

BIOFEEDBACK

THE NEWSLETTER OF THE BIOLOGY DEPARTMENT AT RHODES

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NUMBER 2

The Chair's Niche



Hello Biology!

It has been a very exciting first year as the Chair of Biology. I am constantly amazed at the level of activity and engagement happening in the Department – Did you know that after more than 25 years of space planning by the college we are in the final stages of building a new Plant Science

Research Facility (affectionately

called the greenhouse – but it is so much more!)? This facility will increase research opportunities on campus for students through the work of our faculty.

Did you know that you can study abroad in South Africa and get biology major credit (just ask Dr. Collins!)? Or in the Applied Earth Science and Engineering Program? Or at the Woods Hole Marine Biological Institute? Or you could do research here in Memphis at the Zoo (just ask Dr. Boyle!). Or you could work in town at St. Jude (just ask Dr. Lindquenter!) or Le Bonheur (just ask Dr. Kabelik!). Our faculty work with government agencies such as the USDA (ask Dr. Kelly!). We have programs on campus to support women in STEM (ask Dr. Frawley!) and to help guide students interested in graduate school (ask Dr. Hill or Dr. Pandit!). We can help those interested in teaching in science through the Noyce scholarships (ask Dr. Fitz Gerald!) and we have organizations to engage our students such as $\beta\beta\beta$ (ask Dr. Wheeler!) or Roots (ask Dr. Laport!).

A quick walk around the department lets you see our beautiful orchids and lizards on education display (ask Dr. A. Jaslow!) and you can see the fascinating research posters of your colleagues. Of course, we recognize the great research of our students through our Biology Department Student Research award (ask Dr. Dougherty!). Want to contribute to the next issue of Biofeedback (ask Dr. C. Jaslow!)? There are so many more examples of how faculty work with students, I wish I could name them all. Biology is really an exciting place to be. As you can see, we have been working hard to make sure that students have every opportunity to engage across campus and the world – there is a place for you here (ask me!).

Dr. Mary Miller, Chair

Primary Productivity & Secondary Growth

Honors | Awards | Grants | Publications | Meeting Participation

HONORS AND AWARDS

Congratulations to:

Dr. Gary Lindquenter was appointed Visiting Scientist in the Department of Hematology at St. Jude Children's Research Hospital during the Fall 2019 semester while on sabbatical. He's continuing the research he started there on the embryonic specification of hematopoietic stem cells in the zebrafish model with Dr. Wilson Clements.

Dr. Sarah Boyle was chosen as a National Science Foundation Faculty Fellow with the ASCEND project for a period of four years.



Publications

de la Sancha NU and **Boyle SA**. 2019. Predictive sampling effort and species-area relationship models for estimating richness in fragmented landscapes. *PLoS One* 14(12): e0226529

Roldan RJ, Pajarillo AO, Greenberg JD, Karlinsey JE, Cafiero M, **Frawley ER**, Peterson LW. 2020. Propargylglycine-based antimicrobial compounds are targets of TolC-dependent efflux systems in *Escherichia coli*. *Bioorganic and Medicinal Chemistry Letters*. 30(2): 126875.

Nobre RLG, Caliman A, Cabral CR, Araujo FC, Guerin J, Dantas FCC, Quesado LB, Venticinquen EM, Guariento RD, Amada AM, **Kelly PT**, Vanni MJ, Carneiro LS. 2020. Precipitation, landscape properties and land use interactively affect water quality of tropical freshwaters. *Science of the Total Environment*. 716. <https://doi.org/10.1016/j.scitotenv.2020.137044>

Miller ME. 2020. *Diseases Preventable by Vaccines*. A. Malcolm Campbell (editor), Momentum Press. Print ISBN-13: 978-1-94474-995-8, E-book ISBN-13: 978-1-94474-996-5



Meetings

Mid-South GIS Conference

Oral Presentations:

Dorn P BIOM '20. Maximum entropy modeling for two species of bromeliad in Florida: Using GIS for data preparation and post-model analysis.

Cheang A ENVS '21. GIS analysis of forest loss in the geographical ranges of western gorillas (*Gorilla gorilla*) and eastern gorillas (*Gorilla beringei*) in Central Africa.

Poster Presentations:

Strauss A ENVS '21. South Florida's algae blooms in relation to land use and household income.



Grants and Fellowships

Miller M. 2017-2021. (Senior Personnel/Workshop Coordinator) National Science Foundation 15-527 RCN-UBE: Yeast Orphan Project: Finding a place for ORFans to GO. \$485,852.00 funding over five years to support workshop training for faculty to incorporate research approaches in the teaching laboratory.

Miller M. 2015-2020. (Workshop Leader) National Science Foundation 13-520 RCN-UBE: Bridging the divide between research and education with authentic research experiences in introductory biology. \$499,744.00 funding over five years to support workshop training for faculty to incorporate research approaches at the level of introductory biology laboratories.



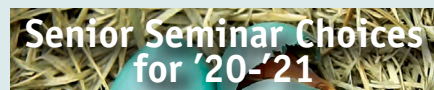
Senior Seminar Lottery

Wednesday, March 25 | 4:00 PM | FJ-D

Next year, the Biology Department will offer three sections of Biology Senior Seminar: one in the fall and two in the spring. Rising seniors, please consult the descriptions of these senior seminar courses below.

All rising Biology seniors must reserve a slot in a fall or spring Biology senior seminar section via a lottery that will be held in the FJ-D at 4:00 PM on Wednesday, March 25.

If you cannot attend the lottery, you must send a representative prepared with an ordered list of your choices. Once you have signed up by lottery, you should list your reserved senior seminar section last on the registration tree under the category of "Other Courses" when you register for that particular semester. Biology students will not be allowed to register in a seminar section other than the one which they reserved through the lottery. If you have questions about the lottery, are planning to be abroad for a semester next year, or are planning to graduate in December, contact Dr. C. Jaslow immediately.



Fall Senior Seminar

BIOL 485. The Evolution of Multicellularity

Dr. Jonathan Fitz Gerald
MWF 11:00-11:50

When we think of the diversity of life, we often imagine the fascinating array of animals and plants that circle the globe, though these are relatively recent developments compared to the 3.5 billion years that single celled organisms dominated the planet both in numbers and in species. From the biggest whale to the cutest kitten, we are also bound to our single cell heritage. Animals are ultimately required to return to a single celled state to reproduce. Even what we perceive as a "single individual" can be considered as a trillion or more individual cells, responding individually to their environment, then passing on that information through a complex series of chemical signals.

In this course, we will examine the transitions in evolution where organisms adopted a multicellular life cycle. Over the past decade, new genomic technologies

and the success of experimentally evolving multicellularity in the lab have changed many of our ideas of how and why multicellularity took hold. These results have had dramatic impacts on our understanding of developmental biology, cancer, group selection and more. By examining multicellularity from these various perspectives, any student of biology should be able to apply their specific skill sets to help unravel the mysteries of multicellularity.

Spring Senior Seminars

BIOL 486-01. Prokaryotic-Eukaryotic Symbioses

Dr. Elaine Frawley
MWF 11:00-11:50

Most multicellular eukaryotic organisms are not just the individuals they appear to be at first glance. Rather, they are one member of a multi-species community consisting mainly of prokaryotes (microbes). This microbial community living on or within a eukaryotic organism can affect aspects of the eukaryote's biology such as metabolism, behavior, development and reproduction. The host environment likewise exerts a strong selective pressure on the microbial community and influences prokaryote physiology and genetics. This senior seminar will examine these close associations between prokaryotes and eukaryotes from both sides of the relationship. Students will learn about high-throughput sequencing and metabolic profiling technologies and will discuss primary literature related to the microbial communities of humans, plants, animals, ocean habitats and other environments, according to class interests. Independent review papers will focus on the current literature characterizing a symbiosis of the student's choice. This seminar should be suited to those with evolutionary and ecological interests as well as those with molecular and biochemical interests.

BIOL 486-02. Avian Biology

Dr. Michael Collins
TR 11:00-12:15

This seminar will cover a wide range of topics including urban ecology, wildlife diseases, community ecology, evolution, physiology, and conservation biology of birds. Students will read and present background information from the primary literature. Students will research topics of their own interest that relate to avian biology, summarize their findings to the class, and evaluate the presentations of other students.



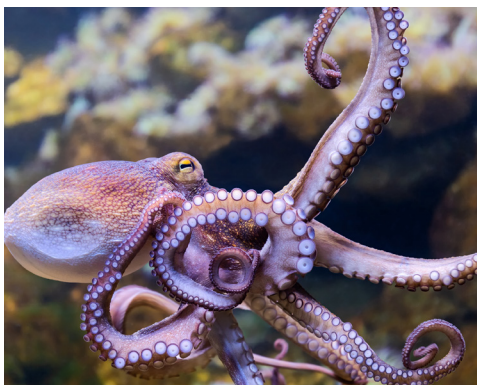
Curricular Evolution Biology Course Updates for 2020 -2021

Course Mutations, Duplications, and Inversions

We are very excited that some of our faculty have received major grants or leaves for research, but these awards do affect staffing in the department. As a result, some Biology courses will not be offered or will appear in different semesters during 2020-2021. For example, Genetics will be taught only in the spring semester next year. Evolution will be offered in the spring instead of the fall, and Introduction to Environmental Science – a course for ENVS majors and minors – will also flip from fall to spring during 2020-2021. Animal Development and Conservation Biology will not appear at all next year, but Histology will be taught in both fall and spring semesters. We are also introducing two new courses! In the fall, Invertebrate Biology with lab makes its debut (see announcement below), and Dr. Frawley is developing a new non-lab course for spring.

NEW! BIOL 311/311L Invertebrate Biology with lab

Invertebrates make up over 95% of the animal species on Earth, but how much do you know about this incredibly diverse and important group of organisms? Taught by new Biology faculty member, Dr. Sydney Moyo, this course will examine the diversity of invertebrates, and how they can be useful proxies for understanding ecosystem processes. Topics will include the morphology, physiology, reproduction, and ecology of major invertebrate groups. The course will



also cover current issues in invertebrate conservation. Laboratories will emphasize original experimental approaches, data analysis, discussion of literature and field work to observe and collect invertebrates. Class meets MWF 9:00-9:50 with lab on Tuesday 12:30-3:30.

BIOL 350 Comparative Vertebrate Morphology/Anatomy

CVM will again be offered with two 9 AM lectures most weeks and two (unequal) formal lab meetings a week. One lab meets Tuesday from 12:30-3:30. The second lab each week meets Friday for a minimum of 50 minutes, either from 1-1:50, or from 2-2:50. Two additional hours in lab are required, but these hours may be completed at other times during the week. The variable Friday lab time allows students to pre-register in another class meeting MWF at either 1 or 2. CVM has two course numbers. The first includes the lecture and Tuesday lab. This one must be enrolled from the main tree (A, B, or C). The second number allows you to choose one of the two Friday lab times. Please pick the 1 PM Friday time if you can. This Friday section should be added from the Lab portion of the tree. See Dr. A. Jaslow if you have questions. Note: Dr. A. Jaslow will be retiring at the end of '20-'21, so this will be the last time he teaches this course.



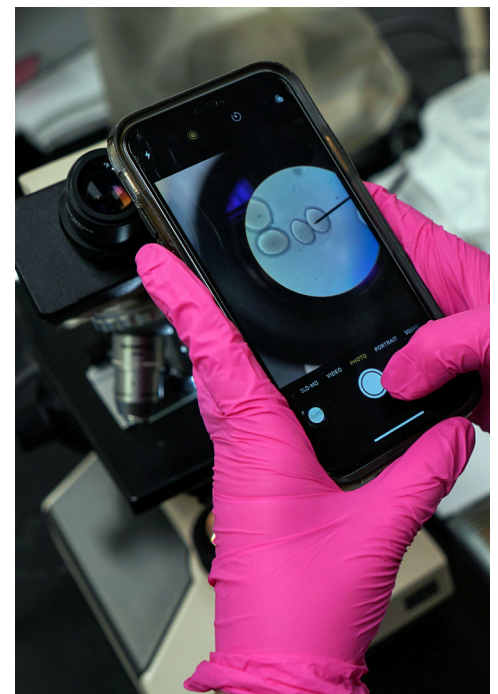
What's Up for Next Spring?

In the spring of 2021 we tentatively plan to offer the following lab courses: Animal Physiology, Evolution, Genetics, Histology,

Microbiology, Molecular Biology, Molecular & Cellular Neuroscience, and Mycology. Courses without lab will include Topics in Biomedical Science and a new course taught by Dr. Frawley that will be announced in the fall issue of Biofeedback. Spring should also include sections of Biochemistry, Mechanisms of Drug Action, and Neuroscience.

Semester in Environmental Sciences at Marine Biological Laboratory

The Marine Biological Laboratory at Woods Hole offers a Semester in Environmental Sciences Program every Fall. This 16-credit program is geared towards Biology, Chemistry, and Environmental Science majors interested in ecosystem science and biogeochemistry. Students take courses such as Aquatic and Terrestrial Ecosystem Analyses, Microbial Ecology, and Independent Research, and get to know many of the staff and visiting scientists at Woods Hole. The SES deadline is March 20 for the Fall 2021 semester. There is an \$17,000 scholarship available. Students who are interested in learning more about the program should contact Dr. Boyle.





FRAZIER JELKE SCIENCE CENTER

Optimal Foraging

The following courses
will be offered next semester

Number	Course Title	Hours Offered
130	Biology I (5 sections)	MWF 9:00-9:50, 10:00-10:50 TR 8:00-9:15, 9:30-10:45, 11:00-12:15
131	Biology I Lab (10 sections)	T 12:30-3:30 W 1:00-4:00 R 12:30-3:30 F 1:00-4:00
207	Animal Behavior (Boyle)	MWF 8:00-8:50 W lab 1:00-4:00
212	Environmental Issues in Southern Africa (Collins)	TR 11:00-12:15
301	Microbiology (Frawley)	MWF 8:00-8:50 R lab 12:30-3:30
307	Cell Biology (Hill)	TR 8:00-9:15
311	Invertebrate Biology (Moyo)	MWF 9:00-9:50 T lab 12:30-3:30
315	Ecology (Collins)	TR 9:30-10:45 M lab 1:00-4:00
325	Molecular Biology (Lindquester)	MWF 9:00-9:50 R lab 12:30-3:30
350	Comp. Vert. Morph (A. Jaslow)	MWF 9:00-9:50 T lab 12:30-3:30 F lab 1:00-2:00 or 2:00-3:00
360	Histology (C. Jaslow)	MWF 8:00-8:50 W lab 1:00-4:00
375	Neuroendocrinology (Kabelik)	MWF 10:00-10:50 M lab 1:00-5:00
BMB 310	Methods in Cell Biology (Hill)	W 1:00-5:00
CHEM 414†	Biochemistry (Stoddard, Loprete)	MWF 11:00-11:50 TR 11:00-12:15
NEUR 270†	Neuroscience (Klatzkin, Pandit)	MWF 9:00-9:50, 10:00-10:50

Senior Seminar Sections

485	The Evolution of Multicellularity (Fitz Gerald)	MWF 11:00-11:50
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†No more than two courses taken outside the Biology Department may count for the six upper-level courses required for the Biology Major.

DEPARTMENTAL MIGRATIONS



Ms. Andrea Wilkins has joined the Biology Department as the new Departmental Assistant. Andrea is a new employee to Rhodes and is enjoying getting to know the campus and the Rhodes community. She has worked in a few different industries since graduating from the University of Tennessee at Knoxville with a B.S. in Biology in 2012, but she is happy to be back around science! In her spare time, she enjoys binge watching shows on Netflix, reading, and learning random trivia. She also enjoys spending time with her family and traveling to new places.

Please stop by the office sometime to introduce yourself and to welcome Andrea.



Signals & Displays

Short Communications

Tri-Beta News

Beta Beta Beta (βββ) is a national biological sciences honor society with an active chapter at Rhodes College. βββ is dedicated to the enrichment of its members' scientific experiences and to the distribution of knowledge gleaned from those experiences. Current chapter activities include participation in the Rhodes Journal of Biological Science, coordination of student research presentations, organization of various fundraising events, and hosting of biological seminars. βββ provides a forum to recognize those students, with a biological science as their undergraduate major, who excel academically. May it be noted that Rhodes has an array of biological science disciplines, meaning there are βββ members who are not only passionate Biology majors, but also Neuroscience, Environmental Science, and Biochemistry and Molecular Biology majors. Regular membership can only be attained through invitation but any student meeting the criteria who is interested in becoming an associate member for the next school year should contact the current president, Filoteia Popescu, at popfi-19@rhodes.edu.

Tri-Beta has some exciting service projects planned for the fall and spring semesters. One ongoing, community-serving project entails volunteering at Springdale Elementary Science Saturday events. Other campus-serving events include Peer Advising hours in which students interested in the biological sciences can seek advice and suggestions about classes from upperclassmen majoring in Biology, Neuroscience, Environmental Science, or Biochemistry and Molecular Biology. Our next induction ceremony will take place next year in the Spring of 2021. We are excited to welcome new individuals into the society and congratulate them on their commitment to biological excellence.

\$\$ Biology Research Award \$\$

This spring, the Biology Department will be presenting the "Award for Outstanding Student Research in Biology." Any Biology Major who has completed research at Rhodes or elsewhere is eligible for this award. The winner will receive a cash prize, be honored

at the award convocation ceremony, and have their name engraved on the Biology Research Award plaque that is displayed outside of the Biology office. To be considered, a student must submit a three to five- page research paper, plus a recommendation from their research supervisor, to Dr. Dougherty, doughertyk@rhodes.edu by Friday, March 27th, 2020. Announcement of the award winner will be made at spring awards convocation ceremony.

Rhodes Symposium

The Rhodes Symposium (formerly known as URCAS) provides you the opportunity to showcase your outstanding work to the entire campus community. You will gain first-hand experience in communicating your research and creative activity, an essential part of professional growth. The Symposium will take place on Friday, May 1, 2020.

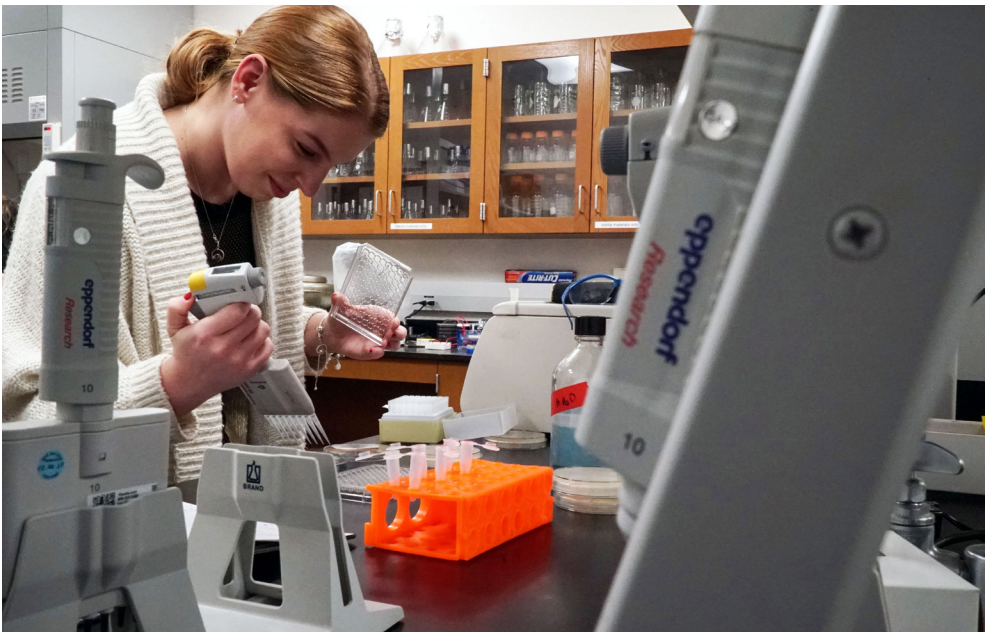
Work in the Biology Department

The Biology Department is looking for students to work as lab Teaching Assistants for the core biology classes next year. These TA positions will consist of approximately 8-10 hours per week of work. We prefer students for this job who have an interest in Biology and have taken Bio I and II. Pay and further details concerning being a TA will be discussed on an individual basis. Also, the RSAP position will be available. If you have been a TA for the fall and spring core labs, we encourage you to apply for this upper level position. Please feel free to contact Sarah Hasty at 843-3431 (email: hastys@rhodes.edu) for additional information. Applications for the lab TA job can be found outside FJ 157. The deadline for fall/spring positions is April 20, 2020. Also, if you are interested in working in the Biology Department this summer, please contact Sarah Hasty.



Mugs for Majors!

The *Pentaceratops* dinosaur that occupied the FJ Lobby for 20 years was removed during renovations in 2013. We now have a mural and fond memories of its time in FJ, plus we also have Biology Dinosaur coffee mugs for majors! When you complete your declaration of a Biology major, stop by the Biology office (FJ 132, by the Robertson Hall connector) and ask Ms. Andrea Wilkins for your mug. You can also pick one up if you declared before this year and never got one. Cheers!





The Hybridization Zone

Environmental Studies and Science Program

On behalf of the Environmental Studies and Sciences (ENVS) faculty, here's a big welcome to our new ENVS majors! There are a range of environmentally-focused courses being offered in Fall 2020. Please see the flyers in Rhodes Tower and FJ to see the full list. In addition to the Biology-focused courses mentioned in this issue of Biofeedback, ENVS 150 Environment & Society, ENVS 111 Physical Geology, and INTD 225 GIS will be offered in Fall 2020. Because Dr. Kelly will be on leave in the fall, BIOL 120 Introduction to Environmental Science will be offered in Spring 2021, not Fall 2020. If you are considering an ENVS major or minor, please speak with Dr. Boyle so she can make sure you receive important emails about environmental opportunities on and off campus.

We are also happy to have Dr. Julia Haas back from her year in Australia, and she will be offering Philosophy and Neuroscience in the fall.

In Spring 2021, we will offer one section of NEUR 270, two sections of NEUR 486 Senior Seminar, and Dr. Klatzkin will again offer Clinical Neuroscience. We also anticipate that the Medicinal and Computational Chemistry course will again be taught that spring.

Have other burning Neuroscience questions? Please email Dr. Kabelik, the chair of Neuroscience, at kabelikd@rhodes.edu.



Biochemistry and Molecular Biology

All three of the core, upper level, BMB lecture courses will be offered fall 2020: BIOL 307 (Cell Biology), BIOL 325/325L (Molecular Biology with lab), and CHEM 414 (Biochemistry). Additionally, BMB 310 (Methods) will be offered in the fall. The spring semester will include only the two core BMB lecture courses: Molecular Biology with lab and Biochemistry. Please consult the online course schedule for times and other information as it is made available for these courses and others that serve as BMB electives.

As an ASBMB accredited program, BMB majors take the ASBMB certification exam to get a certified degree. **The ASBMB Certification Exam** will be taken in senior seminar on March 3 this year.

As always, please feel free to contact program chair Dr. Peterson at petersonl@rhodes.edu if you have questions concerning the BMB program.

Neuroscience Program Announcements

In Fall 2020, the Neuroscience program will offer two sections of NEUR 270, one section of NEUR 485 Senior Seminar, and PSYC 345 Cognitive Neuroscience.



Student Research 2019-2020

Sponsored by Programs at Rhodes

(Rhodes faculty supervisors listed)

Alana A BMB '20. Spectroscopic determination of pKa values for identifying enzyme intermediates in L-DOPA dioxygenase. (Dr. Larry Peterson)

Aronson E BIOL '20. Stomatal size variation between diploid, tetraploid, and hexaploid *L. tridentata* at naturally-occurring zones of sympatry and parapatry. (Dr. Robert Laport)

Batschelett M NEUR '21, Waddell B NEUR '21, and Mendez Morales G NEUR '20. Baseline neural activity differences between bold and shy male green anoles, *Anolis carolinensis*. (Dr. David Kabelik)

Betonio M BMB '20. Synthesis of 3,4-dihydroxyhydrocinnamic acid analogues to investigate dioxygenase activity. (Dr. Larry Peterson)

Bobay M BMB '21, Hernandez J ENVS '21, Perkins D '23. Endocrinology of captive animals. Beth Roberts, Memphis Zoo. (Dr. Sarah Boyle)

Boren R BMB '21. Genetic engineering of *P. aeruginosa* to study novel antimicrobial compounds. (Dr. Elaine Frawley)

Brookover Z BIOM '21 and Christman B BIOM/ENVS '21. Demographic modeling of remnant American chestnut (*Castanea dentata*) populations in western Tennessee. (Dr. Robert Laport)

Chandler M ENVS '22, Cheang A ENVS '21, Perkins D '23, Tucker K BIOL/ENVS '21. Louisiana pine snakes. Dr. Steve Reichling and Jessica Cantrell, Memphis Zoo. (Dr. Sarah Boyle)

Cheney C BIOL '21, Hernandez J ENVS '21, Hill J BIOL '21, Pulaski J ENVS '21, Sawarkar S ANSO '21, Thomas N ENVS '21, Riekerk A '23, Tuznik G '22, and Yde M '23. Spatial and behavioral analyses of captive African elephants. (Dr. Sarah Boyle)

Clary J '22. Elucidating the role of MYOD1 in muscle development and rhabdomyosarcoma. St. Jude Children's Research Hospital, Drs. Mark Hatley, Madeline Bush and Kate Gadek. (Dr. Gary Lindquester)

Cohn M ENVS '21 and Candia K ENVS '20. Amphibian behavior and conservation. Dr. Sinlan Poo, Memphis Zoo. (Dr. Sarah Boyle)

Davies M ENVS '20. Green sea turtle (*Chelonia mydas*) occurrences in the British Virgin Islands. (Dr. Sarah Boyle)

Dempsey E BIOL '20. Modeling the ecological niche of remnant American chestnut (*Castanea dentata*) in western Tennessee. (Dr. Robert Laport)

Enda S '22 and Zhang Y BIOL '20. Behavioral and spatial patterns of the Nile hippo. (Dr. Sarah Boyle)

Freyaldenhoven T BMB '20. Identifying the substrates of Protein Kinase C A (PkcA) during septation in *Aspergillus nidulans*. (Dr. Loretta Jackson-Hayes)

Greenberg M '22. Analysis of carnivore behavior on video footage. Kelsea Wertzberger, Memphis Zoo. (Dr. Sarah Boyle)

Hameed M BMB '21. Determining the domains of the Rho GEF Bud3 that are important for interactions with the Rho-type GTPase Rho4. (Dr. Loretta Jackson-Hayes)

Jones D CHEM '22 and Hyatt D BMB '21. Creation of BiFC plasmids to investigate protein-protein interactions involving EF-hand and IQ-motif proteins in *Aspergillus nidulans*. (Dr. Hill)

Kirkpatrick C BMB '20 and Ho T BMB '22. Co-immunoprecipitation/Mass-Spectrometry investigation of protein-protein interactions involving EF-hand and IQ-motif proteins in *Aspergillus nidulans*. (Dr. Hill)

Krishnan R '23. Characterizing the nitric oxide stress response of magnesium transport mutants in *Salmonella Typhimurium*. (Dr. Elaine Frawley)

Larsen M BMB '21. How loss of the protein NSD1 results in malignant rhabdoid tumors that are resistant to tumor-suppressing drugs. St. Jude Summer Plus, Dr. Charles Roberts and Dr. Yiannis Drosos. (Dr. Elaine Frawley)

Lempner A BMB '21. Regulation of CLN3 nuclear import in *Saccharomyces cerevisiae*. (Dr. Mary Miller)

McGuire C ENVS '20, Lavender A '23, Ton K '23, and Wigman G '22. Analysis of elephant sway behavior on video footage. Melissa Peterson, Memphis Zoo. (Dr. Sarah Boyle)

McKay M BIOL '20. THI73 Mediates Regulation of CLN3 G1 Cyclin Activity in *Saccharomyces cerevisiae*. (Dr. Mary Miller)

Mendez Morales G NEUR '20. Vasopressin receptor (V1aR) expression in green anoles (*Anolis carolinensis*) relative to season (breeding versus non-breeding) and sex (male versus female). (Dr. David Kabelik)

Nyamkondiwa K BMB '22. Investigating the role of ubiquitin conjugating enzymes in pathological and aging proteostasis. St. Jude Children's Research Hospital Drs. Fabio Dementis and Liam Hunt. (Dr. Gary Lindquester)

Ouyang A BIOL '20 and Gasner K BIOL '20. Expression and function of manganese efflux transporters in *Salmonella Typhimurium*. (Dr. Elaine Frawley)

Owen C NEUR '20. Variability in social boldness among female green anole lizards, *Anolis carolinensis*. (Dr. David Kabelik)

Popescu M BIOL '20, Strauss A ENVS '21, Park CY '22, and Velasquez M ENVS '21. Synchrony in zooplankton abundance and primary productivity across variable nitrogen-to-phosphorus ratios in experimental ponds. (Dr. Patrick Kelly)

Powell R '23. Effects of nutrient source on the *Salmonella Typhimurium* response to nitric oxide. (Dr. Elaine Frawley)

Rainey M CHEM '21. Nutrient regulation of CLN3 G1 Cyclin Activity in *Saccharomyces cerevisiae*. (Dr. Mary Miller)

Sawiers V NEUR '21. Local network synchronization in the rat dorsal and ventral hippocampus throughout development. (Dr. Kelly Dougherty)

Schupp W NEUR '20, Sakata K., and Franks H. Enriched environment and standard cage treatment effects on brain-derived neurotrophic factor (BDNF) levels in the hippocampus, prefrontal cortex, and peripheral organs in wild-type and promoter IV defective mice. UTHSC Neuroscience Institute. (Dr. David Kabelik)

Thomasson M BIOL '21. Capsule switching in *S. pneumoniae*. St. Jude Summer Plus, Dr. Jason Rosch. (Dr. Elaine Frawley)

Tiwari A BMB '21. Comparing distributions of the neural activity markers Fos and pS6. (Dr. David Kabelik)

Velasquez M ENVS '21, Popescu M BIOL '20, Park CY '22, and Strauss A ENVS '21. Assessing variability in biogeochemical cycling and stoichiometry in an urban lake. (Dr. Patrick Kelly)

Wu S '23. Giant panda husbandry research. Beth Roberts, Memphis Zoo. (Dr. Sarah Boyle)

Yelemali P NEUR '22. Schiller K, Gibbs S, Wheless J, Narayana S. Clinical, demographic, and behavioral correlates of TMS cortical excitability measure in focal motor epilepsy and tumor patients. Rhodes/UT Neuroscience Research Fellowship. (Dr. David Kabelik).



Rhodes College