

NEWSLETTER

VOL. 20, NO. 1 SEPTEMBER 2016

## GREETINGS FROM DR. ERDAL OZKAN

PROFESSOR AND F.H. "MICK" MERELLI/CIMAREX ENERGY DISTINGUISHED DEPARTMENT HEAD CHAIR

It has been a difficult year for the oil industry. Petroleum Engineering departments have had their fair share of the downturn. At Mines, we have experienced a reduction in our financial support, drop in research funding, and, most importantly, some decline in our student placement and internship statistics. However, thanks to our strong industry ties, dedicated faculty and staff, and excellent alumni support, we withstood the impact of the industry downturn and proceeded with projects to improve our strengths.

As examples of our efforts to combat the adverse effects of the downturn, we offered six, two-day short courses to our seniors in the spring semester to enhance their knowledge, enrich their resumes, and improve their employment prospects. Also, during the summer, we ran three in-campus externship programs for our students who could not secure an industry internship. The five-week externship programs focused on Enhanced Oil Recovery, Drilling and Production Data Analytics, and Hydraulic Fracture Design and comprised of design projects based on industry provided data. Throughout the externships, students worked in teams, designed projects, received training on processing and analyzing data, and learned new software. Most importantly, our externs had the opportunity to interact with industry experts - who graciously contributed to the success of the program - made presentations of their projects to professionals, and received invaluable feedback. You can find more details about the short course and externships programs in this newsletter.

Contrary to intuitive expectations, our student numbers have not changed considerably since the start of the downturn. After two years of downturn, we are expecting a noticeable



Dr. Ozkan presenting the Outstanding Graduating Senior Award to Jeff Olson for the spring 2016 graduation.

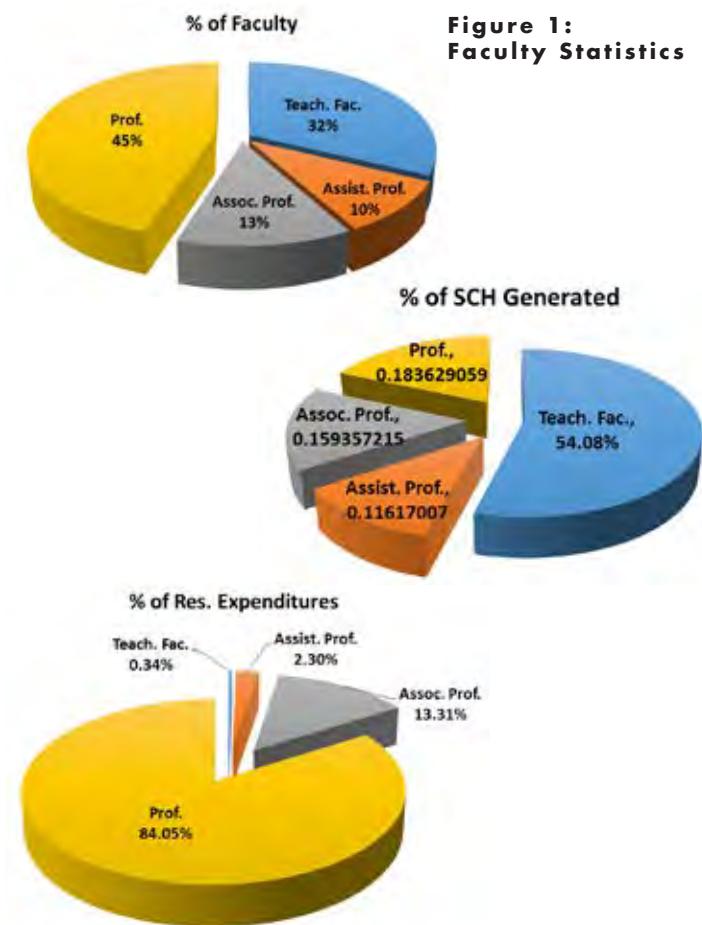
decline in our incoming class size this fall. If the predicted drop of 50-60% holds true and continues for the next three years, we will end up with half of our enrollment in the 2018-19 academic year, which will still be twice the size we had in 2009. Moreover, if the predictions hold and the industry bounces back by 2019, a new hiring wave is also expected, which makes planning really challenging. To add to the problem, in academia we do not have much flexibility to respond to industry cycles, and it takes longer to see the results of new initiatives.

Particularly, being a state institution, it is difficult to put a cap on our enrollment and, because CSM already accepts top students, no other screening criteria (such as grade barriers to advance in the curriculum) can effectively reduce the student flux into Petroleum Engineering when the employment and salary statistics top the charts. As of mid-August, we did not have the final official statistics, but the surveys in April indicated that our final job placement would be over 50%, which was only a few percent below the campus averages for all disciplines.

My citing of the enrollment predictions is not to hide behind statistics. On the contrary, our attitude has been to convert this crisis to an opportunity. To become less vulnerable to the adverse effects of future industry cycles, we need to create practical and realistic solutions. We have started a curriculum revision process to ensure our graduates will be equipped with skills which are most up to date, highly desired, critical, and essential for the industry under any market conditions. We will start some features of our new curriculum this academic year, with the goal of being fully implemented in the 2017-18 academic year.

## DR. OZKAN CONTINUED

Another initiative is to ease the effect of reverse monopoly in the job market for new graduates. During up cycles, the fact that the oil industry is the monopolistic customer of our student product appears to ensure economically and professionally satisfying jobs for our graduates; during down cycles, on the other hand, the results of the reverse monopoly in the job market is devastating. To alleviate the problem, we will provide broader skill sets through minor options which can appeal to non-traditional employers. We will offer minors on petroleum data analytics, midstream engineering, computational sciences for oil industry, corporate social responsibility, and petroleum economics. We will start some of the minor courses this academic year but the official minor designation will be available in the 2017-18 academic year.



All the changes and efforts we have been making require not only financial but also faculty and staff resources. You would like to know that most of our faculty and staff worked non-stop over the summer on various projects from research and curriculum development to field sessions and externships. I must take this opportunity to thank our devoted faculty and staff for their selfless work to implement new programs, while helping our students to achieve their professional goals.

The pie charts in Fig. 1 summarize our current faculty statistics. We have 17 faculty members consisting of five teaching

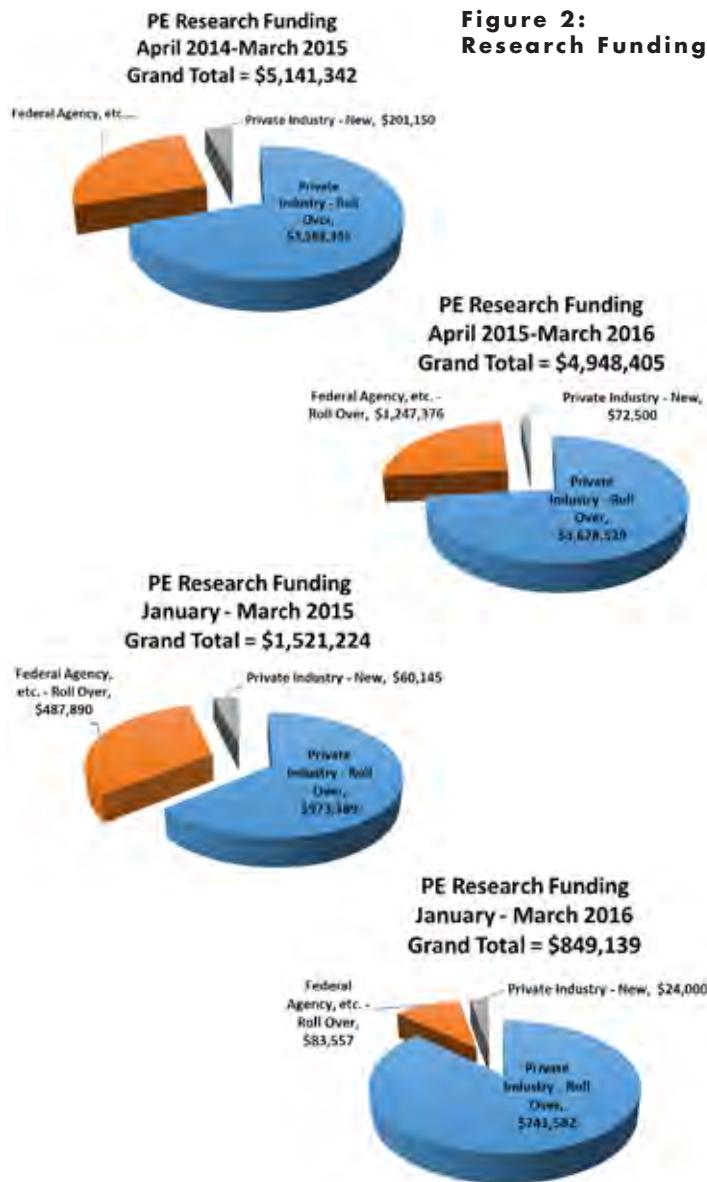
faculty and 12 tenured/tenure-track faculty. Our expert teaching faculty generates more than 50% of the student credit hours (SCH) and our full professors generate 84% of our research funding, which indicate a healthy distribution. Currently, out of our 18 faculty, four will be considered for tenure and 10 will be applying for promotion in the next few years. This makes faculty development an important issue for the department. Especially for our junior faculty, survival in academia depends on teaching excellence and research funding. Under the unfavorable research funding conditions, they need more support to enhance their contacts with the industry and develop their research projects. One of the ways to foster this goal is to provide faculty internships in the industry during summer time. The support of alumni will be immensely appreciated in exploring faculty internship opportunities in their companies.

As shown in Fig.2, on the research front, we have not experienced a significant drop (approximately 4%) in our total research funding for the same 12-month periods (April 1 to March 31) of 2014-15 and 2015-16. This is mostly due to ongoing, multi-year projects. Comparison of the research funding for the first three months (Jan. 1 to March 31) of 2014 and 2015, however, indicated an alarming 44% drop. Analysis of these numbers indicates that our federal funding has been draining at a rate of 83% without new funding. On the other hand, our private industry funding has declined at a rate of 24% but it has been replenished at a much faster rate of 60%.

The decline in federal funds, particularly for fundamental research in academia, was the topic of our visit to Washington D.C. in April with my colleagues from Texas Tech, University of Tulsa, University of Oklahoma, and University of North Dakota, representing the Association of the US Petroleum Engineering Department Heads. We spent two days in Washington D. C. and visited 15 Congressional Representatives and Senators. We also visited the Office of Fossil Energy at DOE. At that point, the Senate and House Appropriation Committees and the Senate had already approved the FY 2017 Energy and Water Development Appropriations Bill. The bill, however, failed to secure the majority vote at the House later in May. House Appropriations Committee Chairman Hal Rogers issued a statement that the result would not stop the process; it was "merely a temporary pause".

If approved, similar to the amount appropriated in FY16, House and Senate bills would appropriate \$23 million for Unconventional Fossil Energy Technologies. Much to our dismay, we have found that, as in the past, the bill did not specify how the funds are to be used by the DOE. Congress' intent on the allocation of funds is explained in an accompanying report, but it is not the law, nor is it binding. In the past, this resulted in DOE's use of the funds in more politically popular areas, such as CO<sub>2</sub> sequestration and methane hydrates, but not on hard-core fossil energy technologies. We will continue our efforts to inform the legislators that current and future bills

## DR. OZKAN CONTINUED



With the intent of improving our cutting-edge research capabilities, we have also been investing in our experimental facilities. In the last year alone, we have spent over \$1.5 million for new lab equipment and experimental setup and we have plans to accelerate our investments. If you get a chance to visit us, we will be happy to show you the new labs and facilities, which will make you proud of your alma mater.

Before concluding, I would also like to note that we have made some major organizational changes to improve our service to our students, faculty, and visitors. We have hired two new administrative staff, Rachel McDonald and Debra Maruffo, and a program manager, Kayla Boster. We have formed a new undergraduate student advising office; Terri Snyder will be responsible for undergraduate advising and will work with Dr. Mark Miller and Dr. Linda Battalora to help answer our undergraduate students' academic needs. Denise Winn-Bower will continue helping our graduate students and research programs. Our main PE Office operations will be managed by Rachel McDonald as program assistant and Debra Maruffo as administrative assistant. Kayla Boster, as the program manager, will help me with strategic planning, hiring, faculty data, industry and alumni relations, and reporting and communications. We expect to improve our student satisfaction with this new organizational structure.

Finally, I want to share with you the news that Dr. Manika Prasad was promoted to full professor in April. This was a long overdue promotion for her outstanding contribution to the department and Mines. Also, if you have not already heard, I would like to give you the news that Dr. Jennifer Miskimins is back on our full time faculty. She left her full-time position at CSM in 2012 to assume a consulting position, which exposed her to a wealth of industry data and experience. She continued her involvement in our research and teaching activities in a part-time capacity since then. Although she has not really been away, having her back at full-time capacity will improve our ability to serve all our constituencies better. She has also graciously agreed to help me with our ambitious projects as the Associate Department Head. Welcome back Jennifer!

Thanks for your continuing support and please stay in touch.

should make their intended R&D allocations in fossil energy binding for DOE.

While striving to improve federal funding on fossil fuel research, we are strengthening our research collaboration with the industry. Despite the restraints of the general budget cuts, we are focusing on strategic research, which helps the industry improve technical and economic efficiency of their projects, and innovations, which contribute to the long-term vitality and prosperity of the industry. We have been proactive in reaching out to domestic and international companies, NOCs and NGOs, and research organizations worldwide. Our efforts have started paying off and you will learn about the new research projects the PE faculty have received in the pages of this newsletter.



# RAMONA M. GRAVES - DEAN OF COLLEGE OF EARTH RESOURCE SCIENCES & ENGINEERING (CERSE)



Dr. Ramona M. Graves

I write my 2016 newsletter article while preparing for the CERSE leadership retreat and watching the Olympics. The College of Earth Resource Sciences and Engineering is the gold medal dream team – Economics and Business, Geology and Geological Engineering, Geophysics, Liberal Arts and International Studies, Mining Engineering, Petroleum Engineering, and the Colorado Geological

Survey. We are a college that represents the traditional strengths of Mines and continues to focus on preparing students for the future through multidisciplinary, innovative research and teaching. I love this common sense, logical grouping of my team: GE, GP, MN and PE find and extract natural resources and develop energy sources, EB gives the solid business case which adds economic value while LAIS keeps us focused on corporate social responsibility and development in an environmentally sound, sustainable manner. CGS partners with Mines to incorporate new energy sources, water resources, geologic hazards, and outreach to the citizen of Colorado.



Dr. Ali and Dr. Waleed at alumni function in Abu Dhabi.

On my travel adventures this year, President Johnson joined me in Saudi Arabia and Abu Dhabi where we had several strategic meetings and alumni gatherings. (See the photo of two of my former graduate students that are now professors at the Abu Dhabi Petroleum Institute.) He also joined the Petroleum Engineering Field Session in California to attend a BBQ hosted by Fred Holmes where we all enjoyed the "keynote" presentation by alum Joe Nahama – wish I had a video of that! The Mining Department Head, Priscilla Nelson, and I were in Morocco to continue to build connections with the Office Cherifien des Phosphates (OCP). One of my treasured memories is being presented with a fez from Fez.

As you'll read in the newsletter, Mines and the Petroleum Engineering Department continue to thrive thanks to faculty, students, alumni, corporate sponsors and, of course, great leadership. (*With great restraint, this year I did not include any photos of my perfect grandson Oliver. Hard to pick one picture from 1.65MM photos!*)



The women of 2016 Petroleum Engineering California Field Session. Dr. Battalora far right in red hat, Dean Graves second from left in cool gloves, Hannah Thompson, fourth from left. Hannah is the first recipient of the Ramona M. Graves Endowed Scholarship Fund.

## FACULTY LETTERS

### LINDA BATTALORA



Dr. Linda Battalora

The Fall 2016 semester is off to a great start! We have new faces in the PE office, new faces in our classrooms, and some revised and new PE courses. This semester we are piloting a merger of PEGN310 Petroleum Reservoir Fluids and PEGN413 Gas Measurement & Formation Evaluation Lab. Drs. Xiaolong Yin, Mansur Ermila, and I will be teaching classroom and lab sections

of this combined PEGN398 course. Additionally, I am teaching the PEGN681 Petroleum Seminar course. Last spring I taught one section of our PEGN439 Multidisciplinary Engineering capstone course with Drs. Tom Davis, Steven Sonnenberg and Mark Miller. I also taught PEGN530 Environmental Law and was Coordinator for our PEGN315 Field Sessions.

In addition to teaching, I serve as the PE Department representative to the Undergraduate Council and Faculty Senate and work with our Undergraduate Curriculum Committee to review courses and propose curriculum changes. I share PE Undergraduate Student Advising with Dr. Mark Miller. I also served on the campus Learning Management System (LMS) Committee to evaluate our LMS system and review new options.

### BATTALORA CONTINUED

In May, I led a group of 40 students to Southern California (Bakersfield, Long Beach, Arroyo Grande, and San Ardo) on the annual California PEGN315 Field Session. During the month of June, I participated in the first Summer Course Revision Intensive. Through a ranking and review process, 29 faculty members were selected by Mines leadership to work with the Trefny Center for Innovative Instruction to develop or revise a course under the instruction of Dr. Sam Spiegel, Timeri Tolnay, and a variety of guest scholars. We were introduced to Mines' Engineering Learning concept and charged with bringing it back to our departments and into the classrooms. It was a pleasure to collaborate with my faculty colleagues and work with Sam and Timeri while developing the PEGN398 course and lab curricula. Over several weeks, we developed an innovative teaching and learning cohort, as well as smaller Professional Learning Communities that will continue to meet throughout the academic year and beyond. This summer intensive experience was exceptional, and I am very appreciative to have been selected to participate in it. The rest of the summer was spent working on course revisions, teaching for the Hydraulic Fracturing and Drilling Data Analytics Externships, teaching for the Unconventional Natural Gas and Oil Institute (UNGI) UGTEP and UNGI-TOPCOP training courses, teaching for SUPERSCHOOL, hiking, traveling, researching, and writing.



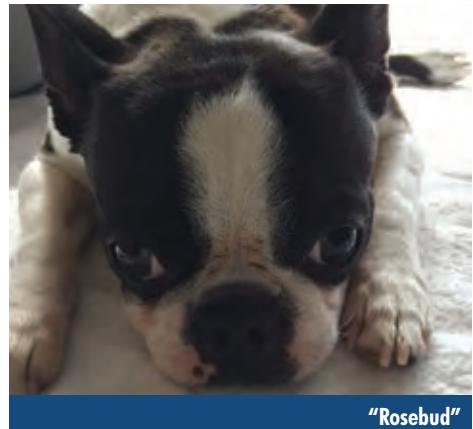
Dr. Battalora doing some "heavy lifting" during California Field Session.

In late spring I was honored to be selected as a Shultz Family Humanitarian Engineering Fellow for a term running July 2016 to August 2018. I will integrate humanitarian engineering and social justice in a new course that will roll out in spring 2017 titled Environmental Law and Sustainability. I have been incorporating Health, Safety, Security, Environment and Social Responsibility (HSSE-SR) into my courses for several years, and as a result of my sustainable development research, I will be incorporating sustainable development into my PE courses as well.

I continue to serve the Society of Petroleum Engineers International (SPE) in a variety of capacities: Denver Section Board Member and Co-Chair of Continuing Education, Sustainable Development Technical Section Steering Committee member, Process Safety Workgroup member, HSSE-SR Advisory Committee member, and 2017 SPE HSSE-SR Conference Social Responsibility Subcommittee Chair. Additionally this year, I was selected by SPE to become an ABET Program Evaluator. Not only are these volunteer activities enjoyable, but they also connect industry to the classroom as I invite industry colleagues to participate in classroom discussions, research, and activities with my students.

I continue to work closely with the Association of International Petroleum Negotiators (AIPN). One of my favorite "duties" as a member of the Education Committee is to judge the annual Writing Competition that is open to all universities that have an affiliation with AIPN. I enjoy the opportunity to read and rate the papers and to work with other members of the Education Committee to select winners to attend the Annual Conference. I am also a member of the Denver Council on Foreign Affairs.

Outside of CSM, I maintain my legal consulting practice in environmental law and international oil and gas law. It is a pleasure to work with my colleagues Laure Bonna, Philippe Auzas, and Audrey Grossot at Bonna Auzas Avocats of Paris, France and to occasionally have them co-teach with me a short course on international hydrocarbon agreements. Additionally, in the spring I was elected to serve on the Colorado Bar Association Environmental Law Section Advisory Council.



"Rosebud"

I continue to take ballet and pointe classes, yoga, and cardio classes, and hike with the Colorado Mountain Club. "Rosebud," my brilliant Boston Terrier, will be eight years old in December. Last summer she had medial patellar luxation surgery and recovered beautifully. She still acts like a puppy, and the "new knees" have helped with that! (smiling)

Thank you for your continuing support of the PE Department and Mines! We look forward to seeing many of you at ATCE 2016 in Dubai and of course, we always enjoy seeing you on campus for alumni events and recruiting!

# ROSMER BRITO



Dr. Rosmer M. Brito

This past spring semester was my first semester here at Mines. The last seven months have been full of exciting new experiences for me as new professor at the Petroleum Engineering Department at Colorado School of Mines. I had the opportunity to start a new graduate level class in the production area with Dr. Ermila (Advanced Production, which will be offered again next spring). We had a small group of students that worked really hard all semester. It was a great pleasure for me to

see them building their own steady-state production simulation software from scratch and to spend time with them in the lab debugging the software. I really want to say thank you to them for being so nice and dedicated during the semester.

My first graduate student joined my group and together we have been working on the planning and construction of the first large scale multiphase flow experimental facility in the department. This will be an experimental facility to study three-phase flow liquid loading phenomenon in large pipe diameters. Based on our schedule the experimental facility will be running by the end of September.

I also had the opportunity to go to my first field session in Massadona...even though I decided to skip the Massadona Burger, the field session was a great experience. The students were well behaved and responsible. They showed interest in the different activities and made me understand why

Mines students are considered one of the best in Petroleum Engineering. Furthermore, the views and surroundings took my breath away (or maybe that was the several days of hiking).

Currently, I am participating in the Drilling and Production Data Analytics Externship group. This has been a great effort for the department to help students that were struggling finding an internship during this oil downturn. The students have been able to get training in different software such as Techlog and SAS and develop a better understanding of how to organize massive amounts of data and how to get useful information out of it. In addition, we had amazing speakers in the drilling and production area that were willing to donate their time to help Mines students. I hope the students are having a great time and learning a lot. Furthermore, I am looking forward to seeing these students convince recruiters to give them an internship position next summer based on the experience they got this summer.

In addition, I have been working with the department to open a new midstream minor. The midstream sector in the oil industry involves the transportation by pipeline, rail, oil tanker or truck, storage, and marketing of crude and gas. We are expecting that this minor will help students to expand their horizons in the oil industry. We will be offering our first class (PEGN498-A Single and Two-phase Flow in Pipeline Networks) this fall and we are working with the Rocky Mountain Pipeliners Club to have different on-campus activities such as lunch & learns and short courses to increase the knowledge about midstream operations. I am looking forward to making this minor a success for the department. I have found the challenge of being on the vanguard of a new research division both excited and rewarding. I hope to help bring a level of excellence to Mines's Production Engineering Division that is on par with the Department's amazing record in drilling and reservoir. Looking forward to the new fall semester.



A visit to a Ward Petroleum Corporation rig during the externships in summer 2016.

## FACULTY LETTERS

### ELIO DEAN



Elio Dean with his wife on the sailboat.

With my first full year as faculty complete, I'm looking forward to year two. This has been an extremely enjoyable year, so allow me to share some of my adventures. If there are any alumni interested in more details about any of the items I highlight please feel free to contact me via email ([eldean@mines.edu](mailto:eldean@mines.edu)).

I taught Petroleum Economics (PEGN 422), Well Testing (PEGN 414), and Multidisciplinary Senior Design (PEGN 439).

Regarding PEGN 422, I've been working with John Wright and Lia Sedillos (John is the author of the text we use and both have taught the course in the past) to improve the course and add more industry insight. I also co-taught/led two field sessions (PEGN 315 and PEGN 316).

Enhanced Oil Recovery is my area of focus. I've been working with industry partners looking into using CO<sub>2</sub> from corn ethanol plants as a CO<sub>2</sub> source for DJ basin EOR projects. I attended the Carbon Capture, Utilization and Storage conference in Tysons Virginia with Scott Hornafius (president of Elk Petroleum), where we presented a paper on the potential of Carbon Negative Oil. I have also been working on technical committees for SPE focusing on EOR (IOR Conference and on the EOR subcommittee of the RDD advisory committee).

I've been working in the Undergraduate Curriculum Committee and we are making improvements. We are including more on data analytics / data science, unconventional, and introducing more software to our students. I've been working with ~20 students conducting EOR screenings to ~30 reservoirs in the DJ basin using numerical simulation software. I've helped some recent graduates start a company where they contract out hours to companies who need engineers on a part time basis. I am also the SPE student chapter faculty advisor and have been able to work with SPE and SPE Denver.

All work and no play makes Jack a dull boy. I try to go sailing at least once a year and had great trip with my family in the Virgin Islands during June/July (figure those pictures are better than work ones). Including work and pleasure I've visited 18 states/territories, Dominican Republic, Brazil, England, and the BVI in the last 12 months.



Snorkling with my kids.

### MANSUR ERMILA



Dr. Mansur Ermila

I have dreamt of going to Colorado School of Mines since I was in my undergraduate school back in my country, and until this day I have moments where I'm still in disbelief that I was fortunate enough to do my PhD and become a teaching faculty member at my dream school.

After getting my bachelor's at Tripoli University I had high hopes that I would be sent by the University to complete my master's

degree at CSM, but unfortunately there were no students sent to the U.S. at that time. After getting my master's degree in Hungary and working in the fields in Libya I moved on to being a lecturer at Tripoli University. Years went by and I was slowly beginning to let go of my CSM dream. Until one day I was informed that I'd been selected to do my PhD abroad, and I took this opportunity to go after my dream once again and see where destiny lead me. The day I received my acceptance letter from CSM was the best day of my life. I was finally able to make my dream come true.

I moved here in late 2006 with my family. At that time my oldest daughter Marwa was 12 years old, Rehana was 8, and Abdullah was 6 years old. Now Marwa is 22, Rehana is 18, and Abdullah is 16. Marwa is a student at Metropolitan State University, Rehana is a student at University of Colorado at Denver and my youngest Abdullah has just recently graduated

### ERMILA CONTINUED

from Lakewood High school. Even though it was a bit hard for them to get used to the environment here at first and to learn a new language, now they are all fluent in English as well as Arabic, and Colorado has become their home and they wouldn't want to be anywhere else in the world.

I started taking Petroleum PhD classes in January 2007 and I graduated in May 2012. After I received my PhD I worked as a research assistant for two and a half years, then in January 2015 I got hired as a teaching associate professor in the PE department.

Moving here and attending this amazing school and being a part of its team has taught me that dreams do come true, that hard work pays off, and most importantly that we are never too old to learn and better ourselves. I learn something new each and every single day from the incredible people that I work with and from my work with my students. I used to get afraid every time I was told I would be teaching new classes or working on new things that I was not familiar with, but with

time I have become more comfortable tackling new subjects and materials. Working at CSM has bettered my teaching skills, my learning skills, and more importantly, I have learned to take the new work as a learning experience and to use it to better my skills and my knowledge. My colleagues are such motivated and hardworking people and I truly do not know where I would be if I didn't have their support and great advice with me along this journey. Studying and working at CSM has made my dreams and the dreams of my family come true and I will forever be grateful for this life-changing opportunity.



My son Abdullah at his high school graduation this year (May 2016).



Our students doing their geology excercise on Dinosaur National Monument (Field session I 2016).



Art done by our students this summer in Massadona (2016).

### ALFRED W. EUSTES



On the Agile Sub-Ice Geological Drill in February in Madison, WI. Currently, the ASIG is in McMurdo, Antarctica.

In June 1996, I joined the Petroleum Engineering Department as a faculty member. I celebrated 20 years with the department this summer. This makes me the longest serving faculty in the department (Ramona Graves is Dean and Mark Miller was one semester after me). A lot of classes have gone by. And most importantly, the large amount students I have had the pleasure of helping to learn about drilling and

completions. For example, I have completed 21 years of PEGN 311 with #22 coming up. I started as a PhD student in 1995 with the class, with Dr. Bill Mitchell mentoring me. 2013 was the only year I didn't lead the class as it was a sabbatical year. I went through my old grading spreadsheets, noting the many familiar names, and also noted that 1,921 students have come through the classes that I have led. The figure below says it all.

That is a lot of engineers that I truly hope helped with their careers. Which is the point of being a faculty member, isn't it?

In addition, being a faculty member means trying to push the edge of the knowledge envelope further. The research efforts in drilling here have been all over this world (and beyond). Dr. Fleckenstein and I have led an effort to understand the reality

### EUSTES CONTINUED



of fracture stimulation and aquifer contamination in Colorado. Last year, two papers for the SPE and a poster at the AGU meeting were presented.

And this year, two more papers will be presented at ATCE. We have also been active in the geothermal drilling and completions area with two joint projects with the National Renewable Energy Laboratory. One was with Dr. Tutuncu on horizontal geothermal completions and the other on NPT and ROP analysis of four recently drilled geothermal wells. We had two papers at the Stanford Geothermal Workshop and two at the Geothermal Resources Council meeting. Finally, since 2000, I have been working with the ice coring and drilling community in various ways. Currently, I am the industrial liaison for the Ice Drilling Program Office.

I am still involved with service activities such as the Drilling Systems Automation Technology Section of the SPE, faculty advisor of the CSM American Association of Drilling Engineers, and various departmental and school committees. Also, Dr. Battalora and I are crafting a new Data Analytics minor program for the department and school. Given the vast amount of sensor information and data coming from drilling, completion, and production operations, it behooves us to educate our students and ourselves in this useful endeavor. In fact, as a start, we have a Drilling and Production Data Analytics Externship program this summer. We are taking data from various sources (oil and gas, geothermal, and ice)

and developing methods that give us insight into operations. (See the Externship article for more information). Next year is the sexennial ABET review, so we might be calling on you to help us out.

On a personal note, the family is doing well. Susan is working for a new company, IHS Markit. Actually, it is the same as before; however, IHS combined with Markit in July, making it a "new" company. Our daughter continues working on her doctorate in microbiology in Utah and our son is taking a gap year from college, working as a credit union teller and steak salesman. I have a new found respect for those who work in the service industry. We need to treat them well.

I will be turning 60 this year (gasp! He looks so young!). Sometime in the next decade, I will most likely step back and retire. When I do, I would like to teach short courses around the world. It is a great way to catch up with you and to keep myself up to date on the vast activities of this industry. I hope to see you at ATCE in Dubai. If not there, maybe in next year's field session or wherever our paths cross. Stay safe.



Susan and I at an iconic location in London.

### WILLIAM FLECKENSTEIN



Will in the snow.

Lower oil prices are having a profound impact throughout our industry, and education is no exception. Several initiatives I have been pursuing since I was the Interim Petroleum Engineering Department Head have been put on ice until oil prices pick up. We were assisting Kuwait with the design of a world class research center, and that has been put on hold until oil prices improve. We

are hosting several Kuwaiti students here that are advancing their education, and hope to continue to assist regardless of oil prices. Education and the advancement of technology is needed at all times, regardless of other conditions.

Dr. Eustes and I have mostly completed our work on a multi-year NSF study of the sustainability of natural gas development, and have found important relationships between wellbore construction and hydrocarbon migration. We presented these results in a variety of venues and publications as diverse as the AGU meeting in San Francisco and the KOGS SPE Conference in Kuwait City. We are happy to report that the contamination of aquifers portrayed in "Gasland" is vastly overstated, and we will continue to get the word out. These results are also important for greenhouse gas emissions; if methane is not migrating to

### FLECKENSTEIN CONTINUED

contaminate the aquifers, it is surely not migrating past those aquifers to the atmosphere. Another issue that has moved to the forefront is induced seismicity. We believe that if there is a linkage between injection wells and induced seismicity a pressure signature may be recognized at the injection well. We need to find operators that would be willing to equip their injection wells with high resolution downhole pressure gauges to look for this relationship. If analysis of the data can identify precursor events, this may allow the injection well operations to be modified to prevent or reduce the energy associated with seismicity, which could be really important if it could reduce the energy associated with large seismic events, such as those pending in areas like California.

I have continued to work on the commercialization potential of my research, and I am shepherding several inventions through the patent process with the school. We have several technologies ready for commercialization in the area of frac sleeves, annular seal verification without CBL's and turbines



**Dr. Fleckenstein at the MLK Breakfast with Carlotta LaNier—a key figure in the Civil Rights Movement and youngest of the Little Rock Nine.**

for horizontal well applications. I have enjoyed my travels this year in the US, Spain and the Middle East and appreciate the hospitality of the CSM alums I have met.

I hope everyone has had a wonderful year and I look forward to seeing many of you at the SPE ATCE in Dubai this fall.

### HOSSEIN KAZEMI - CHESEBRO' DISTINGUISHED CHAIR



**Dr. Kazemi playing in an Over-65 International Soccer Tournament in mid-July.**

It is late-July 2016 and, sadly, summer break is approaching its end. I am enjoying the summer break immensely because I am spending quality time working on topics of interest to me, and it has allowed me to upgrade my classroom lectures and homework assignments for the coming academic year.

**Academics:** One specific area of focus this summer was overseeing the installation and testing of the new PVT cell which took ten months to build in France by a French subsidiary of Core Lab, Inc. The generous and gracious funding for the cell came from Western Holm Corporation in California. For the installation, I was incredibly gratified to see Somayeh Karimi and Ilkay Eker, along with Joe Chen and Ken Benching of Surtek, dedicate a month of their time to learning and testing

the new equipment. Of course, we have a long way to go before we will be able to utilize the equipment. Nonetheless, I can see the light at the end of the tunnel.

Specifically, I plan to work with Professor Xiaolong Yin to use the equipment for research studies on phase behavior in nano and micro-scale porous media. Another possible application of the equipment will be to use the PVT cell as the front end of a core flooding system to saturate cores with live oil at the reservoir pressure and temperature conditions.

In addition to research activity, I taught four graduate courses: Reservoir Simulation I, Enhanced Oil Recovery, Compositional Modeling, and Carbonate Reservoirs (the last course was co-taught with Professor Rick Sarg in the Geology Department).

**Travel:** Because of the industry's business climate, I did not travel much last year. Nonetheless, in late March, I accompanied Dr. Erdal Ozkan on a visit to Kuwait, Daharan, and Abu Dhabi in pursuit of building a stronger academic and research relationships with our friends in these key Middle East countries. You should know that this trip was a brainchild of Erdal and I believe it was very worthwhile because we have already seen reciprocity by our colleagues from KFUPM (King Fahad University of Petroleum and Minerals), and we have had several new discussions with our colleagues from Kuwait and the Petroleum Institute in Abu Dhabi. I also attended the 2015 ATCE in Houston.

### KAZEMI CONTINUED

**Entertainment:** I love sports and summer is often a wonderful time for watching great international competition. This summer I enjoyed the soccer EuroCup in France, and I look forward to the summer olympics in Brazil.

A highpoint of the summer events was attending Mines Athletics Auction in late May. In the picture, my wife is holding the Women Championship Cup that our CSM women soccer team earned by finishing 1st place in the league. Dr. John Wright and his lovely wife Jane were with us for that great and fun evening.

Now, a humorous story: I played in a soccer tournament in mid-July to prove to myself that I was still energetic enough to continue teaching!

**New Academic Year:** As for the new school year (2016-2017), I look forward to teaching, working with students, colleagues and our sponsors. Lots of new and exciting projects

are on the horizon. Specifically, I look forward to the 2016 SPE Annual Technical Conference and Exhibition in Dubai.



At CSM Fund Raising for CSM Great Athletes. From left to right: Dr. John Wright, Jane Wright, Bonnie Kazemi, and H. Kazemi

### CARRIE McCLELLAND



Dr. Carrie McClelland

Even though I am no longer one of the younger, newer members of the faculty, there are still new adventures every year. This year my adventures included venturing into some cross-disciplinary research and finally experiencing Massadona. I have been working with faculty in the Liberal Arts and International Studies department developing ways to best integrate social responsibility into our curriculum. As you know, all of the technical knowledge our students attain is no good if they don't also maintain the social license to operate. It's our goal to help students think about this and learn engagement approaches before they are on the job and find themselves in challenging positions. This work will continue for at least a couple more years.

My other great adventure was to participate in our 316 field session. Historically, I have led our sophomore students on a tour of the industry. This year I accompanied the juniors on their geologically focused session in the beautiful (at least I think it's beautiful...) northwestern corner of Colorado. As a child I was a rock hound and have always loved geology, so this session was a pure joy for me. What a great place to allow students to see the rocks that oil and gas are being extracted from and to learn in a hands-on manner.

I continue to travel a lot both for conferences and personal fun. This year I had the amazing opportunity to travel with the older ladies in my family through Italy, to haul a soccer team across the Midwest to Minneapolis, and to savor our annual trip to Lake Powell.

I hope that this year has been a good one for you. As always, if you are in Golden, please stop by to say hello!



Hiking through Skull creek in Massadona.

### MARK G. MILLER



Mark G. Miller

ago that you couldn't see planets with the naked eye. Those in the second group had several nights of clear skies where things really stood out.

Other than downloading star maps, having a good Massadona Internet connection this year also enabled downloading entire MS and PhD theses immediately before going out to the field. We changed exercises one day to do more Green River carbonate geology. A supplemental antenna really helped the hotspot keep a connection. In previous years, trying to maintain a connection was an exercise in futility. Lengthy email responses frequently were lost and became less lengthy

Massadona night skies are still amazing. This year I downloaded an iPad star map application, pointed it at the sky and was able to see which bright spot was which. One night, Saturn, Jupiter and Mars were all easily visible. Those students who looked up got first-hand experience that Mars really is red. Some students had never had the opportunity to identify a planet before. At least they didn't argue, like a student from about a dozen years

the second time around and almost non-existent if another attempt was needed.

Taking strikes and dips with a compass is another rite of passage associated with field session. In recent years, students purchased compasses that were primarily meant for navigation. Because they don't have a level bubble, the strike measurement can vary from one student to another by several degrees (at least). However, as was noted by Professor Elio Dean this year, and others before him, there are iPhone apps that are meant to take strike and dip. Some applications only require the user to lay the phone on the bedding plane, no rotating, no estimating level, just place the phone on a surface to get location (latitude and longitude) as well as strike and dip. Perhaps future students will be required to have a smart phone rather than a traditional compass. In addition to cars with full tanks of gas, every morning their phones will have to be charged and ready to go.

Dr. Linda Battalora and I were recently selected to be the faculty advisors for all of the department's students. This was done to provide students more consistent advising. Together we each have over 300 advisees. While most students are not required to meet with us, it doesn't take very many to keep us busy. Fortunately, Terri Snyder is our able assistant. Together we are working on an advising website for students where they can find the most current information about our curriculum changes.

### JENNIFER L. MISKIMINS



Dr. Miskimins halibut fishing in Alaska.

May and within a few days was on my way to Midland, TX, with a field session group. Shortly after that, I headed out to Massadona, CO, to resume teaching field session in that part

Greetings to all the alumni out there! If you think you're having a bout of déjà vu or have picked up a department newsletter from a few years ago, I can guarantee that you're not. After a few years absence from the department, I have returned to the faculty full-time. Actually, the "absence" never really was a total one since I continued to teach courses and advise graduate students, but that was in a part-time capacity. I signed my contract to return full-time in early

of the world. Now that's when I started having personal déjà vu. I didn't really expect the rocks to change, but I'm pretty sure nothing else had either!!

Since announcing my return, I can't tell you the number of times I've been asked "why?" The answer is a simple one – I missed you, the alums, and the students. I missed the teaching. I missed the university setting. I've had fun doing what I was doing in the past couple of years, and my engineering skills have been enhanced because of it, but being back at Mines is truly like coming home for me.

So now that I'm back, what will I be doing? Many of the same things that I have in the past. I'll be involved in teaching some graduate and undergraduate classes. I'll be working with Hazim Abass on the FAST Consortium, as well as working on some other research programs. This summer I helped teach one of the externships (you can read about them in another section of this newsletter). In general, just helping the department out where I can, however I can.

# MISKIMINS CONTINUED

Outside of my department duties, I continue to be heavily involved in SPE. In fact, I'm currently sitting on the SPE Board of Directors as the first ever Completions Technical Director. Some of you might have seen the announcement regarding the split between the Drilling and Completions technical areas. I was heavily involved in that transformation, as well as in several other areas of the society. It's been a great experience and one that I believe I'll continue to enjoy during the next two years of my appointment.

As always, I have a few trips planned. I'll be visiting China in August for the SPE Asia Pacific Hydraulic Fracturing

Conference. I'll also be attending ATCE in Dubai and a few other miscellaneous conferences along the way. Personally, not too much exciting other than I'm building a new house. (Never, ever, ever again – and if you've built one before, you know what I'm talking about!) Otherwise, I'm just working on adjusting to being back on campus and settling into my new office. If you're ever on campus or in the Golden area, please swing by and say "hi". (Oh, the photo – a fairly successful fishing trip to Alaska just to prove that I do get out of my office occasionally!)

## JORGE SAMPAIO



Jorge and his wife, Chistina in Torquay, southwest of Melbourne, Victoria (Australia).

OK, the first year is gone, and this time I will not spend much time talking about myself. That was basically the subject of the 2015 newsletter, right after my appointment to the PE department here at Mines. For those interested in my previous life/experience please refer to last-year's newsletter.

It was a busy year, indeed. In Fall 2015 I took on three main activities: co-teaching PEGN311 (Drilling), co-teaching PEGN597 (Tubular Design) and, more intensely, being in charge of the demanding PEGN311L, known as the "Drilling Fluid Lab". That was a big challenge. Workstations in poor conditions, instrumentation needing repair, missing chemicals, missing parts... and 24 students per day, 5 days a week, 3 hours per session, for 13 weeks. But we did it. Lessons learned were: (1) lab requires a lot of preparation (not simply getting the lab manual and running those experiments with mud); (2) the importance of complete workstations with all equipment, accessories and supplies; (3) clear experiment descriptions and supporting material; (4) previous reading (students) of theory, methods, and procedures. From these lessons, I redesigned the whole mud-lab for Fall 2016, introducing a new, thorough lab manual, and a novelty: video-clips with detailed description of all equipment, their use, and procedures. Students will have these video clips in Blackboard and will need to watch them (and pass the

quizzes!) before stepping into the lab for the corresponding lab session.

In Spring 2016 I taught PEGN361 (Completion) and co-taught PEGN598B (Well Planning and Operations). The former is a tough course, demanding a lot of work from students. It really lacks some lab activities (for example, cementing design and tests), which we are considering introducing in 2018. Some cementing equipment were reborn from ashes like the two atmospheric consistometers (quite old indeed), which are now ready to be used in some cement tests. The plan is to get the funding to set up a full undergrad cementing lab, and also a grad (research) cement lab to be operational in 2017.

Beside the junior undergrad students, two graduates (a MS and a PhD) are helping me to help them get their degrees.

Now, just to talk a little bit about the life in Golden area, and Colorado in general. We must all be prepared for changes. Changes in life styles and life dynamics. Being an active person (or couple) we thought initially that we would irremediably miss the previous life style moving from Rio to Lakewood (yes, we now live in Belmar). Although it couldn't be a surprise (remember I got my PhD here at Mines in '96) it was a real challenge. Want to know why? For those watching the Rio-2016 Olympic Games you must have seen those American TV correspondents broadcasting from their Copacabana Beach "Office". Well... we used to live RIGHT THERE, in the beach-front apartment some two blocks away, where I could swim in the open beach everyday before going to work. So the challenge was: can we live without that? YES! Here in Colorado! No ocean beach, but mountains, lakes, rivers, trails, all these wealth of open activities, nature, beauty... and with grown-up kids, nothing else to worry about.

And to make things crazily complete, the wonderful staff in the Petroleum Engineering Department, the sharp students, a fantastic campus, make the perfect conditions.

### AZRA NUR TUTUNCU - HARRY D. CAMPBELL CHAIR



Dr. Tutuncu at the GE Oil and Gas Learning Center in Florence, Italy.

It has been another remarkable year for UNGI. We have continued to work toward solving key challenges by providing solutions such as designing, building and operating multiple measurement assemblies, and creating in-house coupled models capturing multiscale solutions.

One of the unique experimental systems is the patent pending true triaxial measurement assembly that is on loan to UNGI from Geomechanics Engineering & Research, PLLC. The lateral stresses are applied using hydraulic pressure, thus replacing the conventional metal plates typically implemented in other polyaxial cells. Resistivity, directional ultrasonic velocities, and permeability have also been coupled to the geomechanical measurements making the device a fully coupled testing system to obtain novel correlations between these measured quantities, eliminating heterogeneity as it allows simultaneous measurements of single cylindrical sample for multiple parameters.

Our novel experimental and modeling studies have already helped us to conduct customized fracturing fluid and proppant use in the Eagle Ford, Bakken, Niobrara and Vaca Muerta formations, contributing to environmentally safe operations without any "induced seismicity" risk in successful field applications. We are continuing to share our unique dataset and predictive coupled models as fast as our sponsor proprietary agreements allow us to publish. Clean energy resources, such as geothermal energy applications in utilizing shale technologies and deepwater exploration and production are also among projects that are starting to keep us occupied at UNGI.



Anton Padin and Binh Bui were being hooded at the Spring commencement and joined the ranks of UNGI Alumni.

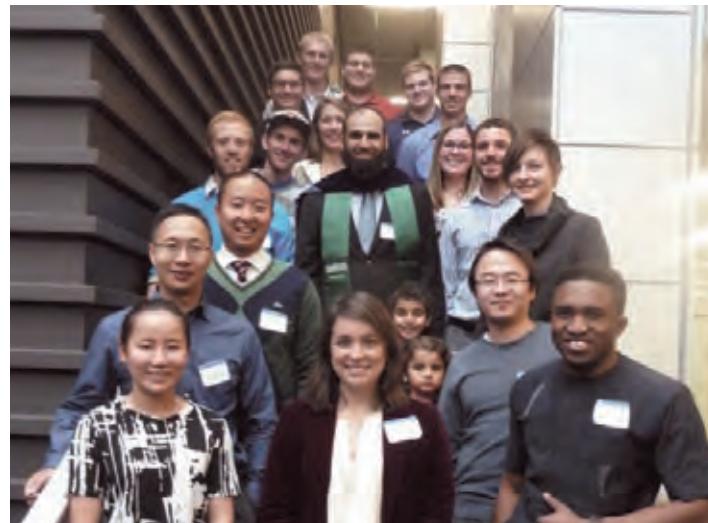
I am happy to inform you of our new UNGI PhDs Adel Alqahtani, Binh Bui, Anton Deben Padin, Nishant Kamath, Jesse Hampton and new MS degrees, Andrew Rixon, Jingwei

Huang and Sebastian Ramirez. Congratulations to all of our graduates for their well-deserved degrees and I would like to thank them for their contributions toward our research and improving our understanding of unconventional reservoir dynamics through their experimental and modeling studies. Xiexiaomeng (Jack) Hu (MS), Theerapat Suppachoknirun (MS), Aidil Adham (MS), Ali Albinali (PhD) and Benjamin Zeidman (PhD) have also successfully defended their theses. Please visit our UNGI website (<http://ungi.mines.edu>) to meet our new team members, their projects and all UNGI Alumni.

Jennifer Curnow and Dr. Binh Bui presented their research at the SEG Annual Meeting in New Orleans, followed by the SPE Hydraulic Fracturing meeting in January. Jack and Theerapat each presented papers at the 50th US Rock Mechanics/Geomechanics Symposium. Dr. Daisuke Katsuki presented UNGI research at the URTEC meeting in San Antonio in early August. The three papers presented at URTEC provide a small window into our unique experimental and modeling capabilities. A full list of the UNGI publications can be reviewed at <http://ungi.mines.edu/publications.html>.

UNGI and ARMA Lunch and Learn sessions continue to bring distinguished speakers including Dr. Olusanmi Olatunde Emmanuel of BG Americas on "Marcellus Shale Reservoir Characteristics", Hal Macartney of Pioneer Natural Resources on "Raton Basin Oil and Gas Operations and the Role of Geothermal Anomaly on Induced Seismicity Events" and Dr. Jon McKenna of Microseismic Inc. on "Using Depletion-Zone Microseismicity to Understand Producing Volumes".

ARMA CSM Student Chapter organized a field trip to San Juan Basin fractured formation outcrops outside San Ysidro, New Mexico in the Fall 2015 semester. The funding for



Adel Alqahtani, an UNGI PhD celebrating with the other December 2015 graduates.

### TUTUNCU CONTINUED

ARMA and UNGI student activities, including the field trip, was provided by Shell, ExxonMobil and Chevron foundation funds. Special thanks to John Lorenz and Scott Cooper of Fracture Studies LLC for their time and guiding the students during the field trip.

The software licenses and guidance from our collaborative educational program partners Schlumberger, Golder Associates, CMG, Ikon and Drilling Info are appreciated for the software access in the geomechanics classes, and for the UNGI research projects.

The 4th UNGI – UGTEP workshop for our Department of State Unconventional Gas Technology Engagement Program (UNGI-UGTEP) was held this summer with participants from Brazil, India, Indonesia and South Africa, with a focus on identifying and safely developing their resources with the best technologies. Paul Hueper, director of the ENR program at the Department of State, also joined us and opened the workshop with an excellent informative presentation. The last half day of the workshop was dedicated to a Government-Industry-Academia Collaboration Forum where we had distinguished speakers from several organizations share their experiences with the participants. We enjoyed hearing the presentations by Sarah Sandberg, COO of Colorado Oil and Gas Commission, Cindy Beeler, Energy Advisor for EPA Region 8, Margaret Ash, Manager of the Field Inspection Unit of COGCC, Stuart Ellsworth, Engineering Manager of COGCC, Robert Williams of USGS National Earthquake Center in Golden, David Neslin, former COGCC director and Partner - Davis Graham & Stubbs LLP and Dr. Luka Powanga, Professor of Economics in Regis University.

The US unconventional technical and regulatory training program (TOPCORP) at UNGI is continuing to blossom with the completed online version of the course. TOPCORP is a

jointly established program between Colorado School of Mines, Penn State and the University of Texas for enhancing the communication between government regulatory agencies and the oil industry. TOPCORP aims to provide energy needs to future communities by developing these vast resources with environmental sensitivity in mind. The online program has been quite well received and attended by regulators and policy makers from 20 oil producing US states as well as Alberta, Canada with a long waiting list for future classes. We are indebted to our sponsors ExxonMobil, GE Oil and Gas and Environmental Defense Fund for their funding and support. Continuing support from Colorado Oil and Gas Commission, Department of Environmental Protection in Pennsylvania and Texas Rail Road Commission, as well as IOGCC, are also recognized and highly appreciated for the national success of the TOPCORP program.

Our collaboration with GE Oil and Gas has reached a new level with participation from faculty of CSM, PSU and UT faculty in their bi-annual training events. The TOPCORP online program was invited to be a small section of GE Oil and Gas training program at their Florence Learning Center in Italy. The trial was quite successful and we received an invitation to offer a 3-day course in Florence twice a year.

On behalf of UNGI, I would like to extend our appreciation and thanks to Noble Energy, Anadarko, Colorado Niobrara Asset group, CalFrac Services, Burlington Resources, PDC Energy and K. P. Kauffman company for allowing our visits to their Niobrara well operations and production facilities throughout the semester with classes, the UNGI UGTEP and TOPCORP training program participants.

I look forward to our ongoing collaboration during the new academic year and also invite new members to our consortia for enriching our learning together.



Dr. Tutuncu at the SPE CSM Student Chapter and SPE Denver Section Joint meeting in Friedhoff Hall with UNGI graduate students Bryan McDowell, Dina Hegazy, Jessica Iriarte, Nick Fetta, Bihn Bui and Olawale Adekunle.

### YU-SHU WU - COMPUTER MODELING GROUP (CMG) CHAIR



Dr. Yu-Shu Wu

In this past year, I have been back to my normal work at Mines teaching and doing research after a year-long sabbatical leave of the 2014-2015 academic year. I would like to mention that the one-year sabbatical leave was very precious and beneficial to me. It was during the one-year leave that I finally found time to complete and publish my first book ("Multiphase Fluid Flow in Porous and Fractured Reservoirs," <http://store.elsevier.com/Multiphase-Fluid-Flow-in-Porous-and-Fractured-Reservoirs/YuShu-Wu/isbn-9780128038482/>) in 2015. More importantly, I had the opportunity to meet and spend time with many former students, old friends, and former colleagues as well as several new friends, while working at two universities: China University of Petroleum (CUP) at Qingdao and King Abdullah University of Science and Technology (KAUST) of Saudi Arabia, as well as at Saudi Aramco Petroleum Company in Dhahran, Saudi Arabia. This one-year experience provided me a unique opportunity and helped me in many ways updating my knowledge in reservoir flow and simulation, simulator development, and better understanding global petroleum industry issues facing our industry around the world. As a result, I feel more confident and very positive for the future of our industry, especially during the current down time.



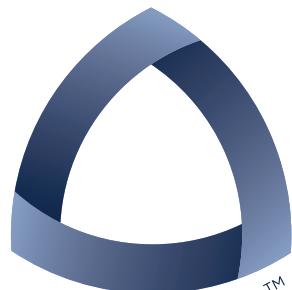
At 2015 SPE ATCE Conference, receiving the SPE Distinguished Member reward.

I would also gladly report to you that in the past year, our research at the Energy Modeling Group (EMG) has continually made significant progress in developing and enhancing geomechanics coupled flow simulation theory and technology for modeling conventional and unconventional reservoirs as well as CO<sub>2</sub> sequestration. Our modeling approach for coupling thermal-hydrologic-mechanic-chemical (THMC) processes in reservoirs is leading the field of reservoir simulation in incorporating geomechanics in reservoir flow and simulation. We are investigating how to simulate fracturing and its propagating processes during high-pressure injection in reservoirs. In particular, earlier this year we completed a four-year project (funded by US DOE) for investigating a new cryogenic fracturing technology, i.e., using liquid nitrogen to frack rocks in laboratory. This is to explore a different, alternative waterless hydraulic fracturing technology with potential to overcome the drawbacks with the current water-based-fluid hydraulic fracturing practice. In addition, EMG is working hard to improve our own hydraulic fracturing simulator (FracCSM) for multistage fracturing along horizontal wells with consideration of stress shadow effect.

The high lights of the past year include the SPE Distinguished Member Award I received at the 2015 SPE ATCE and attending the 2016 conference of Foundation CMG in Vienna in June.



At the Foundation CMG Conference in Vienna on June 1, 2016. Where's Wu?



### XIAOLONG YIN



Dr. Yin on top of Mt. Evans.

Last year, I did not teach at Mines. Instead, I took sabbatical leave at two institutions. I first visited Peking University for six months and worked with the unconventional oil and gas research group there in the department of Energy and Resource Engineering. Their studies cover a wide range of topics from molecular simulations, modeling of hydraulic fracturing, to production forecast of unconventional oil and gas. During my six-month stay in China I also visited several other research institutions – China University of Petroleum, Chinese Academy of Sciences, Tsinghua University and Tianjin University. After I returned to the US in February, I spent three months at Princeton University. Using the opportunity of being in America's Northeast, I also visited colleagues at University of Florida and Old Dominion. This is a year in which I travelled a lot of miles!

In spite of all these travels, I am glad to note that my students have done quite well without me at their side. Ziming Zhu defended his MS thesis on modeling of filtration in December

2015, followed by Jingwei Huang in January 2016, whose MS thesis was on the simulation of two-phase flows in porous media. Finally, Angela Dang defended her MS work on a Niobrara tracer study in April 2016. She also won the student paper competition in the Rocky Mountain Region and will attend the final contest at the upcoming SPE ATCE. I currently advise five PhD students and one MS student, and our research projects cover computational studies of phase behavior and fluid flow through porous media, microfluidic and nanofluidic measurements of phase transition and multiphase flows, and simulations of particulate flows and heat / mass transfer.

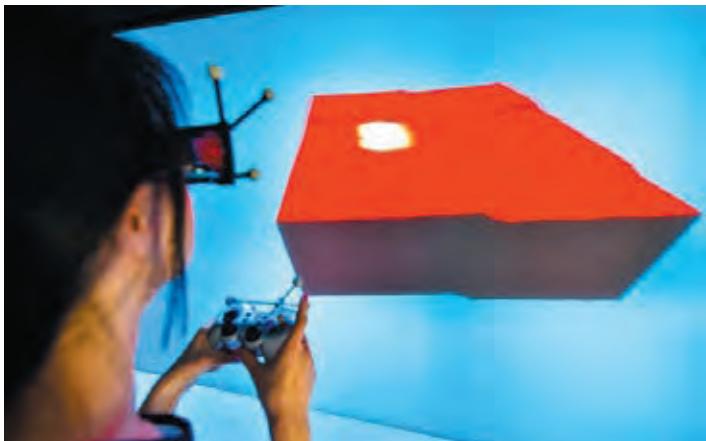
I want to use this opportunity to thank the generous gifts from companies, friends, and alumni in the past few years, specifically from Mr. Fred Holmes and Mrs. Barbara Holmes whom our PVT Research and Fluid Characterization Laboratory is now named after. With their help, the capability of PVT & Fluid Lab has been significant increased. Now every conventional fluid properties and phase behaviors at high pressure and temperature conditions can be performed. We are also investigating how to measure and understand fluid properties and fluid flows in unconventional reservoirs. This lab is now providing a strong support to Mines PE's reservoir engineering research.

The course that I have taught for six years, from 2009 to 2014, PEGN 310 Reservoir Fluid Properties, is going to see a face-lift in Fall 2016. Specifically, this course will assimilate PEGN 413 that used to be a separate course for seniors. The number of credit will increase from two to three, and a Lab session will be incorporated into the curriculum. In Fall 2016, this course will be taught as an "experimental" under course number PEGN 398. Currently, we (Linda, Mansur and myself) are updating course materials to prepare for the upcoming "trial". We are excited and eager to see the outcome of this new course, so that we can excel it when it is formally delivered in Fall 2017.



Some of our many PE graduates in spring of 2016.

### LUIS E. ZERPA



Mengnan (MS 2016) giving a presentation of her reservoir simulation model at the NREL visualization center.

This was my third year as a faculty member of the Petroleum Engineering team at Mines. I am honored to be a member of this excellent group and have enjoyed the supportive and professional atmosphere of the department. This was a very gratifying academic year where I completed two of my initial research projects and graduated three students.

In one project, we studied the effect of formation and dissociation of natural gas hydrates on the porosity and permeability of sediments, which has applications to methane production from unconventional gas hydrate reservoirs. I worked on this project with one graduate student, Fangyu Gao, who received her Master of Science degree in December 2015. Fangyu is now pursuing her doctoral studies at the University of Wyoming.

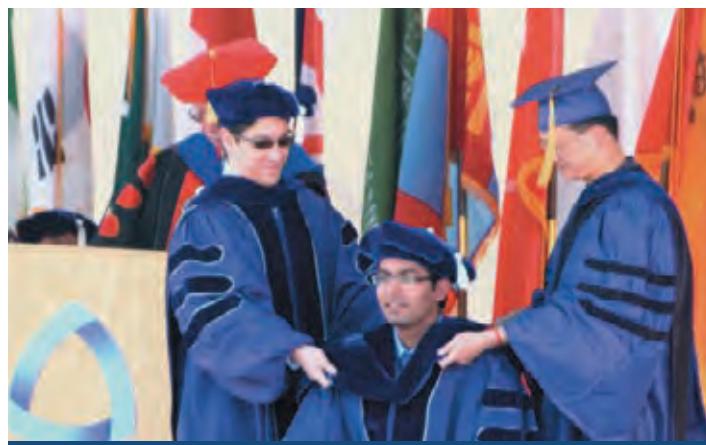
As part of a school-wide collaboration with the National Renewable Energy Laboratory (NREL), we completed our two-year project on the study of sedimentary geothermal energy extraction, which was funded by the U.S. Department of Energy. As the last task of this project, we developed a reservoir model of the Lyons formation in the Wattenberg field in Colorado, and performed reservoir simulations of different well configurations to extract geothermal energy from this sandstone formation. Mengnan Zhou, one of the graduate students participating in this project, successfully defended her master thesis in March 2016. Mengnan moved to Dallas, Texas, to continue her professional career.

Additionally, I closed one chapter of my collaboration with the CSM Center for Hydrate Research, with the graduation of my first PhD student, Piyush Chaudhari, co-advised with Dr. Amadeu Sum (Chemical Engineering Department). Piyush was working on quantifying the risk of gas hydrates plugging a subsea pipeline, and successfully defended his doctoral dissertation in December 2015. Piyush is currently looking for his next professional adventure.

I continue teaching the undergraduate Reservoir Engineering courses and one graduate course on Numerical Methods. I would like to thank my Teaching Assistants who help with the delivery of these courses, without them this would not be an easy task. They not only help with grading assignments and tests, they are also a great asset for the students taking these courses, leveraging the student's opportunity to thoroughly learn the material discussed in class with additional and personalized discussions out of the classroom. I am deeply grateful for the support of our alumni that allow us to hire these outstanding Teaching Assistants.

I have started to design new, exciting research projects to keep growing my research group, which has as a main goal to develop and apply fundamental knowledge in transport phenomena and surface chemistry for the understanding and solution of key problems in petroleum science and engineering. Some of the particular areas we would focus on are: fluid flow in porous media; reservoir engineering and enhanced oil recovery; flow assurance and multiphase flow in pipelines; unconventional energy resources such as shale gas, shale oil and natural gas hydrates, and renewable energy resources such as geothermal energy from sedimentary basins.

As always, it is gratifying get to see the students mature intellectually and get ready to make their next steps of their professional careers. Hopefully, I will get to know more about your professional achievements over this next year. I wish you a remarkable year and higher oil prices.



Piyush's hooding ceremony with Dr. Zerpa and Dr. Sum.



# PHIL WINTERFELD



Dr. Winterfeld tidying up after a snowstorm wreaked havoc in his front yard.

This past year has had its share of exciting developments in Energy Modeling Group (EMG) research.

We have been working on the DOE sponsored carbon storage project, "Quantitative Characterization of Impacts of Coupled Geomechanics and Flow on Safe and Permanent Geological Storage of CO<sub>2</sub> in Fractured Aquifers," for over a year now. This project is concerned with the likelihood of sequestered CO<sub>2</sub> escaping through faults or fractures in the caprock that overlays the saline storage aquifer. We are well on our way to developing an enhanced version of our geomechanical formulation to simulate these effects. In addition, we have been doing extensive laboratory work measuring the relevant rock properties for this process, and studying how rocks fracture under the appropriate conditions by blasting them apart with pressurized brine and super critical CO<sub>2</sub>.

The second phase of the project for CNPC (China National Petroleum Corporation) to develop a simulator coupling reservoir flow and hydraulic fracturing is underway. We are working non-stop to add advancements to the numerical models as well to develop a graphical user interface and the ability to simulate hydraulic fracturing in real time.

## PE STAFF

### FROM THE PE OFFICE STAFF

The office staff has gone through a lot of changes this year as we transitioned into new roles and brought in new people. The PE staff veterans are still around, as Joe and Al oversee the research and teaching labs respectively, but Denise has transitioned back to being the Research Administrator and keeping all the grad students in line, while Terri has now transitioned to being the Undergraduate Program Manager. She is excited to be working directly with all the PE students and her new office is just down the hall from the PE office (MZ 223). If you are on campus stop by and say hi.

Be sure to introduce yourself to our new office staff on your way to visit with Terri. Debra Marrufo has taken over Terri's old role as the department Administrative Assistant, Rachel McDonald is the new Program Assistant and Fiscal Manager, and Kayla Boster is the Program Manager. Debra was once a safety inspector for oil rigs in Colorado, while Rachel used to work for a textbook publisher and Kayla was working on campus with ORA. They bring new skills and much needed assistance to help the hundreds of PE students. They are very excited to be a part of the department and look forward to forging their own ties with students, faculty and alumni.



PE Office Staff (Left to Right) Rachel McDonald, Terri Snyder, Denise Winn-Bower, Al Sami, Debra Marrufo, Joe Chen

# CHEVRON SHORT COURSE SERIES IN PE

One of the ways the PE department addressed the current industry downturn was to offer a series of short courses in the spring of 2016. The Chevron Short Course Series in Petroleum Engineering equipped our graduates with key technical and employable skills to make them able and agile engineers who are knowledgeable in modern technologies, proficient in the use of conventional and contemporary techniques and tools, and progressive and adaptable to dynamic conditions and challenges of the oil industry.

The short courses were one or two day courses which had around 30-60 students attend each time. The courses were given by industry-recognized experts on the following topics:

CMG Training, Dr. Yu-Shu Wu (CSM) ; Fracture Design, Dr. Jennifer Miskimins (CSM); Production Data Analysis, Dr. Dilhan Ilk (DeGolyer and MacNaughton); Oil and Gas Transport, Dr. Cem Sarica (University of Tulsa); Introduction to Big Data Analytics, Dr. Srikanta Mishra (Battelle); ARIES Software Training, Dustin Simmons (Landmark/Halliburton); and Sucker Rod Pumping Fundamentals, Thomas J. Van Akkeren.

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.

## EXTERNSHIP SESSION



Students performing production records research at the COGCC in downtown Denver.

With the current struggles that our industry faces, the number of students that received company internships this year was down from past summers. Since an internship is such an important aspect of a future engineer's education, the department hosted "externships" this summer. The intent was to provide students with an experience similar to what they'd get during a traditional summer internship. The externships ran for five weeks, from July 11th to August 12th, as full time operations. Three tracks were available – hydraulic fracturing treatment design, drilling and production data analytics, and enhanced oil recovery. In total, 54 students participated in the externships. Most of the students will be seniors this coming fall, with some brave juniors and even a few graduate students joining the groups. Eight faculty members and ten graduate student mentors were also involved.

During each externship, the students used industry-provided data sets to work on various projects. They were exposed to

and trained on industry software packages. Deliverables varied between the externships but included weekly updates, final written reports, and final presentations. Several representatives of the companies that sponsored the externships, both monetarily and with data, attended the final presentations. The students also received a certificate of completion that they participated in this summer program.

The department could not have provided this opportunity without the generous support of numerous companies and individuals. Donations to fund the associated costs were provided by BHP Billiton, Chevron, Mr. Robert Howard (PE '56), and Whiting Petroleum. Additionally, the following companies/entities provided actual field data for the students to work on or software used for the various projects – Agu



Site visit with KP Kauffman, Weld County, CO

## SPECIAL PROGRAMS

### EXTERNSHIP SESSION

Caliente Geothermal, Barree & Associates, Colorado Oil and Gas Conservation Commission, Chevron, Devon Energy, Dewardt and Company, Elk Petroleum, Foundation Energy Management, HRM Resources, Great Western Oil & Gas, Ice Drilling Design and Operations, K.P. Kauffman Company, Oil E. Services, Sandia National Laboratory, Stimlab, Surtek, Ultra

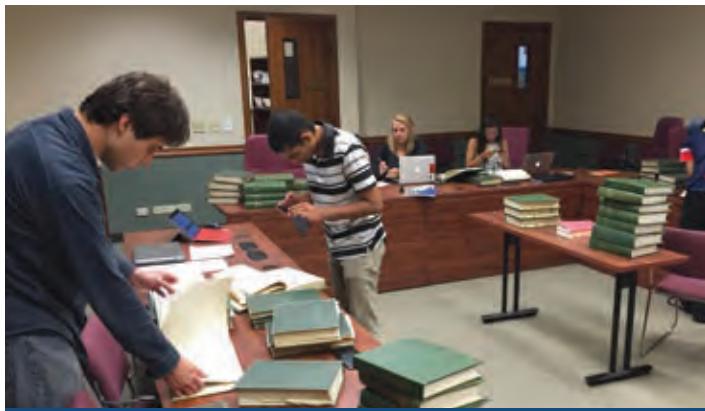


Special guest John de Wardt gave a lecture on "Key Performance Indicators in Drilling Operations" to the students in the drilling externship.

Petroleum, U.S. Navy Geothermal Program Office, and Ward Petroleum. Finally, a large thanks to the numerous individuals that donated their time to come and hear the students' final presentations and provide feedback on them.

The students seemed to thoroughly enjoy the opportunity, and in traditional Mines' style, took on the challenges presented to them head on and with a great deal of enthusiasm. One of the students had the following to say about the experience: "I definitely would recommend it to my peers...you're getting practical experience doing something that you would actually do as an engineer working for a company."

We hope that next year oil prices rebound and internship hires return to previous levels. However, if not, the success of this pilot problem is encouraging and we'll plan to provide these opportunities again next summer. If you'd like to be involved next year, please contact Erdal Ozkan ([eoizkan@mines.edu](mailto:eoizkan@mines.edu)) or Jennifer Miskimins ([jmiskimi@mines.edu](mailto:jmiskimi@mines.edu)) for more information on how to get involved.



More production records research at the COGCC in downtown Denver.



Students on a lab tour at Surtek.



Externship participants, mentors, and faculty at the conclusion of the program.

## STUDENT ORGANIZATIONS

### SOCIETY OF PETROLEUM ENGINEERS



ATCE group in Houston Texas.

As the oil price continues to concern us, it becomes even more important for Mines students to stand out in this competitive market. The Society of Petroleum Engineers (SPE) has been working to provide members with opportunities to become better candidates in this down market. In the past year, SPE has organized several fundraising events Lunch and Learns, field trips and even revamped the officer structure within our organization to better serve our members. These events have been in line with SPE's mission to enhance relationship between students and professionals and to encourage the exchange of technical knowledge between companies and university.

Last Fall, the 8th Annual Golf Tournament at the Arrowhead Golf Club featured 14 teams of students and professionals. This was not only to have some fun, but also to utilize this great networking opportunity. Similarly, the Clay Shoot in the spring at Kiowa Creek Sporting allowed students and professionals to team up to build relationships.

SPE hosted the Denver SPE section meeting in April. Dr. Ramona Graves moderated the panel discussion for Dr. Hossein Kazemi (Colorado School of Mines R&D), Dr. John Seidle (Unconventionals), Mr. Harry Surkalo (EOR Field Implementation) and Steve Enger (Investment Banking). The panelists enthusiastically shared their experience in SPE and the industry and provided great advice to students.

SPE also continues to host Lunch and Learns with companies in the industry. Lunch and Learns are a great way for students to see engineering projects in action and a great avenue for companies to get face-time with students. If you are interested in coming to speak with the Mines SPE chapter, please contact Jessica Iriarte ([jiriarte@mymail.mines.edu](mailto:jiriarte@mymail.mines.edu)).

Mines SPE has been involved in conferences on a regional level all the way to the international level. The chapter sent over 40 members to ATCE in Houston in 2015 and have 53 members signed up for ATCE 2016 in Dubai, UAE. CSM SPE participated in the Rocky Mountain Student Symposium & Paper Contest at Montana Tech. Ashley Burk, Bryan McDowell and Angela Dang each won an award for their research and presentation, with Bryan and Angela being invited to present in Dubai. In February of 2017, the chapter will host the North American Student Symposium which we expect to have around 400 students attending.

SPE's new officer group is eager to organize more beneficial events in the next school year. For more information about Mines SPE, please refer to our website: <http://mines.orgsync.com/org/spemines/home>



CSM-SPE representatives at Rocky Mountain Student Symposium.



SPE officers for 2016-2017 academic year.

### PI EPSILON TAU



**Matt Balderston**

After a tumultuous year for the oil and gas industry as a whole, and participation from the Petroleum Department at Mines, it is time to settle back into another academic year at our beautiful campus, and our terrific building, Marquez Hall. As we look towards a new year, let us take a minute to reflect on this past year's accomplishments.

My name is Matt Balderston, and I am the current chapter president of Pi Epsilon Tau. It is such an honor to be a part of this organization which represents the Petroleum Engineering Honor Society for Colorado School of Mines. Pi Epsilon Tau was started at the University of Oklahoma in 1947, and our Mines chapter was founded in 1983. We are a group that represents both graduate and undergraduate students who display not only high academic standards, but also leadership and outstanding character. Pi Epsilon Tau is dedicated to enhancing student involvement on campus, in industry, and in the community. Our group conducts and participates in different events each year such as Castle of Cans, Discover and Preview Mines, as well as a new mentorship program within the department. Each spring we hold an initiation event where we welcome the newly selected students to the organization.

Pi Epsilon Tau has been given the honor and responsibility to represent the department in many facets. We continue to serve as ambassadors to the department for high school students in the fall and the spring during both the Preview and Discover Mines events put on by the admissions department. This event is a favorite among members as it gives us the chance to show off our wonderful building, Marquez Hall, and to share with high school students the exciting opportunities the Petroleum Engineering department at Mines has to offer.

This year, we sent representatives to the National Council meeting at the University of Texas, Austin. This was a great way to meet students from other universities across the country and collaborate about ways to better operate our organization. Our faculty advisor, Dr. Mark Miller, now holds a prominent role on the national level, as he was elected to be Historian of the new Pi Epsilon Tau board. Other events from this past year included a plunger lift class put on by Golden's own Well Master Corporation, and the joint effort with the student chapter of SPE's event, Energy4Me. These events were great opportunities for our members to enhance their learning experience, and have positive community outreach.

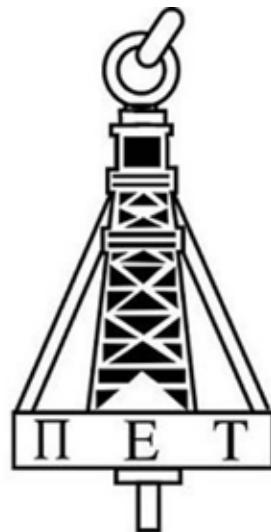
One of the greatest successes of the past year was the continuation and development of the Pi Epsilon Tau mentorship program. This program connects junior and senior petroleum engineering students with underclassmen who are either interested in Petroleum Engineering or have already started their petroleum engineering coursework. The program serves as a way for students to receive guidance and to strengthen the bond between students in the department. To add to the program, we have added an Industry Partner aspect, where we pair current undergraduate students with recent graduates in industry. So far it has been a very successful program, as we look to continually making it better.

We capped off the year by initiating another very impressive class of petroleum engineers into Pi Epsilon Tau. The class consisted of 40 well-qualified graduate and undergraduate students who exhibit integrity and represent Mines in the best possible light.

The officers, with the help of our wonderful faculty advisor Dr. Miller, were able to advance Pi Epsilon Tau and help to improve the experience for students in the department this past year. I am very excited for what this upcoming school year has in store. Pi Epsilon Tau has an exceptional group of individuals leading and I am confident that Pi Epsilon Tau will have another successful year because of their guidance.

Finally, I would like to thank our faculty and staff for all that they do to make this department one of the premier Petroleum Engineering programs. With their support and leadership, the Colorado School of Mines Petroleum Engineering program will continue to be one of the best in the world.

Regards,  
**Matt Balderston**



### AMERICAN ASSOCIATION OF DRILLING ENGINEERS



Taylor Jacob Carlson and  
John Schrader

"An exciting event – the founding of the world's first student chapter of the American Association of Drilling Engineers[s] occurred at CSM this last year," said Dr. Bill Eustes in the Newsletter of the Petroleum Engineering Department vol. 2, no. 1. The year he referenced? 1996. This fall semester, we will celebrate the 20th anniversary of our inauguration. Dr. Eustes remains our faithful advisor.

The AADE at Mines has always filled the roll of a professional society – adding networking and learning opportunities to its student members. But, the last two generations of officers have sought to enhance the organization's standing on campus, diversify its purpose, ramp recruitment, and vet legacy leaders. Today, the AADE at Mines stands stronger than ever.

Our 2016 leadership includes: Taylor Jacob Carlson, President; Bryan McDowell, Vice President; David Choi, Secretary; Ahmed Al Shubbar, Treasurer; John Schrader, Logistics Manager; Mohammad Osama, Outreach; Rend Fetyar, Steve Benfield, Ryan Koenig, Kyle Fry, Patrick Lambie, Event Coordinators. Outgoing President and Vice President Justin Cameron and Lizzy Reale operated the organization in the fall and advised new membership this spring. A big thank you to the both of them for their hard work.



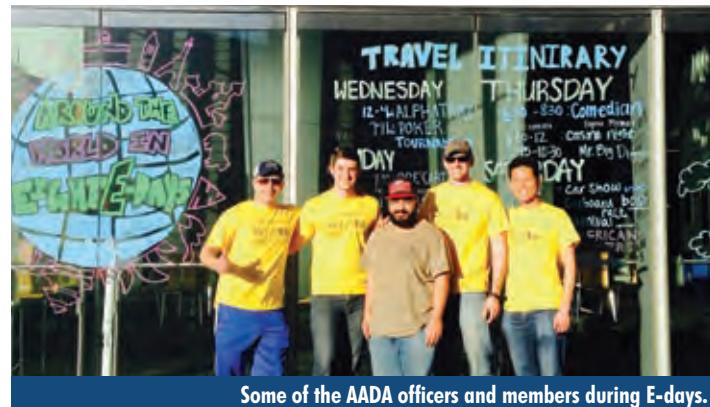
Some of the students after a Wild Well training.

We continue our usual offering of Lunch and Learns. We'd love to thank BHP, Halliburton, Anadarko, Pason, Integrated Petroleum Technologies, Smith Bits, K&M, Dyna-Drill, Liberty Resources, Independent Data Services, Don Nan, the Jeffco Energy Action Project, and all those who contributed to our member's educations this year.

Building on our foundations, the incoming officers included goals to bring resume-building opportunities to our members,

increase the number of off-site tours, encourage underclassmen involvement, add volunteer and charity items to the docket, and entrench some of our legacy events.

To wit, our first Jack-o-lantern Carving Contest raised money for Breast Cancer Research last fall and we will carry over this tradition this October. The AADE also plans on adding a charity fundraiser in February called the Sweetheart 5K. We will again help host the Fin Feather Fur Food Festival (5F) with the Denver Chapter – always a blast – and have already volunteered for their "Mile Hi National Drag Races Tailgate." Last fall, we worked with Cool Science to host over a hundred children during Mines "Bring Your Kids to Work Day." This spring, we volunteered in conjunction with SPE to run the Oilfield Olympics at E-days and this coming semester we look forward to returning to the M-Climb, welcoming freshmen through Mines' stone doors. Even so, the AADE at Mines will only escalate its community and campus involvement going forward.



Some of the AADE officers and members during E-days.

This past semester alone, our off-site tours included the NICL (National Ice Core Laboratory), Pason field analytics facility, Baker Hughes bit factory, Dynadrill's motor power section facilities, and the Antelope (formerly Wearsox) thermal spray centralizer application site. And this April, a group of 20 went to the "Fluids Conference" held in Houston by the national AADE chapter. We look forward to offering more occasions like these to our members in the future.

Our partnership with Wild Well Control continues. They are kind enough to work with us to provide certification to our student members each semester, and we always look forward to the belt buckles. However, we plan on adding a Drilling Specialties "Intro to Drilling Fluids" class geared towards the Junior and Sophomore years.

We also encourage inter-organizational cooperation and membership socialization. Last year we worked with AAPG, ARMA, and SPE on a number of events. We had a screening of the Switch documentary, "There Will Be Blood, Fires of Kuwait," and are planning a group viewing of "Deepwater

## STUDENT ORGANIZATIONS

### AADE CONTINUED

Horizon" to start this semester. Cathedral and BHP both helped us host welcome back BBQ's, which were huge successes (despite the weather). This spring, we hosted our first crawfish boil, thanks to Bryan McDowell. We dubbed it the "Mudbug Masquerade" and it was such a triumph, even in a late spring snow shower, that we will be sure to get an encore performance.

Finally, last year we had a campus-wide presentation by Dr. Bill Eustes on "Extraterrestrial Drilling." After its great reception, we decided to make a spring speaker one of our society's capstone events. So, this year we were lucky enough to get Alex Epstein, author of *The Moral Case for Fossil Fuels*, to join us on campus for a debate forum. The conversations sparked were heated and fruitful. We nearly filled Green Center.

As always, we want to best our historical achievements. I'm already excited about who we'll have next year. In the meantime, I want to thank all of the alumni that continue to support the school, its purpose, and its professional societies.

I want to thank the Denver AADE Chapter for their support, networking, and scholarship funds. And I also want to thank all my officers that make running this organization a fun and fulfilling pursuit.

Best regards,  
**Taylor Jacob Carlson**



AADE 2015 National Technical Conference and Exhibition.

### AMERICAN ROCK MECHANICS ASSOCIATION



John Lorenz instructs students during the ARMA field trip to the Southern San Juan Basin, New Mexico.

It has been a great journey since the establishment of our chapter in March 2012. Our organization has continued to improve services to the geomechanics community here at Mines through the inclusion of a diverse portfolio of events. Such activities include participation in charitable community services and the coordination of a distinguished speaker series jointly with UNGI and other professional societies SPE and AADE which focuses on the industry challenges and technological advancements.

The 2015-2016 academic year kicked off with a special lunch and learn series in the fall semester. Dr. Olusanmi Emmanuel,

an alumni of Colorado School of Mines currently working for BG Group, delivered a presentation entitled "Reservoir Characteristics of the Marcellus Shale and Implications for Natural Gas Production".

Toward the end of the Fall semester, Hal Macartney of Pioneer Natural Resources joined us as a distinguished ARMA-UNGI speaker presenting "Raton Basin oil and gas operations and the role of geothermal anomaly on induced seismicity events".



Manning the ARMA booth at Celebration of Mines.

## STUDENT ORGANIZATIONS

### AMERICAN ROCK MECHANICS ASSOCIATION

There were also joint events ARMA sponsored together with SPE and AADE throughout the semester. ARMA has always had a booth at the annual "Celebration of Mines" event that takes place during the start of the Fall semester and this year was no exception.

The Lunch and Learn series continued into the spring semester with another distinguished guest speaker. Dr. McKenna from Microseismic Inc. provided us with exploratory advances in the industry utilizing micro seismic technology. The talk was entitled 'Using Depletion-Zone Microseismicity to Understand Producing Volumes'.

We were pleased to share the success of our first ARMA field trip offered during the Fall semester. Special thanks to Bryan McDowell, a former president of our Mines ARMA Student Chapter, for coordinating the activities of the field trip. A group of about 20 students embarked on this 3-day field trip that took place in Southeastern San Juan Basin, New Mexico.



We were guided by the experienced geologists John Lorenz and Scott Cooper from Fracture Studies LLC and learned a great deal of details on fractured reservoirs during the trip.

ARMA and AADE also co-hosted a joint session event with the Denver SPE section. The keynote speaker, Alex Epstein, delivered a talk on 'The Moral Case for Fossil Fuels' which contained a distinguished panel of diverse background. They shared their thoughts on the challenges facing the oil and gas industry from political to environmental stand points.

The success of the aforementioned events would not have been possible without the devoted efforts of the ARMA officers, members alike and our devoted ARMA Faculty advisor Dr. Azra N. Tutuncu. Our current officers include Andrew Rixon (President), Bekdar Baizhanov (Vice President), Olawale Adekunle (Treasurer), Jessica L. Iriarte, (Secretary), Dina Hegazy (Event Coordinator) and Binh Bui (Webmaster).

I believe our organization still has more to offer and I strongly encourage new and current members to participate in the activities of the organization. Here's looking forward to greater heights with you all.

**Olawale Adekunle,**  
ARMA Treasurer  
August 2016



# PEGN 315 - COLORADO/WYOMING/NORTH DAKOTA/NEBRASKA FIELD SESSION

By Elio Dean

Thanks to all the companies that helped us on our field session; it was a great experience. Our focus was EOR and unconventional throughout Colorado, Wyoming, North Dakota and Nebraska.



**Samson Energy** taught us about the research they are applying in the development of some of their new Niobrara/Codell assets. Students visited their field to see the facility construction process as well as existing production facilities.



**Whiting Petroleum** gave us two amazing tours, one of their Niobrara assets and another on their Bakken assets. They showed us two drilling rigs, a work over rig, production facilities, and a frac job.

**Ted Williams** showed us the American Dream is still alive and strong as he opened his personal oil field to our students. His field is in the Powder River basin, where he is currently implementing a chemical EOR project. We saw his EOR facilities, production facilities, his personal drilling rig, and airplane landing strip.

**Schlumberger** gave an excellent tour of their ESP facilities, showed us how the technology worked and how it is being used in new Bakken wells to maximize production.



The **BLM** presented how the regulatory side of the industry functions, how they fit into the picture, and explained how the oil industry impacts our communities.

**Elk Petroleum** showed us their Singleton oil field, and shared their plans of EOR implementation to revitalize mature fields. We saw how important respect for land owners is as we drove through a cattle ranch to reach the field.



### COLORADO/WYOMING/NORTH DAKOTA/NEBRASKA CONTINUED

On the fun side we saw Mount Rushmore, clouds in front of Crazy Horse memorial, Devils Tower and a lot of beautiful driving sights throughout eastern Colorado, Wyoming, Montana, North Dakota, South Dakota, and Nebraska.

All of the companies that helped us did a great job, showed our student top notch safety protocols, and a great time. Thanks to all.



Group picture with a Bakken frac job in the background.

### PEGN 315 CALIFORNIA FIELD SESSION 2016 By Linda Battalora

Thanks to the generosity and enthusiasm of our many alumni and friends, the 2016 PEGN 315 California Field Session was a great success. Al Sami, Dr. Nicole M. Smith (Shultz Post-Doctoral Research Fellow in Humanitarian Engineering at CSM), 40 students, six Teaching Assistants (Abla Rhouma, Ganna Savchenko, Olawale Adekunle, Ayush Rastogi, Moutaz Saleh, Charis Karakatsanis) and I enjoyed an eight-day field session in Southern California.

Our first field tour was to **Aera Energy's** (Aera) Belridge field. Aera engineers and CSM alums Ilisa Gustafson, Linda Mohammad, George Hunsaker, Ryan Stef, Matt Erbes, Christine Birkholz, Laura Lunsford, and Tanner Ottaway hosted us for breakfast, a tour of field operations and vendor services, and lunch. We also enjoyed the quiz bowl with prizes moderated by Ryan Stef and comments by Andy Anderson, Vice President of Belridge Operation. We thank all of our alums and Aera for an informative and exciting first day in the field!

**California Resource Corporation** (CRC) and Mines alums Tom Turner (PE), Max Willis (PE), Dan Fletcher (PE), Tim Gross (GE), and Robert Sebag (PE) hosted us at 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 White for a tour of the drilling rig and

production facilities. We also enjoyed a visit to **C & J Energy Services/Tiger Wireline** in Signal Hill where the students learned about wireline logging, well perforating, and pipe recovery equipment and services. We appreciate the hospitality shown to us by CRC and Tiger during our time in California.



2016 Shell Beach Geology Field Trip.

## CALIFORNIA CONTINUED

We were fortunate to once again have Jon Schwalbach (Aera), accompanied by Dave Mayer (Aera, PE alum), lead us on a beach geology field trip. We visited Shell Beach where we learned about petroleum systems including source rocks, fractured reservoirs and conventional clastic reservoirs. The beach geology field trip is always a highlight of the field session. The students love to send selfies with the beach and Pacific Ocean in the background to their friends on the Midland trip. (smiling)

Another highlight of this year's CA trip was a specially arranged tour of **Vandenberg Air Force Base**. In the morning we learned about base history and its participation in the United States Space Program. We also learned about base security and were treated to a special demonstration of the service dogs in training. In the afternoon, the base geologist led us on a tour of the Monterey Shale located on an exquisite portion of the Pacific Coast. Dean Ramona Graves joined our Field Session for this visit and the remainder of the trip.

Many thanks to Miller Newlon, PE alum and Aera Production/Process Reliability Engineer, San Ardo Field, for designing and hosting an educational and interactive field trip including the opportunity to work on select production problems with field personnel. This was our first visit to **Aera's San Ardo Field** and it provided much learning and many photo opportunities. We are very appreciative of Aera's support (Belridge Field, San Ardo Field, Geology Field Trips) throughout the field session.

On Saturday, Aera geologist Mike Clark (Mines alum) led a half-day field trip of Westside San Joaquin Valley oil field history and geology. Dave Mayer and Dave Miner (Aera, Mines alum) joined us on the field trip that included stops at Coles Levee, the

McKittrick Tar Seeps, and the Lakeview Gusher. Fred Holmes (**Holmes Western Oil Corporation**), with assistance by Josh Yurkanin (PE alum), hosted a delicious barbecue lunch at the **West Kern Oil Museum** in Taft. Mines President and Mrs. Paul Johnson, Brian Winkelbyer (CSM), and Dean Ramona Graves also attended. During lunch, we heard from residents and public officials about engaging the local community in oil and gas development. PE alum Joe Nahama provided a few minutes of rhythmic and thought provoking career advice for the students. We continued this discussion on stakeholder engagement later in the evening after the enjoyable and well-attended CSMAA dinner in Bakersfield. Many thanks to Mike, Dave, Joe, and Fred for a memorable day in the field.

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!



Touring Aera's San Ardo Field.



Lunch at the West Kern Oil Museum.

### MIDLAND PEGN 315 FIELD TRIP by Jennifer Miskimins

Midland, Texas – what better place to go for a PEGN 315 field session?! 44 students, six TA's, and three instructors descended on "The Tall City" on Sunday, May 15th. Our first day started with a visit to **XTO** who hosted us on a fracturing location, various field locations, and in their offices. A huge shout-out to alum Taylor Hall for arranging all of that for us, along with some rockin' Texas BBQ.

Day two started with a visit to the **Midland City Council** chambers, where the students had a chance to meet with and interview Midland's mayor and two of the City Council members. The students (and teaching staff) learned a lot about the city's inner workings and the impacts, both positive



Can you find the well locations?



How cold can it get in Texas - ask the ones that are shivering!

and negative, of the oil and gas industry on a city that is so tied to the industry. It was a great lesson for all on social responsibility. That afternoon, we visited the **Permian Basin Petroleum Museum**, which recently underwent a several million dollar facelift. A few current and former museum Board of Trustees members, who are Mines' alums, met us and provided tours and insights into the museum. Truly, if you are ever in the Midland area, this museum is a must-visit! Museums can elicit visions of dusty old bits and equipment just lying around, however, this museum's update was done



At the Rock Hounds baseball game with Juice the Moose.

### MIDLAND CONTINUED

by the same company who put together the Harry Potter exhibit at Universal Studios. That should give you an idea of the creativity that's gone into it!

Our third day had us heading up to Denver City, TX, to visit **Oxy** and their Denver City Unit CO<sub>2</sub> project. This day was rather unique due to the weather. One would expect fairly hot temperatures, even in May, in Midland, however, this day



**Miskimins doesn't feed her students - she makes them dumpster dive!**  
*(Seriously, they're looking at perforating guns, Dr. Graves...)*



The students listening to the Midland mayor.

was in the upper 40's, lower 50's (degrees F) with a rather nasty wind. Usually, you're dreading wearing thick FRC's in Midland, but today we were all very happy to have them on! The visit entailed a tour of the CO<sub>2</sub> processing plant, multiple field locations, and a workover rig. A big thanks here to alum Brent Vangolen, who organized the visit for us!

Day four found us visiting a variety of **Schlumberger** locations in and around Midland. We visited their logging shop, the perforating facility (a big hit with the students – things that go “boom”), and their engineering offices. At the



Midland, TX, field session at Schlumberger.

### MIDLAND CONTINUED

engineering offices, we were provided with a logging short course and a variety of presentations on the different tools that the students were able to see and work with in the morning.

As the fifth day rolled around, the students had seen their fair share of pumping units, so what better way to anchor the trip than with a visit to the **Don-Nan Pump & Supply Company**, a rod pump manufacturing center. Josh Carty and his team at Don-Nan were fantastic in providing tours of their 43-acre facility, as well as a rod pump short course. Once again, we'd like to thank an alum in helping out with this visit – Mr. Barry Thomas and his daughter, Hannah



Visiting XTO and learning about facilities and operations.



Touring Don-Nan Pumps and their working pumping unit display.

Thomas (a current Mines' PE student) were instrumental in getting this visit pulled together (a shout-out to Mrs. Thomas too who made us some awesome homemade cookies!!)

Day five ended with attending a Midland Rock Hounds baseball game in the evening. Of course, prior to going to the game, we realized that several people had not only never been to a game, but weren't familiar with the rules. Therefore, an impromptu baseball tutorial was held in the parking lot of the Fairfield Inn and Suites prior to leaving for the game. Dr. Prasad is still trying to relate home runs to cricket wickets! All and all, a very busy, successful trip to Midland!!



Midland, TX, field session at the Permian Basin Petroleum Museum.

### PEGN 315 OKLAHOMA FIELD SESSION By Bill Eustes

This year, my seventeenth PEGN 315 Field Session I, I led a group of 43 students through my "old stomping grounds" of Oklahoma. It was somewhat of a melancholy feeling driving by my old places from back when I was a drilling engineer with ARCO Oil and Gas in the early 80's. We stayed in Tulsa about a quarter mile from the first home I bought. There was a lot of change; but enough remained that I recognized it. Terri Snyder and Joe Chen were the staff team giving incredible support. And assisting me were Faraj Ahmed, Daniel Chase, Fadi George, Kurt Livo, and Kseniya Zinyakina.



Weir Wellheads next door to Mathena.

This year, we changed the field session to be only one week in duration. In any event...we arrived at OKC (Will Rogers Airport) on Sunday. It took us longer to get our rental vehicles than it did to fly from Denver to Oklahoma City. We left there and drove to Tulsa on the classic Turner Turnpike.

Day 1 saw us visiting the **University of Tulsa's** (Drs. Ozkan and Brita's alma mater) **North Research Campus**. What I found fascinating were the transparent flow loops. You can clearly see the fluid flow patterns. Drs. Sarica and



At the North Research Campus for the University of Tulsa.

### OKLAHOMA CONTINUED

Pereyra (along with a number of graduate students) were our informative hosts. That afternoon, since we were going to the **Baker Hughes Centrilift** manufacturing facility in Claremore the next day, Alex Vilcinskas came with Paul Reid, Kathy Shirley, and Icoa Leon-Lewis (who was the main coordinator for the tour), all from Centrilift, to give us a grand overview of artificial lift and especially ESP's.



Waiting on the steps of the OCC.

On Day 2, we did go to Claremore to tour not only the **Baker Hughes Centrilift Manufacturing Center**, but also the **Artificial Lift Research and Technology Center**, and the **Centrilift Cable Manufacturing Plant**. There were a LOT OF Baker Hughes people (31 tour guides) helping make the tour grand and helpful. They have a lot to offer there. Wow! But wait....there's more. We headed down south to the **Baker Hughes Experimental Test Area** (a.k.a. BETA) near

Beggs, OK. They have a really nice drilling rig there. They had just finished up testing some logging tools, so we were able to crawl around the now quiet rig. Quite the experience to see this operation up close. Thanks goes out to Ed Robinet and Mike McEntire and their BETA Team. And kudos to Bobby Grimes at Hughes Christensen for getting us to the right people!



Mathena Well Control.



Oklahoma Corporation Commission discussion.



Centrilift Manufacturing and Mines.

### OKLAHOMA CONTINUED



Touring a Ward Petroleum pumping unit in Central Oklahoma.

We left Tulsa on the morning of Day 3 to go to **Packer's Plus** in Oklahoma City. DJ Snyder gave the students an excellent talk on horizontal completions and then Salvador Ramirez, Pablo Hernandez, Matt Morin, and Jennifer Hebert showed us what the completion equipment looked like. Then we headed downtown to the **Oklahoma Corporation**



Examining outcrop in the northeast Arbuckle Mountains.

**Commission.** There, in a court room no less, we had the head of the commission, Tim Baker, welcome us and various OCC folks talk with us about the interaction of the government and industry from waste control to induced seismicity. Ms. Virginia Hullinger was our host and Mike Moore, Bob McCoy, Steve Vinje, Dan Walkup, Laura Erichsen, James Phelps, Mark Haden, Phillip Jones, Vincente Vasquez, and Jim Marlatt all discussed aspects of government oversight. We also had a chance to see the Devon Outdoor Oilfield History Museum and a protest about some expressway east of OKC.

We left for El Reno on Day 4 (20 miles!) and spent the morning with **Weir Wellheads** and **Mathena**. Joe McNeil and Matt Green showed us around both companies' operations, respectively. Rick Davis helped us get that tour rigged up. That afternoon, right down the road was **Schlumberger's** camp for cementing and other activities. We had a chance to see and climb on cementing equipment and to see loading and storage facilities. Thanks go to Conrad Longman and to Jonas Vargas here in Denver for helping to arrange this. Assisting Conrad were Cody Carter, Charbel Chaghouri, Jessie Voo, Jordon Reussel, Obaid Samuel, and Mike Martin.



BETA Rig near Beggs, OK

### OKLAHOMA CONTINUED

I also want to add that it was raining and cold. In fact, with the exception of Friday afternoon, it was cold and raining most of the time in Oklahoma. Go figure...I thought for certain we would be hot and muggy.

Day 5 saw us on the H.E. Bailey Turnpike heading out to **Ward Petroleum's** operations near Chickasha. They had a horizontal well they were finishing up. It was very instructive being able to see production equipment and to trace the lines from wellhead to sales. Thanks goes to James Jackson for leading us, John Keeling, Wally Gilbreath, and Joel Acosta for supporting the tour, and to Marshall Hall in Fort Collins and Bill Ward in Enid for arranging our visit. From Ward we went to the Arbuckle Mountains (the students couldn't figure out why they were called "mountains") in southern Oklahoma where we spent the afternoon on a geology field trip. Richard Andrews and Brittany Pritchett were our guides from the **Oklahoma Geological Survey**.

Finally, we headed over to the Chickasaw National Recreational Area near Sulphur for a well-deserved dinner of Oklahoma BBQ and recreation by the Little Niagara Falls. This is a very nice area; I can recommend a visit. The

weather turned warmer and dryer, making for a fine end of my seventeenth Field Session I. Yet another fine trip. Thank you's go out to all named and unnamed that make these opportunities so valuable for our students.

See you somewhere next year!



Little Niagara Falls CNRA.



On a production location with Ward Petroleum.



El Reno Schlumberger Camp.

## FIELD SESSIONS

### PEGN 316 Field Session II - MASSADONA By Mark Miller

The Massadona tavern was wondering where we were when Mother's Day rolled around and there were no students or faculty in camp. Because the school's schedule started a little later than usual, we wound up coming out to Massadona a little later than usual. The first section wound up in a rainy season – students only had one fire. The rest of the time they were in their tents trying to keep or get dry. Tromping around on the first day attracted 10 pounds of clay to each foot. While the second session was warmer, Ramadan started in its middle. Some students didn't eat or drink during the daylight hours. They celebrated the coming of sunset, inviting staff and fellow students to join in the traditional breaking of the fast. The third session was even hotter, but they were treated to the return of one of their favorite faculty.



Enjoying the view while mapping at Skull Creek.

We were extremely fortunate to have Jennifer Miskimins back to help lead the final group of students. Teaching assistants were chomping at the bit to get into her section. New professor Rosmer Brito, along with Elio Dean, Mansur Ermila, Carrie McClelland, and myself rounded out the petroleum faculty. We also were able to get department staff Denise Winn-Bowerr and Terri Snyder to help out for a week each. Evan Jones, a PhD student in the geology department, did a noteworthy job of integrating geologic concepts into the petroleum engineering mindset. Students came back with a strong appreciation for geology and its importance to the engineer. At least one student's opinion changed enough that they decided to go for the geology minor, which now requires nine credit hours beyond the regular petroleum curriculum.



Kacey, Stacey, Jenny and Ethina at Dinosaur National Monument.



2016 Section A

### MASSADONA CONTINUED

Like they have for at least 35 years, both **Chevron** and **Production Logging Services** again helped our students and provided presentations to all three sections. Roy Cramer and Jordan Sayers led much of the discussion at the **Chevron** presentation. Roy gave field overview and CO<sub>2</sub> fundamentals talks. Jordan talked about the geological background and brought out labeled Weber core. Students were able to relate the Dinosaur National Monument outcrop slumping and interdune feature to what they saw in the core. The talk helped students see that geology isn't so bad and in fact can be very useful. In Vernal, students were once again treated to Craig Stratton's excellent production logging primer. We appreciate both Chevron and Production Logging Services donating their valuable time and resources to help our students.



Wow, who says engineers are not creative.



Favorite stop for students, TAs and faculty!



2016 Section B

## FIELD SESSIONS

### MASSADONA CONTINUED



A big thank you to PLS for taking time to teach our students!



Fluvial Exercise-Don't get lost in the sea of grass.



2016 Section C



The morning ritual-what will be our next adventure!



### Department of Petroleum Engineering

Colorado School of Mines  
1500 Illinois Street  
Golden, CO 80401

## PE STATISTICS

### GRADUATES AY 20015-2016

PhD	10
MS/ME	28
BS	191

### CURRENT ENROLLMENT

PhD	47
MS/ME	56
Seniors	271
Juniors	156

\*Sophomore/Freshmen - do not declare until Spring Semester



(Left to right) Back row: Erdal Ozkan, Jorge Sampaio, William Fleckenstein, Mansur Ermila, Mark Miller, Elio Dean, Bill Eustes, Yu-Shu Wu, Hossein Kazemi  
Front row: Rosmer Brito, Manika Prasad, Hazim Abass, Azra Tutuncu, Ramona Graves, Xiaolong Yin, Carrie McClelland, Linda Battalora, Luis Zerpa