

# GGPE

Geosciences and Geological and Petroleum Engineering | Missouri S&T | 2018

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## DR. OBRIST: FIELD CAMP CHEF

Jonathan Obrist Farner, assistant professor of geology and geophysics, took field camp cooking to a whole new level this past summer by creating cooking videos. Search #fieldcampcookingshow on YouTube to get in on the fun. Pictured here is Rock Hammer Chicken.



# Dear alumni, colleagues and friends



The geosciences and geological and petroleum engineering department is doing great, and my first year as the department chair has flown by. One thing I've observed firsthand over the last year is that we have some really talented faculty and students. As detailed in this newsletter, many of our faculty and students won prestigious awards and placed highly in competitions this year.

We are doing well, but we are also capable of doing even more. Our department is truly unique. Only five other universities in the nation host all three of the programs that comprise our single department. That puts us in a unique position to leverage the strengths of our programs to provide students with educational and development opportunities that they can't get anywhere else.

As we move forward, we will work hard to establish this special brand while at the same time strengthening our

individual programs. A great first step in this direction has been the implementation of a new GGPE website, [ggpe.mst.edu](http://ggpe.mst.edu), and our new presence on social media, [facebook.com/MissouriSandTGGPE](https://facebook.com/MissouriSandTGGPE). Be sure to also check out our new departmental video on the front page of our website.

This year was fun because I got to experience my first St. Pats on campus since I attended as an undergrad. It was particularly cool since one of our own students was this year's St. Pat. **Katelyn Jones** was also the first female to hold this position. I also enjoyed popping in for a guest appearance at our geology and geophysics field camp in Cedar City, Utah.

This year also marked the start of what I hope is a new annual tradition, the GGPE student research colloquium. I hope you enjoy this year's newsletter and thanks to everyone for supporting our programs and department.

**David Borrok, Ph.D.**  
Gulf Oil Foundation Professor and chair,  
geosciences and geological and  
petroleum engineering



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## THREE GRADUATES JOIN MINES AND METALLURGY ACADEMY

Three GGPE graduates are among nine new inductees into the Missouri S&T Academy of Mines and Metallurgy.

**Bonnie Carson**, GGph'77, was the second woman hired as a senior field engineer for Schlumberger Well Services. She now owns Utah-based Smiling Lake Consulting.

**David Borrok**, GGph'95, spent five years working in industry before earning a Ph.D. in geochemistry from the University of Notre Dame in 2005. He returned to S&T in 2017 to become the Gulf Oil Foundation Professor and chair of geosciences and geological and petroleum engineering.

**Eric Burkhalter**, GGph'96, began his career as a field engineer for Halliburton Energy Services. He's currently vice president of drilling and completions for Saddle Operating LLC.

In addition, three students from our department received scholarship awards from the academy: **Taylor Steffen**, a senior in geological engineering from Smithville, Mo.; **Alyssa Snider**, a senior in petroleum engineering from St. Peters, Mo.; and **Osvaldino Contreiras**, a senior in geology and geophysics from Luanda, Angola.



## NEW FACULTY PROFILE: MEET RYAN SMITH

This fall, we welcome **Ryan Smith**, who joins the department as a new assistant professor of geological engineering. Smith is teaching courses in geographic information systems (GIS) and remote sensing.

"I'm excited to join the GGPE department and am eager to get to know the students and faculty and to contribute to the exciting research going on at Missouri S&T," Smith says.

He studies how we can use satellite data, as well as airborne and ground-based geophysical data, to better understand groundwater systems.

"I use both physics-based and machine-learning models to improve our understanding of the relationships between the observed data and groundwater," he says.

Smith lived in Iceland during a break in his undergraduate education.

"Living in Iceland sparked an interest in studying the earth, which led to my pursuing a career in the geosciences."

Smith recently completed a Ph.D. in geophysics at Stanford University. He also holds a bachelor's degree in geology from Brigham Young University.

When he's not teaching or conducting research, he enjoys family time and the outdoors.

"I spend most of my 'free time' with my two young children, but I also enjoy road biking and team sports," Smith says. "If you're interested in or curious about what I do, feel free to stop by my office sometime to chat!"

# ALUMNI NEWS

**Adam "Rip" Stringer**, PetE'86, of Houston, a retired Schlumberger Oilfield Services executive, earned an Award of Professional Distinction during December 2017 commencement ceremonies at Missouri S&T.

**Michael Bouchard**, GGph'14, was featured in the Fall/Winter issue of *Missouri S&T Magazine* for his past work with the Mars Rover Design Team and his current research as a Ph.D. student at Washington University in St. Louis.

**Nathan Rohrbaugh**, GeoE'15, MS GeoE'15, received the 2016 State Ability Works Award from the West Virginia Division of Rehabilitation Services for exemplary vocational rehabilitation success.

**Penny Bloedel**, MS GGph'06, was named deputy commander of the U.S. Army Corps of Engineers-Alaska District.

**John Borthwick**, PetE'86, received the Frank H. Mackaman Alumni Volunteer Service Award from the Miner Alumni Association.

In her spare time, **Andrea DuMont**, GeoE'11, writes [thewatermarkblog.com](http://thewatermarkblog.com), to encourage and empower young women and girls who might be interested in the field of engineering. Demystifying engineering and showing how it benefits the world is her mission. "I've been working lately to get the message out that, 'Hey, this is what female engineers do,'" she says. "It's not just math in cubicles all day long."

**Theodore Warren**, PetE'68, returned to campus in May for the Golden Alumni Reunion.



# SPACE RACE ALUM INSPIRES MAY GRADUATES

Geologist **Farouk El-Baz**, MS GGph'61, PhD GGph'64, who played a leading role during NASA's *Apollo* space program in the 1960s, returned to campus as spring commencement speaker with some words of wisdom for new grads.

"The education you received at S&T has prepared you for whatever you encounter in your future professional life," El-Baz told the May graduates. "I can assure you that, from my experiences, the S&T education is second to none."

El-Baz, director of the Center for Remote Sensing and research professor at Boston University, compared his S&T years with graduate school at Massachusetts Institute of Technology.

At MIT, he took a full course load, dated his future wife, was heavily involved in student organizations and hosted a weekly Arabic radio variety show — and still earned mostly A's, something that El-Baz said rarely happened at S&T.

"Be conscious of the great education you received here," he said. "You should realize that the degree you acquire today basically means only one thing, and that is: until today you required someone to take you by the hand and teach you. But from this day forward, you can begin to teach yourself."

In 1967, El-Baz was appointed by NASA as secretary of lunar landing site selection and chairman of astronaut training in orbital observations and photography. His role was chronicled by Tom Hanks in the TV series "From the Earth to the Moon," in a segment titled: "The Brain of Farouk El-Baz." In addition, the name El-Baz was immortalized on a shuttlecraft in the TV series "Star Trek: The Next Generation."

After the *Apollo* program ended, he joined the Smithsonian Institution to establish and direct the Center for Earth and Planetary Studies, and to plan exhibits of the National Air and Space Museum. He's been at Boston University since 1986.

During commencement, El-Baz was awarded Missouri S&T's Chancellor Medal. This fall, he will receive the 2018 Inamori Ethics Prize from the Inamori International Center for Ethics and Excellence at Case Western Reserve University.

## GAO HONORED WITH GOVERNOR'S AWARD FOR TEACHING EXCELLENCE

**Stephen Gao**, professor of geology and geophysics, won the 2018 Governor's Award for Excellence in Teaching. The award is presented annually to one faculty member at each institution of higher education in Missouri.

Gao has been an S&T faculty member for 13 years and has received eight outstanding teaching awards over the past 10 academic years as well as faculty awards for excellence, teaching, research and service for the past five years.

The seismologist was elected a fellow of the Geological Society of America in 2012 as an internationally recognized geophysicist and an excellent teacher and mentor.

Gao has published over 80 peer-reviewed papers in journals including *Nature* and *Science*, many of which involved students as co-authors, and participated in more than 30 externally funded research projects to support field work in Africa, Asia and throughout North America.

"Dr. Gao is an excellent teacher and student mentor and is a great choice for this award," says **David Borrok**, Gulf Oil Foundation Professor and chair of geosciences and geological and petroleum engineering. "Geophysics can be technically challenging. It takes a lot of effort and devotion to teach this content in a way that is accessible and benefits so many of our students."

INDUSTRY COLLABORATION ADVANCES

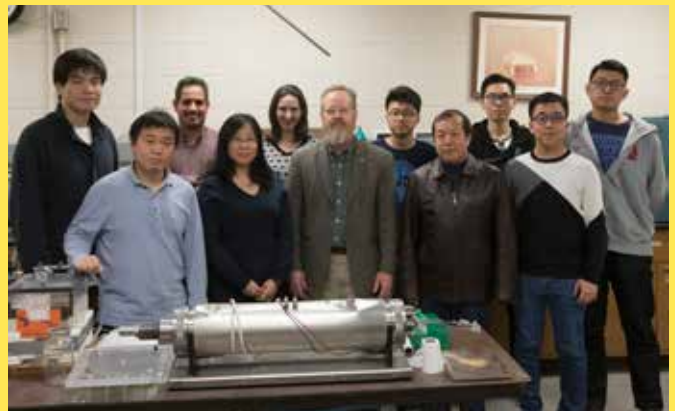
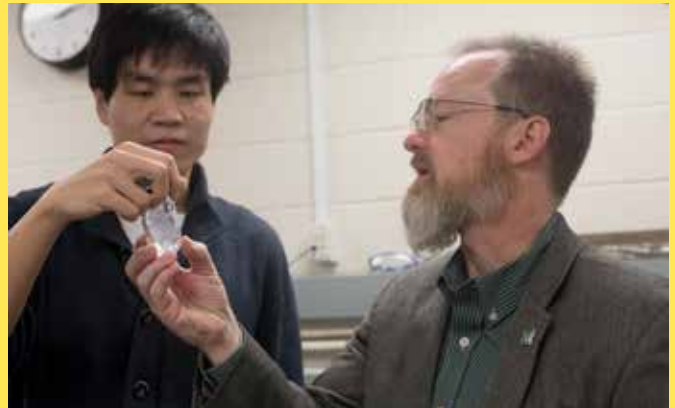
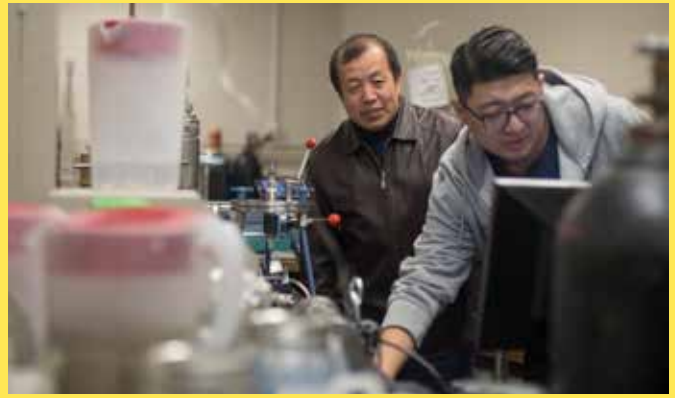
# PARTICLE GEL PETROLEUM RESEARCH



Members of a Missouri S&T-led research partnership working to refine a particle gel that could significantly reduce the amount of wasted water generated in oil production have renewed their efforts for a second, three-year term.

The quest led by **Baojun Bai** and other researchers for a superior pre-formed gel that can be injected into oil reservoirs has the financial support of industry heavyweights such as ConocoPhillips, Occidental Petroleum and Daqing Wantong Chemical (DQWT) in China. Each is a member of the university's Particle Gel Conformance Control Industrial Consortium.

DQWT has purchased the patent license and has brought the commercialized products to market in a country where the use of pre-formed particle gels is much more pervasive. ConocoPhillips has used the product in three wells to solve conduit problems in its Alaska reservoir. Further pilot tests are planned by each of the three industry partners in the coming year.



When it comes to describing the super-absorbent polymer, Bai reverts to an analogy that resonates with anyone who's ever wrangled a fussy newborn.

"It's just like a diaper," says the Lester Birbeck endowed professor of geosciences and geological and petroleum engineering at Missouri S&T, describing a gel he has been cultivating since his time as a young engineer working for state-owned PetroChina in his native country.

As Bai explains, water is typically used to flood an oil well formation to aid in oil recovery. That method often leaves behind as much as two-thirds of a formation's oil. For crude oil wells nearing the end of their productive lives, water can account for up to 98 percent of the material brought to the surface.

Put another way, for every barrel of oil produced worldwide, three barrels of water

are generated. In the U.S., the water-to-oil ratio is more than 9:1, Bai says.

At Missouri S&T, Bai's collaborators include **Thomas Schuman**, professor of chemistry; **Lizhu Wang**, assistant research professor of petroleum engineering; **Mingzhen Wei**, associate professor of petroleum engineering; and graduate students **Jingyang Pu**, **Long Yifu**, **Xindi Sun**, **Adriane Melnyczuk**, **Ze Wang** and **Ali Althuraishawy**.

Bai also received a U.S. Department of Energy grant to explore the use of particle gels to better store carbon dioxide (CO<sub>2</sub>) in oil formations. Using CO<sub>2</sub> for enhanced oil recovery is more efficient because CO<sub>2</sub> can dissolve into oil, reducing viscosity. Storing the gas underground is environmentally friendly as well, keeping it out of the atmosphere. ▣

(Top) Baojun Bai (left) and Haifeng Ding.

(Middle) Tom Schuman and Jingyang Pu examine a sample of particle gel.

(Bottom) Front row: Yifu Long, Xindi Sun, Thomas Schuman, Baojun Bai and ZeWang. Back row: Jingyang Pu, Ali Althuraishawy, Adrienne Melnyczuk, Jiaming Geng, Bowen Yu and Haifeng Ding.

## S&T JOINS \$9.7M OIL, GAS EXPLORATION PROJECT IN SOUTHEASTERN U.S.

A Missouri S&T geologist is part of a four-campus research team that will receive nearly \$10 million from the U.S. Department of Energy and several energy companies in a bid to boost unconventional oil and gas recovery in the interior southeastern United States.

The project is part of a \$30 million investment by the federal agency's Office of Fossil Energy to boost production in reservoirs with less than 50,000 barrels per day of current production.

The team studying the 8-million-acre Tuscaloosa Marine Shale in Louisiana and Mississippi includes **David Borrok**, Gulf Oil Foundation Professor and chair of geosciences and geological and petroleum engineering.

Borrok previously served on the faculty of University of Louisiana at Lafayette, the lead grant recipient and future home of the Tuscaloosa Marine Shale Laboratory.

The research group also includes engineers, geologists and geophysicists from the University of Oklahoma; the University of Southern Mississippi; and Los Alamos National Laboratory.

The Tuscaloosa shale contains an estimated 7 billion barrels of light, sweet crude oil, though its current production rate from roughly 100 wells is just 3,000 barrels per day. Efforts to boost extraction have been stymied by large amounts of swelling clay in the shale, which makes it sensitive to water, Borrok explains.



## FIRST-EVER STUDENT RESEARCH COLLOQUIUM

This year, Friday the 13th wasn't bad luck, it was the start of something really big — the first GGPE student research colloquium. We plan to make the April event an annual one.

The research colloquium was established to give our students an opportunity for networking and professional development and to attract our alumni back to campus to meet with students and faculty.

We had 70 students participate in the daylong event, which included two separate poster sessions and an industry panel to address questions about careers. We had 14 alumni and friends join us for the event, some coming into town from Colorado, Texas and even Pennsylvania. The alumni helped judge posters and participated in the industry panel.

The event ended with a reception at Hasselmann Alumni House. The student research was extremely impressive. The winners of this year's competition and their projects are highlighted below:

**Top undergraduate student: Dylan Crain** — Numerical Simulation of Micro-Annuli Attributes Imposed by Stress Regime and Elastic Contrast

**Top master's student: Mohamed Ahdaya** — The Development of New Formulation of Geopolymer for Wellbore Integrity Improvements

**Ph.D. first place: Abo Taleb Al-Hameedi** — A Comprehensive Analysis of Lost Circulation Materials and Treatments with Applications in Basra's Oil Fields, Iraq: Guidelines and Recommendations

**Ph.D. second place: Ethar H.K. Al-Kamil** — Real-Time Collapse Volume Log Estimation Using Image Processing Approach

**Ph.D. third place (tie): Husam H. Alkinani** — Limiting Drilling Parameters to Control Mud Losses in the Hartha Formation, Rumaila Field, Iraq

**Ph.D. third place (tie): Dheiaa Alfarage** — Mechanistic Study for CO<sub>2</sub>-EOR in Unconventional Liquids Rich Reservoirs

**Ph.D. third place (tie): Marissa K. Spencer** — Dating an Impact Structure Using Microscopic Proxies: Palynology and Geochronology of Decaturville

We will be looking for alumni to come back to campus and participate in next year's event. Right now we are planning for late March or early April, 2019.





## ROGERS SHARES 'RULES OF GEOENGINEERING' IN CANADA

**J. David Rogers** continues to share his expertise with both technical audiences and the broader public, far and wide.

In May, the professor and Karl F. Hasselmann Missouri Endowed Chair in geological and petroleum engineering spoke at the annual meeting of the Canadian Geotechnical Society's southern Ontario section outside Toronto.

During his lecture, "Rogers' Rules of Geoengineering," he used case studies to explore a list of 16 common-sense geoengineering principles (No. 1: "Geology controls everything." No. 2: "There are no ruler-straight lines in geology.")

Rogers remains a sought-after media expert, particularly among news outlets in his home state of California. In the past year, he was quoted by both KQED, a San Francisco PBS station, and the *Sacramento Bee* on the near-failure of northern California's Oroville Dam in 2017.

He's also popular on YouTube, where a series of video lectures from his introductory engineering and geotechnics course has garnered sizable viewership. The first episode alone has been viewed more than 180,000 times.

"I hear from viewers almost every day of the week," he says. "Posting these lectures has had an enormous impact on my exposure to the geotechnical engineering and engineering geology professions."



## LIU NAMED GSA FELLOW

**Kelly Liu**, professor of geosciences and geological and petroleum engineering, has been elected as a Fellow of the Geological Society of America (GSA).

Liu was honored for leadership in using seismic data to determine crust and mantle structure, especially using shear wave splitting and seismic anisotropy to determine the nature of tectonic environments.

To become a fellow, GSA members are nominated by existing fellows in recognition of their distinguished contributions to the geosciences. Examples of contributions include publications, applied research, teaching, administering geological programs, contributing to the public awareness of geology, leading of professional organizations, and taking on editorial, bibliographic and library responsibilities.

Liu has been an S&T faculty member since 2006. She earned master of science and doctoral degrees in geophysics and space physics from the University of California, Los Angeles and a bachelor's degree in exploration geophysics from the China University of Petroleum.



## OBOH-IKUENOBE NAMED AAAS FELLOW

**Francisca Oboh-Ikuenobe**, professor of geosciences and geological and petroleum engineering, was named a Fellow of the American Association for the Advancement of Science (AAAS), the world's largest general scientific society.

The society recognized Oboh-Ikuenobe for her outstanding efforts in educating the next generation of Earth scientists and for her

contributions to the advancement of palynology. Palynology is the study of spores, pollen and other organic microfossils in sediments and sedimentary rocks.

Oboh-Ikuenobe joined Missouri S&T in 1991 and has served as program head of geology and geophysics and interim chair of the geosciences and geological and petroleum engineering department. Her research also focuses on sedimentology and paleontology as well as palynology. Her research has taken her to Nigeria, Ghana, Namibia, Australia and Egypt, as well as the Grand Canyon and other spots in the U.S.

Oboh-Ikuenobe was named Missouri S&T Woman of the Year in 2004 in recognition of her student mentoring efforts as well as her role in promoting science education to girls and young women in the local community and at university summer camps.

She was also recently featured in the popular podcast *People Behind the Science*, where Oboh-Ikuenobe discussed her childhood, career and research interests. You can listen to the interview at [peoplebehindthescience.com/dr-francisca-ikuenobe/](http://peoplebehindthescience.com/dr-francisca-ikuenobe/)

# “IT’S ABOUT TIME!”

GEOLOGY,  
GEOPHYSICS  
MAJOR MAKES  
HISTORY AS FIRST  
FEMALE ST. PAT



The annual St. Pat’s celebration at Missouri S&T has been a campus fixture for more than a century. This past year — for the first time in 110 years of Best Ever celebrations — St. Pat was a woman. And the first female patron saint of engineers hails from our department.

**Katelyn Jones**, a senior in geology and geophysics from Sugar Creek, Mo., says she was in disbelief upon being named to the prestigious position by the student-run organization after serving as an executive board member.

“When they called my name, I was in complete and utter shock,” Jones told a Rolla newspaper. “I didn’t know how to react.”

Her active involvement comes after initially not knowing what to make of the more typical St. Pat’s profile.

“I was actually kind of scared,” she says of her first exposure to the (mainly) men who served as the group’s public faces.

“Big scary leather jackets. Big guys. No women,” she recalls.

“Women were definitely not treated equally by many of their peers, professors and fellow board reps just because this organization was always so male predominant,” Jones adds.

Jones says she sought a leadership role with St. Pat’s after being told by an alumnus that “there’s no way I was going to make it.”

“When people tell me I can’t do something, I go ahead and do it anyway,” she says.

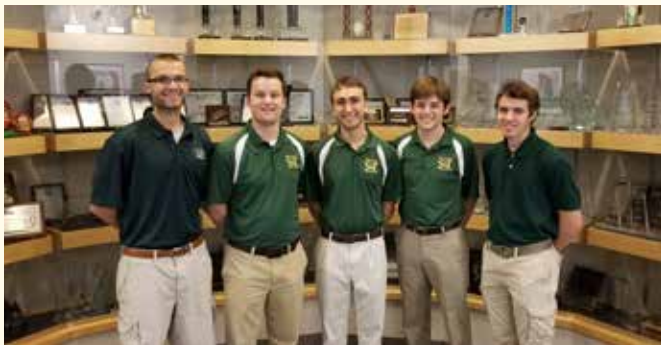
“I feel incredibly honored to have been selected as the first female St. Pat,” Jones told the paper. “Throughout the history of the St. Pat’s Board, we have only ever had 20 initiated female board reps. I am proud to be able to represent every female board rep who put in just as many hours of work as I did, tried their best and were under-represented.”



## PETROBOWL TEAM MOVES ON TO ANNUAL COMPETITION

Our PetroBowl team placed fifth in the regional Society of Petroleum Engineers (SPE) PetroBowl competition, and qualified for the International PetroBowl competition at SPE's annual technical conference and exhibition in Fort Worth, Texas.

The region includes all petroleum engineering programs in North America. The PetroBowl competition pits SPE student chapter teams against each other in a series of rapid-fire rounds, where teams answered technical and nontechnical industry-related questions on petroleum and geology topics.



## DRILLBOTICS UPDATE

Now in its second year, Drillbotics brings together students from petroleum engineering, geology and geophysics, mechanical engineering, and computer science to construct an automated drilling rig for the annual Society of Petroleum Engineers' Drilling Systems Automation Technical Section competition.

This year the team was invited to compete in the second phase of the competition.

"The team utilizes an array of automation, sensor and bit technology to design a rig that drills into large samples of rock," says team member **Aaron Roth**, a senior in mechanical engineering who is pursuing a minor in petroleum engineering. "The team emphasizes innovation as well as creativity to solve known drilling issues, highlight new ones, and introduce automation and other forms of technology into the field of drilling."

"Our team didn't place as a top finalist due to sensor issues, however it was a great learning experience for the team, and we hope to compete again and place next year."



## PETROLEUM GRADUATES ADDRESS MAY COMMENCEMENT CEREMONY

A pair of petroleum engineering students were among the six graduating students chosen to speak at S&T's May commencement ceremonies.

**Alexander Brooks**, PetE'18 (top), of Belleville, Ill., urged his fellow graduates to be "bold and courageous," describing how he drew strength from his S&T classmates after experiencing a personal setback while studying abroad in Malaysia.

"The pressure from losing my best friend caused me pain difficult to describe," Brooks said, referring to a break-up with his girlfriend of four years. "However, the S&T students who accompanied me ... helped relieve the pressure of a failure I had never known."

**Rahul Menon**, MS PetE'18 (bottom), from India and Dubai, described being warmly welcomed as an international student in an unfamiliar country, state and city.

"My fears were quickly put to rest," he said. "It was easy to fit in."

Brooks said before the ceremony that he plans to work outside of the United States after graduation. As a student, he was a member of the National Society of Black Engineers and the Society of Petroleum Engineers.

Menon, who has a bachelor's degree in mechanical engineering, was treasurer for the India Association and a member of Pi Epsilon Tau and the Society of Petroleum Engineers.



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# MAP THE FUTURE FOR A MINER

For many students in our department, field camp is the ultimate hike into the real world. It's the place where lectures and labs converge on the rock of experience.

Your annual support of the geosciences and geological and petroleum engineering department makes a difference in many ways. And making field camp possible is one. Whether it's putting gas in vans, replacing worn-out equipment or feeding hungry Miners after a long day in the field, your support matters.

So when you get a phone call from a student eager to share what's happening on campus and in our department, we hope you'll take time to connect and catch up. We also hope you'll help us map the future for tomorrow's leaders by giving back.

[give.mst.edu](http://give.mst.edu)

