

BIOPHILES

Biological Sciences | Missouri S&T | Spring 2020

NEW LABS AND
COURSES ENGAGE
AND INSPIRE STUDENTS

page 2





TRANSFORMING LEARNING INTO LEADERSHIP

In biological sciences, most students conduct research as undergraduates. Many also publish and present their findings at professional conferences. These opportunities are life-changing for the Miners who make the leap from student to scientist and scholar.

When an S&T student calls you during our department's annual phonathon, we hope you'll take time to talk with the student. 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. Every gift supports undergraduate research and professional development opportunities that help launch the leaders of tomorrow.

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DEAR ALUMNI AND FRIENDS

On behalf of the students, staff and faculty of biological sciences, welcome to the 2020 *Biophiles* newsletter. We're excited to share with you some of the recent activities of our department.

One hallmark of our undergraduate program is the engagement of over two-thirds of our students in research. We are so proud of their accomplishments and delighted that many of them traveled this year to present their research at regional and national conferences. They presented at the Midwest Yeast Meeting, the Midwest Regional 3-D Symposium, the Missouri Academy of Sciences, a Gordon Conference on Sleep Regulation and Function, and national meetings of the Entomological Society and the Society for Integrative and Comparative Biology. For the third year in a row, 10 biological sciences students participated in the American Medical Student Association (AMSA) Convention in Washington, D.C.

A major accomplishment for the year was the completion of the Schrenk Hall west wing renovations with the addition of teaching and research spaces for biology students and faculty. Our research space nearly doubled, providing new labs for half our faculty, and addressing several longstanding research space deficiencies. The enhanced teaching lab space allowed us to expand our curriculum by adding or upgrading several lab courses in micro-, molecular and organismal biology.

Professor Ronald Frank officially retired in September after 31 years of service to S&T. Dr. Frank retires as the longest-tenured member of our department's active faculty. He has been an important part of the history of our department, and we all owe him a great deal of appreciation for where we are

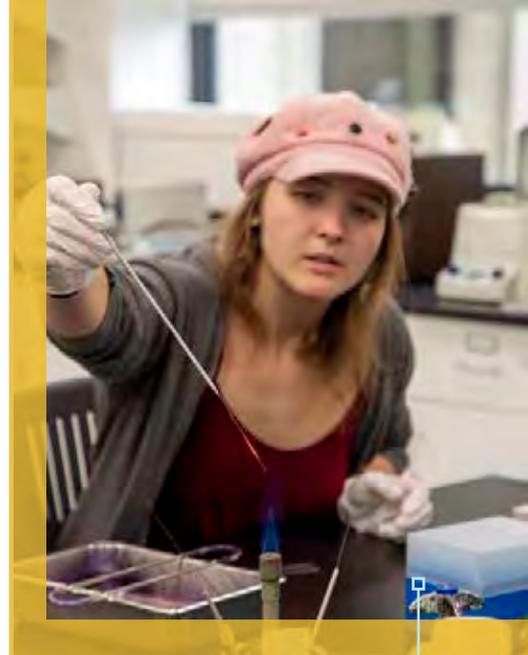


today. Though Ron may be officially retired, he continues to teach genetics courses as a Chancellor's Professor, a part-time appointment reserved for retired faculty who wish to continue contributing to S&T.

There are many more activities and accomplishments of our students, faculty and alumni on the following pages. We hope you will enjoy reading about them.

Warm regards,

David Duvernell
Professor and Chair,
Biological Sciences



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Read about some of our faculty accomplishments.

KEEP IN TOUCH

It's easy to stay in touch with your alma mater. Just say hello when a student representative calls during phonathon, or drop us a note at biosci@mst.edu. Tell us what you're doing with your biological sciences degree, and what you've been up to since you left Rolla. We love to hear from our graduates, and share their accomplishments among our alumni achievement stories.



NEW LABS AND COURSES ENGAGE AND INSPIRE STUDENTS

Active engagement is critical to successful student learning outcomes, and lab experiences provide some of the most engaging activities for our biology students. They learn not only technical skills but also the scientific process and scientific communication. For many of our students, lab experiences have launched an interest in research careers.

The completion of Schrenk Hall's west wing renovation in summer 2019 added new teaching lab space for biological sciences and enabled expansion of lab course offerings this past fall. Moving microbiology and molecular genetics lab courses to the new space made older lab spaces in Schrenk Hall's east wing available for new organismal biology labs.

Katie Shannon enhanced the Molecular Biology Lab experience by adding CRISPR (Clustered Regularly Interspaced Short Palindromic Repeats) technology, which is the hallmark of a bacterial defense system that forms the basis for CRISPR-Cas9 genome editing technology. In the last decade CRISPR technology has dominated the field of DNA editing, with applications in yeast, plants and animals.

Shannon's students identified a gene that was not completely characterized, then designed a strategy to modify their uncharacterized yeast gene using the revolutionary new CRISPR technique. Students designed primers and conducted PCR (polymerase chain reaction), preparing DNA using bacteria, and running DNA gels.

David Westenberg introduced a lab experience into his pathogenic microbiology course. Students learned various techniques used by clinical microbiologists to isolate and identify pathogenic organisms – techniques like using differential media, metabolic and molecular diagnostic tests, and antibiotic sensitivity. "Many of our students go on to health care careers and experiencing the fundamental methods of infectious disease diagnosis is valuable in those careers," Westenberg says.

Robin Verble and **David Duvernell** addressed a student desire, identified through student surveys, for more organismal biology courses. They offered lab-based Animal Behavior and Ichthyology courses for the first time in our department. Animal Behavior Lab students investigated a variety of animal models, including hissing cockroaches and mice and conducted

observational studies of a lemur colony housed at nearby Cub Creek Science Camp.

Ichthyology students travelled to diverse habitats throughout the Missouri Ozarks as far as the Bootheel region to collect fish. Missouri Department of Conservation fisheries biologists Nick Girondo and Bob Hrabik participated in several lab and field activities. The students founded an S&T fish collection that will be enhanced by future students in the course.

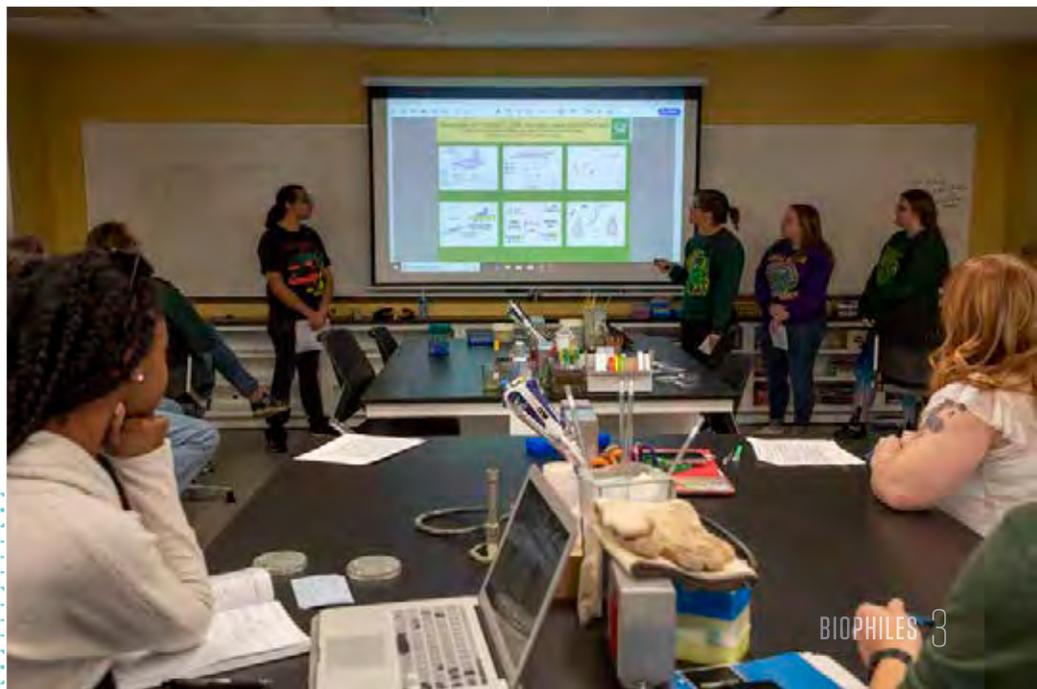
Julie Semon reintroduced Comparative Vertebrate Anatomy to our curriculum. In this standard organismal biology course, students examined the gross and micro anatomy of over two dozen species, including fish, amphibians, reptiles, birds and mammals. The course is valuable to students interested in both human health professions and animal diversity.

Top Left: Biological sciences senior Riley McFarlane, left, and junior Aurelia Garland work on an agar art project with Dave Westenberg. The students tried coating glass objects with agar and painting them with pigmented bacteria.

Top Right: Students built enrichment activities for a lemur colony at Cub Creek Science Camp.

Middle: Graduate student Nada Abokefa works in one of the newly renovated biology research labs in Schrenk Hall West as part of Julie Semon's regenerative medicine lab.

Bottom: Molecular Genetics lab students present their projects on genetically modified yeast cells using CRISPR technology.





BIOLOGY ALUMNA BRINGS STEM TO KIDS

Sarah Boutte, BSci'03, published her second children's book – this one focused on introducing STEM to young minds. Before her son was born, she flew offshore as an oilfield helicopter pilot.

"When I got pregnant, I moved to instruction and simulators," says Boutte, who later transitioned to part-time work.

She says teaching pilots how to fly helicopters for the oil industry inspired an interest in writing, and she began thinking about children's books.

"As a teacher, making sure to get my message across is very important," says Boutte. "I think spiritual growth plays a big part in that, and when I had kids, I couldn't find many resources to help my children grow in that way. I want my kids to know and understand how much they are loved, especially when we are so busy in life, so I decided to write a book."

Boutte's first book, *Do You Know How Much Your Mama Loves You?* was published in 2017. *Mama, Do You Know?* was released in March 2018.

It attempts to address the hard-to-answer questions toddlers often ask.

"Last summer my son asked me things like, 'Why don't sea turtles get cold when they are in water all the time?' or, 'Mama, do you love (my sibling) more than me?'" says Boutte. "A lot of parents clam up and freeze, and I tried to find a way to come up with explanations."



BIOLOGY STUDENTS HELP REDISCOVER PALLID SHINER

This past September, Bob Hrabik, the recently retired head ichthyologist for the State of Missouri and author of the third edition of *Fishes of Missouri*, led the students in S&T's Ichthyology class on a fish collecting trip in the remote habitats of Big Cane Conservation Area in Butler County, Mo.

The students were sampling and learning about lowland fishes, working in wetlands, swamps, meandering and sluggish lowland creeks, and ditch habitats. During the excursion, Hrabik identified specimens of the pallid shiner that was assumed to be extirpated.

Pallid shiners were last reported in Missouri waters in 1956. The species was once widespread over the eastern half of Missouri, but over time it became increasingly less common, then vanished.

Causes of the disappearance are unknown, but changing land use and the channelization of the Mississippi River are possibilities.



BIOLOGY STUDENTS ARE ON FYRE

The First Year Research Experience (FYRE) offered through the College of Arts, Sciences, and Business gives new students a chance to work one-on-one with a faculty mentor on a specific research project.

FYRE students pose questions, check data and create knowledge. The program is designed to improve critical thinking, communication, and presentation and leadership skills.

This spring, five biology students are involved in research projects.

- » **Elizabeth Feth** works with **Chen Hou** on a project titled "Why do insects grow fast, but end up with small body size at high temperatures?"
- » **Alex Daniels** works with **Beth Kania-Gosche** in teacher education and certification on a project titled "Gamifying teacher education: incentivizing and tracking students' professional engagement."
- » **Bethany Huinker** works with **Katie Shannon** on a project titled "Domain analysis of a protein-protein interaction important for cytokinesis."
- » **Gabrielle Hightower** works with **Ting Shen** in psychology on a project titled "What is the impact of intervention programs on executive functions: a meta-analysis?"
- » **Dylan Johnson** works with **Robin Verble** on a project titled "Optimization of Berlese extraction methodology."

NEW ADVISORY BOARD SEEKS INSPIRING, IMAGINATIVE LEADERS

As S&T expands its scientific research capabilities and academic offerings, our academic leaders want to incorporate outside expertise to enhance our efforts in many ways.

Our new Chemistry, Biochemistry, and Biology Advisory Board (CBBAB) will be instrumental in advising department leaders on ways to expand on current partnerships between departments and colleges and build new ones. They will help build partnerships with industry, government agencies and NGOs, and acquire needed infrastructure and instrumentation. And they will help advance our research missions through new undergraduate and graduate research fellowships, scholarships and internships.

We're looking for S&T alumni or graduates from a recognized university with degrees in chemistry, biochemistry, life sciences or biological sciences. Members should have successfully worked in their field for at least 10 years, and demonstrate leadership, achievement, and personal and professional integrity.

CBBAB members will become valuable ambassadors for Missouri S&T. If this challenging role sounds attractive to you, please let us know! We'd love to share more of our vision with you.

To learn more, please contact biological sciences chair David Duvernell at biosci@mst.edu.



DESHAWN JONES: THREE-TIME ACADEMIC ALL-AMERICAN

It seems nothing can derail senior running back **Deshawn Jones**, who played Miner football since his freshman year.

Jones closed out his playing career as the all-time leading rusher in S&T's history and earned a spot on the Academic All-America second team for the third time (one of only five Miners across all S&T teams ever to do so). He also holds every S&T running back record.

Jones says he wants to play football as long as his body will let him. He's pursuing his first life goal of playing with the pros, marketing his highlights to the NFL, Canadian Football League, German Football League and the newly incarnated XFL.

True to his next life goal of becoming a trauma surgeon, Jones has already taken the Medical College Admissions Test (MCAT) and is studying in the areas he wants to improve.

"I'm excited to see how everything I've done here pays off," says Jones. "Leaving S&T is bittersweet. I've got bonds with my team, coaches and professors. Since I've been here, I've also helped the same two elementary school kids with their homework in the Mentoring-Makes-a Difference program in Rolla and have bonds and a lot of good memories with them."

ALUMNI NOTES

- » **Sarah Buckley**, BSci'19, **Paige Eickhoff**, BSci'19, **Jason Nguyen**, BSci'19, and **Alyssa Laughlin**, BSci'19, successfully completed their honors theses.
- » **Kevin Creighton**, BSci'13, serves as principal of Dent-Phelps (Missouri) R3 school district. He previously taught seventh- and eighth-grade science. Creighton, a native of Newburg, Mo., wanted to be a doctor, but fell in love with teaching during college.
- » **Lauren Flowers**, BSci'18, a former Academic All American volleyball player for the Miners, was accepted into medical school at the University of Missouri.
- » **Tyler Johnson**, BSci'09, Hist'09, is an assistant director of admissions at Missouri S&T.
- » **Brett Vessell**, BSci'11, studied podiatry at Midwestern University and then completed a reconstructive rearfoot and ankle residency at University of Louisville/Jewish Hospitals Podiatric Medicine and Surgery in 2018. Vessell is now a physician with Foot and Ankle Specialists in Louisville, Ky.

GREETINGS FROM THE BEAUTIFUL MISSOURI OZARKS!

The Ozark Research Field Station had a busy and productive year. We hosted researchers from Missouri S&T, Texas Tech University, Southeastern Missouri State University, University of Missouri-St. Louis and the University of Missouri who utilized the field station for a variety of projects from fire ecology to endangered species. We hosted Boy Scouts, Girl Scouts, the Graduate Women in Science, biological sciences senior seminar teams, and Missouri Master Naturalists for service and education days. We hosted a community bonfire and a fishing day, and taught courses in plant identification, insect ecology, and field ecology. One of the most exciting collaborations was with the architectural design senior seminar class: They completed site plans for future buildings at the field station. These students have some creative and original ideas!

As we continue to expand our research program, we hope to engage more universities from across the region, grow our physical footprint with bunkhouses, classrooms, and laboratories, and find new ways to engage our community through summer camps and events.

We are always looking for partnerships with our alumni and friends! If you'd like to have more information, receive an annual report or be added to our mailing list, please email verbler@mst.edu, call Robin at 573-341-7274 or send us a Facebook message [fb.com/ozarkresearch](https://www.facebook.com/ozarkresearch).

Best wishes,

Robin M. Verble, Ph.D., Director

JESSICA BROOKS: BIO SCI SENIOR, MDC RESEARCHER

Last summer, senior **Jessica Brooks** turned a passion for animals and a fascination for evolution and genetics into an internship with the Missouri Department of Conservation (MDC).

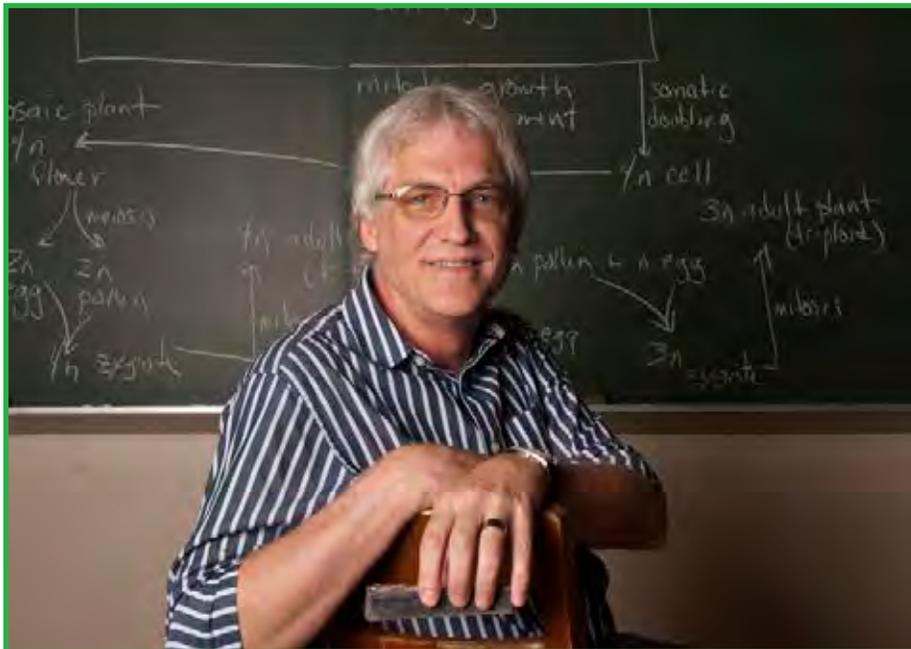
Working with mentor **David Duvernell**, Brooks analyzed gar samples, looking for evidence that alligator gar hybridized with other species. The largest gar species, alligator gar can grow to 6 feet in length and weigh over 100 pounds. Once widespread throughout the Midwest, they are now considered rare, threatened or endangered in many states.

"The decline is due to the usual environmental and human factors, most notably habitat decline from river channelization and overfishing," says Brooks, who also performed microsatellite genotyping to see if the collected fish came only from released hatchery fish (which was expected) or they bred with a residual population.

"We found no alligator gar hybrids and no evidence of non-hatchery origin," she says.

MDC officials were pleased with Brooks' work and arranged for her to continue her research in Duvernell's lab at S&T during the school year. After graduation, Brooks plans to get her Ph.D. and work in conservation.

"There is just an amazing amount of information that can be found about animals and the history of life on Earth by looking at the DNA of creatures alive today."



FORMER MINER SWIMMER HONORED BY GLVC

Paul Stricker, LSci'82, received the 2019 Dr. Charles Bertram Alumni Award of Distinction from the Great Lakes Valley Conference.

An All-American swimmer during his years at S&T, Stricker is one of 200 doctors in the U.S. who is board-certified in both sports medicine and pediatrics. He was a physician for the U.S. delegation at the Sydney Olympics in 2000, the first pediatrician to be selected by the U.S. Olympic Committee for the Summer Olympic Games.

Stricker has served as a team physician for USA Swimming, Diving, Soccer and Basketball, was the head physician for USA at the World University Games, and among other positions, served as a team physician for Vanderbilt University and University of California, Los Angeles.

RONALD FRANK RETIRES

This past September, Chancellor's Professor **Ronald L. Frank** officially retired after a 31-year career on the biological sciences faculty at S&T. He is still around, though, conducting research.

An expert in evolution, molecular genetics and genomics, Frank studies the identification of gene families using computer algorithms, the evolution and expression of gene families in plants and phenylalanine ammonia lyase genes in soybeans.

During his tenure, he received numerous awards for teaching, advising and faculty service. And in 2013 he received the Governor's Award for Excellence in Teaching. He is the primary freshman advisor in biological sciences and also advises biology majors pursuing secondary education certification.

Frank was faculty advisor for Phi Sigma National Biological Honor Society, a chapter he helped establish in 1994.

He has co-authored journal articles with computer science colleagues on the development of bioinformatics tools and protein structure prediction and has supervised many undergraduate research projects over the years, providing young scientists with access to cutting-edge technologies including current techniques in genomics and proteomics research.

GERMEROOTH STUDIES ANTS IN BORNEO



As part of the Opportunities for Undergraduate Research Program, biological sciences senior **Lily Germeroth** traveled to Borneo to study ants. She conducts research in Robin Verble's Fire Ecology Lab.

The Borneo ant project, which is supported by a grant from the National Science Foundation, examines ant biodiversity in the Crocker Range in Sabah, Malaysia. Germeroth worked along with faculty and undergraduate researchers from other universities. Related projects include studies of bat, fungal and small mammal populations in the region.

This year the researchers, who were stationed at Inobong Substation, sampled bats and leaf litter ants.

Germeroth presented her research this past fall at the St. Louis Ecology Evolution and Conservation conference at Lewis and Clark Community College.

"Talking about science is one of my favorite things," Germeroth says.



Photo courtesy of Vanessa Mahan

STINGRAY BAY AND BEYOND

Vanessa Mahan displays a baby stingray in the touch tank at the Kansas City Zoo.

Senior **Vanessa Mahan** thought she wanted to be a medical doctor. But after a semester's coursework in cell biology, she decided the profession was not for her. Further exploring her interests through a biodiversity course, Mahan found her passion — merging medicine with her love of animals.

And not just any animals. Mahan focuses on threatened or endangered species like whales, sharks, seals and turtles. Last summer, she interned as an education instructor at the Kansas City Zoo's Stingray Bay, a 20,000-gallon "touch tank" designed to let visitors easily touch two species of stingrays and the smallest species of sharks. The internship gave her just the marine conservation experience she was looking for.

The internship at Stingray Bay was one of four summer job offers Mahan received.

“We wouldn't have been able to do what we've done without being at S&T. There's nothing like it anywhere else.”

Her scientific job qualifications were bolstered by the award-winning "Bionic Bowel" innovation project she and research partner **Catherine Pollman**, BSci '19, created as part of S&T's BioDesign and Innovation course taught by **Julie Semon**. Their invention uses bioactive glass to potentially change the pH level in the body of a Crohn's disease sufferer. By including the biomaterial in an oral medicine that dissolves and prevents scar tissue, the two realized they could implant the glass in the human body via a pill to repair the damaged area.

In April, they pitched the project in the University of Missouri System's Entrepreneur Quest Student Accelerator competition and won \$5,000. In May, they crossed the next step by winning a \$10,000 Blue Cross Blue Shield Healthcare Innovation Prize at the University of Missouri-Kansas City. With their winnings, Mahan and Pollman are starting animal trials for their proof-of-concept, and then will begin the patent application process.

"We wouldn't have been able to do what we've done without being at S&T," says Mahan. "There's nothing like it anywhere else. We definitely get a lot of practical training that other schools don't offer."



FACULTY

BITS

- » **Melanie Mormile** was named associate dean for research and external relations in the College of Arts, Sciences, and Business (CASB) after serving a year as interim associate dean.
- » **David Duvernell** was interviewed by St. Louis Public Radio in June in a feature on alligator gar reintroduction efforts in southeast Missouri by the Missouri Department of Conservation (MDC). Duvernell is studying the genetics of the species in new populations that MDC manages.
- » **Robin Verble** and **David Duvernell** were interviewed by St. Louis Public Radio in October in a feature on the importance of Fort Leonard Wood U.S. Army training post as a nature reserve and research area. Duvernell studies fish populations around the post, some of which are rare species, and Verble is looking at an endangered moth that may be present on the post.
- » **Chen Hou** co-authored "Toward a metabolic theory of life history," published in the journal *PNAS* (the Proceedings of the National Academy of Sciences) in December 2019. In the Fall semester, Hou hosted visiting professor Xiaolong Tang from Lanzhou University. The two worked on the temperature-size rule for ectothermic species. Hou also presented a TEDx talk at S&T in April on "collectivism versus individualism" exploring similarities between solitary animals, ant colonies and human cities.
- » **Yue-Wern Huang** was named a Faculty Fellow with the vice chancellor of research and dean of graduate studies, where he coordinated a delegation that visited universities in China and Taiwan to promote S&T's international research programs.
- » **David Westenberg** organized a display of the Smithsonian's "Outbreak" exhibit at the Rolla Centre in February commemorating the 100th anniversary of the 1918 flu pandemic. He also gave a campus presentation on the subject for a lecture series on the centennial anniversary of World War I. Westenberg was interviewed by *MEL* magazine for a series of articles focused on the spread of germs and infectious disease. In May he received the Great Lakes Valley Conference Faculty Mentor Award.



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150 YEARS

LET'S CELEBRATE MISSOURI S&T'S STORY

From our founding in 1870 as a pioneering technical school to our 21st century standing as a national technological university, Missouri S&T's story spans a century and a half of remarkable change.

GET SET TO CELEBRATE 150 YEARS OF MINER PRIDE!

A year of special events kicks off with MinerFest 150 in October 2020 and concludes with the Alumni of Influence celebration in November 2021. In between, mark your calendar in green for our biggest best ever festival — or “Bestival” — over St. Pat's Weekend in March 2021.

Watch for the publication launch in October 2020 of a commemorative book by Curators' Distinguished Teaching Professor emeritus Larry Gragg. His history of the university spans 150 years of Miner milestones, memories and mischief.

Visit 150.mst.edu for more information.