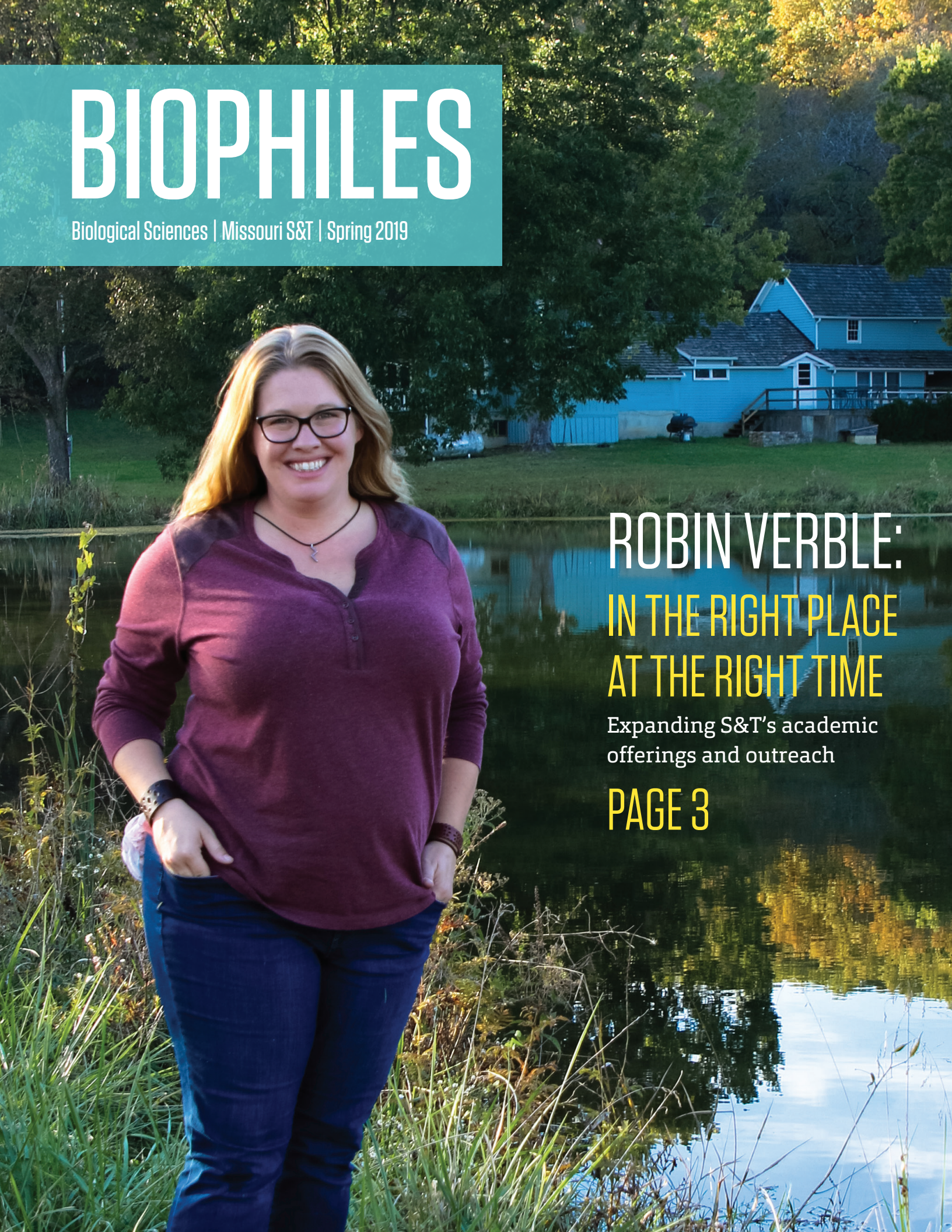
BIOPHILES

Biological Sciences | Missouri S&T | Spring 2019



ROBIN VERBLE:
IN THE RIGHT PLACE AT THE RIGHT TIME

Expanding S&T's academic offerings and outreach

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TRANSFORMING LEARNING INTO LEADERSHIP

In biological sciences, the majority of students conduct research as undergraduates. Many present their findings at professional conferences and some obtain published authorship. These opportunities are life-changing for the Miners who make the leap from student to scientist and scholar.

Our department's annual phonathon is underway, and every gift supports the undergraduate research and professional development opportunities that launch the leaders of tomorrow. We hope you'll take time to talk with the Missouri S&T student who calls. It's a great way to learn what's happening in biological sciences and across campus. And it's also a great time to give back.

give.mst.edu

DEAR ALUMNI AND FRIENDS

Welcome to the 2019 *Biophiles* newsletter. In this edition, we tell you all about the great things our department has been up to in the past year. Many of our students have been involved in research, including those who participated in Missouri S&T's FYRE (First Year Research Experience) and OURE (Opportunities for Undergraduate Research Experience) programs. Some traveled to attend conferences and workshops, like our American Medical Student Association attendees, and several earned notable internships. We also highlight the activities of three of our faculty members.

We were very fortunate to welcome a new faculty member to our department this past summer. Dr. Robin Verble has joined us as director of the Missouri S&T Ozark Research Field Station. Dr. Verble has taken the lead in the process of programming and developing our field station. You can learn all about her research and efforts in this issue.

Perhaps the biggest story for the past year has been all the activities associated with Phase II of the Schrenk Hall renovations, which include renovations to the basement and three floors of the west wing. These renovations do not replace our long-term goal of constructing a new Biosciences Complex, which is still in the planning stages, but the renovations of Schrenk's west wing will add new, desperately needed teaching and research lab space for biological sciences and chemistry students and faculty.

This past June the biological sciences and chemistry administrative offices moved from the Schrenk Hall west wing to its east wing to make room for the Phase II renovations. When Phase II is complete, biological sciences will have a new microbiology and molecular genetics teaching lab on the first floor and roughly 5,000 square feet of research lab space in the basement to accommodate six

faculty members and shared equipment. We are very much looking forward to the move.

As always, we greatly appreciate your involvement and support of our programs, students and faculty. Please visit us and stay connected as we continue to grow and advance our efforts and accomplishments.

Warm regards,

David Duvernell
Professor and Chair,
Biological Sciences

IN THIS ISSUE

3-D BIOPRINTING OF STEM CELLS COMES FROM INTERDISCIPLINARY EXPERTISE

When **Julie Semon**, assistant professor of biological sciences, received funding from S&T's Best in Class program in 2015, she formed a collaborative interdisciplinary research team whose members could share their respective expertise.

The team investigates the 3-D bioprinting of cellularized scaffolds, which are carriers for stem cells that are designed to repair damaged or diseased tissue in clinical applications. The new scaffolds can also be used in the lab to study and model diseases.

Team members for this project include **Ming Leu**, professor of mechanical and aerospace engineering and an expert in 3-D printing; **Delbert Day**, Curators' Distinguished Professor emeritus of ceramic engineering and inventor of borate bioactive glass; **Krishna Kolan**, a postdoctoral scholar in mechanical engineering; and over a dozen undergraduate students in mechanical engineering, ceramic engineering, and biological sciences.

"I couldn't think of a better place than S&T, a more appropriate group, or a more opportune time to do this work," says Semon.

"Synthetic scaffolds have been used for 20 years," she says, "but they all have the same drawback — a lack of blood supply. By combining the borate bioactive glass with live stem cells and 3-D printing, we've found a potential way to support the blood supply needed for tissue repair, and our research is ongoing."

In addition to teaching classes and coaching bio-design teams on their inventions, Semon studies regenerative medicine and runs a lab at S&T centered on cell therapy.

GRADUATES MOVING ON TO ADVANCED DEGREES AND PROGRAMS

Grace Deitzler, BSci'16
Oregon State University, Ph.D. program in microbiology

Ivana Grimm, BSci'16
Arkansas College of Osteopathic Medicine

Jordan Trager, BSci'16
Kansas City University of Medicine and Biosciences, MS program

Alexis White, BSci'18
Pacific Lutheran University, BSN-RN program

Jonah Heitman, BSci'18
University of Missouri-Kansas City School of Dentistry

Lisa Gutgesell, BSci'18 University of Illinois-Chicago, Ph.D. program in medical sciences

Seth Carder, BSci'18
University of Kansas School of Medicine

Megan Fairfield, BSci'18
Royal Veterinary College in London

Olivia Basler, BSci'19
Goldfarb School of Nursing, BSN-RN program

Congratulations to our accomplished alumni. If you are a biological sciences graduate continuing your education in a graduate or professional program, please let us know at **biosci@mst.edu**.

In the right place at the right time

Robin Verble's ecological expertise expands S&T's academic offerings and outreach

Tracking the state of the ecosystem by studying its forests, fires and insect population makes **Robin Verble** tick, and she uses her findings to help advance healthy and sustainable management of natural areas.

Verble joined the university in summer 2018 as founding director of Missouri S&T's Ozark Research Field Station and associate professor of biological sciences.

"I put a lot of value on finding ways to provide students more hands-on experience," says Verble. "This opportunity not only increases their employability, but also helps them find their passion."

The field station's nine-acre biological resource site was made available to S&T through a partnership with the Missouri Department of Conservation. It will position S&T at the State's leading edge of teaching and learning about environmental issues, conservation and natural resources in an outdoor classroom rich in ecological history. It's located about 20 miles southwest of Rolla on land settled in the 1860s containing ponds, streams, woods, wildlife and a historical house.

Verble's vision for extending S&T's academic offerings through the field station includes adding courses in field ecology, organismal biology and field taxonomy and other courses across various university departments. She's making the field station available throughout S&T and the community through the public school system and organizations like the Girl Scouts, Missouri Master Naturalists and the Audubon Society.

> **"I put a lot of value on finding ways to provide students more hands-on experience."**

"There's so much to be learned from our local ecology and land use history," says Verble. "As climates change, individual places change along with them — and place-based studies allow us to observe our impacts on these local systems. It's important to connect this knowledge to college students, the university, public school students and naturalist groups."

Verble's research focus is fire ecology. She studies the effects of wildland and prescribed fires on the insect community, a bio-diverse species group that is easy to find and identify.

"Insects are a barometer for ecosystem health," says Verble, "especially after a fire, they're a ubiquitous, bottom-up indicator of what shape the environment is in."

From 2012 to 2018, Verble was director of the Center for Fire Ecology at Texas Tech in Lubbock and an assistant professor in the school's Department of Natural Resources Management. Before that, she worked for three years as the curator of insects at the Watson Museum of Entomology at the University of Arkansas, Little Rock.

Verble holds a Ph.D. in applied ecology from the University of Arkansas at Little Rock, an M.S. in entomology from the University of Arkansas, and a B.S. in biophysics from the University of Southern Indiana.

"Dr. Verble joins our department at an important time as we build on existing strengths by broadening our academic expertise in new areas of ecology and organismal biology," says **David Duvernell**, chair and professor of biological sciences. "Her leadership as our field station director is central to these efforts."

DR. NORD GALE

Dr. **Nord Gale**, Curators' Distinguished Teaching Professor emeritus and the founding chair of biological sciences at Missouri S&T, died Friday, Feb. 1. He was 80.

Gale joined the faculty in 1968 and reintroduced biology to the university after its curriculum was discontinued in the 1940s. Initial courses were offered as part of the chemistry curriculum. The life sciences department was formed in 1983, and Gale was appointed chair.

He served on the S&T faculty for 32 years until his retirement during the 1999–2000 academic year. Under his leadership, the department grew from a faculty of two — himself and **James Hufham** — to 11 full-time academic positions.

Gale's research area was in bacterial physiology when he arrived at S&T, but he soon became involved in research on heavy metals in aquatic organisms in Missouri's Lead Belt. He was well known among rural Missouri residents for his efficient method of sampling streams and ponds by "electrofishing."

Gale was a pioneer in involving undergraduate students in research. He was rarely seen working on any project without a team of students nearby, whether in the field or lab.

During his time at S&T, Gale received 18 Outstanding Teaching Awards and the Governor's Award for Excellence in Education and was named Curators' Distinguished Teaching Professor. One of Gale's final accomplishments before retirement was writing the proposal that ultimately established a graduate program in biology.

Gale is survived by his wife, Joan, daughters Dawna Johnston and Sheri Jones, and son Steve Gale.

Memorial contributions honoring Gale may be made by designating the Gale-Hufman Endowed Scholarship Fund at **give.mst.edu**.

BIOLOGY MAJORS ARE "ON FYRE" AND LOVING IT!

Now in its third year, the First Year Research Experience (FYRE) program offered by the College of Arts, Sciences, and Business (CASB) is growing rapidly — and first-year biological sciences majors are some of FYRE's most active participants.

Each spring semester, the FYRE program provides first-year and new transfer students an opportunity to work one-on-one with a faculty mentor on a specific research project. The program helps students improve critical thinking, communication, presentation and leadership skills while learning solid research methods and generating new knowledge.

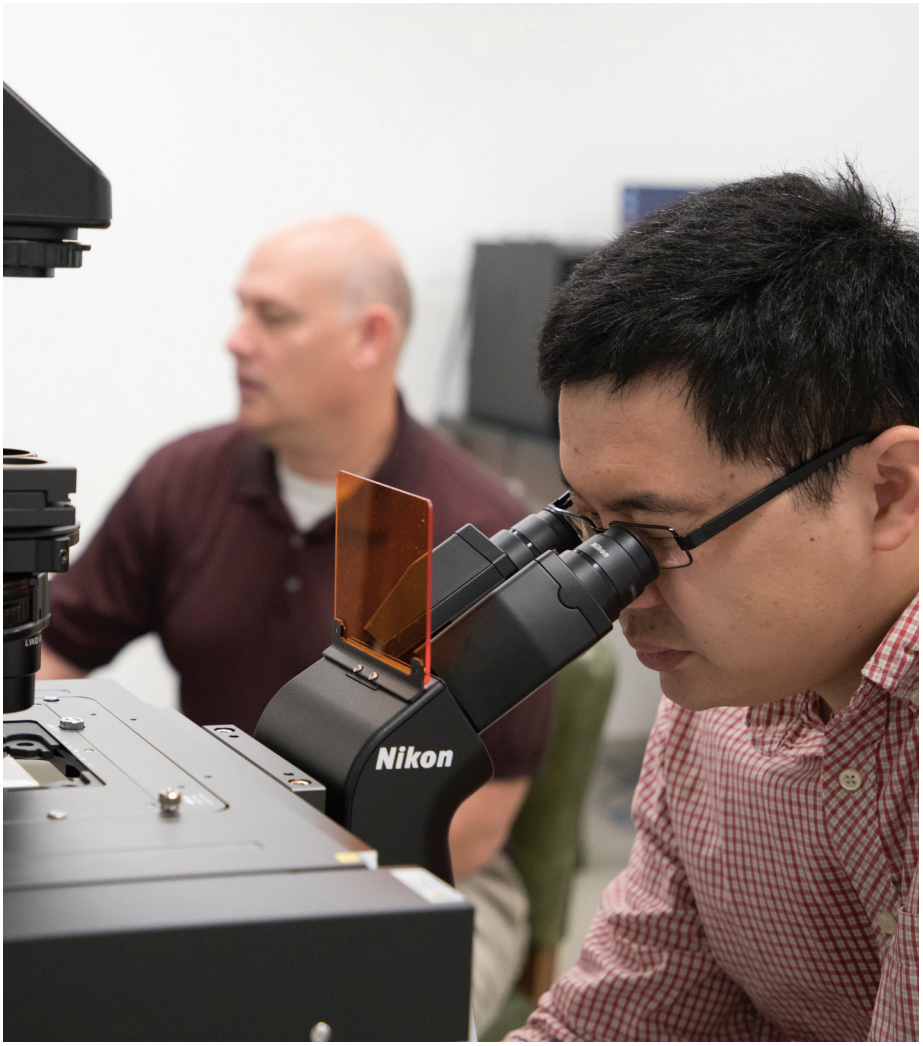
"Biological sciences majors are always enthusiastic applicants to the FYRE program, and faculty across the college love mentoring these students," says **Kate Drowne**, director of the FYRE program and CASB associate dean. "BioSci majors are known for being hardworking, willing to learn and eager to contribute meaningfully to all kinds of projects."

In 2019, seven first-year biological sciences majors are participating in research projects hosted by faculty in a variety of departments:

- **Sunee Hermon** is collecting data and biographical sketches for a music history app with **David Samson** in arts, languages and philosophy
- **Sarah Darknell** is investigating the regulation of a protein kinase in cytokinesis with **Katie Shannon** in biological sciences
- **Morgan Banker** is identifying histaminergic neurons in *drosophila* with **Matthew Thimgan** in biological sciences
- **Anna Peacock** is building a linguistic perceptions survey with **Sarah Hercula** in English and technical communication
- **Maya Washington** is studying the bias of play to determine if game reviews impede the development of narrative-based digital games with **Daniel Reardon** in English and technical communication
- **Nicole Kucera** is working on the search for the Akwamu people in the slave societies of the Americas, 1729–34, with **Justin Pope** in history and political science
- **Sophia Longwell** is studying the impact of classroom design on active learning with **Michelle Schwartze** in teacher education and certification

In 2018, one biological sciences major, **Blake Bryant**, participated in FYRE. Bryant was mentored by **Matt Thimgan** to research the detection of sleepiness with physiologic measures. Bryant presented his poster, "Physiological Biomarkers of Sleep," at the 2018 Undergraduate Research Conference (UGRC) in the Havener Center, where 76 student researchers made oral, poster and proposal presentations.

The FYRE program started in 2017 with nine faculty-student research teams, grew to 18 teams in 2018, and now 29 CASB faculty members from 10 different departments are providing research apprenticeships for interested students majoring in a CASB discipline.



NEW CONFOCAL MICROSCOPE IS QUITE AN EYE-OPENER

For years a confocal microscope has been at the top of the wish list for members of the biological sciences department, as well as researchers who use microscopy in other departments across campus. We're happy to report that in 2018, multiple academic departments, colleges and the office of sponsored programs came together to pool resources to acquire a Nikon A1R-HD confocal microscope, valued at over $350,000. The new microscope is managed on behalf of all users in S&T's Center for Biomedical Research. It is housed in the renovated space in Schrenk Hall.

Confocal microscopy is an advanced technique for visualizing cellular and sub-cellular biological materials. It improves on conventional, wide-field optical and fluorescence microcopy by using pinhole laser illumination to eliminate out-of-focus light that can blur images of specimens. It generates optical slices that can provide three-dimensional imagery. Consequently, confocal microscopes provide some of the sharpest, most stunning images of thick specimens possible with modern microscopy technology.

This critical equipment acquisition opens up so many new opportunities for our students and faculty. With it, our students are able to learn microscopy techniques using modern technology, and our researchers have the capability to explore tissues and cells at levels of resolution and clarity never before possible at S&T.

MILLIPORESIGMA'S LAB INCUBATOR DONATION ENHANCES STUDENT RESEARCH CAPABILITIES

The biological sciences department is grateful to MilliporeSigma, a global supplier of biotechnology and pharmaceutical solutions, for the donation of four CO_2 laboratory incubators worth approximately $30,000.

The donation was facilitated by **Daniel Miller**, BSci'12, MS ABio'14, an associate R&D scientist at MilliporeSigma's St. Louis campus. While at S&T, Miller was mentored by **Katie Shannon**, teaching professor and director of the Cytokinesis Laboratory.

The incubators are specially designed for growing mammalian cells under programmable gas and temperature settings. They provide students the newest technology in cell culture to perform research in animal physiology, toxicology, microbiology and cell regeneration.

More than a dozen undergraduate and graduate students have already benefited from working with the incubators on projects ranging from the growth of adipose stem cells to the development of targeted nanodelivery treatments of cancer cells.

Q&A

WHAT'S SLEEP GOT TO DO WITH IT?

Matthew Thimgan, associate professor of biological sciences, conducts interdisciplinary research to understand how sleep is regulated, how sleep deprivation impacts us, and if we can identify a biomarker of sleepiness.

Q: Why focus your research on sleep?

A: Sleep deprivation impacts nearly everyone at some point or another. Some people have difficulty falling asleep, either on a short- or long-term basis, and others get less sleep than they should because they have a new baby or choose to stay up because of work or entertainment.

Q: What type of work are you doing?

A: In one project, my lab is collaborating with **Gayla Olbricht** and **V.A. Samaranayake** from mathematics and statistics to determine how we might facilitate the initiation or maintenance of sleep or possibly stimulate the body to replicate the function of sleep until the person has the opportunity to sleep again.

Q: How do you go about studying sleep cycles?

A: We are funded by the NIH to look at this in the fruit fly because we can monitor sleep over their entire lifespan, and their lifespan is pretty short. We take their sleep pattern and we mathematically model it to determine important factors linked to lifespan, including predicting whether they will be long- or short-lived. We can then look at the molecular differences between the two groups of flies. The differences should be attributed to differences in sleep patterns that result in bad outcomes like illness and decreased cognitive function. Then we can use the data to find a way to improve molecular function and decrease the impact of sleep deprivation.

Q: How can your work be applied?

A: I'm working with **Amber Henslee** and **Devin Burns** from psychology and **Ivan Guardiola** from engineering management to understand what sleep patterns might contribute to cognitive deficits and then identify them before there is a major accident.

Q: How do you get your data for this project?

A: In a two-year project funded by the College of Arts, Sciences, and Business, we monitored the activity pattern of around 40 students for a semester from which we can derive sleep patterns. We asked them how sleepy they felt and had them perform cognitive tasks and physiological tests four times a week. We are in the process of analyzing the data, but we can already see a high variability within sleep and cognitive performance in our participants. Sleep patterns and how sleepy a participant feels correlate with their cognitive performance. We are now relating the cognitive performance to sleep patterns or to physiologic measures to see if a pattern emerges that can predict sleepiness. We hope to apply our results in research, industrial and, potentially, clinical environments.

NEW LAB DEDICATED TO TEACHING MICRO- AND MOLECULAR GENETICS CLASSES

We're very excited about the renovation this summer of a new teaching lab for biological sciences on the first floor of Schrenk Hall's west wing.

Biological sciences currently has three teaching labs in the east wing of Schrenk Hall where we teach 12–15 lab sections to over 200 students per semester. One of our labs is in the basement of Schrenk Hall, where we currently teach microbiology. Structural challenges in the aging building, and the basement location create moisture and humidity issues that make the site less than ideal for microbial and cell culture techniques.

The nearly completed renovations of the west wing will provide us with a new teaching lab space that is part of a multi-million-dollar renovation project. This lab will host microbiology and molecular genetics lab courses in the Fall 2019 semester, and will be our new center for delivering advanced training in microbial and DNA technologies. Students who attend labs in this new space will learn techniques such as next-generation sequencing and analysis, real-time PCR detection and quantification, and CRISPR DNA editing.

Even as we think about an exciting future for our students in a new micro- and molecular technology-driven lab, the expansion of teaching lab space will create other new opportunities for enhanced lab experiences in our curriculum. Existing teaching labs will be retained, providing opportunities to develop additional new lab courses. In the next year we have plans for new course offerings in comparative vertebrate anatomy, entomology, ichthyology and animal behavior, and we are making major renovations and investments to our human physiology lab.

As we expand the lab classroom space we occupy, we are thinking about everything that is necessary to equip students for success in our new teaching lab.

We're currently raising funds and accepting donations to equip this new teaching lab for our students.

Partial list of needs for our new lab space:

- Compound microscopes
- Stereoscopes
- Pipettes
- Horizontal gel electrophoresis rigs
- Incubators
- Dry baths and stir plates
- Vortexes
- Centrifuges
- Power supplies
- Thermal cycler
- Electroporator
- Deli refrigerator
- Vertical gel electrophoresis rigs

BIOLOGICAL SCIENCES PROPELS ALUMNA TO SUCCESS IN INFORMATION TECHNOLOGY

Marcie Rucker, BSci'99, came to Missouri S&T knowing she wanted to study biological sciences. "DNA, proteins, I loved all of it," says Rucker. "Whether it was lab work or medicine, I didn't have a destination; I just knew that I liked the science."

Originally from Farmington, Mo., Rucker chose S&T for its size because she knew she would get more individual attention from her professors.

"Instead of being one of 120 in a class, I was one of 20," says Rucker. "What I cherished the most was that we got to do undergraduate research with the professors. They were very open to teaching you things that maybe you didn't get to learn otherwise."

After graduation, she entered a Ph.D. program at Saint Louis University Medical School, but she discovered that it was not for her. A temporary staffing agency job with Monsanto changed the course of her life. She started out as a junior molecular biologist performing DNA extractions. When the temporary job ended, Monsanto kept her on permanently.

She soon realized that what she loved most was teaching people how to use the software that made the biologists' jobs better and analyzing data.

"That's when I took the big step of working in information technology. I acted as a liaison between the scientists and the developers," says Rucker. "Your developers didn't necessarily know science and your scientists weren't big into IT."

Rucker worked her way up to IT director, service integration lead, for Monsanto, and she's responsible for their IT end-to-end services.

BIOSCI COMMENCEMENT SPEAKERS

Two of our recent graduates were chosen to represent the College of Arts, Sciences, and Business at their commencement ceremonies.

Lacey Raper, BSci'18, spoke in May. "I believe that as graduates from S&T, we have unique experiences that are extremely valuable," she said. "We are not the people to look at a problem and believe there is no answer. We understand that progress is not made alone, and we reach to find the people who can come together and run tirelessly with us as we push for a solution."

Dalal Abduljaleel, BSci'18, spoke in December. "The most valuable principle I learned throughout my entire life is knowing who to ask for help when I needed it, and to accept the help when it's offered," she said. "When you help, support and love others, love will find its way back to you! When you need help, ask for it and I assure you that people around you will rush to take care of you. But this won't happen unless you've learned how to take care of them first."

FACULTY PROFILE:

Melanie Mormile

Prof. **Melanie Mormile** has been a member of the biological sciences faculty since 1999. A prolific researcher in environmental microbiology, Mormile studies microorganisms that can survive in extreme conditions, like hypersaline lakes that serve as early analogs to Mars, and what those microorganisms can do for us — things like producing energy or developing useful compounds.

She holds two patents on the use of a haloalkaliphilic bacterium for biohydrogen gas production and one for the conversion of waste glycerol to propanediol, and she has brought in over $5 million in externally funded research.

In 2012, Mormile started working with slightly larger organisms — S&T design team students — as faculty advisor to the Mars Rover Design Team. In 2017, she helped guide the team to its first international championship.

Mormile ventured into the administration as special assistant to the provost in 2015, then served as associate provost for faculty affairs in 2016.

"I mainly served as liaison between faculty and the provost and oversaw things such as the promotion and tenure process and post-tenure review," Mormile says. "I also helped guide the development of CAFE, a center that provides guidance for faculty members so they can become better instructors and researchers."

That position ended last May. Now she serves as interim associate dean for research and external relations in the College of Arts, Sciences, and Business.

This past fall, Mormile began a two-year term as president of the Missouri Branch of the American Society for Microbiology. And in January, she started a five-year term as editor-in-chief of *SIMB News*, a quarterly news magazine of the Society for Industrial Microbiology and Biotechnology, for which she will also write.

"The largest challenge is always time," Mormile says. "On one hand, there never seems to be enough of it. On the other hand, things do not progress as fast as you would like them. But I have learned to be more patient as well as to know when to press on things harder so goals can be achieved."

After all that, she still teaches — this semester it's Astrobiology, but she also teaches Bioremediation, Geomicrobiology and Environmental Microbiology. And she's still leading students in the search for and identification of new microorganisms.

"I'm always happy when I can help someone else be successful," she says.

FACULTY NEWS

Yue-Wern Huang

Yue-Wern Huang, professor of biological sciences and director of the department's environmental toxicology lab, was appointed to the editorial board of the peer-reviewed journal *Current Gene Therapy*. He was also invited by the Taiwan Ministry of Education to conduct an onsite program evaluation of the National Taiwan University Biodiversity Research Center.

Julie Semon

Assistant professor **Julie Semon** and associate professor **Dave Westenberg** received S&T's 2018 Faculty Teaching Award for demonstrating excellence in teaching and teaching-related activities.

Katie Shannon

This past fall, **Katie Shannon** was promoted to teaching professor of biological sciences.

Matthew Thimgan

This past fall, **Matthew Thimgan** was promoted to associate professor of biological sciences.

Robin Verble

Fire ecology expert **Robin Verble** was interviewed in November by Planet Watch Radio for a live broadcast on California wildfires; and in January 2019 for an article on animal extinction that appeared on **mashable.com**.

Dave Westenberg

Dave Westenberg led a public forum, "Editing our Evolution — Rewriting the Human Genome," in March and December 2018. Developed in conjunction with the Boston Museum of Science and the NSF, the forums aimed to close communication gaps between scientists and society surrounding the potential benefits and liabilities associated with gene editing. Westenberg also taught a three-day synthetic biology workshop at Rockefeller University in July for middle-school, high-school and college-level STEM teachers.

NOTES FROM THE FIELD STATION

Greetings!

As you likely read in this edition of *Biophiles*, I am the founding director of the Ozarks Research Field Station, and I'm excited to lead this project for S&T.

I'm working with university partners, state and federal agencies, and prospective donors on this multidisciplinary site where diverse students can engage in experiential, place-based education. The field station teams are committed to engaging with our local community and reaching out through a variety of events.

In 2018 we hosted a clean-up day, a community fishing day and an autumn birding event. Two teams from the biological sciences senior seminar class worked at the station in the fall. They hosted a Girl Scout field day, planted native wildflowers, identified and permanently tagged trees and performed maintenance tasks on the property.

This January, **Theo Sumnicht** joined our team as field station caretaker. Sumnicht comes to us with a background in secondary science education, tropical ecology and entomology. He has worked at field stations across the world for his own research, and he brings a diverse perspective and a wealth of enthusiasm to the position.

We are also teaching university courses at the station in summer 2019, including topics such as environmental methods, field ecology and insect ecology. And, we'll be hosting more community events throughout the year.

Check out the Ozark Research Field Station on Facebook to keep up with all our events and news! And, please reach out if you would like to learn more or visit the field station. I'm excited about building and sharing this unique resource with you.

Warm regards,

Robin Verble
Director, Ozark Research Field Station

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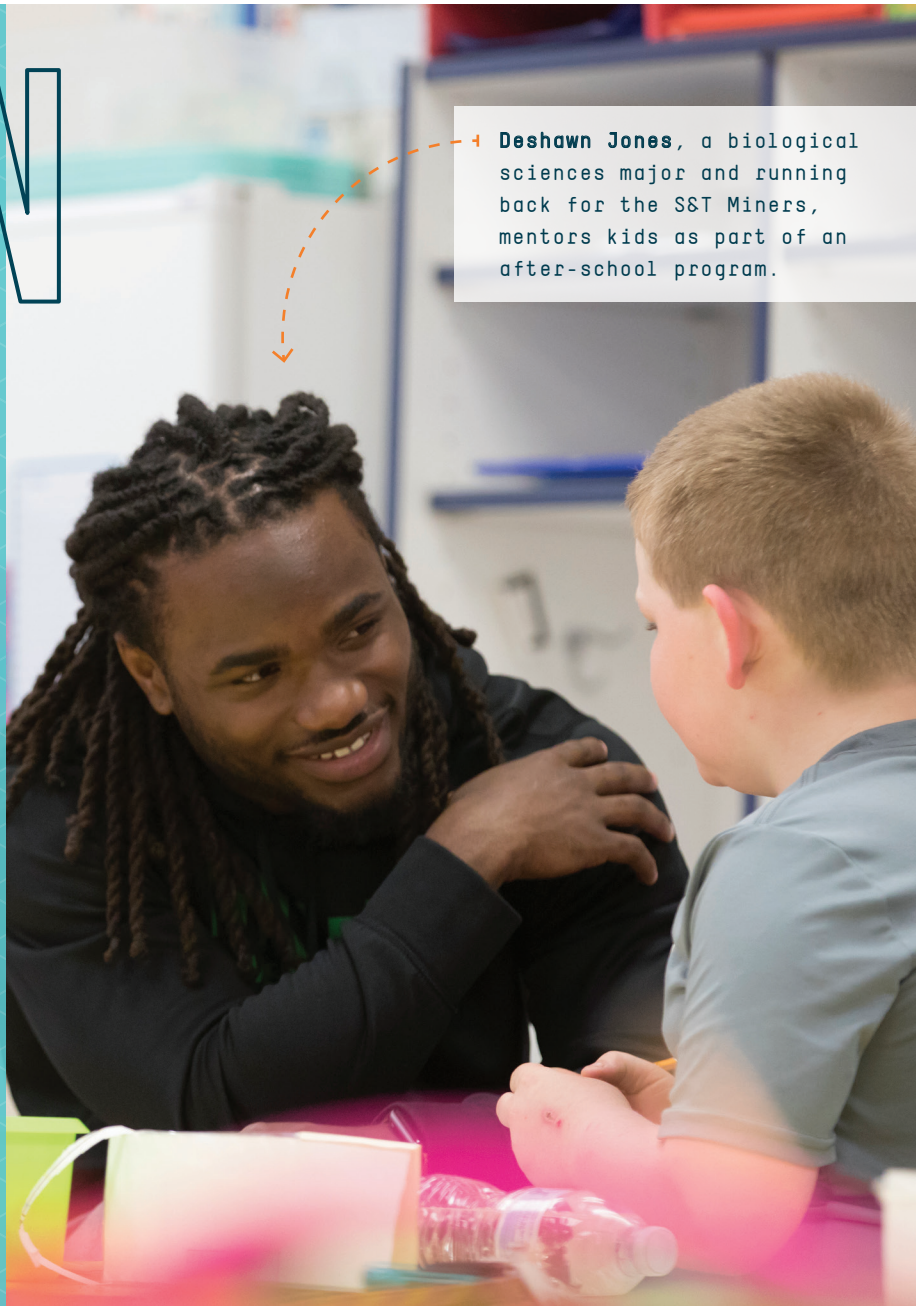
KEEP IN TOUCH

Tell us how you're doing. We'd love to hear about new appointments, degrees earned, job promotions and other family or professional news.

Get in touch with us by emailing **biosci@mst.edu**. Tell us what you're doing with your biological sciences degree (and/or your emphasis areas in pre-med, bioinformatics or secondary education) so we can feature your accomplishments among our alumni achievement stories.



Deshawn Jones, a biological sciences major and running back for the S&T Miners, mentors kids as part of an after-school program.