Department of

# PETROLEUM ENGINEERING

## NEWSLETTER

COLORADO SCHOOL OF MINES
EARTH • ENERGY • ENVIRONMENT

September 2019

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## PE Department Leadership

Interim Department Head — Jennifer Miskimins
Program Manager — Kayla Boster

## PE Staff

Program Assistant — Rachel McDonald
UG Program Manager — Terri Snyder
Research Administrator — Denise Winn-Bower
Lab Coordinator — Joe Chen

## Faculty

Linda Battalora
Elio Dean
Mansur Ermila
Bill Eustes
Yilin Fan
Hossein Kazemi
Mark Miller
Erdal Ozkan
Manika Prasad
Jorge Sampaio
Azra Tutuncu
Yu-Shu Wu
Xiaolong Yin
Luis Zerpa

## Research Faculty

Somayeh Karimi
Tadesse Weldu Teklu
Phil Winterfeld

## Adjunct Faculty

Jim Crompton
Will Fleckenstein
Trent Green

# MESSAGE FROM INTERIM DEPT. HEAD

Greeting from the Interim Department Head or — as most seem to want to call me — the iDH. This August, Dr. Erdal Ozkan stepped down as Department Head, and I was asked to step into the department's leadership role for the time-being. These are big shoes to fill, and between Dr. Ozkan's resignation and Dr. Ramona Graves' retirement (see page 14), it is a time of transition for the department. As the old saying goes, the only constant is change, however, perhaps more now than ever before, we need your support and patronage as alumni to help navigate the waters ahead of us.

Fortunately, as with most change, there are opportunities that come along with such. I am pleased to report that the PE department remains strong, with employment rates at or above 90%, and after three years of on-campus externships, we did not need to run this program this summer due to students finding other opportunities. We are also seeing more recruiters either return or start at Mines, most driven by alumni efforts, and we can't thank you enough for providing these opportunities to our student body.

You will note that the newsletter format has changed a little bit this year. We hope that it is more "user-friendly" and that you enjoy it and the updates that it provides. As always, thank you for your continuing support! And if you ever have questions about the department, the school, or just want to reach out, we are only a phone call or email away!

Sincerely,

Jennifer Miskimins

Interim Department Head

## Recognition of Service

After four years at the helm of the PE Department, Dr. Erdal Ozkan stepped down as Department Head (DH) this past summer to return to a full-time faculty position. Dr. Ozkan provided strong leadership for the department through a very challenging time with the downturn in prices and the associated impacts it had on the department's enrollment and industry support. Throughout his tenure as DH, Dr. Ozkan implemented numerous programs to help both the students and the faculty weather the storm.

He implemented a summer externship program that provided students with an opportunity to work on industry projects and strengthen their resumes. He also started a short course series for students to expose them to topics and software packages that might not be covered under the current curriculum. In 2018, Dr. Ozkan reconstituted the Program's Advisory Board, a group of industry and academic professionals that help to guide and update the department's curriculum and enhance other aspects of the department's culture.

One of the largest contributions that Dr. Ozkan made to the department was establishing programs that support the petroleum engineering programs at Nazarbayev and Satbayev Universities in Kazakhstan. A win-win exchange situation for all those involved. When you see Dr. Ozkan next, please thank him for his service! Our department is stronger because of his dedication and efforts!!

# DEPARTMENT STATISTICS

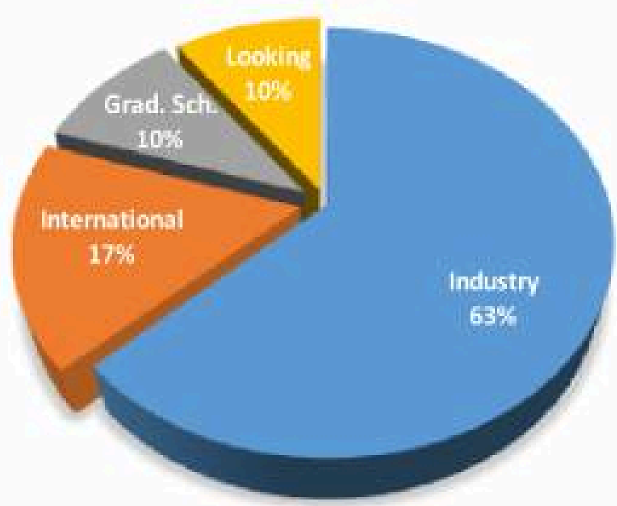
## Students

### PE Student Enrollment

| | 2015-16 | 2016-17 | 2017-18 | 2018-19 | 2019-20 (predicted) |
|---|---|---|---|---|---|
| **Undergraduate Program** | | | | | |
| Freshman | 134 | 69 | 43 | 73 | 40 |
| Sophmores | 125 | 101 | 67 | 54 | 78 |
| Juniors | 172 | 102 | 89 | 73 | 63 |
| Seniors | 393 | 367 | 261 | 178 | 99 |
| **Total Undergraduates** | **824** | **639** | **460** | **378** | **280** |
| Spring Graduating Class | 167 | 166 | 132 | 90 | 105 |
| **Graduate Program** | | | | | |
| ME | 14 | 17 | 21 | 16 | 11 |
| MS | 45 | 35 | 36 | 31 | 41 |
| PhD | 47 | 48 | 51 | 49 | 50 |
| **Total Graduate Students** | **106** | **100** | **108** | **96** | **102** |
| Spring Graduting Class | 37 | 26 | 36 | 12 | 15 |

### BS Graduation Placement

AY 2017-18



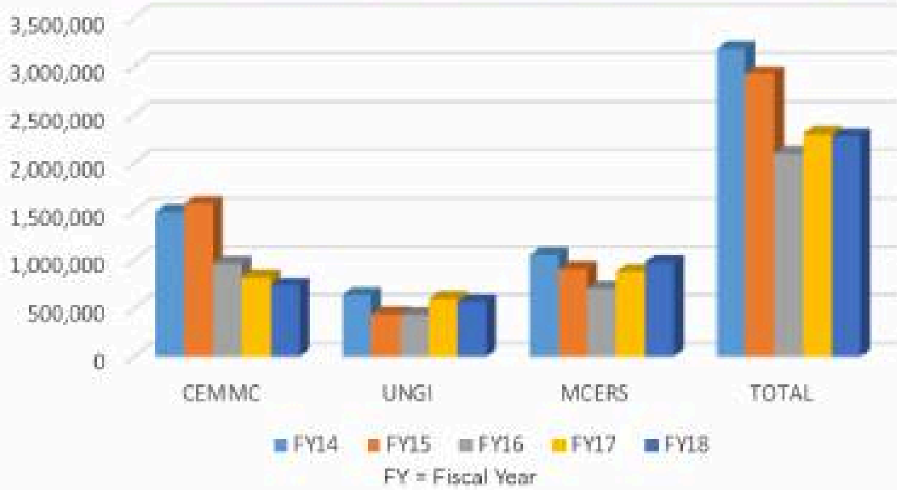

### GRADUATION OUTCOMES

AY 2017-18

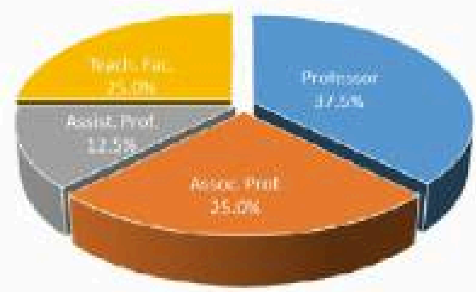
| | Ave. Salary | Placement |
|---|---|---|
| UG | $81,291 | 90% |
| MS/ME | $85,400 | 93% |
| PhD | not reported | 100% |

## Faculty & Research

### Research Centers Expenditures




### PE Faculty Breakdown




# PROGRAM ADVISORY BOARD

## Alumni Survey

The Program Advisory Board (PAB) for the Petroleum Engineering (PE) Department at Mines sent a survey to 2450 Mines PE alumni for whom the department has contact information. About 18% responded, with representation from each decade back to the 1950s. A presentation summarizing the results of the survey was reviewed by the PAB at their April 2019 meeting. The presentation is posted on the department website here: **www.petroleum.mines.edu/advisoryboard**

The survey subcommittee asked questions to collect demographical information and decided to analyze the survey information in three groups, by years of Fulltime Experience: 0-4 years (139 responses), 5-9 years (109 responses) and > 10 years (193 responses). Additional questions covered career preparation and how well their education met program objectives within 3 to 5 years of graduation. The survey covered preparation for lifelong learning to learn new skills and preparation for career change. The survey requested feedback on which aspect of PE education at Mines provided the best preparation for the alumni's career. The survey also asked what changes, if any, should be made to the PE education at Mines. The survey asked for input as to whether select topics should be given added emphasis in the PE curriculum at Mines in the future, as well as feedback on the quality of Mines professors and their respective industry experience. The PAB plans to use the results of the survey to guide their future advice for the PE department, and they will issue a similar survey to alumni annually.

The survey subcommittee also conducted a second survey of employers, but did not get sufficient response from employers to come up with meaningful understanding of what employers think of CSM graduates. We need to do a better job of identifying key engineering hiring manager contacts such as a VP of Engineering at employers to get a better response. Please provide the engineering hiring manager contact information for your employer to Kayla Boster at kboster@mines.edu so she can send them the survey.

### ALUMNI SURVEY

We want to conitune to strengthen the department, and this requires a few minutes of our Alumni's time. Please follow the below link to a short survey. Your participation is greatly appreciated!

**https://www.surveymonkey.com/r/CQQ8M82**

# FACULTY NEWS

## In the Classroom

Several of our faculty helped develop course content for Nazarbayev University. These included

- Advanced Reservoir Engineering - **Dr. Zerpa**
- Advanced Production Engineering - **Dr. Fan**
- Advanced Petroleum Economics and Reservoir Management - **Elio Dean**
- Advanced Well Stimulation Methods - **Dr. Miskimins**
- Advanced Enhanced Oil Recovery - **Dr. Wu**

**Dr. Ermila** continues to enjoy his time in the classroom. His 14 years of field experience continues to aid him in tackling all kind of petroleum engineering problems in the classroom and lab. He enjoys working with students of varying expertise levels, from freshman to seniors and grad students.

**Dr. Sampaio** is thrilled with the new digital rheometers for the PEGN311 Mud Lab; they brought several advantages for the students, including more reliable results. The students were introduced to rheometer programing and automatic experiment runs (saving time during the lab sessions). Now different teams obtain similar results, which reduces frustration compared to using inadequate instruments. A new video clip was shot to help to learn how to use and how to program the digital instrument and the lab manual was also updated to include the details of the rheometer. However, students are required to use the old instruments in lab session 1 to give them hands-on experience with the mechanical rheometers which still are the standard in most rigs.

**Dr. Miskimins** has now officially completed 54 cumulative weeks (+1 year) in Massadona!

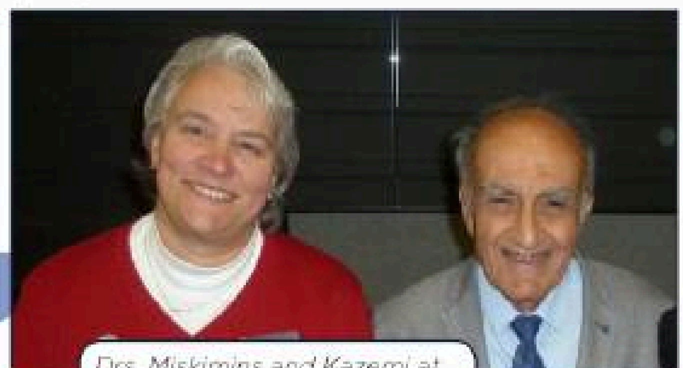
## Awards and Honors

We were well represented among the technical awards given out by the SPE Rocky Mountain Region. **Dr. Battalora** (Regional Sustainability and Stewardship in the Oil and Gas Industry Award), **Dr. Fleckenstein** (Regional Completions Optimization and Technology Award) and **Dr. Eustes** (Regional Drilling Engineering Award) all received awards.

**Dr. Battalora** was the recipient of the SPE Distinguished Member Award and was recognized during the award ceremony at ATCE 2018.


*Dr. Battalora received her Distinguished Member Award from SPE President Darcy Spady at ATCE 2018.*

Each semester the PE students nominate faculty for the Enger Teaching award and we announce the winner at our department graduation reception. This year **Dr. Miskimins** received it in the fall and **Dr. Kazemi** in the spring.



*Drs. Miskimins and Kazemi at the fall graduation reception.*

**Dr. Battalora** was selected as a SPE Distinguished Lecturer for the 2019-2020 Program and was elected to be a Faculty Trustee for the Colorado School of Mines Board of Trustees.

**Dr. Prasad** was named Distinguished Instructor Short Course (DISC) on Rock Physics by the Society of Exploration Geophysicists (SEG) for 2019. She was also elected as 2nd Vice President of SEG 2019

# Papers, Presentations & Conferences

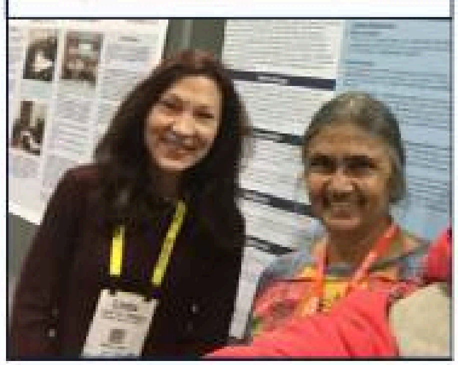
**Dr. Sampaio** was the Technical Organizer for ASME-OMAE 2018 in Madrid. The Petroleum Engineering Section reached the 3rd largest session of the 11 sessions of the conference. He also chaired the OMAE-2019 Drilling Mechanics Topic in Glasgow, Scotland. Graduate students are encouraged to submit papers for the next conference (OMAE-2020) in Fort Lauderdale, FL.

**Dr. Tutuncu** traveled to Pretoria, South Africa in March 2019 as an invitee of Academy of Science of South Africa (ASSAf) to speak at an unconventional meeting and on their unconventional shale gas exploration and development review to provide advice. Then in April she was the keynote speaker and an expert advisor representing United States at the CCOP and Korea Institute of Geoscience and Mineral Resources (KIGAM) South and East Asia Unconventional Oil and Gas Resources Meeting held in Hanoi, Vietnam.

**Dr. Winterfeld** presented "Simulation of coupled thermal-hydrological-mechanical phenomena in heterogeneous and radial systems" at TOUGH Symposium 2018. The symposium is about applications and extensions of TOUGH2, which is a fluid and heat flow simulator developed at Berkeley Lab. He also presented "Reservoir Simulation Code for Modeling Chemical Tracers and Embedded Natural Fractures at EGS Collab" at Stanford Geothermal Workshop in February 2019. This reasearch is part of the EGS-Collab SIGMA-V project, which is a multi-lab and university collaborative research project concerned with intermediate-scale EGS (Enhanced geothermal Systems) reservoir creation processes.

**Dr. Fan** had papers published in *Journal of Natural Gas Science and Engineering* and *International Journal of Multiphase Flow* during the past academic year. She also made a presentation at the Tulsa University Fluid Flow Project Advisory Board Meeting on Pseudo-slug Body Liquid Holdup Modeling.

*Drs. Battalora and Prasad with their poster at AGU 2018.*



*Drs. Graves and Fan at fall graduation, 2018.*

**Dr. Tutuncu** is serving as the newly elected SEG Research Committee Chair and the co-chair of the 54th US Rock Mechanics/Geomechanics Symposium to be held in Golden, Colorado in June 2020. We are glad to bring the Geomechanics Symposium to Golden after thirteen years of hiatus to host this annual ARMA event at our beautiful campus.

**Dr. Yin**'s group published an article with Virginia Tech on how to use image recognition neural networks and machine learning to directly "see" permeability of geometries from images. "Seeing permeability from images: fast prediction with convolutional neural networks" was published in Vol. 63, Issue 18 of *Science Bulletin*.

Grad students from **UNGI** have excellent representation of research findings with three papers presented in 53th US Rock Mechanics/Geomechanics Symposium in Brooklyn, New York in June 2019 and two papers at URTeC Conference in Denver in July 2019.

A journal paper entitled "An Experimental Investigation of Coupled Geomechanical, Acoustic and Permeability Characterization of Berea Sandstone Using a Novel True Triaxial Assembly" by Baizhanov B., Katsuki D., **Tutuncu A. N.** and Mese A.I., has been published in the prestigious *Rock Mechanics and Rock Engineering Journal*.

**Dr. Kazemi** presented the opening technical talk "Production Performance of Carbonate Reservoirs—Relation to the Diversity of Pore Structure and Rock Fluid Interaction" at the International Symposium on Carbonate Reservoir and Unconventional Oil and Gas Development, July 2018, Beijing, China.

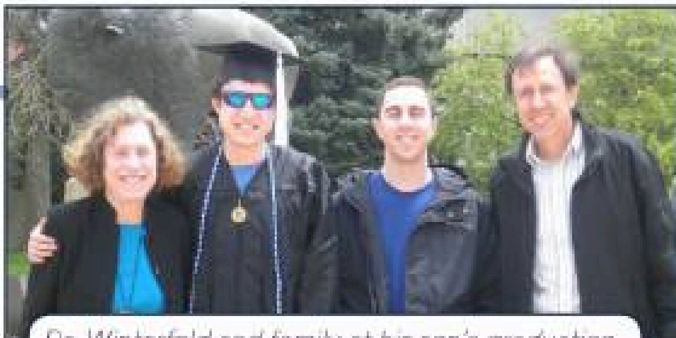
**Dr. Kazemi** co-authored a whopping 12 technical papers in 2018, most of which were co-authored with CSM faculty or students in the department.

**Dr. Wu** published 6 peer-reviewed journal papers, 1 peer-reviewed book chapter, 5 SPE papers, 4 other conference papers, and gave 8 invited talks/presentations and 1 major research report in the 2018-2019 academic year.

# Personal News

The academic year started with a devastating event for **Dr. Azra Tutuncu** with the passing of Dr. Ali I. Mese, her 40-year best friend and 35-year beloved husband. She would like to take this opportunity to thank all their friends in Houston and Denver and our Mines family for their tremendous support to withstand this big loss.

**Dr. Winterfeld** and family attended the graduation of his youngest son Andrew, who received a B.A. in neuroscience at CU Boulder.

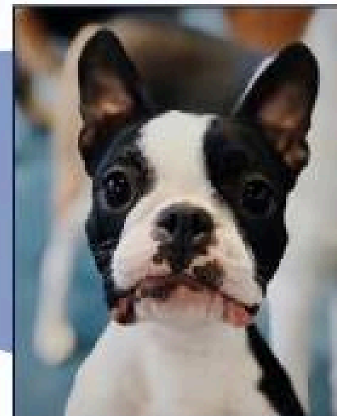


*Dr. Winterfeld and family at his son's graduation.*

**Dr. Fan** has settled down in Lakewood near Green Mountain.

**Dr. Prasad** gets to move her office across the road to the Green Center as she moves to join the Geophysics department. The decision to change departments was a hard one, but thankfully we'll still be able to see and collaborate with her.

**Dr. Battalora** still loves her Boston Terrier Daisy, who is now 1.5 years old.



# Research News

CalFrac has donated several equipment to PE. The company left the Denver area and dropped cementing services to focus in hydraulic fracturing, and decided to get rid of its cementing equipment. **Dr. Sampaio** worked with CalFrac and the donated instruments were delivered in late fall 2018. They include a curing cell, High Pressure High Temperature Consistometer, Ultra-high Temperature Ultrasonic Cement Analyzer, HPHT Viscometer, Atmospheric Consistometer, HPHT Filter press, Constant Speed Mixer and an Instrument Viscometer. These instruments retail for around $400k and are in excellent conditions. Most will serve for research once we finish installing all of them.

**FAST** is celebrating its 15th anniversary this year and continues to be one of the department's largest research groups. Currently 9 PhD and 2 MS students are working on projects including topics such as proppant transport in fractures and horizontal wellbores, well-to-well hydraulic fracture interference, machine learning, and fiber-optics applications to stimulation.

During its 15-year history, **FAST** has graduated 24 MS's and 13 PhD's (hi to all of the FAST alums out there), published over 50 papers, and has become known as one of the leading university research programs in hydraulic fracturing and stimulation technology. FAST currently has ten member companies that actively participate in the two semi-annual meetings, however, we are always looking for new companies to join and provide their input and needs in the area of stimulation. New projects are suggested by the member companies and voted on by all members to be pursued or not. If you would like to join FAST or find out more information about it, please see the website at **www.mines.edu/fast/** or contact Dr. Jennifer Miskimins (jmiskimi@mines.edu).

**Dr. Miskimins** worked with NREL on geothermal hydraulic fracturing modeling for the Sigma V geothermal project taking place in South Dakota. She is also working with Encana on a proppant transport and perforation distribution project, and just starting working with Crestone Peak Resources on a refracturing project.

We continue our plot to take over the Edgar Mine with **Dr. Miskimins** installing a fiber-optics instrumented horizontal well in conjunction with Dr. Ali Tura, Geophysics.

Drs. **Tutuncu, Kazemi** and **Yin** started a new, 2-year research project, funded by RIPED, titled "Microscale flow mechanism characterization and numerical simulation of ultra-low permeability reservoirs".

Dr. Fan's research with PhD student Ayush Rastogi regarding the onset of Liquid Loading in 6-in. Inclined Pipe is active and close to the end. The main objective is to experimentally and theoretically investigate the onset of liquid accumulation in large diameter inclined pipes or deviated wellbores. The experimental result and modeling work on onset of liquid loading will be presented at ATCE 2019.

*Parts of the new research facility Dr. Fan and her grad students have been building.*

Dr. Fan and her grad students started two new research projects. The first is a new collaborative Ph.D. research project on fiber optic sensing for multiphase flow with RCP in the Geophysics department and the preliminary experimental study has been finished. The project shows promising results in characterizing multiphase flow behavior. The second new Ph.D. research project is on emulsion characterization and modeling for hydrate prediction application. This new project is supposed to improve the current modeling for hydrate formation prediction.

UNGI's joint training program TOPCORP is making waves and has received funding to extend the program to international regulators from Guyana with sponsorship from ExxonMobil. API and other sponsors also joined their support for the domestic training program.

Experimental and modeling research studies at UNGI is ongoing in full speed and they have 3 MS and 1 PhD students joining UNGI in Fall 2019 to continue building on research studies conducted by recent graduates.

Dr. Winterfeld closed his DOE project on CO2 sequestration, "Quantitative Characterization of Impacts of Coupled Geomechanics and Flow on Safe and Permanent Geological Storage of CO2 in Fractured Aquifers" and continues to work with NREL on "Geothermal Reservoir Modeling with TOUGH2-EGS," part of the EGS-Collab SIGMA-V project.

The UREP consortium presented research on filtration of hydrocarbons through tight formations, the first experimental finding of its kind, at the URTeC conference held in Denver, in July 2019. Research that further explored the effect of CO2 on filtration with identification of novel CO2-EOR mechanisms will be presented at the upcoming SPE ATCE in Calgary.

# STUDENT NEWS

## Awards and Honors

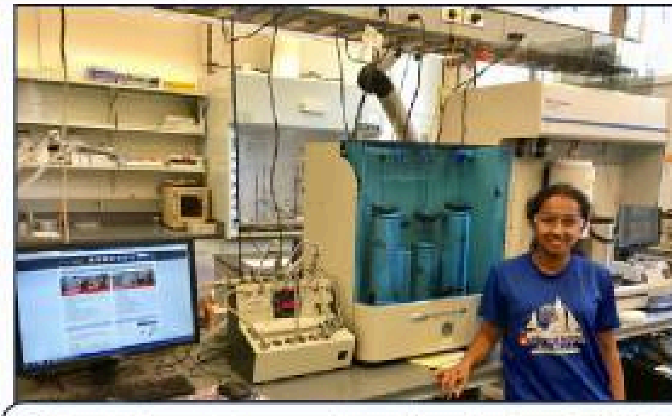
**Julian Zhijun Liu** PhD '20 won first place in Mines' GRADS symposium with his oral presentation "Investigation of Hindered Transport of Large Hydrocarbon Molecules in Nanoporous Materials".

Julian with his GRADS award.

Information from a study authored by **Daniel Croce** PhD '19 was quoted in "A Glimpse Into Oxy's Artificial Lift Strategy" (E&P Hart Energy, 10/4/2018).

**Connor Clark** MS '18 filed a patent based on his MS research entitled "System and Method of Locating Downhole Objects in a Wellbore".

**Manju Murugesu** BS '17, MS '19 was selected for the second cohort of the Knight-Hennessy Scholars program, which provides full funding for graduate studies at Stanford University.



Manju getting some experimental work done in the lab.

SPE Denver section held a student poster in conjunction with DAPUB 2019. There were several great posters, and **Ayush Rastogi** PhD '20 clinched first place with **Daniel Croce** PhD '19 in second while **Eiman Al Munif** PhD '20 and **Ye Tian** PhD '20 tied for third.

Ayush being recognized for winning the DAPUB student paper contest.

**Keerthikanand Mohanraj, Ilkay Eker** (fall 2018), **Mehmet Torcuk** (spring 2019) and **Ilham Permata**, **Jyoti Kanwar** and **Nicholas Wehbe** (summer 2019) have joined the UNGI Alumni Club.

# Papers and Presentations

**Jayant Saxena** '19 presented a paper titled "Slickwater, Hybrid, Suspended Proppant: Practical use of Data Analytics to Determine Hydraulic Fracture Fluids" at the April SPE Western Regional Meeting 2019 in San Jose. The paper was co-authored by Lia Sedillos (Covia Corp), Russell Roundtree (IHS Markit), Carlos Convers (GP - MS '17), and Elio Dean (PE Faculty).

**Nicolas Rosenhagen** '19 wrote/published and presented an SPE paper (195204-MS: Dimensionless Section-Level Cumulative Oil Vs. Pumped Fluid Normalization Plot in Unconventional Development) at the SPE OKC Oil and Gas Symposium on April 9th. The paper was part of the Unconventional Reservoir Development Technical Program.

*Nicolas with his co-authors from Anadarko Petroleum (Steve Nash and Kevin Tanner) right after his presentation at the SPE OKC Oil and Gas Symposium.*

**Asm Kamruzzaman** PhD '20 presented his paper "Non-invasive pressure sensing in microfluidic chips using laser interferometry" at the International Society for Optics and Photonics (SPIE) Conference in March 2019, Denver, Colorado.

We had two papers presented at SPE Abu Dhabi International Petroleum Exhibition & Conference in November 2018: "Production Potential of Shilaif Formation in UAE Using an Integrated Reservoir Characterization Approach" by **Mohamed Alzaabi** MS '18, **Ilkay Uzun** PhD '18, **Erdinc Eker** PhD '18 and Drs. Kazemi and Ozkan and "Production Enhancement for Tight-Gas Condensate Reservoirs: A Compositional Dual-Porosity Model for Sabriyah Field, Kuwait" by **Mesferah M. Al Qahtani** MS '17, **Ilkay Uzun** PhD '18 and Dr. Kazemi.

**Chayapod Beokhaimook** MS '18 presented his paper, co-authored with Dr. Kazemi, "Quantifying Near-Wellbore Permeability Including Fractures Using Real-Time Pressure from Distributed Downhole Measurements" at the SPE Reservoir Simulation Symposium in April 2019.

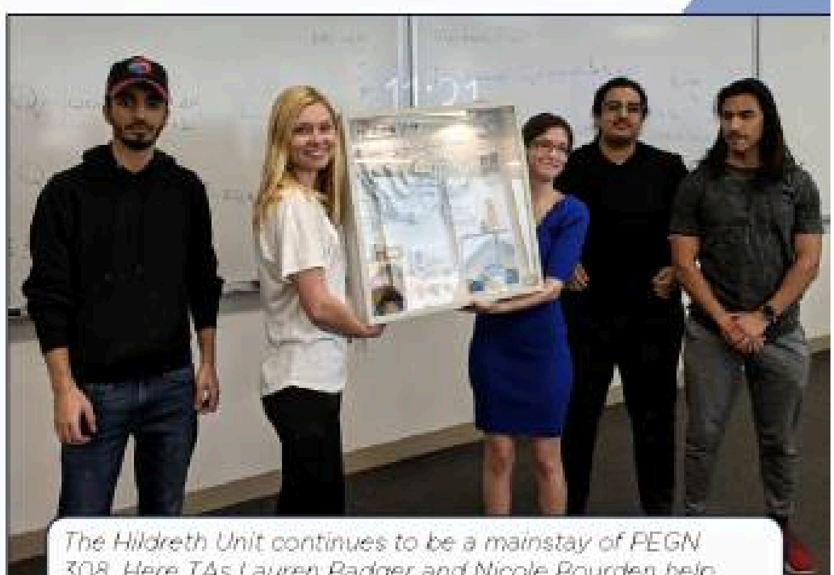
**Yanrui Ning** PhD '17 presented her paper, co-authored with Drs. Kazemi and Davis, "Integration of Dual-Porosity Modeling with 4D Seismic and Microseismic Technology in Niobrara and Codell Formations, DJ Basin" at SPE ATCE 2018.

**Ziming Zhou** MS '16, PhD '20 represented the UREP consortium when he presented research on filtration of hydrocarbons through tight formations, the first experimental finding of its kind, at the URTeC conference held in Denver, July 2019.

**Ozan Uzun** MS '18, PhD '23 also presented at URTeC 2019. His paper "Assessment of Improved Oil Recovery by Osmotic Pressure in Unconventional Reservoirs: Application to Niobrara Chalk and Codell Sandstone" was co-authored with Dr. Kzaemi.

**Asm Kamruzzaman** PhD '20 presented his paper titled "Petrophysical Rock Typing in Unconventional Shale Plays: The Niobrara Formation Case Study" (co-authored with CSM faculty Manika Prasad and Stephen Sonnenberg) at URTeC 2019 as well.

**Faraj Ahmad** PhD '19 presented his first SPE paper to over 300 people at the SPE Hydraulic Fracturing Technology Conference (February 2019).



*The Hildreth Unit continues to be a mainstay of PEGN 308. Here TAs Lauren Badger and Nicole Bourden help the spring 2019 winners show off their unit. Hamood Al-Busaidi, Younes Adbais and Muhannad Alattas put together an impressive display with lots of additional information, such as a QRC code to a 3-D model of their unit.*

## Chevron Short Course Series

We had five sessions of the Chevron Short Course Series this year. They included: *Trouble Free Drilling*, presented by John Mitchell; *Production Technologie and Applications*, presented by Noble Energy at their Greeley, CO training facility; *Reservoir Management*, presented by Zack Warren and Michael Hirschf of Great Western Oil and Gas, *Induced Seismicity*, presented by Tim Tyrrell and Kris Nygaard of ExxonMobil-XTO; and *Microseismic Fundamentals and Applications*, presented by Dr. Jon McKenna of Microseismic Inc.

Around 70 students, mostly seniors with a few juniors and grad students, participated in the series this year. Upon completion of the short course, the students received a certificate of completion as well as additional skills, knowledge, and training to put on their resume.

Students were excited for the opportunity to learn skills that were immediately useful in classes and internships. We are always looking for interesting and useful instructors and courses, so please contact Dr. Mansur Ermila (mermila@mines.edu) if you would like to participate or share an opportunity for a course students would benefit from.

A big thanks to **Chevron** for their continued support.

*Students listening to Dr. Jon McKenna during his short course.*

# Distinguished Seminar Series

We continue to work on strengthening and expanding our seminar series and invited local and out of state speakers from industry and academia to come and speak to our graduate students on a variety of topics. The presentations were an hour long on Friday mornings every two weeks.

We want to continue building interest and momentum. To do so, we need to continue getting compelling and distinguished presenters who can cover topics ranging from technical issues to developing soft skills.

We are still looking for speakers for this academic year. We are especially inerested in speakers who can address future opportunities (research opportunities in new techniques, future of the field, etc.), technical topics or related topics such as artificial intelligence or banking and its involvement in O&G.

Please contact the department at (303) 273-3740 or petroleum@mines.edu with speaker referrals or to volunteer to speak on these or related topics.

## PRESENTERS IN AY 18-19

### Fall 2018

- Stefan Miska, University of Tulsa. *The Effec of O&G Production Related Activities on Induced Seismicity*
- Russell Johns, Penn State. *Transport Mechanisms for Oil Shale and Implactions for the Solvent Huff'n-Puff Process*
- Vakkeyil Naveen Nair, Halliburton. *Directional Drilling Approach: Bridging the class room learning with field operations*
- Cheng Chen, Virginia Tech. *Pore-scale Imaging/Modeling and the Application in the Study of Proppant Compaction and Embedment*
- Russell Johns, Penn State. *How to Make Compositional Simulation Truly Compositional*
- Ergün Kuru, University of Alberta. *Assessment of Critical Conditions Required for Effective Hole Cleaning in Horizontal Wells*
- Francisco Alhanati, CFER. *Unconventional Well Applications - Challenges for Articial Lift*

### Spring 2019

- Roel Snieder, CSM. *How to (Not) Give a Truly Terrible Talk*
- Christopher Thiry and Brianna Buljung, CSM. *Start Your Research Right: Conducting Literature Reviews and Organizing Your Research*
- Rajan Chokshi, University of Houston. *Real-Time Data Acquisition & Analysis for Enhanced Production*
- Shari Dunn-Norman, Missouri State University. *Are there Health Effects from Unconventional Oil and Gas Development?*
- Andrzej Wojtanowicz, Louisiana State University. *Well Integrity Loss due Gas Flow behind Casing – Mechanism, Diagnosis, and Remediation*
- Phaneendra Kondapi, University of Houston. *Key Flow Assurance Strategies to Understand Overall System Performance in Field Applications*
- Soheil Saraji, University of Wyoming. *Flow of Complex Fluids in Porous Media: Implications for Enhanced Oil Recovery*
- Mark Knackstedt, Australian National University. *Digital Maerials Design*

# SUPPORTING PE STUDENTS

Scholarships provide much needed financial assistance to students pursuing studies in the Department of Petroleum Engineering, especially to those who demonstrate a passion for learning and applying new knowledge in support of the science and engineering community.

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# END OF AN ERA

*Dr. Graves set the foundation for her students to have enjoyable and rewarding careers. As a professor, Dr. Graves represents the very best of our industry and Mines. I always tried my best to "pay attention" (especially when she used that phrase) because there was much to learn about being a petroleum engineer and a better person. As a friend, Ramona is someone that I will always hold in high esteem. I wish her the very best in retirement.*

*Brian Owens MS '91*

*On Sunday afternoons, Dr. Graves sat at her table, looked at students' pictures, and memorized students' names. Rock Props course was a course size of >120 and she could call each student's name. In fact, she knew everybody's name in PE department. She always enthusiastically supports her students with their studies, research, navigate career options, etc. She ran our department like family.*

*Dr Graves gave me many 'B's in my rock props course assignments. It is still painful in year 2019. In fact, her strict grading helped me become more detail-oriented and that's why Mines graduates are top-performers in the petroleum industry.*

*Dr. Grave loves China and Chinese students. As an international student, I always feel loved and welcome in Mines. I enjoy being your student so much, Dr. Graves! And thank you so much, Mines!*

*Sunny Wenhhi Wu MS '10*

*I have an immense amount of respect for Dr. Graves. She taught my dad ('91) and then she taught my brother ('17) and then she was still willing to put up with another Thomas when I came along ('18). Dr. Graves had a profound impact on my collegiate experience. She awarded me with the very first Ramona M. Graves Endowed Scholarship, which extended from my sophomore year until I graduated. Her support for my education and development as an engineer has given me the confidence I need to pursue a successful career in a competitive industry. There is a reason that many of her students have gone on to become leaders in the industry as executives and managers and CEO's. She pushes her students to do their best, as any good teacher should do, but then she goes above and beyond and inspires her students to be passionate about their work. She cares that her students care. She taught us that our work is important in this world and it is a privilege to become a petroleum engineer. And she is a huge reason that it's an even bigger privilege to become a petroleum engineer from Colorado School of Mines.*

*Hannah Thomas '18*

*Two generations of Mines petroleum engineering students taught by Dr. Graves.*

*Brett Allison '17*

## RETIR
## OF DR.
## GR

Dr. Ramona Graves has been affili
in various capacities for 42 years. In
strive for, but few succeed at. She start
was hired as a faculty member, moving up
Vice Provost. The volume of students she ha
and the influence she has had on the oil and g

Born in rural Nebraska in the 1950s, her career o
State College with degrees in math and physics, s
realized it was not an ideal fit and after a friend su
ed taking classes at University of Nebraska in chem
would not bring her joy, and she applied to a numbe
became the second women in the United States to e

Graduating was just the beginning though and her fir
you this was not what she wanted, but knew that tak
away from her young children; she agreed and never l

These days the majority of our alumni have taken PEG
ing the saying around here that Ramona really is the
only passion though; she has been heavily involved i
Co-Director of the Center for Earth Materials, Mecha
serves as Society of Petroleum Engineer's (SPE) Dire
well as previously served on SPE's Academic Adviso
and honors including the inaugural Pinnacle Award f

The Petroleum Engineering department and t
and friend. The legacy that she leaves behind
ly appreciate and reflect on — and she ha
an, these pages are covered with sentim
show their gratitude and support for her

We wish you the best Ramona, and know
each other again.

With love and gratitude,

*The Department of*
*at the Colorado*

*"A jar of crude oil smells Green!!" Dr. Ramona Graves, AKA change of perspective! What an enthusiastic professor. Thank you Dr. Graves!*

*Amanuel Berhe '14*

## EMENT
## RAMONA
## AVES

ated with Colorado School of Mines that time she has achieved what many ed as a PhD student and upon graduating, to department head, and eventually a Dean/ s taught and the lives she has impacted is vast, as industry is immeasurable.

otions were limited. After graduating from Kearney he became a high school math teacher. She quickly ggested she would make a great engineer, she start- ical engineering. It didn't take long to realize this too r of other programs. In the end she came to Mines and arn a PhD in Petroleum Engineering.

st job offer was to teach in the department. She will tell ing a job in industry would force her to travel too much ooked back.

N 308, i.e. "Rock Props", from Dr. Graves, further solidify- ace of petroleum at Mines. Teaching has never been her research as the director of Laser/Rock Interaction and nics and Characterization (CEMMC). She also currently ctor of Academia, is a distinguished member of SPE, as y Committee. This all on top of her many other awards rom *Oil and Gas Investor*.

he university are losing a great asset, partner, is one that only those she has taught can ful- s taught many! To honor this amazing wom- ents from alumni, colleagues and friends to retirement and the next chapter of her life.

this is not goodbye, instead it's until we see

*Petroleum Engineering*
*School of Mines*

*With the retirement of Dr. Graves, CSM has lost a great professor and an amazing person. Out of all the teachers and professors that I have had throughout my academic career, Dr. Graves has unquestionably made the greatest impact. From the first day of her reservoir rock properties class, Dr. Graves exuded a no-nonsense approach which promoted important values such as grit, ownership, discipline, dedication, and passion. These values stuck with her students, allowing for the development of many young Petroleum Engineers who are not afraid of hard work or a challenge.*

*Not only was Dr. Graves an amazing professor in the classroom, but she was also a great mentor outside it. I saw firsthand how many of my peers would consult Dr. Graves on a wide variety of topics including internships, jobs, industry outlook, possible minors, study abroad programs, and graduate school opportunities. Dr. Graves' investment in her students went far beyond what could possibly be expected. In my own experience, she was able to have insights about me that I wasn't aware of myself. She used those insights to help pinpoint the direction of my career.*

*Dr. Graves truly left a legacy of excellence at CSM, and I'm forever grateful that I had the chance to learn from such an outstanding person during my time at CSM.*

*Steve Benfield '18*

*The first time I met Dr. Graves I was in need of department approval to start my PE courses without having completed a required pre-requisite. A friend of mine was in tight with Dr. Graves and set-up the meeting for me. The conversation started with me explaining my situation. The response is classic Dr. Graves:*

*Me "So, can I please have approval to take RRP and EPICS II simultaneously?"*

*Dr. Graves "Are you stupid or just don't pay attention?"*

*Me, after about 20 seconds of thought with a dumbfounded look on my face, "It's probably a little bit of both."*

*Dr. Graves "That was the only suitable answer." She signed the paperwork and told me "Get out of my sight!"*

*To this day, she is still one of my favorite people and truly one of a few key people that are responsible for any semblance of success I have. A retirement much deserved as there are many of us "special" kids that had no chance without her help.*

*Levi Harris '09*

*Because of Dr. Graves, I mentally "grade" my coworker's tables and charts... no borders? -10 points. Missing units? -10 points. I still have my 308 binder on my desk for quick reference.*

*Ashley Reed '12*

**We invite you to view this retrospective interview with Dr. Graves**

https://youtu.be/S5beliAN-mQ

# INTRODUCING DR. YILIN FAN

The department was lucky enough to hire an Assistant Professor this year to bring expertise in the Production and Midstream areas of Petroleum Engineering. Dr. Yilin Fan started in summer of 2018, and has fit in perfectly with the flow of the department and our students.

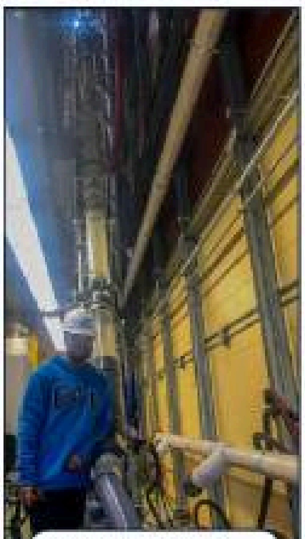

Dr. Yilin Fan

Dr. Fan received her undergraduate degree from China University of Petroleum (East China) with a B.S. in Oil and Gas Storage and Transportation Engineering. In 2010 she joined University of Tulsa as a master's student in Petroleum Engineering, graduating in 2012, then staying to receive her PhD in 2017. After graduating, she was appointed a Post Doc position, which she held for an additional year before coming to Mines.

Yilin's PhD work at University of Tulsa was related to multiphase flow in pipes. The study was done in order to look at two main areas, experimental and modeling work on the onset of liquid accumulation in order to understand what the lowest gas velocity is to avoid liquid accumulation, thus preventing pipeline internal corrosion. The second area is the characterization of pseudo-slug flow, a flow pattern that had not been well understood due to its complexity.

She was involved in several projects during her Post Doc appointment, including one with an industry partner looking at air and emulsion flow in horizontal pipes. She also co-advised two master students, whose projects were gas lift in horizontal wells and intermittent flow analysis in inclined pipes.

Since she started at Mines, she has taught one section of Mechanics of Petroleum Production and co-taught Petroleum Midstream design with Trent Green in the spring semester. This was a great starting point to get to know our undergraduate students better and she has praised the aptitude and work ethic of Mines students because of these courses.


Aysush with the equipment for his experiments.

Currently, she is advising two PhD students. Ayush Rastogi is studying the onset of liquid accumulation in large diameter pipes, experimentally and theoretically. He has finished the experimental program and developed a new unified model to predict the onset of liquid accumulation. They will present their findings in this upcoming ATCE 2019. Kanat Karatayev, another PhD student, is working on the emulsion characterization for hydrate formation application. She is bringing on a new Master and a new PhD student for this fall semester, who will be working on some projects in the production area.

If that weren't enough, Yilin has also been extremely active in collaborative projects across campus and is already becoming a huge resources for many different projects and departments. Her recent interest lies in the fiber optic sensing (FOS). She is now collaborating with Geophysic's Reservoir Characterization Project (RCP) and exploring the application of FOS technology in production and multiphase flow area. They have finished some preliminary experimental studies, which will be presented at the SPE DAS Workshop in Denver this August and SEG DAS post-convention workshop this September.

The Petroleum Department believes Yilin is an integral addition to the department expanding on a huge piece of industry that was missing from our program. Of course living in Colorado and working in Golden doesn't hurt either!

Welcome Dr. Fan, we feel lucky to have you as a part of our growing team.

# MIDSTREAM MINOR CAPSTONE

With tremedous support from indstury, techicial advice from Adjunct Professor Trent Green and Assistant Professor Dr. Yilin Fan, our first class of Colorado School of Mines Petroluem Midstream Minor Degree holders graduated in spring 2019. We especially thank all the experts from the industy who supported our design class - PEGN463 Petroleum Midstream Design - this past semester, and congratulate all the students who earned the first petroleum midstream minor degree!

It was our greatest honor to have Meritage Midstream this year who provided us a real industrial project on fuel gas conditioning for their pipeline network as the senior design project. Justin Eckes, one of the students, said "this project was a great way to experience an engineering project first hand. It required consideration from ideation to


Our students and engineers from Meritage Midstream.

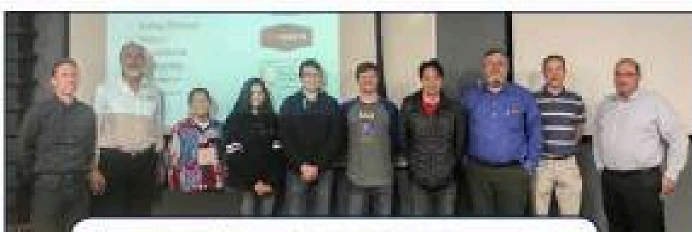
implementation with all the rabbit holes an engineer can think up." We want to specially thank Mr. Brain Peters (VP, Engineering & Construction) and his technical team who donated their spare time preparing and presenting the project, answering students' questions throughout the semester, and listening to as well as providing feedback on the students' final presentation. We also thank Brad Gentry (Engineering Manager, Mines Alumni) and Dain Santarelli (Project Manager), who also attended the student's final project presentation and made valuable suggestions and comments.

In addition, we want to sincerely thank all the invited guest speakers in PEGN 463! Their cutting-edge technologies and technical knowledge and experiences are precious for all our students. JJ Williams (Regional Director for OptaSense Inc. and 2019 chairman of the Fiber Optic Sensing Association (FOSA)), gave a lecture about pipeline monitoring using fiber optic sensing. Mr. Bruce Bingham (Manager of Engineering and Technology Development, T.D.Williamson) and Mr. Eric Freeman (Sr. Manager, Engineering Talent Development, T.D.Williamson) talked about hot-tapping and pipeline pigging. Dr. Mike Kirkwood (Director, Integrity Engineering Solutions, T.D.Williamson) provided a lecture on pipeline integrity. Mr. Jeffrey Citrone (Manager, Health & Safety Compliance) and Mr. James Fleak (Director, Regulatory Compliance) from Kahuna Midstream presented on environmental and safety regulations. Mr. Kevin D. Burt, territory manager (SW Region) from Gardner Denver, lectured on liquid ring pump and compressor technology for the petroleum midstream sector. We also had a great talk on vapor recovery technologies and regulatory issues given by CSM PE alumni Mr. Peter M. Mueller (Co-founder, technical & regulatory advisor of EcoVapor Recovery Systems, CSM PE '78), Mr. Mike Leonard (Community relations unit manager, COGCC), Mr. Paul Munding (VP of petroleum engineering, Flogistix), and Mr. Jason Fortner (Director of Sales & Marketing, Flogistix).

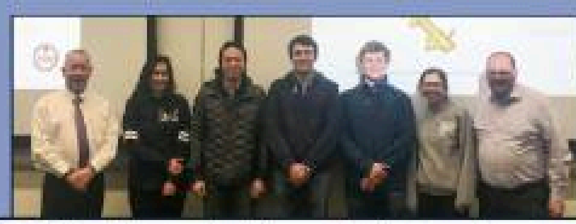
Mr. Eric Freeman giving a lecture on pipeline pigging. Mr. Bruce Bingham (sitting front row, left) just finished his presentation on hot tapping.

We wouldn't have had such a successful semester without your support for this class and the petroleum midstream minor degree. We believe that the petroleum midstream minor will grow stronger and stronger. Our goal is simple: to make our students ready to work in industry by the time they graduate!

Mr. Kevin D. Burt and Prof. Green.



The group from the vapor recovery class.



Dr. Mike Kirkwood with our students and professor.

JJ Williams' class lecture and a slide from the lecture showing a Fiber Optic Sensor Signal when monitoring surrounding activities.

# DONOR APPRECIATION

We want to thank all of the individuals and companies who made donations to the department this past year. Their generosity enables us to more effectively serve our students.

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Ms. Yijia Zhang
Dr. Zhou Zhou

*Kayla and Manika with Lorena Van Metre and Mark Elder from ConocoPhillips during their annual visit.*

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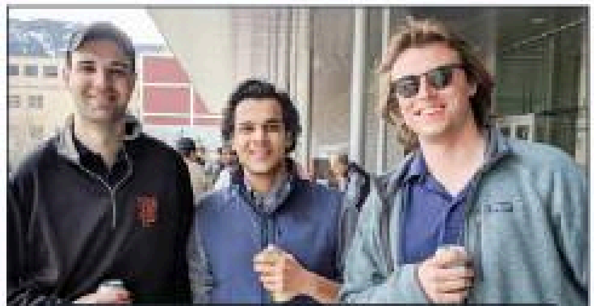
# STUDENT ORGANIZATIONS

## American Association of Drilling Engineers (AADE)

For the 2018-2019 academic year, the CSM chapter of AADE conducted numerous events to provide our members and the general student body at Mines an opportunity to engage with industry professionals. Our events included various Lunch & Learns, rig tours, short courses, a keynote speaker, and the annual crawfish boil.



*The student org presidents from SPE, AADE and AAPG during the crawfish boil.*

Lunch & Learns are usually an hour-long event held on campus that involve petroleum companies around the Rocky Mountain region coming to campus to discuss the current state of the oil and gas industry and to provide students a different learning environment than the typical classroom. Some of the companies CSM AADE brought to campus included Noble Energy, Liberty Oilfield Services, Bison Oil & Gas, Rare Petro, and Scientific Drilling.

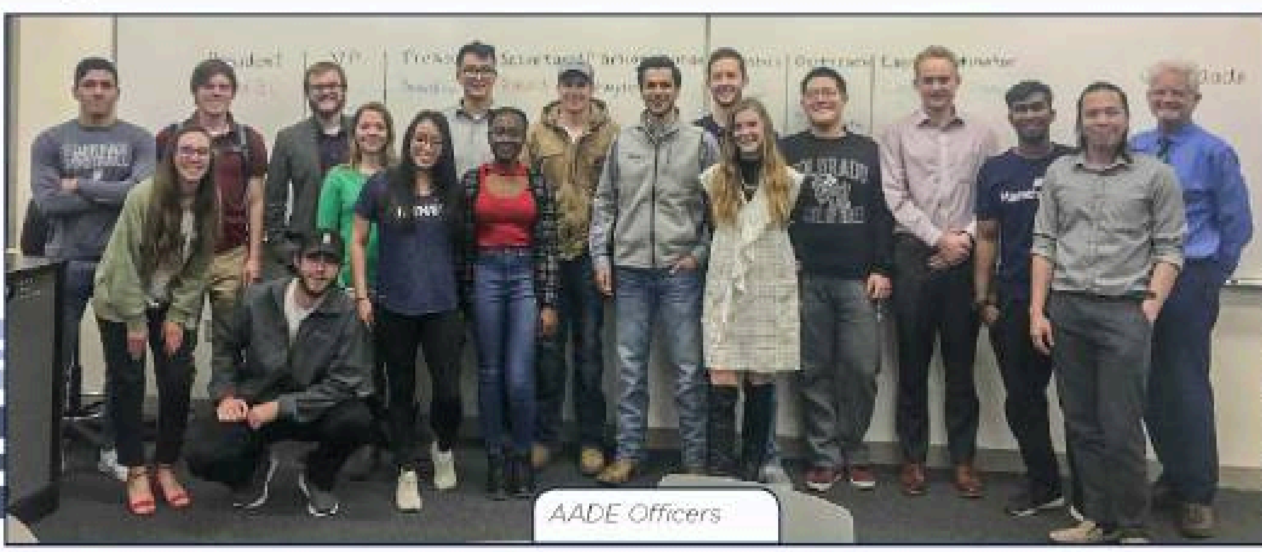
On the other hand, rig tours were carried out to provide students an opportunity to visually see what has been taught in their respective PE courses. Last semester, CSM AADE was able to visit Creekstone Peak Resources drilling rig in Weld County, Colorado.

CSM AADE was able to provide a few short courses this academic year that included Wild Weld Control and a Cased-Hole Logging course with SPWLA. These short courses usually took a few hours and were solely conducted to provide students a wealth of information about a specific topic that is vital to the oil and gas industry. A great benefit of CSM AADE short courses is that they can provide our members with IADC certification.

During the Spring semester of this previous academic year, CSM AADE hosted Dominic Spencer, CEO of Nine Point Energy, as the keynote speaker. Every year CSM AADE chooses a single individual to be their keynote speaker to provide students an in-depth analysis of a specific basin, the company's operations, and the various problems that need to be overcome to lead a successful Oil and Gas company.

Lastly, CSM AADE, along with SPE and AAPG, held their annual Crawfish Boil to bring together CSM students and industry professionals. This interaction provides students an opportunity to engage with various companies and learn more about the industry.

We have quite a few new ideas and big plans for the 2019-2020 academic year. Essentially, our focus will be on rig tours to increase our membership and to provide our graduating seniors with more field experience as they begin working within the oil and gas industry. Soon after the fall semester begins, CSM AADE plans on traveling to Calgary to visit drilling rigs in Canada. Similarly, we plan on visiting the Williston Basin in North Dakota. Another goal for the following academic year is to appoint a Volunteer Chair to increase our presence on campus and our leadership in community outreach.



*AADE Officers*

# American Rock Mechanics Association (ARMA)

Eight years have gone by since ARMA CSM chapter's inception and the organization has grown alongside the development of the oil and gas industry. Within the past decade, the application of geomechanics to shale development and beyond in oilfield operations has propelled the US to the top oil and gas producer in the world. This growth has also translated to new learning experiences and the search for more efficient ways to develop such unconventional assets. The advancement in technology has been nothing short of amazing and this learning has translated into the CSM community through the ARMA chapter. As a backbone of the geomechanics community on the CSM campus, ARMA continues to provide services for knowledge improvement paramount to solving the challenges we witness in today's operations while contributing to socio-economic development around the Mines community. Such activities include participation in charitable community services and fundraisers. Importantly, these activities were possible with the help of our primary donor Chevron and their continued support of ARMA over the years. Chevron understands the relevance of geomechanics to the industry and the generous contributions to CSM ARMA are very much appreciated.

*Keerthik and Wale at Celebration of Mines.*

## PAST AND RECENT EVENTS

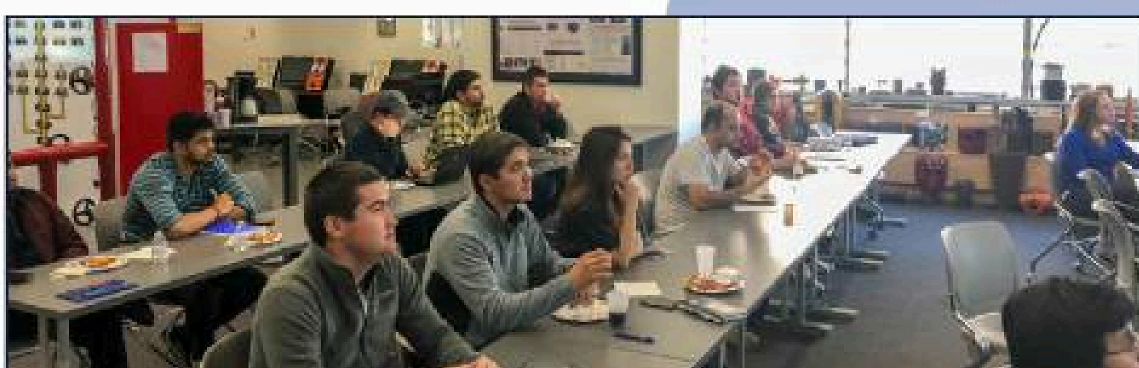
The beginning of the 2018 – 19 academic year kicked off with the annual Celebration of Mines where our organization had the opportunity to highlight what we represent and our activities to mostly the incoming freshmen. We received positive feedback from the event and got new members in the process.

In a bid to create more understanding of how commercial softwares are used in asset evaluation, we invited Schlumberger to give a series of workshops detailing geomechanical workflow of assets from evaluation to production. We had a two-part event on this with a summary lecture followed by a software workshop two weeks later.

FractureID's great Lunch and Learn presentation was on the process of utilizing in-situ mechanical rock properties to target landing zones and improve completions in the Permian basin.

Liberty Oilfield Services returned for continued Lunch and Learn discussions on historical overview of shale trends, fracture design evaluation in the Powder River Basin and the outlook of completion designs.


*Schlumberger Geomechanics Workshop Training I (Oct 2018)*


*Students listening attentively during the Lunch and Learn with FractureID (Nov 2018).*


## UPCOMING EVENT – ARMA SYMPOSIUM 2020

It is with great excitement that we announce that the annual ARMA symposium will take place on CSM campus next academic year. As the inaugural student chapter, CSM ARMA is working in collaboration with other student chapters and the ARMA board to ensure the success of the event. The symposium will be a culmination of the events planned out for the upcoming year and we look forward to the continuous growth of our organization in the coming years.

# Society of Petroleum Engineers (SPE)

The Colorado School of Mines SPE Student Chapter has continued to deliver events and programs involving community service participation, industry engagement, technical presentations, career development and continuous support to our SPE members.

CSM SPE officers have organized a variety of Lunch & Learn sessions throughout the academic year. These sessions served as an opportunity for students to have lunch and listen to technical and non-technical presentations from oil and gas companies. Some of the companies we had a pleasure to be part of our sessions were Noble Energy, Apache, PetroValues, and Concho.

Before career day every fall and spring semester, CSM SPE organized mock interviews to provide students the opportunity to practice their interviewing skills with real employers before career fair.

CSM SPE, AADE and AAPG held the 4th Annual Mudbug Masquerade in March, a day where students, faculty and professionals enjoyed the crawfish boil on campus. We also held our 2019 Clayshoot Fundraiser on April 11th, where students had the opportunity to have fun and network with professionals.

This year, we were able to send 37 students to the 2018 Annual Technical Conference and Exhibition (ATCE) in Dallas, Texas, and we sent several students to the 2019 North America Student Symposium (NASS) in Houston, Texas in February, including our Petrobowl team.

CSM SPE and all officers are looking forward as an organization to continue with our hard work, continue organizing our annual events and Lunch & Learn sessions, and getting involved as much as we can in the 2019-2020 academic year. Our upcoming events this year include the 2019 ATCE in Calgary, Canada, plans to attend the 2019 NASS and hold the **2019 CSM SPE Fundraiser Golf Tournament** on September 20th.

*SPE and AADE joint Lunch and Learn with Noble Energy in September.*

*Students, faculty, staff and alumni enjoyed the crawfish boil in March.*

*Students representing CSM SPE at PetroBowl in Houston, Texas.*

## PEGN 315 — California, led by Dr. Linda Battalora

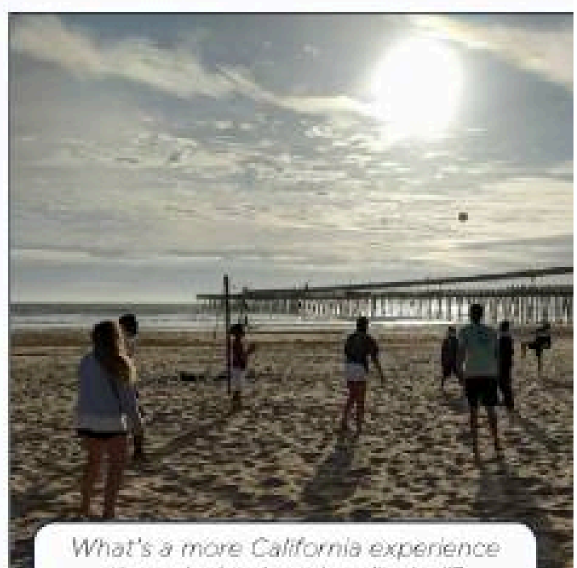
Thanks to the generosity and enthusiasm of our many alumni and friends, the 2019 PEGN 315 California Field Session was a great success. Myself, Mark Miller, Kayla Boster, three teaching assistants (Dan Croce, Kirt McKenna, and Ayush Rastogi) and 32 students enjoyed an action-packed session in Southern California.

Our first field tour was hosted by **Aera Energy** in Bakersfield. Mines alums Peter Ashton, Nick Clausnitzer, Matt Erbes, Laura Lunsford, Linda Mohammad, Christine Moran, Max Moran, and Tanner Ottaway hosted us for breakfast, a tour of field operations, vendor services, and lunch. We also enjoyed a presentation by AERA's Belridge Vice President of Operations, Jeff Dittman. Thank you AERA and PE alums for providing an informative and exciting first day in the field!

**California Resources Corporation (CRC)** and Mines alum Jeff Quintana arranged our second day in the field. Our day began with a safety meeting and presentation on the history and operations at Elk Hills followed by a comprehensive site tour including the Consolidated Control Facility. We traveled to the **West Kern Oil Museum** in Taft for a delicious BBQ lunch hosted by Fred Holmes (**Holmes Western Oil Corporation**), with assistance by Josh Yurkanin (PE alum). During lunch, Joe Nahama (PE alum, President of **PetroRock**) provided thought provoking career advice including a rap song performance based on the Broadway musical, *Hamilton*. After lunch, we drove to Paso Robles for a tour of **Scientific Drilling International's (SDI)** Applied Technology Center, where all manufacturing, research and development are performed for MWD/LWD tools, Gyro surveying tools, and Cased Hole Services Tools. This tour was led by Carl Healy MS '21 and Austin Pile (PE Alum). Many thanks to Jeff, Fred, Josh, Joe, Carl and Austin for a memorable second day in the field.

*The group enjoyed their coastal geology field trip.*

Miller Newlon, **Aera** Production/Process Reliability Engineer and PE alum, coordinated an educational and interactive third day tour at AERA's San Ardo Field. The students enjoyed learning about production problems, solutions to the problems, and fishing tools. A "food truck" lunch was enjoyed by all. We are very appreciative of Miller's time and effort to lead this field tour. We also thank AERA for their support (Belridge Field and San Ardo Field tours) throughout the field session.



*What's a more California experience than playing beach volleyball?*

This year, David Miner and Greg Gordon (Mines alums) led us on a coastal hydrocarbon systems geology field trip featuring instruction on source rocks, fractured reservoirs, and conventional clastic reservoirs. The beach geology field trip is always a highlight of the field session. With the Pacific Ocean as a back drop, the students enjoy sending "selfies" to their friends on the Texas field session trip.

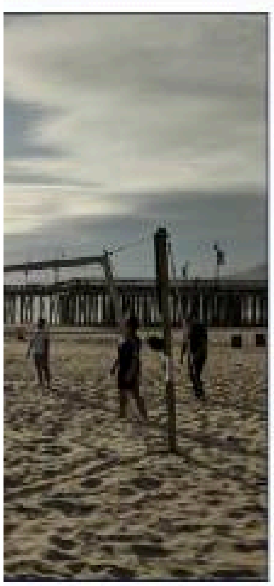
Our last day in the field was hosted by **CRC** and Mines alums Tom Turner, Dan Fletcher, and Robert Sebag. We visited CRC's Long Beach office for lunch and presentations on CRC assets Wilmington Field and THUMS islands. After a safety meeting, we took a boat ride to Island Freeman for a tour of the facilities and drilling rig. PE alum William Stevenson, **Long Beach Energy Resources Department**, joined us for the THUMS tour. Earlier that day, we visited **C & J Energy Services/Tiger Wireline** in Signal Hill where the students learned more about wireline services including logging, well perforating, and pipe recovery equipment and services. We appreciate the hospitality shown to us by CRC (Elk Hills and Long Beach/THUMS tours) and Tiger during our time in California.

The field session in Southern California would not be possible without the generosity of our alums and friends in the area. The students, TAs, Staff, and Faculty had a wonderful learning experience and another enjoyable visit to California. Thanks again! We hope to see you next year!

*Getting a workover rig tour from AERA.*

*AERA San Ardo Field Tour 2019.*

*The whole group at AERA's Belridge site.*



*Meeting with the Bakersfield alumni was great.*

## PEGN 315 — Texas, led by Dr. Xiaolong Yin

The 2019 Summer Field Session started on May 13th of 2019. This year, our group headed to Midland, Texas, the center of the Permian Basin, the current top oil producer in the US, and perhaps also in the world. Permian Basin currently has a rig count of 450, and a daily oil production in excess of 4 million barrels per day. Visiting Permian Basin is really a trip that goes into the center of action.


*The whole group at Don-Nan.*

Our group has 32 students, three graduate teaching assistants (Yakup Coskuner, Deep Joshi, Kanat Karatayev), and three faculty/staff (Xiaolong Yin, Yilin Fan, Rachel McDonald). In five days, we visited a number of companies from service providers to operators. It was a wonderful experience both for the students and for the group leads: five of the six group leads were also first timers in the field session. We want to use this opportunity to thank all companies who warmly hosted us – Don-Nan, Calfrac, UpCurve, Sivalls, NOV, Occidental – and thank all friends and alumni who greeted and guided us and made the trip memorable!

On our first day, we drove from Lubbock, the city where we landed, to Midland. The trip took about three hours. After checking into the hotel and having lunch, we visited the **Permian Basin Petroleum Museum**. This museum presents in significant detail the geology and history of Permian Basin oilfield, and has a wonderful collection of tools and demos for students to learn the process of field development and how equipment works.

On the second day, we visited **Don-Nan**, a company specialized in making parts for rod pumps and gas lift. Behind an almost inconspicuous gate along Highway 158, Don-Nan runs an impressively large yard that provides parts and services to rod pumps and gas lift not only in the Permian Basin but also across country. Our host, Josh Carty, organized a thorough tour of the facility, which included two mini-lectures on rod pumps and gas lift.

*Getting our safety instructions at the Calfrac site.*

In the morning of Day Three, we greeted PE alum Tom Migchelbrink from **Calfrac**. Tom and a number of other alums (Anjali Jha, Bryan Kang, Bob Sharpless, Matt Sinkey, AJ Ambrose) organized a trip for us to a fracturing site near Pecos operated by **UpCurve**. There, we greeted Drew Reed, Calfrac's manager in **Artesia**, and Dena Dembowski, UpCurves manager on-site. They gave us tour of the site and explained fracturing operations in details to the students. In the afternoon, we spent an hour with **Sivalls**, a company in Odessa that specializes in making pressure surface equipment, such as those used in separations and dehydrations. In the evening, we attended the welcome event organized by Anthony Bordonaro of the local M-club, with the help from Justin Moos (PE alum) from Nine Energy Services and Molly Beyer from the Mines Foundation. The two-hour party brought enthusiastic conversations, and was definitely a highlight and a very memorable part of this Midland trip.

On Thursday, we visited a number of facilities of **National Oilfield Varco** (NOV) in Odessa-Midland. To better service the busy drilling activities in the region, NOV is putting online a brand-new, automated drill pipe inspection facility, which was our first stop. In the afternoon, we visited a pipe coating facility and a rod inspection and recondition facility, both of which are also specialties of NOV. Daniel Luna, the local manager, set up the trip and stayed with us throughout the day. It was a wonderful example of the strong and efficient infrastructural support that has made Permian conventional and unconventional operations such a success.

On the last day of the trip, we visited the field office of **Oxy** in Artesia, NM. This unconventional asset of Oxy is growing very rapidly with huge potential. Take the words from Brent Vangolen, a PE alum at Oxy who helped us get the tour, "... 9000 BOPD when I took over the asset, running 170 MBOPD now, and headed to 600 MBOPD in 5 years". Highly efficient drilling / completion practices keep the cost low; experimentation of unconventional EOR is likely to maintain the production strong for many years to come. Our host took our group to tank batteries, a fracturing site, and a drilling site. Students have observed some of the equipment used in these activities in previous days; this tour, however, showed from an operator's viewpoint how these activities are properly planned to develop a field. The tour was nicely organized, explained, and TIMED. We successfully completed the tours on time(!), which allowed us to get back to Midland and catch our evening flight back to Denver. Thank you Oxy!


*At the entrance to NOV's brand new inspection facility that is so sparkly new we couldn't take any photos inside.*

*Everyone at the Calfrac site.*


*Students had a wonderful time speaking with all of the alumni who came to the welcome event on Wednesday.*

# PEGN 316 — Massadona, led by Dr. Jennifer Miskimins

Once again we ran four weeks of the PEGN 316 field camp - two sessions at two weeks each - and once again, we experienced all four seasons that Colorado has to offer - sun, rain, hail, and snow!! 85 total students survived this onslaught, and although I don't think they really believe me, the weather that they experienced wasn't the worst we've ever seen - close, but not quite.

As always, our wonderful partners - **Chevron** and **Production Logging Services** (PLS) - provided daylong discussions and presentations for us on the Rangely field case study and production logging techniques for each of the two sessions. Roy Cramer with Chevron and Craig Stratton with PLS lead the respective charges as they have for so many years, and we continue to be indebted to their generosity and enthusiasm!! Leona, and the folks at the **Bedrock Depot** in Dinosaur, CO, also continued to also help us this year by providing access to

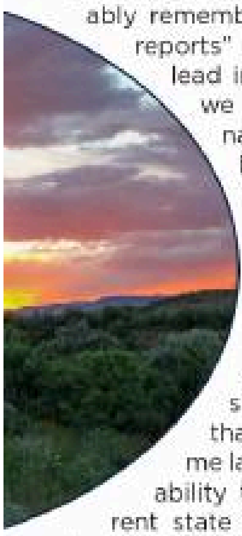
*Finding shade is kind of like watching a 6-year old's soccer game.*

*Sunset over camp.*

*Groups photos! Session A above and Session B below.*

certain mapping areas in Skull Creek, as well as saving the day with chocolate malts when the temperature reached 95° F.

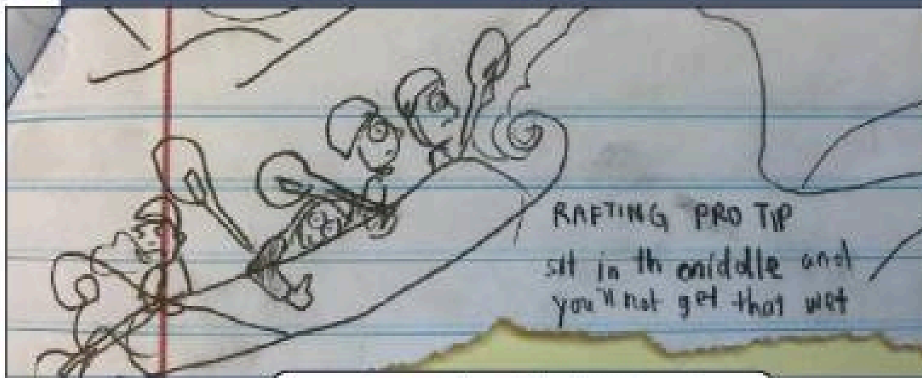
We made one addition to camp this year, as the Amoco seismic trailer that so many of you remember is starting to show its wear and tear of +30 years. We would like to thank Shell for sponsoring the purchase of a new "Tough Shed" that now houses our supplies and some operational activities – it's now the only structure without leaks!



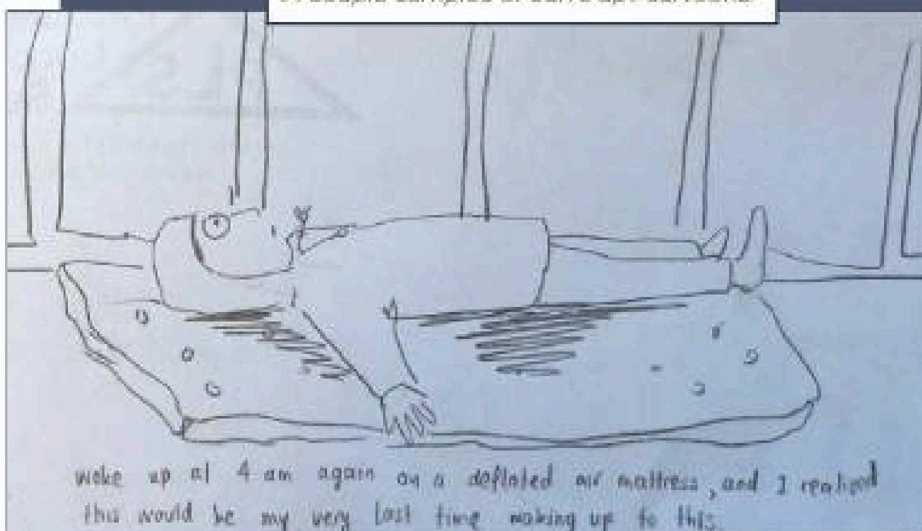
Every year when writing these articles, I try and capture some of the camp that might spur some memories for you, and over the years, we have had some students that do a better job than I do in achieving such. Many of you probably remember doing "morning reports" each day for the lead instructor. This year, we had a phenomenally talented young lady, Wan Jun Aida Wan Ahmad Johari, also known as Jun, who provided me sketches each day. A better description really would be that she drafted cartoons that frequently had me laughing aloud at her ability to capture the current state of the camp. With her permission, she's allowed me to publish a few as space allows for your viewing pleasure!

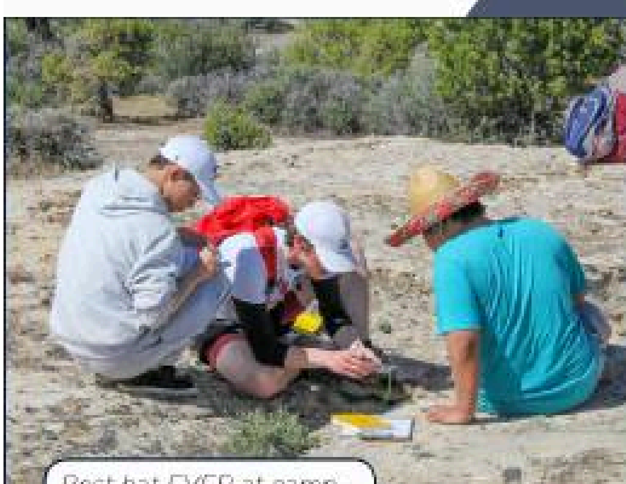
How many of you wish that you'd had the first tip on Split Mountain? And how many of you completely relate to the second one?

In addition to Jun's sketches, we've included some field session photos to spur some additional memories!




A couple samples of Jun's apt cartoons.



Best hat EVER at camp.

Cornhole will soon be an export to multiple countries.

COLORADO SCHOOL OF MINES
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**Department of Petroleum Engineering**

1500 Illinois St.

Golden, CO 80401

# Save the Date!

**MINES PE ALUMNI RECEPTION**
**ATCE, CALGARY**

Please watch your inbox for registration information.

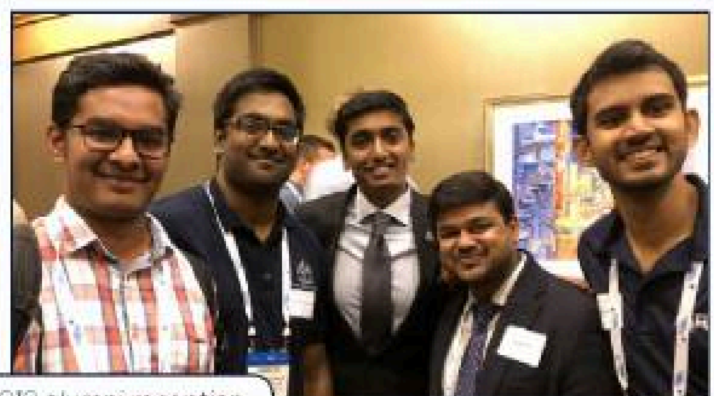
**MONDAY, SEPT. 30**

**6:00-7:30 PM**

Fairmont Palliser

Alberta Ballroom, Mezzanine Level

We now offer a digital version of the PE newsletter! Update your profile at **minesalumni.com/update** to receive newsletters or other types of digital communications from Mines.



*Students at the ATCE 2018 alumni reception.*

## #IDIGMINES GIVING DAY

This past spring was the third #idigmines Giving Day. Departments and organizations across campus competed to see who could get the largest numbers of donations in 24 hours. On the line were bragging rights and a share of the many bonus prizes offered. PE received 63 donations, 15% more than the year before, totaling $17,485 which qualified us for a portion of $850.00 in bonus money.

We want to do even better next time! Please put February 6th, 2020 on your calendar and be ready to participate so we can claim our spot on top! With our large alumni base, we can be victorious in nabbing both the bragging rights and top prizes.