Curation and Metric Analysis of Human Skeletal Remains”



**Marissa Turner**, **Madonna Ghobrial**, and **Valerie Risk**, Biology; Rebecca Seipelt-Thiemann (faculty sponsor), Biology; “Validation and Annotation of Novel Gender-related *Cryptococcus neoformans* Genes Identified by RNA Sequencing”



**Joshua Evers**, Biology; Lynn Boyd (faculty sponsor), Biology; “Characterizing the role of the sperm specific proteasomal subunit RPN-6.2 in *Caenorhabditis elegans*”

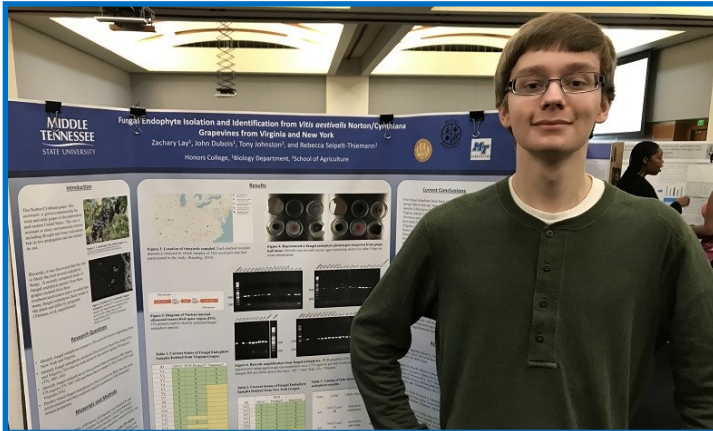


**Kami Dyer**-pictured, Chemistry; **Daniel Bryant**, Molecular Biosciences; Evidence Nwangwa, Chemistry; **Rajarshi Ghosh**, Molecular Biosciences; Anthony Farone, faculty, Biology; Paul Kline (author/faculty sponsor), Chemistry; “Purification and Composition of Polysaccharides Isolated from *Cannabis sativa* Cherry Hemp Root”

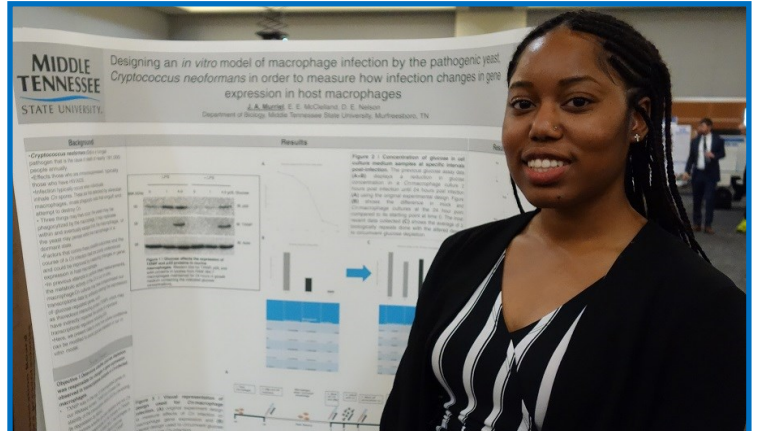


# Scholars Week Highlights Faculty and Student Research

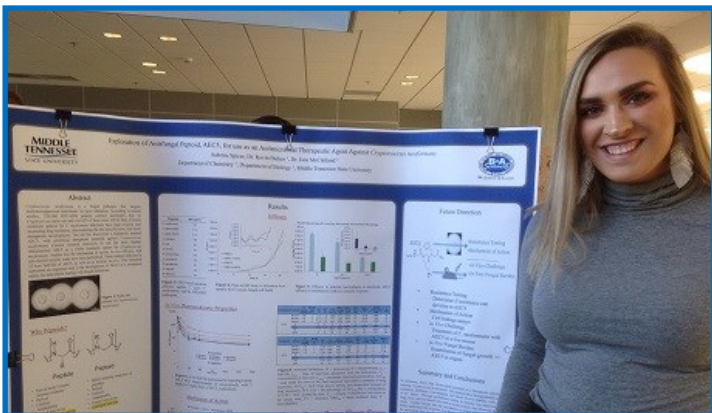
## Scholars Week University-Wide Poster Exposition—March 22, 2019



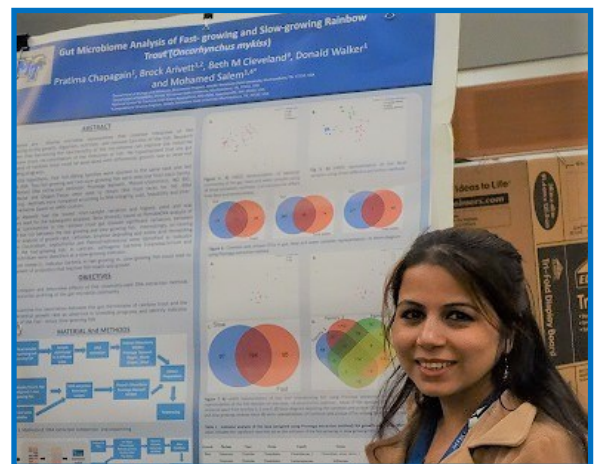
**Zachary Lay**, Biology; John Dubois, faculty, Biology; Tony Johnston, faculty, Agriculture; Rebecca Seipelt-Theimann (author/faculty sponsor), Biology; “Fungal Endophyte Isolation and Identification from *Vitis aestivalis* Norton/Cynthiana Grapevines from Virginia and New York”



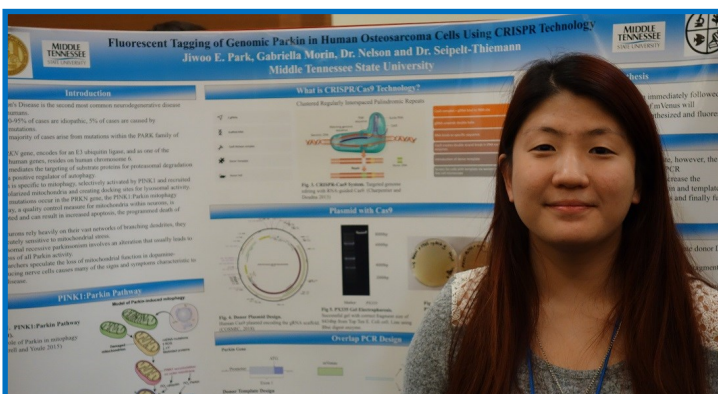
**Jada Murriel**, Biology; David Nelson (faculty sponsor), Biology; “Designing a Mammalian Macrophage: Cn culture System to Study cChanges in Gene Expression in Host Macrophages”



Sabrina Spicer, pictured, Chemistry; Erin McClelland, faculty, Biology; Kevin Bicker (faculty sponsor), Chemistry; “Characterization of the Antifungal Peptoid, AEC5, as a Potential Therapeutic Agent against *Cryptococcus neoformans*”



**Pratima Chapagain**, Molecular Biosciences; **Brock Arivett**, Molecular Biosciences; Mohamed Salem (faculty sponsor), Biology; “Gut Microbiome Analysis of Fast- and Slow-growing Rainbow Trout (*Oncorhynchus mykiss*)”



**Jiwoo Park**—pictured, Biology; **Gabriella Morin**, Biology; Rebecca Seipelt-Theimann (faculty sponsor), Biology; “Fluorescent Tagging of Genomic Parkin in Human Osteosarcoma Cells Using CRISPR Technology”

**Steffany Jenkins**, Biology; James Robertson (faculty sponsor), Biology; “Genetic Regulation of a Camphor Mediated Light Switch”

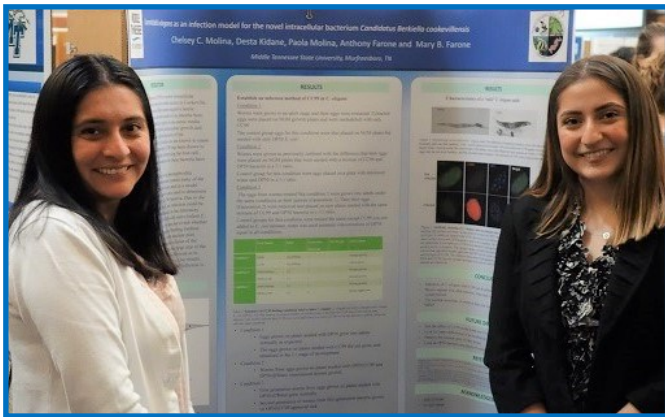
**Madison Childers**, Biology; Erin McClelland (author/faculty sponsor), Biology; “Using CRISPR to create reconstituted strains in *C. neoformans* BCAT gene”

**Kerri Harger**, Biology; Scott Handy (faculty sponsor), Chemistry; “Reduction of Benzils (1,2 diketone) to Benzoin: Reactivity and Regioselectivity”

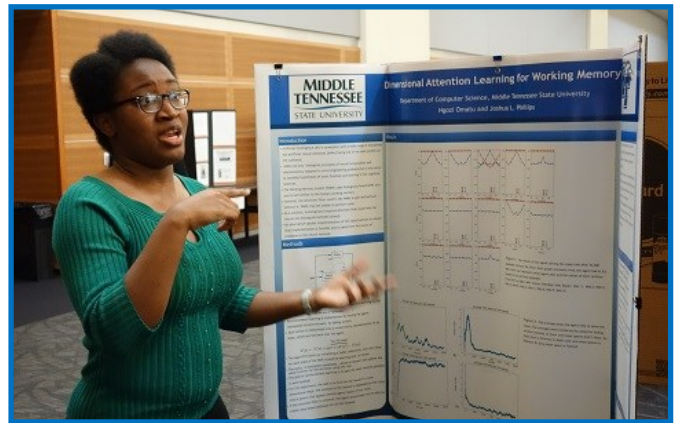


# Scholars Week Highlights Faculty and Student Research

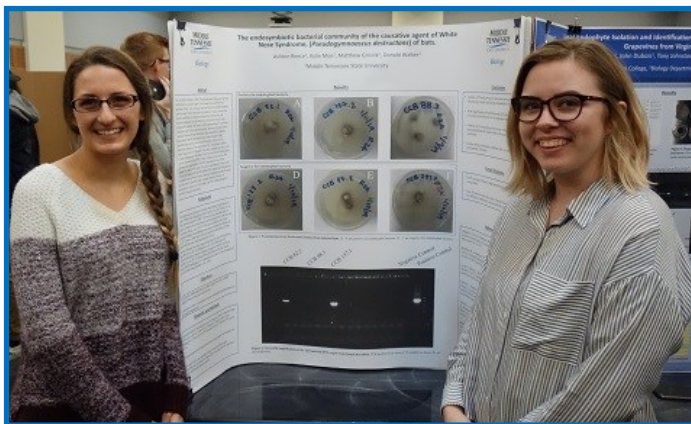
## Scholars Week University-Wide Poster Exposition—March 22, 2019



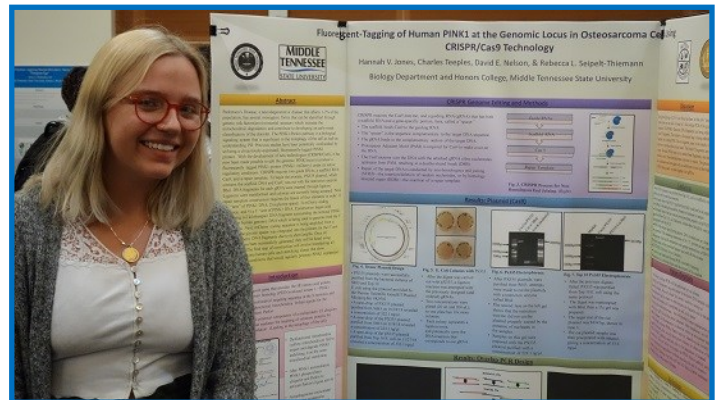
**Paola Molina**, Molecular Biosciences; **Chelsey Molina**, Biology; **Desta Kidane**, Molecular Biosciences; **Anthony Farone** (author/faculty sponsor), Biology; **Mary B. Farone**, faculty, Biology; “*Caenorhabditis elegans* as an Infection Model for the Novel Intracellular Bacterium *Candidatus Berkiella cookevillensis*”



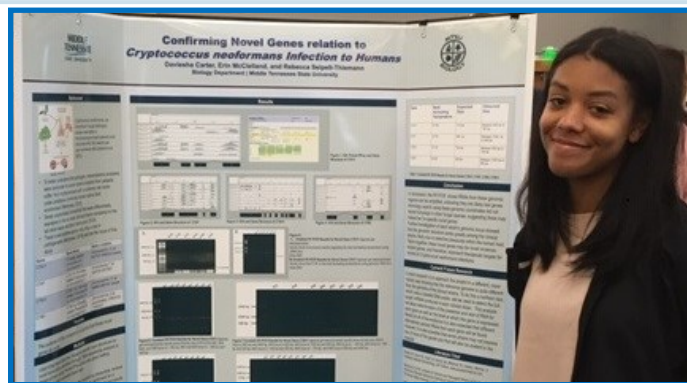
**Ngozi Omatu**, Biology; **Joshua Phillips** (faculty sponsor), Computational Science; “Dimensional Attention Learning For Working Memory”



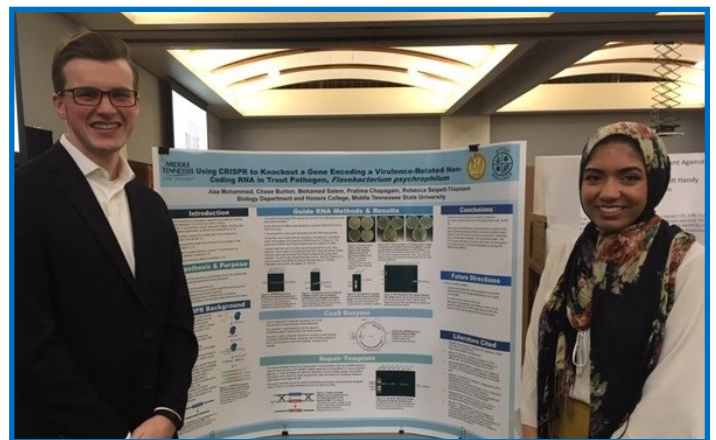
**Kylie Moe**, Biology; **Ashton Reece**, Biology; **Matt Grisnik**, Molecular Biosciences; **Donald Walker** (author/faculty sponsor), Biology; “The Endosymbiotic Bacterial Community of the Causative Agent of White Nose Syndrome, (*Pseudogymnoascus destructans*) of Bats”



**Hannah Jones**, **Charles Teeple**, Chemistry; **David Nelson**, faculty, Biology; **Rebecca Seipelt-Thiemann** (author/faculty sponsor), Biology; “Fluorescent-Tagging of Genomic PINK1 in Human Osteosarcoma Cells Using CRISPR/Cas9 Technology”



**Daviesha Carter**, Biology; **Rebecca Seipelt-Thiemann** (author/faculty sponsor), Biology; **Erin McClelland**, faculty, Biology; “Novel Gene Verification and Annotation in Clinically-Associated Strains of *Cryptococcus neoformans*”

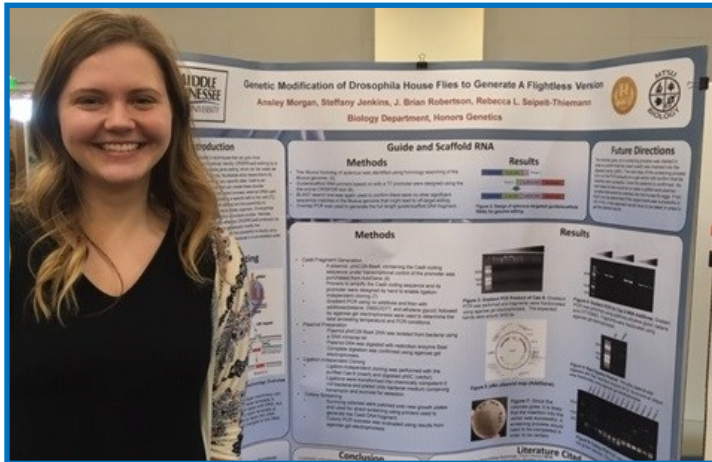


**Chase Burton**, Biology; **Alaa Mohammed**, Biology; **Rebecca Seipelt-Thiemann** (faculty sponsor), Biology; “Using CRISPR to Knock out a Gene Encoding a Virulence-related Non-Coding RNA in Trout Pathogen *Flavobacterium psychrophilum*”

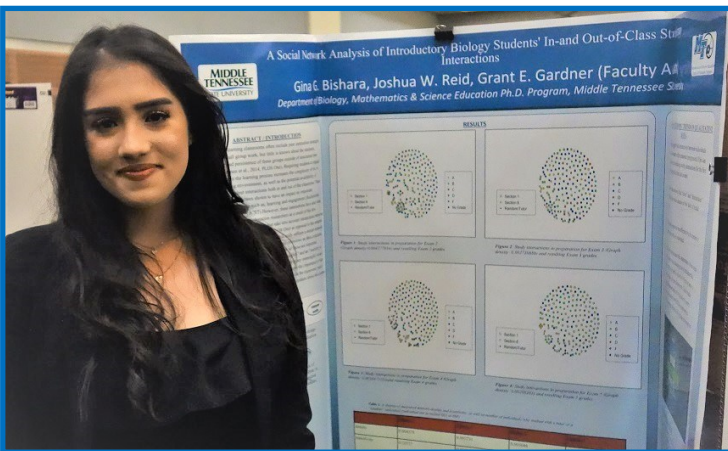


# Scholars Week Highlights Faculty and Student Research

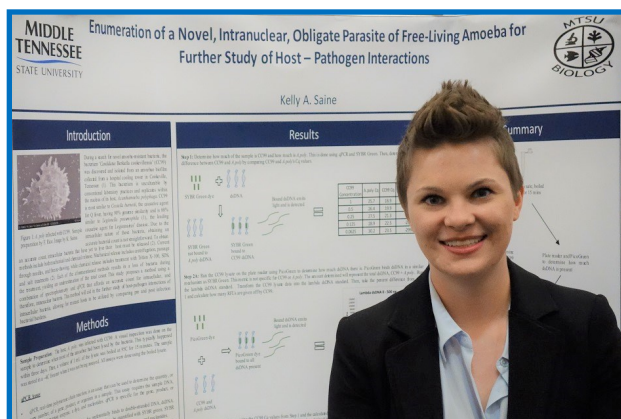
## Scholars Week University-Wide Poster Exposition—March 22, 2019



**Anasley Morgan, Biology;** Rebecca Seipelt-Thiemann (faculty sponsor), Biology; "CRISPR-based Genetic Modification for a Flightless Housefly (*Musca domestica*)"

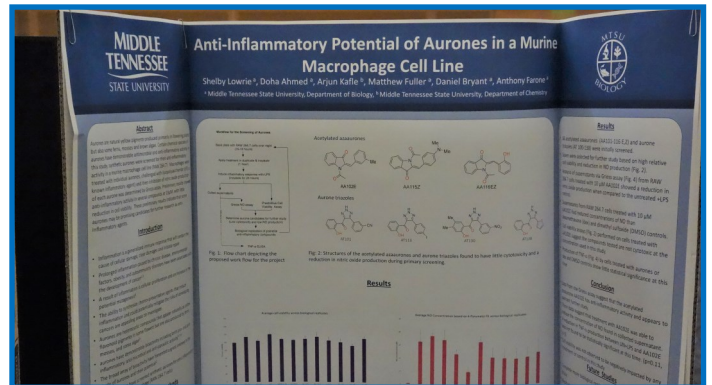


**Gina Bishara, Biology; Joshua Reid, Mathematics and Science Education; Grant Gardner (faculty sponsor), Biology;** "A Social Network Analysis of Introductory Biology Students' In-and Out-of-Class Study Group Interactions"



**Kelly Gross, Biology; Mary Farone (faculty sponsor), Biology;** "Enumeration of a Novel, Intranuclear, Obligate Parasite of Free-Living Amoeba for Further Study of Host-Pathogen Interactions"

### Other posters presented



**Shelby Lowrie, MSPS Biology; Doha Ahmed, Biology; Arjun Kafle, Chemistry; Matthew Fuller, Molecular Biosciences; Daniel Bryant, Molecular Biosciences; Anthony Farone (faculty sponsor), Biology;** "Anti-Inflammatory Potential of Aurones in a Murine Macrophage Cell Line"

**Zenar Barwari, Biology; Rebecca Seipelt-Thiemann (faculty sponsor), Biology;** "Identification of Novel Gender-related Virulence Genes in *Cryptococcus neoformans*"

**Merna Ghobrial, Biology; Rebecca Seipelt-Thiemann, (author/faculty sponsor), Biology; Mary Farone, faculty, Biology;** "Investigating the Ability of Spice Extracts to Inhibit Bacterial Growth and Histamine Accumulation Associated with Scombroid Food Poisoning"

**Don Srisuriyo, Biology; Scott Handy (faculty sponsor), Chemistry;** "Dyeing to Know: A Natural Approach to Dyeing Textiles"

**Robert Owen, Biology; Lynn Boyd, (author/faculty sponsor), Biology;** "Examining the Role of F56F11.4 in Sperm of *Caenorhabditis Elegans*"

**Dirhat Mohammed, Biology, Dhruvi Lad, Biology; Grant Gardner, (author/faculty sponsor), Biology; Joshua Reid, graduate student, Math and Science Education;** "Graduate Teaching Assistants' Cognition Related to Teaching: A Validation of Five Instruments"

**Ali Ali, Molecular Biosciences; Rafet Al Tobasei, Postdoctoral fellow; Daniela Lourenco; Tim Leeds; Brett Kenney; Mohamed Salem, (author/faculty sponsor), Biology;** "Genome-wide Association Study Identifies Genomic Loci Affecting Fillet Firmness and Protein Content in Rainbow Trout"

# Scholars Week Highlights Faculty and Student Research

## Scholars Week University-Wide Poster Exposition—March 22, 2019

**Luke Philipose**, Biology; Ngee Chong (faculty sponsor), Chemistry; “Effects of Vaping Conditions on the Formation of Volatile Organic Compounds in Electronic Cigarette Emissions”

**Bethany Poff**, Biology; **Niah Frantzen**, Biology; Rebecca Seipelt-Thiemann (faculty sponsor), Biology; “CRISPR-based Knock-in of BCAT-deficient *Cryptococcus neoformans*”



**Prianca Griggs**, Biology; Erin McClelland (faculty sponsor), Biology; “Examining SNF3’s Role in the Virulence of *Cryptococcus neoformans*”

**Atia Ahmed**, Biology; Mary Farone (faculty sponsor), Biology; “*Cronobacter sakazakii*, a Possible Intracellular Bacterium in *Acanthamoeba polyphaga*”

**Joseph Rosen**, Biology; Erin McClelland (faculty sponsor), Biology; Scott Handy (faculty sponsor), Chemistry; “Isolation of 23B as a Potential Therapeutic Agent against *Cryptococcus neoformans*”

**Michael Dixon-Morgan**, Biology; **Daniel Bryant**, Molecular Biosciences; **Rajarshi Ghosh**, Molecular Biosciences; **Shannon Smith**, Molecular Biosciences; Paul Kline, faculty, Chemistry; Anthony Farone, (author/faculty sponsor), Biology; “Analysis of Bioactive Crude Polysaccharide Composition in White and Red American Ginseng (*Panax Quinquefolius*) Roots”

**Jamila Tucker**, Biology; Erin McClelland (author/faculty sponsor), Biology; “The Role of Testosterone in the Melanization of *Cryptococcus Neoformans*”

**Fatmah Alqahtani**, Molecular Biosciences; Mary Farone, (author/faculty sponsor), Biology; Scott Handy, faculty, Chemistry; Zachary Taylor, undergraduate student, Chemistry; “A Chemogenomic Approach to Understanding the Anti-fungal Action of a Bioactive Aurone Compound”

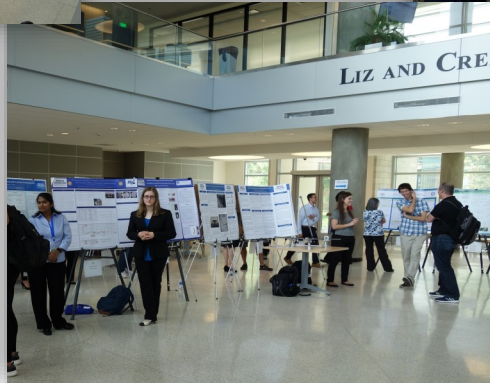




# MTSU Summer Research Celebration

The **Summer Research Celebration** is an on-campus event for all students from all colleges to report research results produced over the summer to the MTSU community. Students have an opportunity to present informally, meet other scholars, and find out about research and creative work at MTSU.

On August 31, 2018, 12 students mentored by Biology faculty presented posters.



**Simon E. Pergande**, Forensic Science major; Mentor, Yangseung Jeong; “Population Density and Species Composition of Forensically Important Flies by Season at the Anthropological Research Facility of University of Tennessee”

**Michelle K. Sabir**, Biology/Physiology major; Mentor, Erin McClelland; “How the Polysaccharide Capsule of *Cryptococcus neoformans* Plays a Key Role in Human Susceptibility to Cn Related Infections”

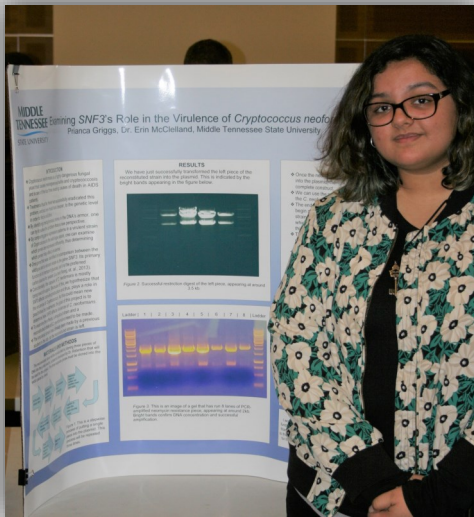
**Stephen M. Tansie**, M.S. candidate in Biotechnology, and **Mitch C. Merryman**, 2018 M.S. Biology; Mentors-Rebecca Seipelt-Thiemann and Erin McClelland; “Detailed Transcript Analysis of Virulence Gene *Lacc2* from Clinically-derived *Cryptococcus neoformans* strains shows Alternative Splicing”

**Kirsten N. Welch**, Biology/Microbiology major, and **Arjun Kafle**, Ph.D. candidate in Molecular Biosciences; Mentors-Erin McClelland, and Scott Handy ; “Classification of Multiple Aurones for the Pathogenic Yeast *Cryptococcus Neoformans*”

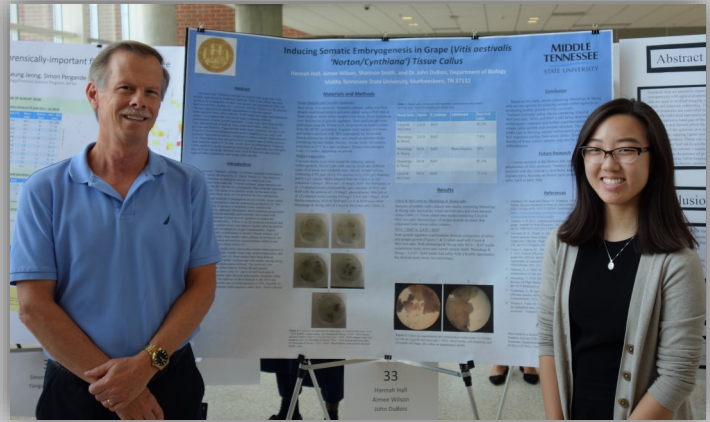




# MTSU Summer 2018 Research Celebration



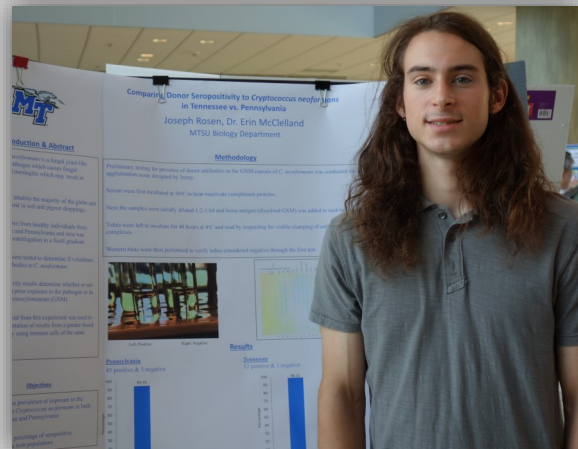
**Prianca R. Griggs**, Biology/Physiology major; mentor-Erin McClelland; “Examining SNF3’s Role in the Virulence of *Cryptococcus Neoformans*”



**Hannah J. Hall**, Biology/Genetics and Biotechnology major and **Aimee C. Wilson**, 2017 B.S. Biology; mentor-John Dubois; “Inducing Somatic Embryogenesis of Grape (*Vitis aestivalis* Norton/Cynthiana”) Callus”



**Gabrielle T. Hampton**, Biology/Microbiology major; mentor-Anthony Newsome; “Activity of Plant Extracts and Aurone Derivatives against Clinical Isolates of *Acanthamoeba*”



**Joseph A. Rosen**, Biology/Microbiology major; mentor-Erin McClelland; “Comparing Seropositivity to *Cryptococcus Neoformans* in Healthy Individuals in Tennessee and Pennsylvania”



**Ross D. Thomas**, Plant and Soil Science/Agriculture major; mentor-Rebecca Seipelt-Thiemann; “Missouri Grape Endophyte Identification”

# 2019 Biology Scholarship Recipients

Each year the Biology faculty is honored to be able to work with outstanding students who excel in the classroom, conduct independent research, attend courses at field stations, present papers at scientific meetings, and perform exceptionally well on national standardized tests. To help defray the costs of these activities and to recognize these students, the department is pleased to offer a number of scholarships. Although these scholarships include monetary awards, their intention is to recognize students for efforts above and beyond the expected. The Biology faculty congratulates every student recipient.

## **Kurt E. Blum Botany Research Scholarship:**

Awarded in support of graduate research in botany.

*Rachel Bailey* *Miles Matchinske*

## **William H. Butler Jr. Graduate Research Scholarship:**

To provide support for expenses associated with thesis research.

*Jamila Tucker*

## **Cynthia Chappell First Year Award for Summer Research:**

Awarded to support research efforts.

*Alexander S. Romer*

## **Kevin Driver Memorial Biology Scholarship:**

Awarded to support research efforts.

*Ayushi Samirkumar Patel*

## **John D. DuBois Scholarship:**

Awarded to an undergraduate or graduate student to provide travel for paper presentations at scientific meetings.

*Gabriella Morin*

## **Mary C. Dunn Graduate Scholarship:**

Awarded to support research efforts.

*Alejandro Grajal-Puche* *Wesley Riley*

*Forest Rice*

## **J.L. Fletcher Graduate Scholarship:**

Awarded to a beginning biology graduate student.

*Chelsea Campbell* *Forest Rice*

*Alejandro Grajal-Puche* *Jamila Tucker*

*Steven Joseph*

## **Thomas Hemmerly Graduate Research Scholarship:**

Awarded to provide support of expenses associated with thesis research.

*Forest Rice*

## **Charles Holland Biology Club Scholarship:**

Awarded to a senior continuing in the Graduate School at MTSU.

*Jeremy Smith*

## **Freeman P. Jordan Jr. Scholarship:**

Awarded to a Biology major in support of research.

*Rachel Bailey* *Emma Phipps*

## **Padgett Kelly Research Scholarship:**

Awarded to support summer studies of field research in ecology or conservation biology.

*Jeremy Smith*

## **Mitchell Magid Memorial Work Scholarship:**

Awarded to support research efforts.

*Marzea Akter* *Savannah Lawwell*  
*Ceon Brown* *Marena Mikael*  
*Anika Chowdhury* *Dirhat Mahdi Mohammed*  
*Christopher Hedden* *Ayushi Samirkumar Patel*

## **George Murphy Scholarship:**

Awarded to support research efforts.

*Natalie Schroth*

## **J. Gerald Parchment Biological Field Station Scholarship:**

Awarded to a Biology major of sophomore or above standing for summer study or academic year research.

*Alejandro Grajal-Puche* *Jeremy Smith*

## **John A. Patten Scholarship:**

Awarded to a Biology major of sophomore or above (including graduate) standing for research support or summer study.

*Tiffany Harvey* *Jeremy Smith*

## **Mary de los Reyes Biology Scholarship:**

Awarded to support research efforts.

*Jiwoo Park* *Ayushi Samirkumar Patel*

## **Wayne Rosing Biology Scholarship:**

Awarded to a Biology major of junior standing with a botany emphasis or a minor in Secondary Education.

*Miles Matchinske*

## **Eugene F. Strobel Scholarship:**

Awarded to a Biology major of junior standing who plans a teaching career at the secondary or college level.

*Tiffany Harvey* *Miles Matchinske*

## **Sarah H. Swain Undergraduate Research Scholarship:**

Awarded to purchase supplies or support travel associated with research projects.

*Gabriella Morin* *Jiwoo Park*

# 2019 Biology Scholarship Recipients

## **Marion R. Wells Graduate Research Scholarship:**

Awarded to provide support for thesis research conducted during summer months.

**Alejandro Grajal-Puche**      **Forest Rice**  
**Steven Joseph**

**Stephen M. Wright Research Scholarship:** Awarded to support any aspect associated with undergraduate research in microbiology or biotechnology.

**Gabriella Morin**

## **John M. Zamora Graduate Research Scholarship:**

Awarded to purchase supplies or support travel associated with research projects.

**Jamila Tucker**      **Chelsea Campbell**

## **Incoming Freshman Scholarships 2018-19**

**Patrick J. Doyle Freshman Scholarship:** Awarded annually to an incoming freshman Biology major.

**Anika Chowdhury**      **Christopher Hedden**

**Ellis Rucker Freshman Scholarship:** Awarded annually to an incoming freshman Biology major.

**Anika Chowdhury**      **Christopher Hedden**

## **Clay M. Chandler Outstanding Freshman Biology**

**Award and Scholarship:** Awarded to an outstanding freshman Biology major.

**Kristen Beasley**

## **Ralph E. Sharp Outstanding Sophomore Award and**

**Scholarship:** Awarded to a Biology major of sophomore standing based on academic performance.

**Steffany Jenkins**

## **Philip M. Mathis Outstanding Junior Award and Schol-**

**arship:** Awarded to a Biology major of junior standing.

**Rema Kanakrieh**

**Peter I. Karl Outstanding Senior Award:** Awarded to the outstanding senior(s).

**Robert L. Owen**

## **Elliott Dawson/BioVentures Biotechnology Scholar-**

**ship:** Awarded to a Biology major who has taken or is currently enrolled in Biotechnology.

**Doha Ahmed**

**Matthew Spock**

## **C.W. Wiser Medical/Allied Health Award and Scholar-**

**ship:** Awarded to a graduating student who will continue studies in the medical sciences at a school of medical technology or other allied health field.

**Tenina Jenkins**

**Christopher Watts**

## **Let us hear from you ...**

*BioUpdate* wants to feature the accomplishments of alumni, and we encourage you to update us!

Send us your name, MTSU degree/year, and an update of your professional/career activities, awards, accomplishments. You may also include any personal news of interest that you would like to share with our readers.

Please include an email address so we can contact you if we need additional information.

Send contact information and updates to

Biology Department, MTSU Box 60, Murfreesboro, TN 37132

Fax: 615-898-5093

Email: [biology@mtsu.edu](mailto:biology@mtsu.edu)

