Welcome to our Departmental Newsletter. This issue has a bit of something for everybody with news over the past year on faculty, students, honors & achievements, and updates on various programs in the Department.

My goal for this newsletter is that we migrate to a more frequent publication schedule – eventually getting out updates at least once per semester. In addition, I would like the newsletter to have some future focus as well. With that in mind, please see the next page for a list of upcoming Van Tuyl lectures and information on where to find our upcoming GE Research Fair on February 22nd. I invite any of you living in or visiting the Denver area to stop in, say hello and attend one of these events.

The most important event happening early this semester is the one-day, #idigmines giving event on Thursday, February 8th https://idig.mines.edu/campaigns/geology-and-geological-engineering. Last year, with your help our Department raised a total of $30,516 from 363 individual donors. Including the bonus of $25,000 for winning with the highest number of donors, our total take-away from idigmines 2017 was $54,451. These funds were a huge help and used to support our students and field camp last summer:

$500 each to AAPG, SEG, and AEG as a thank you for their engagement and help with the #idigmines campaign

$28,499 to help cover faculty salaries for Field Camp 2017

$16,688 to pay for graduate student teaching assistants for Field Camp 2017

$7,764 for travel expenses for both student TAs and faculty during Field Camp 2017

The use of donations from the 2017 #idigmines campaign in this way gave us leverage to use other more restricted accounts for other student-centered purposes. Thank you so much to those of you who donated last year. Please follow the link above or go to the end of our GE Newsletter to learn more about this year’s #idigmines campaign.

In early November, Ramona Graves, Dean of the College of Earth Resource Sciences and Engineering, announced that I had been appointed Department Head and that the Department would be initiating a search for a new department head to replace me when I complete my term in the next 12-18 months. When Ramona asked me to be the Interim Department Head in May 2016, it was with the clear understanding that she wanted a two to three year commitment from me with a charge to bring stability, cohesiveness, and direction to the Department – basically a turnaround opportunity in leadership terms. We have clearly made a lot of progress towards developing an outstanding Department but still have more work to do; and I am committed and excited by the opportunities ahead. As an alum, I would like to leave the Department in much better condition than when I arrived, and ready to be taken to an even higher level of performance under the next department head’s leadership.

This has been a very good year for the Geology and Geological Engineering Department, and it has been a blast to be the Department Head. We had three of our faculty take on very important roles in 2017 including: Wendy Harrison – Interim VP Research and Technology Transfer, Wendy Zhou – Dean of Graduate Studies, and Reed Maxwell – Faculty Senate President. In addition, several other faculty members and students have won awards, which are highlighted in this Newsletter. I want to take a moment to thank all of our Faculty & Staff, Students, Alumni, Families and Friends for your dedication to providing and supporting a great GE Department and Mines experience.

My education at Mines has had a profound positive impact on my life. I trust that our alumni and students have the same experience. Thanks!
Thin Section Lab Update:
We have a few program updates we would like to note. For instance, the Department’s Thin Section Laboratory has successfully fundraised and purchased a brand new lapping machine which should arrive early February 2018. Over $175,000 was raised through generous contributions by Academic Affairs (Tom Boyd), VPRTT (Wendy Harrison), a $25,000 matching fund challenge by alumni Tim Bartshe, a sizeable discount from Logitech Ltd, and private donations through the CSM Foundation’s Gold Mine Crowdfunding page orchestrated by Gretchen Gilliland. This new machine will replace a 40 year old, obsolete lapping machine that the manufacturer considers the oldest operating piece of Logitech equipment in the world. The new machine will allow the lab to produce more geologic thin sections of higher quality than ever before. Our students and laboratory staff would like to thank everyone who made this crucial upgrade possible.

New Course Update:
Dr. Alexei Milkov’s new course “Petroleum Systems Analysis” was given in 2017 where students learn to analyze petroleum systems and use tools of geochemistry and basin modeling to add value in E&P projects. Dr. Milkov also developed a new course “Volumes and Risks Assessment for Conventional and Unconventional Plays and Prospects” to be offered in Spring 2018. This is a unique course (not offered at any other University to date) in which students learn to translate geological knowledge into sound and realistic numbers and ranges for consistent assessment of volumes and risks in exploration projects.

Van Tuyl Lecture Series:
In 2017, we hosted 27 Van Tuyl Lecture Series speakers. These Thursday lectures are invaluable to the faculty and often act as an extra class (with free pizza) for the students. Some of the lectures we hosted in 2017 included: Erick Burns from USGS, Mason Dykstra from Anadarko, Ursula Hammes from A&M University, and Darcy Lecturer: Kamini Singha for CSM, to mention a few.
For our Spring 2018 Van Tuyl lecture series, we’re hosting: Charles Werner with Gamma Remote Sensing AG, Jose Cerrato with the University of New Mexico, Reinhard Sachsenhofer with Montan Universitat Leoben, and 10 others. Visit https://geology.mines.edu/events-calendar/lectures/ to learn more!

GE Department Student Chapter Associations:
Our student chapter field trips this year created opportunities for department involvement and interaction. AAPG and SEG went on a number of field trips this year, including a combined AAPG-SEG field trip during Fall 2017. The combined student-lead field trip went to Idaho Springs and the Colorado National Monument. In Idaho Springs, Patrick Wood led a tour of the Edgar Experimental Mine with Dr. Graham Closs and Mining Engineers to teach students the relationship between ore-deposit science and engineering in the underground mine environment. The second day of the trip to the Colorado National Monument reviewed the formation of basins and maturation of petroleum fields in Colorado. This part of the trip was performed in conjunction with the CSM American Association of Petroleum Geologists student chapter, led by chapter President Bryan McDowell. Cross-disciplinary education on this trip was able to bridge the gap between ore deposit geology and petroleum geology, with active discussions on how ore formation and petroleum field maturation relate between the two student chapters.

Field Camp 2017:
As we do every summer, the department held an exciting field session for Juniors. Students visited locations around Colorado and Utah in order to build their field skills. This is always an exciting event for the department and a way to get everyone connected and involved.

2017 was an absolute success and we are excited to update you on all that went on this year. Read the rest of the newsletter to find achievements, student spotlights and awards, thesis and dissertation completions, program updates and more!!
WELCOME DR. RICHARD PALIN

Richard obtained both his Masters degree in Geology (2008) and PhD in Metamorphic Geology (2013) from the University of Oxford, UK. His PhD research involved field- and laboratory-based studies of the thermal and structural evolution of numerous parts of the Himalayan Range and Tibetan Plateau. He is principally a metamorphic petrologist, but frequently integrates geochemistry, isotope geochronology, and structural geology into his work. His current research interests include the mechanisms and physico-chemical effects of fluid–rock and melt–rock interactions in different metamorphic environments; Early-Earth, secular changes in metamorphism and tectonic styles since the Archean; and metamorphism on extraterrestrial rocky bodies in our solar system. He currently has 18 papers published in international journals, including articles in Nature Geoscience and Nature. He is looking forward to forming fruitful collaborations with many members of the Geology Department.

WELCOME DR. ZHAOSHAN CHANG

Zhaoshan Chang is an economic geologist. He has PhD degrees in economic geology from Peking University (PKU), China (1997) and Washington State University (WSU), USA (2003). Zhaoshan will join CSM as the Charles Fogarty Endowed Chair in Economic Geology in early 2018. Zhaoshan has studied a wide spectrum of mineral systems, including porphyry-, skarn-, epithermal-, IOCG- deposits, W-Sn, and sediment-hosted gold deposits in 14 countries. He works closely with the mineral industry on exploration-oriented research projects, looking for far field signals, discriminators and zoning patterns in mineralogy, textures, spectral features, whole rock and mineral geochemistry, and isotopic compositions that can be directly used in exploration. He also works on ore-forming processes and ore-controlling factors, magma fertility, and regional metallogenesis. His research mainly involves field investigation and drill core logging, petrography, SWIR spectral techniques, WR and mineral chemistry, textural imaging using various techniques (LA-ICP-MS, PIXE, CL, BSE, microprobe), geochronology, fluid inclusion thermometry and composition, various isotope systems (O-H-S-C; Cu-Zn-Fe; Sr, Hf), and LA-ICP-MS techniques (dating and trace element analysis).

NEW POSITION ANNOUNCEMENT:
GEOLOGY AND GEOLOGICAL ENGINEERING OPEN RANK FACULTY

Colorado School of Mines (Mines) invites applications for a tenure-track position. We will consider all ranks. We seek candidates with a strong potential for interdisciplinary research collaborations within the Department of Geology & Geological Engineering and across Mines (e.g. with civil and environmental engineering, hydrogeology, geophysics, and/or petroleum engineering). We will consider candidates with expertise in a wide range of research areas, including, but not limited to, earth surface processes and geomorphology, engineering geology, and coupled problems (e.g. thermo-hydro-mechanical). While the successful candidate need not hold a Geological Engineering degree, they must have the potential to collaborate with the Engineering faculty in the Department of Geology & Geological Engineering on research, graduate student advising and teaching activities.

Applicants will be asked to complete an online application. To review further details of this position, please click on the preceding link.
2017 ACHIEVEMENTS

FACULTY

Donna Anderson, Ph.D., Affiliate Faculty: received the 2017 Outstanding Scientist Award from the Rocky Mountain Association of Geologists.

Wendy Zhou, Ph.D., Associate Professor: Appointed Dean of Graduate Studies. Wendy maintains her Associate Professor position within GE and continues teaching.

Kamini Singha, Ph.D., Professor: Ben Fryrear Endowed Chair for Innovation and Excellence at the Colorado School of Mines, 2017; Society of Exploration Geophysicists Women’s Network Committee’s Pioneer in Geophysics, 2017; Colorado School of Mines Dean’s Faculty Excellence Award, 2017; National Ground Water Association Darcy Lecturer, 2017

David Leach, Ph.D., Research Professor: received the SGA-Newmont Gold Medal from the Society of Geology Applied to Ore Deposits (SGA) that recognized a career involving unusually original work in the mineral deposit sector.

Reed Maxwell, Ph.D., Awarded the Senior Research Excellence award by the Mines Research Council.

Bruce Trudgill, Ph.D., Associate Professor: Awarded the Outstanding Faculty Award in GE.

Yvette Kuiper, Ph.D., Received Tenure and promotion to Associate Professor.

Stephen Sonnenberg, Ph.D., 2017 Heritage of the Petroleum Geologist recognition (Top 100 Petroleum Geologist Award, AAPG), faculty representative for IBA Team 2017—1st place Rocky Mountain Section AAPG, AAPG Student Chapter—Best Chapter Award in AAPG 2017

STUDENTS

Daniel Halford: received Grant-in-Aid from AAPG

David Rey: CUAHSI Pathfinder Fellow (2018)

Helen Malenda: National Science Foundation GRIP Fellow (2017)

Rosemarie Fryer: received grants totaling $4500 from GSA and AAPG for field work costs

Luke Pettinga: submitted a paper to Geology entitled “Morphometric scaling relationships in submarine channel-lobe systems: implications for turbidite depositional processes and stratigraphic architecture”

Ariel Rickel received the inaugural Women of Steele Award from the Association of Environmental and Engineering Geologists at their Annual Meeting in Colorado Springs in September.

Cole Rosenbaum and Allan Foster received the Martin L. Stout Scholarship from the Association of Environmental and Engineering Geologists at their Annual Meeting in Colorado Springs in September.

Omid Arabnia received the Shlemon Quaternary Engineering Geology Scholarship from the Association of Environmental and Engineering Geologists at their Annual Meeting in Colorado Springs in September.

Miguel Tavars Nassif, 2017. SEG Canada Foundation Student Grant, $3,900

Allison Seversen, 2017. GSA Graduate Student Research Grant, $2,500

Julia Hawn, 2017. Fred F. Meisner Memorial Fund, Outstanding Senior Award, $1500.

Michelle Franke, 2017. Robert M. Hutchinson Memorial Fund, Brunton Award, $1000 plus a new Brunton compass.
David LaPorte, a master’s student in the Department of Geology and Geological Engineering advised by Paul Santi, is working to help mitigate landslide risk in communities in Guatemala thanks to a Fulbright grant.

In 2015, a devastating landslide in a Guatemala City ravine killed an estimated 350 people in the settlement of El Cambray II, highlighting the urgent need for more research on landslide risk management.

LaPorte is conducting research at the Universidad de San Carlos de Guatemala, with the cooperation of Coordinadora Nacional para la Reducción de Desastres, as part of a project to evaluate landslide risk management in precarious settlements of Guatemala City’s metropolitan area and develop cost-effective solutions.

“These settlements are built on the slopes of steep ravines and are populated by the area’s most economically vulnerable population,” explained LaPorte, whose ultimate goal is to help those who have little choice but to live in at-risk areas by studying ways to better manage these natural hazards.

To do this, LaPorte is evaluating the current landslide risk management initiatives put in place by Guatemalan government agencies and NGOs, such as risk-reduction tools and educational programs. “I plan to evaluate the effectiveness of some of these initiatives through a study of risk perception and behavior of the inhabitants of at-risk communities,” he said. Currently, there are no statistics in this field, which LaPorte’s research is working to address. Communities will be surveyed before and after risk-communication strategies are implemented, with the ultimate goal of improving initiatives to encourage risk-reducing behavioral change.

One of the biggest challenges LaPorte has faced during his three months in Guatemala thus far has been breaking into the existing network of researchers and organizations, many of whom have been working on this issue for years. “As an independent researcher, it has been challenging to catch up on the understanding of the way things are done here, and the recent history of risk-management initiatives in the settlements,” he said. But LaPorte said everyone he has collaborated with has been very helpful, and finds this opportunity to experience a new community and culture very rewarding.

“The core of the Fulbright program is based on increasing cultural exchange and mutual understanding between people in the US and those abroad,” he said. “Being able to dedicate ten months of my master’s degree to not only my thesis project field work, but also to this cultural exchange, is such a joy.”

LaPorte is confident that the experience will help him “ become a more globally competent citizen and engineer.”

“It is work that I love, and that has been made possible by the Fulbright grant.”
Nominations from Dr. Alexis Navarre-Sitchler and Dr. Kamini Singha.

I am a wonderer whose interests and hobbies range from articulate and repetitive analytical geochemical techniques to children’s literature. I find my passion in the bravado of politics, the discomfort of social media science communication, and the nostalgia of a child’s imagination. No matter the range of my interests, I aim to be an observer, student, and teacher of the scientific world.

As a child who grew up in a middle-class suburb of Houston, I am not naïve to the opportunities of which I have been afforded during my short and privileged life. I had a wall covered in books, mentors who have guided my way, and critics who have knocked me down a peg or ten. My immigrant father instilled in me the simple beauty of waking up before the sun to a quiet world filled with possibilities. My mother, chronically ill since before I was born, showed me how to smile through struggles and to always be inspired by hope. I was fortunate to have a life that could safely be as twined and twisted as the hair that sits atop my head: starting as an introverted high school student who didn’t have a clue, to an adventurer who moved across the country to New York City to pursue a degree in screenwriting, to a free-spirit in Austin with big ideas, three jobs, and a thirst for something more.

Austin was where I found my love for the sciences — testing out astronomy, analytical chemistry, and medicine before tumbling into the Earth Sciences and brightly-colored Chacos. Time and again I relay the experience of searching for the life-changing story that would drive my future, and finding it in the dim auditorium of the first lecture of my introductory geology class. I began studying paleontology at U.T.‘s vertebrate paleontology lab, but soon found my way into a high temperature geochemistry lab, picking mineral grains and running a mass spectrometer. I was constantly surrounded by people who inspired me and pushed me further into my studies and out into the natural world, which I held so dear. During this time, I met a fellow geologist — a brilliant sedimentologist who years later would become my husband — and together we moved to Colorado, where he could pursue his passion in sedimentary petrology, and I could learn an entirely new world of the geosciences: low temperature earth surface processes. The alien world of biogeochemistry and weathering processes introduced me to field work in the Rocky Mountains and a new, rich, community of driven scientists and like-minded individuals.

During this formative time, I continuously reflect-ed on all of the opportunities that I was granted to get to where I am. Those who supported my growth inspired me to create and join spaces where I could help other young women find their way. In 2010, I founded the Geosciences Leadership Organization for Women (GLOW) at the University of Texas. During my involvement with this group, I met countless women who increased my awareness and fluency in the importance of intersectional diversity in the sciences, and I actively began participating in organizations who promoted K-12 science education in communities with demographics that were underrepresented in the Earth Sciences and provided funding for programs to encourage women in the sciences and contribute to their retention in the workforce. The Association for Women Geoscientists (AWG) and 500 Women Scientists are just two examples of these organizations that I became involved with. I have served on AWG’s board of directors or executive committee since 2014, and chair multiple committees to bring mentorship to young women across the world and funds to worthy projects within the U.S. Nothing is more important to me than providing encouragement and opportunities to young scientists who have struggled along their path. My pipe dream is to figure out a way to find a way to synthesize my passion for communication, diversity, and science into a future career.

In 2015, I started along this pathway by developing a project which integrates children’s love of adventure with foundational critical thinking skills: MD and Finn. MD and Finn is a self-written/published children’s book series which I developed to address the lack of diversity in children’s literature. MD is a little girl who continuously explores, discovers, and builds the world around her with her best friend, Finn the fox. They encourage one another to ask questions, brainstorm, make mistakes, and learn from absolutely everything. The primary goal of the series is to create a character in which young girls can see reflections of themselves solving problems, testing the scientific method, learning from mistakes, and enjoying the little pieces of science in daily life. A coupled purpose is to equally represent characters from different races, ethnicities, gender identities, religions, and disabilities. In bringing these books to life, I have been given the unique opportunity to regularly engage with classrooms and families who may be meeting an actual scientist for the very first time. For a few young girls, this may also be their first opportunity to see a potential reflection of themselves, in a lab coat. These experiences drive me to continue the never-ending pursuit of science so that I can contribute to both the future of scientific knowledge and of scientific diversity.
HONORING PROFESSOR EMERITUS JOHN WARME

The Department of Geology and Geological Engineering hosted WarmeFest, a two-day celebration in honor of Professor Emeritus Dr. John Warme, bringing together over 100 alumni, colleagues and friends from across the world to celebrate his 50-year career.

“Planning for the WarmeFest was a complete surprise to me, and was set up before I was told,” said Warme. “The committee who put it together kept it a secret from me for three and a half months while they set it up, attending to every detail with cooperation from the Alumni Association, Foundation, college and department.”

After earning a bachelor’s degree from Augustana College in Illinois and a PhD from UCLA, Warme went on to hold a postdoctoral appointment as a Fulbright Scholar at the University of Edinburgh in Scotland. He began his teaching career at Rice university in 1967, moving up ranks from assistant to full professor prior to joining the Colorado School of Mines faculty in 1979. Warme served as the director of Exploration Geosciences Institute during his tenure. He was granted emeritus status upon retirement in 2002.

Warme stated that he felt “deeply grateful to realize many things through this event” of which he was not fully aware. “It was a chance for me to review my career for myself as well as outline it for others, and realize that my academic history touched so many people who expressed their feelings,” he said.

“We all enjoyed learning more about Dr. Warme’s distinguished and eventful career,” said Geology and Geological Engineering Associate Professor Piret Plink-Björklund, one of the event’s organizers.

The Friday program included a welcome from Mines President Paul Johnson, as well as both technical talks and personal stories reflecting on research, field and classroom experiences with Warme.

“WarmeFest was a wonderful event honoring Dr. John Warme,” said College of Earth Resource Sciences and Engineering Dean Ramona Graves. “John’s scientific contribution to geology and his commitment to education are renowned. I personally enjoyed reminiscing with him about our co-taught classes and research. He was an important mentor to me as a young faculty member.”

A similar event honoring Dr. Robert J. Weimer’s 54 years of contribution to the Geology and Geological Engineering Department, WeimerFest, was held in 2004. In October 2011, the Mines Geology Trail was dedicated to Weimer. Similarly to WeimerFest, attendance registration fees for WarmeFest will be used to enrich the department, particularly students’ field activities.

“Every faculty should have such a marvelous chance to gather with former students, faculty and research colleagues, family and good friends, in the campus setting that was their academic home,” said Warme, giving his sincerest thanks to all involved in organizing the event.
We held our annual GE Student Research Fair on February 23, 2017. Students from the Department of Geophysics were also invited to participate. The event, sponsored by ConocoPhillips, gave students a chance to present their research to a panel of judges consisting of Mines faculty as well as members of industry. Our 2018 GE Research Fair will be held Thursday, 2/22, from 4-6pm in our Ben Parker Student Center. Come join us!

Winners from eight categories were chosen:

1: Undergraduate: Allan Foster
2: Geophysics Masters: James Johnson
3: Economic Geology Masters: Emily Gentry
4: Geological Engineering Master: Cole Rosenbaum
5: Hydrology Masters: Kenneth Swift Bird
6: Petroleum/Soft Rock Masters: Sarah King
7: Pre-Candidacy PhD: Sankhaneel Sinha
8: PhD Candidates: Jianqiao Wang

Jianqiao Wang
CSM Geology & Geological Engineering/ Geophysics Research Fair PhD Winner

“Are Fluvial Facies Models Useful?”

Abstract: Recognition of fluvial planform styles is important for paleogeographic reconstruction of rivers, but the classic fluvial facies models for meandering and braided rivers established in the 1970s are too idealized. Some studies in the ancient and modern rivers show the ‘odd’ cases that do not fit the classic models. One example from the late Cretaceous Ferron Sandstone illustrates that facies models do not always work in the real world: 1) both braid bars and point bars may occur within a single meandering channel; 2) braid bars may incorporate into compound point bars as they migrate and attach to a channel margin. These are similar to the highly sinuous channel filled largely with downstream accreting units and compound bars in the modern Red River at the Texas-Oklahoma border.

Some of the ‘odds’ cases can be also due to climatic effects. The old facies models only fit for perennial fluvial systems. A seasonal river facies model has been recently developed mainly based on studies in modern rivers highly influenced by seasonality. Similar depositional features are observed in the Sunnyside Delta Interval of the Green River Formation: e.g., high proportion of Froude super- and trans-critical flow sedimentary structures; highly variable internal architectures including upstream, downstream and lateral accretion, and vertical aggradation of heterolithic infills, as opposed to the ‘lack of well-developed barforms’ described in the seasonal river facies model.

To conclude, facies models may be a useful starting point, but will never perfectly reflect the variability of nature. Instead of trying to force real-world data into specific planform styles of rivers, researchers should focus on documenting and communicating the processes recorded in the rock. Comparison with modern rivers can be very helpful to interpret the ancient records.
A NOTE FROM THE ECONOMIC GEOLOGY PROGRAM

STEVE ENDERS, RICH GOLDFARB, ALEXANDER GYSI, DAVE LEACH, MURRAY HITZMAN, ELIZABETH HOLLEY, YVETTE KUIPER, THOMAS MONECKE, RICHARD PALIN, KATHARINA PFAFF, AND RIC WENDLANDT

GENERAL NEWS:

- Steve Enders is enjoying his role as department head. We have hired Zhaoshan Chang to fill our Fogarty Professor of Economic Geology position, and our new metamorphic petrologist faculty member, Richard Palin, has begun teaching, advising, and providing field specific research.


- David Leach presented a workshop and invited paper on base metals deposits in Asia at the SEG Beijing conference on “Ore Deposits of Asia: China and Beyond.” He also presented a workshop at the SEG-SGA China Ore Deposit Models Workshop in Changba, China. Dave is currently working on the connections between evaporites and sediment-hosted base-metal deposits with a focus on Asia, North Africa, and the Americas.

- Yvette Kuiper, with co-PIs Basil Tikoff and Laurel Goodwin (U Wisconsin – Madison), writing committee chairs Kate Huntington (U Washington) and Keith Klepeis (U Vermont), and ~130 others just finalized a two year effort resulting in a community vision document on the future of tectonics research and societal impact, prepared for the US National Science-Foundation: Huntington, K.W., and Klepeis, K.A., with 66 community contributors, 2018, Challenges and opportunities for research in tectonics: Understanding deformation and the processes that link Earth systems, from geologic time to human time. A community vision document submitted to the U.S. National Science Foundation. University of Washington, 84 pp. https://doi.org/10.6069/H52R3PQ5. The document is based on over a year and a half of community discussion and data gathering. This included contributions of ~90 scientists at a 3-day workshop held at the University of Madison - Wisconsin (EAR-1542001 to Tikoff, Kuiper and Goodwin), idea papers contributed by participants, and contributions by 43 scientists who did not attend the workshop. Extensive community input was gathered before, during, and after that workshop, at town hall meetings at the national GSA and AGU meetings, through online surveys, and through focus group discussions. The draft document was circulated for community comment in September 2017. Feedback and discussion continued through the Future Directions in Tectonics initiative at the GSA annual meeting in October 2017, which involved 13 sessions and nearly 270 abstracts related to the vision document themes. The result is a community document that incorporates the opinions of hundreds of scientists and includes direct contributions from nearly 70 people.

- Ric Wendlandt, Wendy Harrison, and Thomas Monecke were awarded a NSF Industry/University Cooperative Research Center (I/UCRC) planning grant award in early 2017 to develop a CSM-industry research center focused on mineral exploration. The planning meeting for the proposed IUCRC, the Center for Advanced Subsurface Earth Resource Models (CASERM), was convened at Mines on Sept. 14-15, 2017, bringing together potential members from the exploration and mining sector, service providers, consulting companies, software developers, and federal agencies. The meeting attendance was outstanding, including 52 representatives from 38 companies, federal agencies, and national labs. A follow-up proposal, requesting NSF approval and 5 years’ support for the Center has now been submitted. For more information on CASERM, please contact Ric, Wendy, or Thomas, or check-out the Center’s web site at http://3dearth.mines.edu/3DEarth-Home/.
Elizabeth Holley’s Mining Geology Research Group – 2017 Highlights: Awarded an NSF CAREER Grant! The project “Did Carlin-Type Gold Come from Magmas” evaluates the genetic connection between Nevada’s famous CTGD gold mineralization and Eocene magmatism. The project will support geo- and thermochronology by current PhD student Dante Huff, as well as stable isotope and fluid inclusion studies: funded PhD position available! The project will facilitate student field trips to Nevada as part of Elizabeth’s graduate Mining Geology course (MNGN 528), and a partnership connecting inner city K-12 teachers with the Colorado Mining Association’s “All About Mining” continuing education program.

Elizabeth is currently accepting PhD applicants for two large collaborative projects. For an NSF-funded project on artisanal gold mining in Peru and Colombia (Co-PIs include CSM faculty Juan Lucena, Nicole Smith, Jessica Smith and Kate Smits), she seeks PhD students with backgrounds in economic geology and interest in ore characterization and geometallurgy; a position is also available in ore processing/mining engineering. For a NIOSH-funded project on ground control in underground mines (PI Gabe Walton), Elizabeth seeks students with expertise in geological mapping and rock mechanics; the project focuses on improving roof failure prediction with innovative mapping and monitoring methods, in collaboration with current MS student Meriel Young.

This year two MS students successfully defended their theses: Lauren Foiles (R-Mode Factor Analysis of Stream Sediment Data in the Fairbanks Mining District, East-Central Alaska, co-advised by Rich Goldfarb) and Johana Pedraza Rojas (Geologic Controls on Alteration and Mineralization at the Wharf Mine, South Dakota). Three PhD students in Mining Engineering round out the Mining Geology Research Group.

The interdisciplinary synergy has been fantastic, and together the team is making great strides solving mining problems with geological tools.

Richard Palin’s Metamorphic Geology Research Group – 2017 Highlights: In Fall 2017, my ‘Metamorphic Geology’ research group was officially established, and I currently have one PhD student and three MS students completing independent research projects on a variety of geological problems. PhD candidate David Hernández Uribe and I travelled out to the Colorado Plateau in the preceding summer to collect a range of crustal and mantle xenoliths from the Navajo Volcanic Field, Four Corners region, which he has now started to examine. David will perform detailed geochronology and thermobarometry on these rocks to provide new insight into the paleo-lithospheric thickness and structure of the plateau region, and potentially place new constraints on its uplift and deformation history. Zachary Palmer and Hannah Beauschesne, two of my MS students, are also studying local rocks: Zach is studying the petrogenesis of unusual Zn-bearing high-grade metamorphic rocks collected from the Wet Mountains, Southern Rocky Mountains, and Hannah is attempting to elucidate the physico-chemical conditions and timing of topaz- and rutile-rich gneisses exposed in the Evergreen region of the Colorado Front Range, just 20 minutes’ drive away from Mines! Her work will expand our understanding of fluid–rock interactions in the crustal environment, and pave the way for creating thermodynamic descriptions of F-bearing minerals that can be used for forward and inverse petrological modeling. Finally, Trevor Copple, my third MS student, is studying metamorphosed volcanogenic massive sulfide ore deposits from the Paleoproterozoic Penokean volcanic belt, Canada. He will constrain the pressure and temperature conditions reached during metamorphism, and investigate the petrological changes that occurred in order to produce predictive models for use in future exploration projects. While it is very early days, we expect to see some important results being produced in everyone’s projects very soon!
We continue to have strong participation in the Engineering Geology specialty, with about half of our undergraduates entering in this concentration area, and with a graduate student cohort around 15-20. Dr. Jerry Higgins officially retired in June, and while we will miss his expertise and long memory of the program (he was our official “human hard drive”), we are fortunate enough to be able to hire another faculty member who will support the group. Our focus for this new hire is in earth surface processes, geomorphology, engineering geology and/or coupled problems.

- Paul Santi continues to be active in research and professional society activities. He is one of the directors of the 7th International Debris Flow Hazards Mitigation Conference, which will be held in Golden in June 2019, and he recently completed his 5-year commitment as a national AEG officer. His graduate students are tackling a wide array of practical problems. They are studying landslides in the vicinity of the deadly West Salt Creek landslide near Grand Junction, trying to identify whether prehistoric slides had the same movement style. They are also are continuing development of methods to predict whether landslides will have manageable short runout distances or more dangerous long runout distances. Other students are measuring the change in soil properties and erodibility following wildfire. And as described later in this newsletter, Santi’s students continue our humanitarian work in Guatemala City, trying to reduce landslide risks for poor communities.

- Gabe Walton, the newest Engineering Geology faculty member (started in 2015), has established an active research group with an emphasis on applications of numerical modeling, geophysics, and remote sensing to Geological Engineering problems. Rockfall mechanics, monitoring, and management is a major research area for Gabe and his graduate students, with current projects focused on critical areas of rockfall hazards along I-70 being conducted in collaboration with the Colorado Department of Transportation. Gabe currently serves as Program Director for the Underground Construction and Tunnel Engineering program, and is currently leading graduate research related to geological model development for tunnel design and planning and geomechanical modeling for underground mining risk reduction.

- Wendy Zhou has recently become the Dean of Graduate Studies for Mines, overseeing our graduate degrees, graduate students, and managing strategic initiatives of the university’s growing graduate school. She also maintains a half-time appointment in our department, conducting research, and advising graduate students. She continues research using InSAR and PSInSAR to detect ground conditions and slope movement, developing methods to predict levee failure, and using GIS for hazard assessment and environmental studies.
The Maxwell Research group has been busy this year, from snow surveys in the East River watershed in Crested Butte, to working with the National Water Center in Tuscaloosa, and modeling a range of domains using the integrated model ParFlow.

This fall we received two master’s students, Rachel Corrigan and Sarah Trutner and welcomed back PhD student Mary Michael Forrester, who completed her master’s degree in December 2016. In Spring of 2017, Mary Michael also worked with glaciologists and climate scientists at Oak Ridge National Laboratory (ORNL) to study melting rates of the Greenland Ice Sheet (GIS). Specifically, she was part of a development team for the Land Ice Verification and Validation Toolkit (LIVVkit), a performance validation package for ice sheet modelers. LIVVkit verifies model physics and compares outputs to other established models at a range of resolutions, to surface mass balance estimates from hundreds of ice core observations, and to thousands of airborne radar measurements. Mary Michael’s work at ORNL was part of the Higher Education Research Experience program (HERE) at the Oak Ridge Institute for Science and Education.

Anna Ryken, along with others in the group, worked to set up an eddy covariance tower and meteorological station near the East River in Crested Butte, CO. Her research seeks to better understand the interactions between groundwater, snow fluxes, and the atmosphere in mountainous environments through observations and modeling. The group will use this information to improve the hydrologic model, ParFlow-CLM and give us a better grasp on overall system behavior.

Lauren Thatch completed a summer internship at the US Bureau of Reclamation funded by Conservation Legacy. During her internship, Lauren helped developed the Tulare Region of the CalSim 3 Model, a water resources planning model in California jointly developed and managed by the California Department of Water Resources and the Bureau of Reclamation. This internship provided an excellent opportunity to gain a better understanding of water management models in use and how water resources are distributed in California’s Central Valley.

Annette Hein continues her important work on large droughts like the Dustbowl, and uses numerical models to explore the importance of temperature, precipitation and land cover change. This summer she installed mini-weather-stations on agricultural fields to measure the differences in evaporation caused by farming.
Lauren Foster was selected by the National Science Foundation as one of ten PhD students across the country to receive a Blue Waters Graduate Fellowship. The fellowship program provides support and access to the National Center for Supercomputing Applications to advance cutting edge research. Lauren is taking this opportunity to better understand climate feedbacks in the snowmelt-dominated headwater systems that supply water to more than 1/6th of the world’s population, including the Southwest USA. Using the Blue Waters system, Lauren is applying a hyper-resolution (10 m) integrated model over 255 square kilometers to perform the first study to vary resolution over 2 orders of magnitude.

Lauren Foster uses landcover and geology type maps as inputs for the East River model.
Danielle Tijerina received the American Association of University Women: Selected Professions Fellowship, which aims to support and acknowledge female students pursuing degrees where women's participation has traditionally been low. This fellowship will support her research in applying large-scale, integrated hydrologic models over large geographic areas. She also received a summer research fellowship opportunity at the NOAA National Water Center in Tuscaloosa, AL. There she worked to understand hydrologic model uncertainty to better inform decision making and water prediction.

Finally, Caitlin Collins is finishing her masters research on bracketing evapotranspiration estimates in the high Sierras and the effects of lateral groundwater flow on plant water stress during the recent California drought. She will defend this work this spring semester. In January, Caitlin also began working for Daniel B. Stephens & Associates as a hydrologic modeler.

We are excited to see what exciting science experiences and research this year will bring!

Picture 5: Danielle Tijerina spent the 2017 summer conducting research on hydrologic modeling at the National Water Center in Tuscaloosa, AL.
The students in the 2017 Mines field camp spent six weeks mapping in wildly varying terrains across Colorado and Utah. Structural Professor Bruce Trudgill organized field camp this year and had help from seven other professors (Mary Carr, Paul Santi, Wendy Zhou, Nigel Kelly, Holly Brunkal, Christian Shorey, and Graham Closs) to lead the weekly exercises at seven different sites. The strength of the CSM field camp is its focus on intensive detailed mapping in a variety of different geologic areas.

The first week of field camp was run out of Moab, UT where the students mapped folded and faulted Mesozoic sedimentary rocks. The second week of field camp focused on mapping surficial glacial deposits, correlating moraines, glacial outwash, and other alluvial deposits to create a full geologic history of Pleistocene in Durango, CO. The third week was in Salida, CO where the students mapped complex intrusive/contact metamorphic terrain, early Paleozoic sedimentary rocks were deposited on Precambrian crystalline basement, and then intruded by a Cretaceous intermediate pluton. In the fourth week the students mapped volcanic terrain including flows, lahars, and sub-volcanic intrusions, and ash flow tuff sheets in the San Juan Volcanic Field. Next the students mapped in the area surrounding Molas Lake which is a complex area of Precambrian basement and Paleozoic sedimentary rocks that has been affected by a series of faults that have undergone multiple reactivations throughout geologic time. In the final week of field camp, the students had the option to choose between geologic hazard mapping in Silverton, CO or underground mapping at Edgar Mine in Idaho Spring, CO.

The 2017 CSM Field Camp class photo

Molas Lake and surrounding mapping area for week 5

Thank you to ConocoPhilips for providing donations to cover delicious BBQ meals to our hungry and tired students!
This past summer the Colorado School of Mines Geological Engineering department traveled to Scotland to experience the cultural and historical value of geologic work done in the area. The class was led by Richard Wendlandt and Wendy Harrison in the geology department. The goal of the trip was to look at historically significant rocks that helped modern geology become what it is today. All who attended were encouraged to look at formations and outcrops the way James Hutton, George Barrow, Charles Lyell, and other influential geologists viewed them hundreds of years ago. By walking the paths that our forefathers in geology walked, we gained an appreciation for geology and history that would have been lost in a classroom.

Along the trip, we worked with professors to unravel regional metamorphic events seen in the rocks. We also learned about regional and contact metamorphic suites in the area, intrusive events, global and regional plate tectonics, and regional glaciation.

The students who attended the trip would like to acknowledge the professors and TA’s who helped make this trip so educational, entertaining, and worthwhile.
The Advanced Sedimentology is taught in seminar format and focuses on depositional processes and dynamics that construct stratigraphy. The students read published papers, learn to synthesize large amounts of data, as well as critically evaluate existing depositional models and knowledge about processes of sediment entrainment, transport and deposition.

The field trip to Mont Saint Michel and Gironde, France is designed to teach the students dynamics of sediment entrainment, transport and deposition in modern environments. Mont Saint Michel area presents a fantastic natural laboratory for observing sediment dynamics over 24 hours, trenching and learning what is preserved over a period of couple of days, couple of years, 10s of years and 1000s of years, the whole Quaternary. Over a rather restricted coastal area in the Mont Saint Michel the students can work on high-energy tide-dominated estuarine system with tidal range of 15 m (!), low-energy tidal flats, mixed tide and wave systems, and high-energy wave systems. The students can observe the interaction between main shallow marine processes: tides, waves and fluvial. Mont Saint Michel provides a great opportunity for walking-out the depositional systems from proximal to distal.
GEOL610: Gets Muddy in France

This October Dr. Plink-Bjorklund’s Advanced Sedimentology class got the opportunity to travel to Normandy, France to observe the sedimentary processes acting within the Bay of Mont Saint Michel. We spent six days in field and traversed over 100 km through various supra- and intertidal sub-environments associated with the bay. Funding for the student trip was generously provided by Statoil.

The Bay of Mont Saint Michel provides an excellent outdoor laboratory for observing and comparing modern hydrodynamic processes (i.e. tide vs wave) and resulting sedimentary structures across multiple environments. Because of its geographic location the bay experiences some of the largest tidal ranges on Earth (up to 15m). Additionally, the shape of the bay itself impacts the relative influence of hydrodynamic processes acting on the sediments resulting in 1) a sediment starved western embayment, 2) a tide-dominated estuary, and 3) a wave-dominated norther coast.

On our second day in France we embarked on a ca. 14 km traverse to observe the sedimentary processes occurring on the tidal bars within the outer estuary portion of the bay. Although primarily sand dominated, thick fluid mud lenses were commonly encountered along tidal bar margins. The following day was greeted by cold temperatures, wind, and rain, but some fresh oysters from Cancale boosted the morale. Cancale is located within the western sediment starved embayment and although the weather wasn’t ideal we were able to get a traverse in on the mud flats. There we were able to observe the transgressive ravinement surface and shell lag. Later in the trip we were able to complete a long transect from the embayment into the outer estuary.

One day was spent with Dr. Bernadette Tessier from the University of Caen, Normandy who led a series of lectures as we made stops within the inner and central portions of the estuary. We got to observe some beautiful climbing ripples, learn about tidal rhythmites, and experience firsthand the effects of playing in quicksand.
On the sixth day we did a traverse along the northern littoral of the bay. We began in a prograding wave-dominated barrier and back barrier system that became more and more retrogradational as we traversed north. Along this transect we got to compare and contrast tidal-ravinement surfaces versus wave-ravinement surfaces as well as the interaction between estuary (tide-dominated) and coastal (wave-dominated) processes.

Dr. Lennart Bjorklund accompanied us on the trip and helped us to see the “bigger” picture with his lectures and knowledge on the bedrock geology of the region. Metasedimentary turbidite exposures along the northern wave-dominated coast provided great exercises for determining depositional processes and stratigraphic relationships as these rocks were greatly deformed, weathered, and inverted. Additionally, there is an interesting story relating to the granitic rocks that Mont Saint Michel is built from and those it rests upon.

A special thank you goes to Dr. Plink-Bjorklund, Dr. Tessier, and Dr. Bjorklund for organizing and leading this trip. Photos courtesy of Luke Pettinga, Brittany Abbuhl, and Andrew Heger.
AAPG STUDENT CHAPTER

AAPG Student Chapter Named Best in the Nation

ACE 2017 was held April 2 to 5 in Houston, Texas, with the chapter’s high honor being awarded at the Student Reception on April 3. Several speakers were there to address the student chapters, including AAPG President Paul W. Britt.

Chapter President for 2017 Joshua Payne, a master’s student in geology, couldn’t be more proud. “Personally, as a student of the science and great beneficiary of the opportunities and resources available through AAPG and its rich history, there is no higher honor at this stage of my career,” he said. Payne went on to boast about his fellow chapter members, noting the “exceptional character and leadership of each of the members.”

“This is a reflection on the overall culture that is inherent to Colorado School of Mines, one of integrity, innovation, success and a will to never give up.”

The AAPG Student Chapter had a busy 2017, hosting a total of 22 Lunch & Learns, 5 workshops, 4 field trips, and multiple special events. The chapter was proud to win the Outstanding Domestic Student Chapter Award at the AAPG Annual Conference & Exhibition as well as first place in the Rocky Mountain Region for the Imperial Barrel Award. Highlights of the spring semester include a three-part petrophysics workshop taught by Dan Krygowski and field trips to the Guadalupe Mountains and the Western US. The chapter also hosted AAPG Distinguished Lecturer Tim Collett for a presentation on gas hydrates. The summer offered a short respite followed by an equally busy fall semester. The chapter kicked off the fall semester by cleaning the Bob Weimer Trail in preparation for the first Van Tuyl lecture, led by Dr. Weimer himself. Shortly afterwards, students participated in the annual AAPG-SEG camping trip by heading to the western slope to learn about a mixture of petroleum and hard rock geology. The chapter held its first football tailgate during homecoming weekend, a workshop on hydraulic fracturing, and continued its annual moustache competition at the Moustachio Bashio. The semester wrapped up with a Wolfcampian carbonates field trip and three-president panel composed by Denise Cox (President Elect, AAPG), Nancy House (President, SEG), and Janeen Judah (Past President, SPE). In short, the chapter had a great 2017 and are looking forward to making 2018 even better!
2017 proved to be a great year for the Colorado School of Mines AEG student chapter. We regularly experienced great participation and attendance at our meetings from our senior class, and the amount of other undergraduates involved is on the rise. Reaching out to the sophomore and junior classes consistently, as well as inviting new graduate students, is always a goal at AEG. Continued work is also being done to increase student involvement at the AEG Mile High regional chapter meetings. AEG was also active volunteering around campus. We participated in the inaugural year of Digger Drive and joined the annual “Helluva Service Event” where several students were rewarded with a dinner with President Paul Johnson for their efforts.

What made this year really special was the Association of Environmental and Engineering Geologists National Convention. We were fortunate enough that this annual conference was held in Colorado Springs this past year, allowing for many of our student members to attend. AEG members from Colorado School of Mines played a huge part in making the conference a success. Students volunteered at the conference to ensure that all events went smoothly and presented their research to attendees from around the world. Presenters included Christopher Higgins, Ashton Krajnovich, David LaPorte, Stephen Semmens, Lauren Southerland, and Kendal Wnuk. Recent graduates Cole Rosenbaum and Alvaro Puente also presented, as did GE professors Paul Santi and Wendy Zhou. Several students from Colorado School of Mines were also awarded scholarships at the conference. Cole Rosenbaum and Allen Foster III each received a Martin L. Stout Scholarship, in the graduate and undergraduate divisions respectively, Stephen Semmens was the recipient of the Lemke Award for an outstanding original student abstract, and Omid Arabnia was honored with the Shlemon Quaternary Engineering Geology Scholarship. Finally, Ariel Rickel and Tatjana Scherschel were especially distinguished as they were the first recipients of the Women of Steel Award, which recognizes the achievements of women studying within the Geological Engineering discipline.

2017 saw the CSM AEG student chapter members often engage themselves in activities both on and off campus activities, and this is a trend that is sure to continue. The future of the student chapter looks bright as upcoming officer elections will see an almost complete overhaul of leadership as many of our seniors graduate. There is no doubt that this up and coming class will be ready to continue where 2017 left off and ensure that 2018 is another successful year for AEG.

Adam Malsam
CSM AEG Student Chapter President
Colorado School of Mines 2018
Society of Economic Geology (SEG) introduced students in Fall 2017 to our field through student-organized field trips, lunch and learn lectures, and campus-wide events. The CSM SEG Student Chapter provides bi-monthly technical lunches for members; this year our talks are structured around exploration, feasibility, and resource-modeling, exposing students to different aspects of the mining cycle and the range of career options that exist for economic geologists. The CSM SEG Student Chapter also coordinates field trips for members and industry professionals alike. A student-lead field trip took place over September 9-10 to Idaho Springs and Colorado National Monument. In Idaho Springs, Patrick Wood led a tour of the Edgar Experimental Mine with Dr. Graham Closs and Mining Engineers to teach students the relationship between ore-deposit science and engineering in the underground mine environment. The second day of the trip to Colorado National Monument reviewed the formation of basins and maturation of petroleum fields in Colorado. This part of the trip was performed in conjunction with the CSM American Association of Petroleum Geologists student chapter, led by chapter President Bryan McDowell. Cross-disciplinary education on this trip was able to bridge the gap between ore deposit geology and petroleum geology, with active discussions on how ore formation and petroleum field maturation relate between the two student chapters.

Last year, the CSM SEG Student Chapter travelled to Moab to explore uranium roll-front deposit, sedimentary rock-hosted copper deposit systems related to the tectonic history of Western Colorado and Eastern Utah. This year we will study the breath of precious and base metal deposit styles present in Northern Peru during a 10-day trip exploring the cities of Lima, Cusco, Cajamarca and their respective cultural/geologic history and ore metallogeny.

Student chapter lunch and learn talks included the following:

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<tr>
<th>Lecture Date</th>
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<th>Lunch and Learn Topic</th>
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<tr>
<td>09/28/17</td>
<td>Wes Hall</td>
<td>Dissertation Research</td>
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<tr>
<td>10/12/17</td>
<td>Gordon Seibel</td>
<td>Resource Modeling</td>
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<td>10/26/17</td>
<td>Dan Wood</td>
<td>Exploration for Concealed Deposits</td>
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<tr>
<td>10/28/17</td>
<td>SEG DVD video</td>
<td>Tolgoi Porphyry Cu-Au Deposits</td>
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<tr>
<td>11/02/17</td>
<td>Larry James</td>
<td>Mining in Peru from 1900’s to present</td>
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<tr>
<td>11/09/17</td>
<td>Peter Price</td>
<td>GIS in Exploration</td>
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<td>12/14/17</td>
<td>Quinton Hennigh</td>
<td>Au exploration in Pilbara, Western Australia</td>
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The CoRE research group at Mines has spent many days in the field in 2017 and lots of research has been accomplished! The 100th annual meeting of the AAPG in Houston (April 2017) showcased CoRE’s current research, with 3 posters, 3 talks, and a research booth in the exhibition hall. Luke Pettinga (2nd year Ph.D.) submitted a paper to Geology focusing on scaling relationships in submarine depositional systems and is currently studying grain size trends in submarine levee deposits. Rosie Fryer (2nd year M.S.) spent about 3 weeks in the field during 2017 collecting data for her project that quantifies bed thickness trends in submarine lobe deposits at the Cabrillo National Monument, San Diego, CA. Rosie will spend the spring and summer of 2018 finishing her data analysis and writing her thesis before joining HilCorp (Houston, TX) as a petroleum geologist in the fall. Clark Gilbert (1st year Ph.D.) spent 2 weeks in the field collecting a sample suite for detrital zircon analysis to understand the tectonostratigraphic evolution of the Ventura Basin in central California, and has already begun the mineral-separation process and will analyze those samples early in 2018. Wylie Walker (1st year M.S.) spent 1 week in the field in the Guadalupe Mountains (Texas) collecting preliminary data for his project that describes proximal mass-wasting deposits of the Bone Spring Formation. This trip coincided with Wylie’s birthday, so he brought helium balloons and tied them to his tent :). Wylie will be interning this summer with Encana in Denver, working on Permian Basin assets that will help him better understand his thesis area. Undergraduate researcher Dingxin Cai (2016-17) completed her project on submarine channel super-elevation and will be presenting her work at 2018 AAPG. Undergraduate researcher Ali Downard (2017-18) has made significant progress on applying machine learning algorithms on a turbidite core database. Ali was also awarded a prestigious undergraduate internship with Chevron during the summer of 2018. Lauren Shumaker (Post-doc) has submitted a paper to Geosphere on submarine channel morphometrics, and is now collecting data to link modern submarine channels on the seafloor to channel deposits preserved in the subsurface and outcrops. Lauren is also teaching a graduate-level course in the Spring 2018 semester entitled “The Art and Design of Communicating Science”. Mary Carr (Program Manager), along with providing organizational expertise to CoRE, is working with Bruce Trudgill on the interaction between eolian sedimentation and salt movement in the Eagle Basin of Colorado. During 2017, Zane Jobe (CoRE Director) has spent about 5 weeks in the field with students, taught and co-taught two graduate-level courses on stratigraphic architecture, and published three papers in GSA Bulletin, JGR-Earth Surface, and Marine and Petroleum Geology. Zane has also put quite a bit of effort into the 2018 AAPG convention, where he will be a Theme chair.
The Integrated GroundWater Modeling Center (IGWMC) supports faculty and students who participate in developing and leading community education and outreach events throughout the year, both on campus and off. We had a busy spring in 2017, hosting 6 short courses covering a range of topics including: FloPy, FREEWAT, UCODE, MODFLOW 6, and ParFlow. These short courses were associated with our biennial conference, MODFLOW and More, which was hosted on CSM campus from May 21 through 24 with approximately 300 attendees from academia and industry. The theme of MODFLOW and More 2017 was “Modeling for Sustainability” and included oral and poster sessions on a variety of topics including: advances in integrated hydrologic modeling, impacts of hydraulic fracturing on groundwater resources, coupled flow and transport modeling, and implications of human activities on water quantity and quality. The conference was a great success and we closed the week with Dr. Kamini Singha giving her Darcy lecture to a full house in Friedhoff Hall.

We also continued our progress in expanding our outreach in the community, participating in science and engineering nights at local elementary and middle schools in the region. These events are well-attended and allow students and parents to learn about hydrology using engaging, hands-on activities. These events are fun for all participants, including undergraduate and graduate students, who can hone their communication and teaching skills. Volunteers are always welcome, so if this sounds like fun to you please contact Lisa Gallagher (lgallagher@mines.edu).

In 2017 we had an increasing demand for classroom-based lessons and visits, which supported our goal of expanding our educational toolbox to engage more students. We covered topics like hydrology, geoscience careers, and soil pollution and remediation. Graduate students and staff went to schools to serve as panel experts and science fair judges. We also had a few on-campus events, which allowed us to demonstrate what the geosciences has to offer. Overall, our events impacted 23 schools and about 1500 students.

As we look ahead to 2018, we are very excited about what’s to come. The Consortium of Universities for the Advancement of Hydrologic Science (CUAHSI) is sponsoring a ParFlow short course hosted by the IGWMC on CSM campus from March 21 to 23. We are also working with Dr. Kamini Singha to continue the Mining for Talent program, which will provide high school students the opportunity to tour CSM campus, visit labs, and participate in experiments to learn about the geosciences. Last, but certainly not least, we will be hosting a workshop for teachers to learn about the mountain pine beetle infestation in the Rocky Mountain West and its impacts to water quantity and quality. This NSF-funded workshop will be hosted at Windy Peak Outdoor Lab (Bailey, CO), providing a unique experience for participating teachers. Look for more on this in the months ahead.

We are continuing to develop our education and outreach program at the IGWMC. Come check us out on Facebook (www.facebook.com/igwmc/) or Twitter (@IGWMC).
Dr. Lesli J. Wood – Robert J. Weimer Chair and Professor of Sedimentary and Petroleum Geology.

The past year has been one for settling down in teaching of classes and continuing to drive forward to keep our SAND Consortium strongly supported in times of low commodity prices. I supervise 14 graduate students in research projects that span from Borneo to the San Juan Basin of New Mexico. I graduated my second CSM master’s student, Mr. Andrew Reisdorf, in the spring of 2017 and just graduated four excellent master’s students last week. I am teaching, what might be the only Seismic Geomorphology course in academia, as well as GE204 (Geologic Principles and Processes), and GE503 and 504 (Integrated Exploration and Development I and II). We hosted Dr. Henry Posamentier as the 2017 Weimer Lecturer in November. Henry devoted two days to continuous interaction with our students and they were thrilled. He enjoyed himself so much that he has decided to return next year! Those are the type of longer term relationships that we hope the Weimer Lecture will enable every year. Bob and others all went to dinner with Henry and his wife, Ceri. A good time was had by all.

As Chair of the Admissions and Support Team, I get to see all the great applications that come in to the department. The class for 2018 application is exceptionally high quality and we will get several new excellent students. I think future graduates will continue to be leaders in the field. We have designed a new criteria-based admissions process and for award of departmental support that we feel allows us to track the quality of our students coming in and going out so we can measure our own performance. I am currently on the new hiring committee for our position in Fluvial Geomorphology, a person that I know my entire group will interact with a lot! Things are good!

The Sedimentary Analogs Database and Research Program is healthy with six companies; bhpBilliton, ExxonMobil, Woodside Energy, INPEX, bp and Repsol, supporting our students’ working all over the world. This program brings in ~$250,000 a year in support. Dr. Rob Gawthorpe from University of Bergen, Norway spent 2017 with us, and will continue collaborating with our program in the study of rift basins around the world. He has received a prestigious 5-year, VISTA professorship which will allow for our exchange of students and professors between universities. In addition we are working in the San Juan Basin of New Mexico, the northwest shelf of Australia, Malaysia & Borneo, New Zealand, Indonesia, offshore Guyana, Colombia, Trinidad, and other areas.

I was pleased to present a keynote address to the Advances in Deepwater Systems Conference at the Geological Society of London in January. While there, I also met with our S4SLIDE international submarine landslides group, and we have collaborated on a key community paper this year in the measurement of submarine landslide deposits. SAND researchers have participated in NSF-sponsored summer programs and most recently put one of our own, Mr. Sebastian Cardona on IODP Leg 631 as the onboard junior sedimentologist. SAND researchers presented eight papers at AAPG in Houston in May, and I am pleased to report that my band, Lesli Wood and the Spiceboys, played a sold out show for the 100th Anniversary Gala of AAPG in Houston! It was a super fun party and fitting of our third appearance at AAPG National Conventions. 2018 will be spectacular!
Steve Sonnenberg’s research focuses on unconventional petroleum systems (from the micro-pore to outcrop scales). He runs the MUDTOC research consortia. This project is multi-faceted (geology, geophysics, engineering) and industry supported. Monies from industry are used for tuition, fees, and stipends for students and laboratory analyses as needed. Studies include the following North America areas: Bakken (Williston Basin); Niobrara (Rockies region); Mowry (Rockies area); Skull Creek Shale (Rockies area); Sharon Springs Member of Pierre Shale (Rockies region); Halo plays in the Powder River Basin (Frontier/Turner; Sussex, Shannon, Teapot, Teckla, Parkman); Marcellus and Utica (Appalachian Basin); Haynesville Shale (Gulf Coast); Wolfcamp, Avalon, Bone Springs, Dean Formations (Permian Basin). Kathy Emme works as the research manager for the consortia.

Students Supervised MUDTOC:
Lauren Bane (Niobrara project), Shawn Lopez (Niobrara project), Torell Stewart (Niobrara project), Walter Nelson (Niobrara project), Cankut Kondakci (Niobrara project), Kira Timm (Sharon Springs project), Alexa Sociani (Mowry project), Jeromie McChesney (Frontier Sandstone project), Joe Dellenbach (Frontier Sandstone project), Manny Corral (Shannon Sandstone project), John Morgan (Skull Creek Shale project), Jingqui Xu (Bakken project), Allison Keator (Haynesville project), Carolina Mayorga (Haynesville project), Brittany Abbuhl (Permian Basin project), Jenny Blake (Permian Basin project), April Bevenour (Permian Basin project), Jacquie Colborne (Permian Basin project), Chris Matson (Scoop and Stack project), Andrew Wood (Marcellus project), Jason Eliassen (Marcellus project), Josh Shaw (Marcellus project), Sy Luke (Marcellus project), Pablo Benitez (Vaca Muerta project)

Students Graduated 2017:
The past few years have been a bit of a cliff hanger for PTTC, but I am happy to say that we have pulled back from edge of the cliff financially and things are improving, thanks in part to our wonderful sponsors. The Rocky Mountain Section - AAPG Foundation has provided funds for half-price registration for unemployed geologists for three years. I am happy to say that this will be the last year that we will need funding from RMS – AAPG Foundation, since the ranks of the unemployed appear to be decreasing. PTTC Rocky Mtn Section has also been consistently supported by North Ranch Resources and White Eagle Exploration. In September of 2017, PTTC also benefited from sponsorship from the Four Corners Chapter of SPE resulting in a very successful joint event in Durango on Hydraulic Fracturing in Horizontal Wells.

In 2017 PTTC Rocky Mtn Region held six events providing opportunities to improve skills from Carbonate Diagenesis to Petroleum Economics. We held two courses centered-around cores at the USGS Core Research including Sedimentology and Ichnology of the Cretaceous Parkman Sandstone (see figure above). The CRC is such a terrific resource for petroleum professionals and researchers to take advantage of here in the Denver area.

2018 is off to a great start with three successful workshops already completed and approximately seven more planned for the remainder of the year. We will be offering Petrophysics of Unconventional Resources as one of the short courses during the AAPG convention in Salt Lake City.

During the past year, I returned to working in the Chevron Center of Research Excellence as the part-time Program Manager and also working with CoRE graduate students on their research. I serve in a similar capacity with Lesli Wood’s SAND consortium. I am also still co-teaching the first week of field camp in Moab Utah with Bruce Trudgill. It has been fun to plug into so many different aspects of the Geology and Geological Engineering Department.
Over the last four years, I have been able to establish a small research group with all of my students working in the Electron Beam Laboratory. This provides my students a valuable experience in sample preparation, electron beam microscopy and interaction with fellow students, researchers and industry. In addition to my research in mineralogy, igneous and metamorphic petrology and economic geology, I am continually conducting methods development to promote the application of automated mineralogy in the Earth Sciences. Masters of Science students Philip Persson (‘The geochemical and mineralogical evolution of the Mount Rosa Complex, El Paso County, Colorado, USA’) and Timothy Wyatt (‘The residence of Uranium in roll front deposit: A case study’) graduated in 2017, which leaves the group with four MS students (Lyndsey Fisher, Alyssa Smith, Isaac Simon, as well as Kelsey Livingston, who joined our group in January 2018).

In February 2017, application specialists from TESCAN and I co-hosted an automated mineralogy and FE-SEM imaging workshop (in conjunction with last year’s SME conference in Denver) here at the Colorado School of Mines. There were more than 30 people, including students, faculty, and industry that participated and made this workshop a big success. Students not only learned from TESCAN’s application specialists, but were also able to interact with interested professionals from industry. In addition to managing the Electron Beam Facility and advising students, I also taught the 3 credit class ‘Reflected Light and Electron Beam Microscopy’ (GEOL523A) during Spring 2017. Twelve enthusiastic MS and PhD students participated and agreed that this class was immensely useful for their thesis research and future career plans.

In 2017, the Electron Beam Facility enabled over 50 graduate and 15 undergraduate students to gain hands on experience using Electron Beam instruments (FE-SEM and automated mineralogy), which represent the most widely used analytical tools in industry today. Unfortunately, the Electron Beam Laboratory is currently dealing with aging detectors that require replacement and I am seeking funds to sustain operation and to be able to continue to provide our students with an education that keeps them on the technological forefront. My goal for 2018 is to raise sufficient funds to allow me to designate our tungsten filament SEM as a methods development and teaching instrument for our undergraduates, a unique opportunity that would set our undergraduate program apart from other universities. If you would like to contribute and enable us to continue and expand our educational efforts to make our students the most desired in their fields, we would love to hear from you.

Alyssa Smith and Zach Palmer discussing their thesis projects using the FE-SEM.

Automated mineralogy (TIMA). Isaac Simon is getting ready to analyze his samples.
Richard Palin, Ph.D., Assistant Professor: Nature paper (Wade et al., 2017) entitled “The divergent fates of primitive hydrospheric water on Earth and Mars”, which gives a new explanation for the current lack of liquid water on Mars. This publication has since gained significant media attention.


The Potential Gas Agency (PGA) led by Director Dr. Milkov assisted the Potential Gas Committee (PGC) in publication of its biennial assessment of the U.S. natural gas resources. The report “Potential Supply of Natural Gas in the United States (December 31, 2016)” indicates that the U.S. possesses a total technically recoverable resource base of 2,817 trillion cubic feet (Tcf). This is the highest resource evaluation in the Committee’s 52-year history, exceeding the previous high assessment (from 2014) by 302 Tcf (increase of 12%). The increase resulted from reassessments of shale gas resources in the Atlantic, Gulf Coast, Mid-Continent and Rocky Mountain areas. The main results were presented at the press conference in Washington, D.C.


Zane Jobe, Ph.D., Marine and Petroleum Geology entitled “Modeling uncertainty in the three-dimensional structural deformation and stratigraphic evolution from outcrop data: implications for submarine channel knickpoint recognition” doi: 10.1016/j.marpetgeo.2017.05.004.


Frieman, B.M., Kuiper, Y.D., Monecke, T., Kelly, N.M., 2017. Precambrian geology and new structural data, Kirkland Lake area, Ontario; Geological Survey of Canada, Open File 8245, 8 p., with 1:10 000 scale bedrock geological map.


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2017 President Dante Huff and current 2018 President Patrick Wood discussing the collapse breccia as a result of salt tectonics in Sinbad Valley.