Message from our Department Head, Dr. Wendy Bohrson

I am delighted to be writing you as the (relatively) new Department Head of Geology and Geological Engineering. I am so pleased to have joined the Department and Mines. It is also a real pleasure to be back in Colorado after many (many!) years.

I have enjoyed getting to know our remarkable faculty, hard-working students, and amazing staff. I am thoroughly impressed by the Department. We have breadth and depth of expertise and experience in our geology and geological engineering faculty, and of course an outstanding reputation. Our students happily accept the academic challenges we put before them, and in return, graduate with a diverse set of skills that help them navigate the complex reality of the job and graduate school worlds (not to mention day-to-day life). And as you all know, our staff is exceptional; they seem to know almost everything, and in a couple of cases, answered questions before I even asked them. I was also very fortunate to take the reins from our former Department Head, Dr. Steve Enders, who, when I arrived, was generous with his time and knowledge. Steve is currently bringing his energy and expertise to campus as the Director of Subsurface Frontiers. In his “spare” time, he is teaching and mentoring students in our Department as well. The virtual clapping you hear is from a grateful Department for Steve’s leadership.

I have also met many alumni and friends of our Department. You all provide support for our Department by sharing your time and expertise and through your generous monetary support as well. The network of friends and alumni who help our students get jobs in industry is especially impressive, and I hope the Department can continue to enhance our relationships with all of you, as well as the companies and agencies that support and employ our students. I invite you to visit campus and the Department so that I can get to know you better. Let us know if you are coming to town.

The last five months have been a whirlwind. Among the exciting news is we are engaged in two faculty searches at the moment. One position is in any discipline in the broad areas of geology and geological engineering; we are excited to expand what we do, and, at the same time, build on our science and engineering strengths. We are also searching for a person who has expertise in crustal processes. This position is available because Dr. Richard Palin resigned; he and his family returned to Britain, where they are closer to family and where Richard is now a faculty member at Oxford. We were sad to see Richard and his family leave but wish them the very best in their new lives.

A subset of our faculty is involved in the design of new building space in the proposed Subsurface Frontiers building, which is a part of the Subsurface Frontiers initiative that Steve is leading. A subset of faculty and students will move into this new space, and we will move a number of our analytical and sample preparation labs as well. Many hours have been spent deciding everything from where the instruments will go to what cabinets we need to who should be near whom so that we maximize the interdisciplinary work we do. This new state-of-the-art building will also be home to scientists from the USGS Geology, Geophysics, and Geochemistry Science Center. New collaborations will develop, students, faculty and staff will have enhanced access to labs and instrumentation, and our expertise in geology and engineering will grow. The building, indeed, the whole endeavor, represents remarkable new opportunities for our Department and Mines.

This spring we will embark on an undergraduate curriculum review. Why, you ask? We want to ensure that we provide our students with opportunities to receive the best possible education. As a consequence, we may update, rearrange, change, but be assured, the curriculum will remain rigorous so that our reputation remains strong, and we will, of course, carefully assess everything we do so that we maintain our ABET accreditation. The graduate curriculum will get its update in academic year 20-21, with the same goals. We want all of our students to have a signature experience that prepares them for life!

Finally, #idigmines is coming on February 6th. More details on the back cover. One big message to all of you who have been so generous to this Department through your contributions: a hearty thanks!! We very much appreciate your support of Geology and Geological Engineering.

I invite you to get caught up with our department; read on for amazing stories of success and achievement from a group of remarkable individuals! All the best for 2020—to a happy, healthy year filled with great experiences and new discoveries.

Best regards,

Dr. Wendy Bohrson

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2019 Faculty Awards:

Mary Carr was awarded the 2019 Julie A. Lefever Memorial Award from the Petroleum Technology Transfer Council (PTTC) to recognize those who have done an exceptional job at sharing geoscience knowledge with the science community and/or general public.

Affiliate Faculty members Donna Anderson and Mark Longman received the 2019 RMAG Best Paper Award for their article about the Ordovician and Devonian stratigraphy of southwest Wyoming in the Mountain Geologist. Donna also received the Faculty and Staff Philanthropy Award from the Colorado School of Mines Foundation.

Reed Maxwell was elected as a fellow of the American Geophysical Union, an honor bestowed to less than 0.1 percent of AGU’s total global membership. Reed was recognized for “outstanding contributions toward the advancement of integrated hydrological simulation across scales.” In addition to this high honor, Reed was named the 2020 Henry Darcy Distinguished Lecturer by the Groundwater Foundation. Lecturers are selected by a panel of scientists and engineers for their outstanding contributions to the field. Reed will be traveling around the world in 2020, and we will look forward to hearing about his adventures!

Kamini Singha was awarded the 2019/2020 Fulbright Scholar (Ireland). Please be on the look out for our 2020 GE Newsletter write-up about her experiences! In addition to this, Kamini received the following: Colorado School of Mines W.M. Keck Mentorship Award, Colorado School of Mines Faculty Senate Distinguished Lecturer, and the Visiting International Research Fellowship from Flinders University in Australia. Kamini also participated in the American Geosciences Institute Geoscience Congressional Visits Days in September, talking with CO and UT Senators and Representatives about the importance of funding the earth sciences.

Bruce Trudgill was awarded the Colorado School of Mines Senior Class Faculty Award.

Richard Wendlandt was elected Emeritus Professor and has been continuing on with us as a Research Professor helping to director our new Center for Advanced Subsurface Earth Resource Models (CASERM) in GE.

Van Tuyl Lecture Series 2019:

In 2019, we hosted 22 Van Tuyl Lecture Series speakers as well as the Weimer Distinguished Lecture with speaker John Grotzinger from the California Institute of Technology (CalTech). These Thursday lectures are invaluable to the faculty and often act as an extra class (with free pizza) for the students. Also, there were four Joint Hosted Lectures with the Geophysics Heiland Lectures. Some of the lectures we hosted in 2019 included: Oliver Jogautz from MIT, Joe Macquaker from ExxonMobil Upstream Research Company, Matt Thomas from the USGS, and SEG International Lecturer: Yasushi Watanabe from Yasushi Watanabe, to mention a few.

For our Spring 2020 Van Tuyl lecture series, we will be hosting: Dorrik Stow FRSE (Fellow of the Royal Society of Edinburgh) from the Institute of Geo-Energy Heriot-Watt University Edinburgh Scotland, Jane Willenbring from the University of California San Diego, Joe Macquaker from ExxonMobil, and six others. Visit https://geology.mines.edu/events-calendar/lectures/ to learn more!
I am so happy to be back in Colorado. I started my life here but mostly grew up in New York. I came west for college and graduate school, and after a long time away, am back among the Rockies.

After getting my undergraduate degrees from Stanford University, I was fortunate to get a job at the US Geological Survey. I assisted my boss in mapping part of a Hawaiian volcano. While in Hawaii, I got the chance to monitor the active flows of Kilauea, and from then on, I knew I wanted to be an igneous petrologist. The fierce heat, the crackling sound of the lava moving, the intensity of monitoring the flows...all of this got me addicted to molten rock! I am yet another example of why field experiences are so crucial; they inspire, educate, and help us lock in on our professional passions.

After a fantastic experience at the USGS, I settled down at UCLA and studied the petrology and isotope geochemistry of a relatively young volcano in Mexico. After completing my PhD work, I migrated up the coast to UC Santa Barbara, where I was a researcher for a number of years. Then, with my geologist husband, Jeff Lee (who is a Research Professor in Geophysics), I moved to of Washington State. We spent 20+ years as faculty members at Central Washington University.

Since becoming a professor, I have tried to share my excitement about volcanoes with my students. We study how magmas change composition in time and space, mostly by studying young volcanoes like Kilauea and Mt. Etna (and more!). By doing field work that allows us to chronicle the eruptive history of a volcano, we document how magmas evolve—from the basaltic magmas typical of Hawaii to the more silicic ones like those that erupt Mt. St Helens. Using some new(ish) technology, we analyze tiny portions of volcanic crystals. If you think of the crystals as little tape recorders (an outdated concept), as they grow from interior to exterior, they document the conditions of the magma. As the magma changes due to cooling, receiving new magma input, and assimilating surrounding rock, the crystals record that history via changes in color and texture, as shown in the crystal to the left from Crater Lake (MS student Michelle Tebbe’s work, 2012). We reconstruct what happens through a volcano’s life cycle to better understand how the mantle and crust evolve with time and to help volcanologists better predict eruptions.

With colleagues in Santa Barbara and Helsinki, I also build computer models of the processes that drive compositional change. We can mathematically describe these processes, and by developing sophisticated computer code, we can use computational results to tell us more about the processes that are predicted by the crystal work. My students are trained in a combination of field work, collecting analytical data, and computational modeling—a trifecta of geology training.

I really enjoying teaching, and my favorite type of teaching is to show my love of volcanoes by taking students to the Big Island of Hawaii. There, we hike over lava flows, visit the summit caldera of Kilauea, surf at Green Sands Beach.... Students definitely get a better sense of volcanology by being on a volcano. I hope to be able to take Mines students and alums to Hawaii sometime in the near future. Stayed tuned!

I am looking forward to working with Mines students on my research and to expanding my horizons by becoming more involved in the critical minerals work that our Department does. Please read on in this newsletter for more stories about the innovative research we do in Geology and Geological Engineering.
My name is Emre Cankut Kondakci and I am a fourth year graduate student, and a first year PhD student studying Geology under Dr. Stephen A. Sonnenberg. I graduated from my master’s degree in spring 2019 semester. Our master’s project focused on understanding the unconventional resource potential of the Niobrara Formation in Trabing Field, Powder River Basin, Wyoming. The study was conducted by incorporating several different methodologies to get a more detailed understanding on the distribution of reservoir and source rock attributes in the Niobrara Formation, which defines a complex stratigraphy due to its mudrock nature. Methods used in the project included subsurface data in the form of well-logs, visual observations from cores, thin sections, and scanning electron microscopy, quantitative and qualitative mineralogical data from x-ray diffraction (XRD) and x-ray fluorescence (XRF), as well as quantitative measurements for source rock parameters, porosity, permeability, and water saturation. The data was later used to generate models including organic richness, geomechanics, and fluid-phase profiles. The project revealed the geologic evidence for the presence of a working resource potential in the Niobrara Formation, in Trabing Field. Our PhD project focuses on delineating and understanding the complex stratigraphic architecture of the Niobrara Formation in the Rocky Mountain area. The geographic extents of this project spans from Southern Canada to the state of New Mexico. The study aims to provide a region-wide understanding of the Niobrara Formation, a formation that has been in the focal point of oil and gas explorers for decades. As part of my graduate studies, I am also responsible for administering the x-ray fluorescence (XRF) tool and the source rock analyzer (SRA).

I was born in Oslo, Norway and raised in Turkey. My early childhood years were mainly focused on an interest towards nature and especially dinosaurs, where I would watch Jurassic Park on VHS several times a day. Having grown up with an immense interest towards these gigantic and impressive beings that lived millions of years ago, resulted in blooming a very strong scientifically curious personality in me over the years. My parents, and my mom especially, proved the fact that education starts in the family. My family always reminded me to try to be my best, always push the limits, and always shoot for the stars. As a teenager I was very interested in natural sciences. Reading books and watching documentaries on chemistry, biology, and not so much about physics were my hobbies as a teenager. Then I discovered the music in me. I started playing acoustic guitar, and quickly progressed into electric guitar, because I was impatient and wanted to play rock music. Today, I still enjoy reading scientific books, and playing guitar actively. In addition, I practice yoga daily, and spend time with my beloved cat, Moonshine.

I attended Middle East Technical University and graduated with a bachelor’s degree in Geological Engineering in 2013. After graduation, I worked on drilling rigs for about two and a half years. I spent a year and a half on oil and gas operations as an onsite mud-logger. Then, I worked as a well-site geologist for a geothermal company. Meanwhile, I was awarded a scholarship from the Turkish Government to study in the United States in 2016. When I was notified about my acceptance to Colorado School of Mines, I was very excited to see what my future would hold for me. Being part of the Colorado School of Mines as a graduate student, with many influential people who supported me at all costs, turned my dreams into reality. For someone who always wanted to be a scientist and a teacher, the department of Geology and Geological Engineering gave me the opportunity to be a part of teaching with many teaching assistantship positions, which I enjoyed greatly and took pride in. As of fall 2019 semester, the department honored me with a teaching position for sedimentology and stratigraphy (GEOL 315) and structural geology (GEOL 308) for petroleum and geophysical engineering students. And after teaching one semester, my love and passion towards teaching became immeasurable. My career will definitely be focused in academia.

Overall, Colorado School of Mines Geology and Geological Engineering Department provided me a life that was merely a dream. My time here as a graduate student, and a new teacher had a profound impact on my personality, and my professional life. Having been a part of this valuable geology family is now something I take pride in. I, personally, am looking forward to improving myself as a person, as a student, and as not only a teacher but also as an educator. I would like to thank my mother, my sister, my aunt, my uncle, my grandmother, my advisor Dr. Stephen A. Sonnenberg, the MUDTOC consortia, and my greatest friends Jenny Blake, Andrew Wood and many more, my cat Moonshine, all my students, as well as Cheryl Medford and Dorie Chen for being irreplaceable in the best and strongest geology family. I would also like to specially thank Dr. Jennifer Miskimins, Dr. Ramona Graves, Wes Buchanan, Dr. Donna S. Anderson, Dr. Marsha French, Dr. Lesli J. Wood, Kathy Emme, Jim Emme, and all the GE faculty that contributed greatly to who I am today.
My name is Sage Langston-Stewart, and I am a senior undergraduate student studying mineral and petroleum exploration majoring in Geological Engineering. I began working in Dr. Katharina Pfaff’s lab in July of this year, just after field session. The first week I was put to work in Jae Erickson’s Thin Section Lab to learn sample preparation techniques. After completing optical microscopy and petrology here at Mines, I was very curious about the entire process. It was amazing to realize the accuracy and precision at which this work is done. Taking a rock and turning it into a 30 micron thin slice on a glass slide just blew my mind. Such detail and care is needed to cut, grind, lap, and polish varying types of samples. After this week in the Thin Section Lab, I was directed back to the SEM lab. I was hired on with CASERM to work on a hyperspectral data project. Initially, I looked into ways to accurately and precisely shave down a rock sample into equal slices to be scanned at certain intervals in order to create a 3-dimensional model. Using my new acquired skills and knowledge from the thin section lab, I worked on different techniques to make this happen.

Along the way, I learned how to drive the scanning electron microscopy (SEM) machine. I worked on a few industry samples to identify different minerals such as gold and silver using backscattered electron (BSE) imaging and electron dispersive spectroscopy (EDS). I used these tools to identify economic minerals in a multitude of samples. In addition, I learned how to use the TIMA software for automated mineralogy. I often reduced data and flagged minerals of interest for the client. One of my favorite projects included creating new definitions in the software for identifying platinum group elements (PGE’s). The scan had shown a large portion of unidentified minerals. Using the software, I lined up the spectra to identify the elements involved and created new mineral definitions that the computer had not seen before.

This semester I was hired on by both Jae and Katha to work in both of their labs. In Jae’s thin section lab, I make thin sections for students and industry. Working in the thin section lab has exposed me to so many different types of rocks, and working with the rock from whole sample down to the thin section really allows me to learn about different minerals, textures, and properties along the way. As for Katha’s lab, I’ve been working with Erik Tharalson on a hyperspectral data project. The goal of this project is to line up hyperspectral data with automated mineralogy data in order to improve future subsurface modeling. We start with a hyperspectral scan and an automated mineralogy scan of the same rock slice. These two data are in different formats. We’ve been working with people in different areas in order to convert and line up these data to match up. This involves a lot of work on R studio, excel, and adobe illustrator to align the images properly. I also conduct sample preparation work such as making grain mounts and carbon coating.

Overall, my experience in these labs has been such an amazing opportunity. I’ve learned so much from mineralogy, to sample preparation, to mineral formulas, to different scientific methods. And, it was all very hands on, which I especially love. This experience has also led to great insights for my future. I’ve discovered the behind the scenes technology and operations of what goes into furthering my education and career.
We would like to express our sincere thanks to the sponsors of the Applied Stratigraphy field trip to San Diego, CA this semester. The purpose of this trip was to gain a better understanding of deep-water depositional systems within an active margin by observing, in outcrop, the scale and variability present in these otherwise unobservable environments. Beach cliffs were measured and described in order to assess the impact of sea-level and tectonic changes on stratigraphic relationships. Observations were used to assess 1) variations in sedimentary response to tectonic events, 2) active margin sedimentation, 3) changes from upper to lower slope and slope to basin floor systems, 4) variations within basin floor fan channels and lobes, and 5) the high variability of sedimentary structures that occur in gravity flow deposits.

There is a level of understanding that only comes from spending time in the field, so this was a valuable experience for us all. Thank you again for your support for without you none of this would be possible.
The biggest news of the year is that Chevron has recommitted $900,000 to continue to support CoRE until 2022! We will continue to provide leading research to Chevron and the community! Our research group has producing great science and having a lot of fun in 2019 - we enjoyed lots of field work all throughout the year, presented our work at AAPG and AGU, and hosted several meetings with Chevron. Also, we launched a new and improved website! https://core.mines.edu – there are updated pages for personnel and recent publications, and there are new summaries of our research themes: (1) Stratigraphic architecture, (2) Scaling relationships, (3) Sediment dispersal patterns, and (4) Machine-learning for facies prediction.

**Wylie Walker** (M.S. 2019) graduated, began a full-time job at Encana in Denver, and submitted a paper for publication in *Geosphere* entitled “Progradational Slope Architecture and Sediment Partitioning in the Outcropping Mixed Siliciclastic-Carbonate Bone Spring Formation, Permian Basin, west Texas” from his thesis (photo at right). **Luke Pettinga** (Ph.D. 2020) submitted a paper entitled “How Do Submarine Canyon-Channel Systems (Re)shape Continental Margins?” to the *Journal of Sedimentary Research*, and is now making headway on another chapter on the quantitative analysis of submarine levee architecture and evolution, which he presented at AGU. Luke also collected detrital zircon geochronology and heavy mineral suites samples for his fourth chapter that will investigate the spatial and/or temporal variability in provenance signatures of isolated marine sand bodies, Western Interior Seaway, Colorado. Lastly, Luke interned with EOG this summer, and has accepted a full-time job offer from EOG and will be joining their office in Fort Worth - congrats to Luke! **Kaci Kus** (M.S., 2020) spent several weeks in the field this year working on her thesis project “Quantifying bed-scale architecture of submarine lobe deposits, Point Loma Fm., California.” Kaci has a great dataset that includes graphic logs, XRF, and a high-resolution digital outcrop model that she is using to characterize these low net-to-gross deposits that are a great analog for Permian basin assets. Kaci also interned at Oxy over the summer working on the Midland Basin.

**Thomas Martin** (Ph.D. 2022) spent the summer at the USGS Core Research Center with **Jared Tadla** (CoRE undergraduate researcher) describing and XRFing cores from the Lewis Shale, Washakie Basin, southeastern Wyoming in order to (1) build reproducible well-to-core machine-learning models and (2) understand temporal and spatial changes in sediment routing in the Washakie Basin. Thomas has also been working closely with Ross to complete his first chapter entitled “Automated lithology prediction from core images and well logs using machine learning” (photo at right). Thomas is also is the captain of the CoRE swim team and resident computer hardware consultant. **Ross Meyer** (CoRE Data Scientist) got a new System76 computer this year to run machine-learning models, and has been very productive! He submitted a paper and codebase on core-photo data wrangling to *JOSS, The Journal of Open-Source Software*. This codebase takes core photos and assembles them into core columns with depth-registered pixel values. This is a highly useful algorithm for quickly getting data into a format to import into Petrel and/or perform image-based deep-learning (which Thomas is working on with Ross).
Clark Gilbert (Ph.D. 2021) enjoyed his internship at Equinor in Austin this summer, and has been putting final touches on his first chapter that uses mixture-modeling of detrital zircon geochronology and automated mineralogy data to investigate ancient sediment routing into the Ventura strike-slip basin, California. Clark also had more time this year to go in the field to log sections and describe the deep-water architecture of the Modelo Formation in the Ventura Basin. Evan Gross (M.S. 2020) interned this summer with Chevron and received a full-time offer – congrats to Evan! He also went into the field several times this year (photo at left) to work on his thesis entitled “Bounding surface architecture of a wet eolian system: Entrada Sandstone, Utah” and has found very interesting laterally discontinuous dune-interdune architectures, which is the subject of his poster at the AGU meeting in December. Evan has also become the drone-master, producing an amazing digital outcrop model of his field area in southeastern Utah. Mary Carr (Program Manager) has been working on various eolian projects, including working closely with Evan to parameterize eolian bounding-surface heterogeneity for reservoir modeling purposes. Mary has also led the re-organization of the gear closet, and joined the CoRE swim team.

CoRE did a summer outcrop blitz to investigate the turbidite bed continuity in the Cloridorme Formation, Quebec (see photo at left). Zane, Kaci, Luke, Thomas, and Chance Seckinger (M.S. 2021) spent 10 days collecting a great dataset as an analog for predicting horizontal well heterogeneity in the Permian Basin. Not surprisingly, these basin-plain deposits are much more complex than conceptual models suggest.

In addition to advising CoRE students, Zane Jobe (CoRE Director) has been working with Ross on a project to automatically classify environments of deposition using core descriptions and deep-learning models, and presented this work at the AAPG meeting. Zane also submitted a paper entitled “Avulsion criteria for submarine channels as compared to rivers” to Frontiers in Earth Science that can be used to parameterize reservoir models in submarine-channel settings. Rosie Fryer (M.S. 2018) is having a great time at Hilcorp in Houston, and published a paper from her thesis entitled “Quantification of the bed-scale architecture of submarine depositional environments” in The Depositional Record, a new open-access journal. In fact, all the papers CoRE researchers published in 2019 are open-access! We look forward to 2020, where we will do lots of field work and publish great papers!
The Integrated GroundWater Modeling Center (IGWMC) is an internationally oriented research, education, and information center for integrated groundwater modeling. Our efforts focus on conducting research in practical, applied areas of groundwater hydrology and modeling, as well as engaging with our community through education and outreach initiatives. The IGWMC also organizes and supports short courses, workshops, and conferences to advance the appropriate use of quality-assured models in groundwater resources protection and management.

2019 was a big year for the Integrated GroundWater Modeling Center. We hosted the MODFLOW and More conference series, the largest applied hydrological modeling conference in the world. This conference series unites cutting-edge developments and practical applications of hydrologic models related to groundwater. The conference brings together model users and developers to exchange ideas on the latest innovations in model applications, discuss the capabilities and limitations of currently available codes, and explore directions for future developments. This year was marked by a record number of attendees at over 300, the Birdsell-Dreiss distinguished lecture, and the Henry Darcy distinguished lecture.

Along with the MODFLOW and More conference, the IGWMC hosted 7 short courses, 1 workshop, and 1 mini-conference. Short courses covered a range of software, including ParFlow, FREEWAT, UCODE, FloPy, MODFLOW 6, PEST, PEST++, and HYDRUS. We also had record attendance for these continuing education programs in 2019. Additionally, the first ParFlow Advanced short course was taught this fall at the University of Arizona in Tucson, AZ. Instructors included IGWMC Director Reed Maxwell, Laura Condon (University of Arizona), and Nick Engdahl (Washington State University).
The IGWMC had the pleasure of working with American Geophysical Union (AGU) TV in the Fall of 2019 to produce a short film highlighting the research and education outreach programs of the IGWMC, as well as the Geology and Geotechnical Engineering Department and Hydrological Sciences and Engineering program at Mines. IGWMC students and faculty put on a mini-STEM fair at Mitchell Elementary School in Golden, CO and hosted the film crew on campus to cover the center. We are very excited to be featured on AGU TV for the American Geophysical Union Fall Meeting in San Francisco, CA in December 2019. Please check out our website for highlights: igwmc.mines.edu.
Last, but certainly not least, we would like to congratulate our fearless leader, IGWMC Director Reed Maxwell. Dr. Maxwell was elected as a fellow of the American Geophysical Union, an honor bestowed to less than 0.1 percent of AGU’s total global membership. Reed was recognized for “outstanding contributions toward the advancement of integrated hydrological simulation across scales.” In addition to this high honor, Dr. Maxwell was named the 2020 Henry Darcy Distinguished Lecturer by the Groundwater Foundation. Lecturers are selected by a panel of scientists and engineers for their outstanding contributions to the field. Reed will be traveling around the world in 2020, and we will look forward to hearing about his adventures!

Dr. Reed Maxwell at the AGU conference this past December in San Francisco accepting this honor.
PTTC continues to offer high-quality low-cost workshops to the Rocky Mountain Energy community. Early in 2019 we joined forces with Denver Region Exploration Geologists’ Society, SEG and Society for Geology Applied to Mineral Deposits to put on five Ore Deposits courses. In October we worked with the 4Corners chapter of SPE to provide a Hydraulic Fracturing course in Durango. Late in the year PTTC hosted a Permian Basin Core Workshop taught by Robert Lindsay. The first workshop of the spring will be taught by a trio of experts, from iReservoir and the BEG, Reinaldo Michela, Jim Gilman and Chris Zahm. The focus will be on Geologic Modeling and Flow Simulation.

PTTC Rocky Mountain Region has been fortunate to secure several sponsorships over the past year (listed below). Most have been undesignated donations to the organization; two of the donations have targeted helping the oil and gas community. The Rocky Mountain Section of AAPG Foundation gave a generous donation to provide half-price registration to unemployed professionals. White Eagle Exploration made half-price registration available to a number of students. To learn more about becoming a sustaining sponsor of PTTC, please go to our national website at www.pttc.org/sponsor.
A NOTE FROM THE GE PROFESSIONAL MASTER PROGRAMS
(NON-THESIS)
WRITTEN BY NICOLE HURTIG

Earlier this year Thomas Monecke (former director of the Professional Master in Mineral Exploration) and Steve Enders (former department head) were successful in attaining funding for a part-time position for supporting the growth of professional and non-thesis MSc Programs in the Department of Geology and Geological Engineering. This position was filled in June by hiring Nicole Hurtig who has experience in mineral exploration, ore deposits, geothermal energy and petroleum geochemistry.

The new director of the PM Program in Mineral Exploration is Zhaoshan Chang who holds the Charles F. Fogarty endowed Chair in Economic Geology. Under his and Thomas Monecke’s direction the program has made significant strides in a new direction by offering the majority of courses in block mode increasing the attractiveness of the program for working professionals in the mineral industry. The Program currently has seven enrolled students, a number we hope to double next year.

This year we submitted a proposal for two new Graduate Certificates in Economic Geology and Exploration Methods that will greatly improve our education opportunities for working professionals and part-time students. Further we greatly expanded our offers in continued professional education in collaboration with CPES (Continuing Professional Education Services) for non-degree students.

The director of the non-thesis Master Program in Geological Engineering is Paul Santi and currently 6 students are enrolled. We have revised the required number of hours for the degree (30) to bring it in line with other non-thesis programs, but we still require a 6-hour independent study to give the students a research and scholarly experience similar to a reduced-scale thesis. We feel that this experience is an essential preparation for the types of employment this students will have, especially for the majority of them who will enter the engineering consulting field. Students are working on various projects related to rock stability monitoring and modeling, debris flow and landslide analysis, and wildfire effects on soil properties.

The Professional Master Program in Petroleum Reservoir Systems (interdisciplinary) is jointly directed by Steve Sonnenberg (Geology and Geological Engineering), Jennifer Miskimins (Petroleum Engineering) and Ali Tura (Geophysical Engineering). Currently seven students are enrolled in the Program. We are working on two new Graduate Certificates in Economic Geology and Exploration Methods. Further, Zane Jobe a research assistant professor in petroleum science, is currently working on a short courses and a new certificate in data analysis, which is relevant to new directions in the field of petroleum industry.

The Professional Master’s in Environmental Geochemistry (interdisciplinary) is jointly directed by Alexander Gysi (Geology and Geological Engineering) and Jim Ranville (Chemistry). Currently there are no students enrolled in this Professional Master Program and we have renewed our efforts in outreach and advertisement to increase student numbers next Fall. With the departure of Alexander Gysi next year, we are also searching for a new co-director in the GE department.

We have increased our advertisement and outreach efforts significantly by distributing flyers during conferences and online advertisement with professional associations. Wendy Bohrson and Nicole Hurtig attended the Student Career Fair at Mines and promoted the GE non-thesis graduate programs to Mines undergraduate students. In October, Zhaoshan Chang and Nicole Hurtig attended the SEG 2019 conference in Santiago, Chile on South American Metallogeny: Sierra to Craton manning a booth representing our Professional Master Program in Mineral Exploration, the department of Geology and Geological Engineering and the CASERM research center. It was a great experience and a pleasure to converse with so many working professionals and students from different countries and backgrounds. Our initiative to newly offer modular courses and certificates in the PM programs enabling degree-completion as a part-time student in the on-job mode has received an overwhelming positive response from many conference participants. Over 80 people have signed up for more information on our programs and research initiatives at Mines. We are very excited and hopeful to welcome new students into our PM Program next Fall and greatly diversify our student population.
A NOTE FROM THE ECONOMIC GEOLOGY GROUP

General News and Welcome:

We are a very active group of Faculty and staff whose interest is to advance our understanding of our planet Earth from early evolution and mechanisms of plate tectonics to the formation of mineral deposits, and for developing new methods for mineral resources exploration, using a wide variety of approaches from field studies to laboratory analysis and data analytics at various scales.

Currently, we advise over 50 graduate students conducting research from the early-Earth evolution and the formation of mountain belts in time and space and fundamental and applied research in mineral resources science. If you are interested in our students, our work or if you would like to work with us, please visit us in the Department to see what we are up.

The Center for Advanced Subsurface Earth Resource Models (CASERM), under the leadership of Ric Wendlandt, Thomas Monecke, and Wendy Harrison, continues to grow its industry membership and diversify its research portfolio as the 2nd year of center operations begins. The CASERM is an Industry/University Cooperative Research Center that is a collaboration among industry, government agencies, and universities (Mines and Virginia Tech) with research and logistical support provided by both center members and the National Science Foundation. The research focus of CASERM is to transform the way geoscience data is used to locate and characterize subsurface earth resources and, thus, to enhance exploration success, decrease prospect development time, and reduce overall spending. Members include AngloGold Ashanti, Newcrest, Rio Tinto, Ioneer, Seequent, Skeena, and Lundin and current projects include the following: (1) developing machine learning methods for resource modeling and mine planning; (2) defining distal signatures and vectors of hydrothermal systems in carbonates; (3) applying seismic and radar high-resolution 3D mapping of geologic features beyond the mined volume; and (4) using quantitative automated mineralogy to increase the value of hyper-spectral core data. For more information, visit the CASERM web site, https://caserm.mines.edu/ or contact Ric, Thomas, or Wendy.

We welcome Wendy Bohrson to our Department. Wendy is an igneous petrologist and joined us in July 2019. We are very excited to have her as our new Department Head. Welcome Wendy!

We also welcome Nicole Hurtig who joined us in June 2019 to run and oversee our Professional Master in Mineral Exploration. Welcome Nicole!

Katharina Pfaff is happy to announce that the Mineral and Materials Characterization (MMC) Facility entered a partnership with Bruker to create infrastructure dedicated to connecting academia, industry, and Bruker’s geology focused technology. Bruker’s initial investment into this newly established laboratory is just over $1 M dollars and will include a Hitachi FlexSEM 1000 with Bruker Detectors and Bruker’s automated mineralogy solution, AMICS, a micro XRF system (M4 Tornado) and Bruker’s Handheld XRF analyzer. If you are interested in getting access to our newly available instrumentation, please contact Katharina Pfaff.

Zhaoshan Chang established a LA-ICP-MS laboratory with an ASI Resolution-SE ArF excimer 193 nm laser system and an Agilent 8900 ICP-MS/MS system. The lab can analyze trace elements in minerals down to ppb level, and conduct zircon U-Pb dating. In addition, his team is expending the capacities. With the new triple quadrupole ICP-MS, it is possible to separate isotopes that traditional quad or magnetic section ICP-MS could not do, via pre-filtering and mass shift. Two PhD students has joined the team to develop new methods including in-situ Rb-Sr dating, in-situ S isotope analysis, and U-Pb dating of unconventional minerals such as cassiterite, wolframite, apatite and titanite.

Three of our junior Faculty members will leave us in 2019 to continue their careers at the University of Oxford (Richard Palin) and at New Mexico Tech (Alexander Gysi and Nicole Hurtig). We wish them all the best.
As in previous years, our faculty members have been very active and travelled the world to present short courses, supervise students in the field and to represent us at conferences:

- **Wendy Bohrson** arrived at Mines in mid-July after teaching part of the Granites II short course in Roscoff, France. She and her colleagues also taught a short course at the 2019 American Geophysical Union meeting in San Francisco. Wendy is looking forward to teaching in spring, and she will begin to recruit graduate students this spring as well.

- **Zhaoshan Chang** delivered a keynote presentation at the 33rd International Mining Conference on October 24 in Acapulco, Mexico, and a poster presentation at the SEG conference in Santiago, Chile. He also gave three presentations to the Candelaria mine and BHP Billiton geologists in Santiago, Chile. In January he taught in a short course at Mines on New Developments in the Geology and Exploration of Ore Deposits, together with Jeff Hedenquist, Rich Goldfarb, Dave Leach and Thomas Monecke. In addition, Zhaoshan was selected to be the SEG (Society of Economic Geologists) International Exchange Lecturer for 2020. Invitations can be made at the SEG website and his airfare to the lecture sites will be covered by the SEG. One of his PhD students graduated; he worked on an unusual metamorphic hydrothermal skarn and vein type W deposit, Watershed, in NE Queensland. Three new PhD students and one new MS student joined his team. Two of them work on LA-ICP-MS method development, and two on distal signals and vectors of hydrothermal deposits in carbonates (one working on Candelaria in Chile, and one on Bingham, Utah, Resolution, Arizona, and a third deposit). In addition to a number of papers published or accepted for publication, Zhaoshan completed editing the SEG Special Publication volume Mineral Deposits of China together with Rich Goldfarb, in which he contributed a chapter on Skarn Deposits of China. As the Director of the Professional Master in Mineral Exploration program, Zhaoshan works closely with Nicole (PM program Manager) and all related parties to try to make it possible for geologists to take the program without leaving their jobs. Zhaoshan continues serving as an Associate Editor for Economic Geology, Mineralium Deposita, and Acta Geologica Sinica (English Edition), and served as a SEG Nominating Committee member for 2019. He is also an Adjunct Professor of James Cook University, Australia, a Guest Research Professor of the Institute of Geology, Chinese Academy of Geological Sciences, the Chair of the IAGOD Working Group on Skarn Deposits, and a SEG Mentor.

- **Steve Enders** continued in his Department Head role through Summer 2019 when Wendy Bohrson took over. In addition to his department head duties, Steve taught GEGN 403 – Mineral Exploration Design and GEOL 514 – Business of Economic Geology during the Spring 2019 semester. He took cohorts of students from those courses to the AME Exploration Roundup, Society for Mining, Metallurgy & Exploration, Prospectors and Developers of Canada, and Discoveries 2019 conferences where they had outstanding opportunities to learn how the mineral exploration business works and to build their network of contacts. Steve presented an invited talk at the Discoveries 2019 conference in Mexico entitled “Innovation in Exploration: An Outlook on Approaches to Enhancing Our Imaginations”, which was subsequently presented at the Denver Region Exploration Geologists Society and the SME Thrive meetings during the Fall 2019 semester. Upon completion of his department head role, Steve was promoted to the new position as Director of Subsurface Frontiers for Mines and is responsible for the programmatic aspects of the various research and education programs that address challenges in the subsurface. This includes acting as the liaison between Mines and the USGS as work progresses on the new Subsurface Frontiers Building and co-location of about 150 geoscientists to the Mines campus. In his new role, Steve was co-convenor of the USGS MRP Science Forum on campus in May, attended the National Academy of Sciences Committee on Earth Resources workshop on Subsurface Data and Machine Learning this summer, and gave an invited talk at the AASG/USGS workshop on Data Preservation in September. He currently has one PhD and one MSc graduate students in economic geology and visited their field areas in Oaxaca, Mexico and in Tintic, Utah. In addition, Steve advises 10 undergraduate students in the department and he was the faculty advisor for the SEG Student Field Trip to the American Southwest.

- **Alexander Gysi** has graduated 2 PhD and 2 MS students in 2019, and he has received a NSF CAREER grant over the summer to do research on REE in hydrothermal fluids and in ore deposits. Three new graduate students joined his group in the Fall and a visiting scholar for 6 months. Alex has given a numerical modeling workshop in Moscow in November and got an invited talk on REE mineral deposits. Alex also organized a session entitled “Fluids in the crust” at the AGU Fall Meeting in San Francisco and had an invited talk at the Hubbert Quorum meeting at the USGS in Menlo Park. Considerable progress has also been made on the MINES thermodynamic database (http://tdb.mines.edu), with MINES19 published online in November. Further, we have a series manuscripts under review in Economic Geology and Ore Geology Reviews, stay tuned for new publications coming out early 2020.
A NOTE FROM THE ECONOMIC GEOLOGY GROUP CONT’D

- **Elizabeth Holley**'s Mining Geology Research Group is bigger than ever with 8 PhD students, 1 post-doctoral fellow, and a co-advised master's student. Our work continues to examine the intersections of mining and geology from exploration to mine development, production, and closure. Please visit our website at https://mininggeologyresearch.mines.edu/ to look at our individual projects and read the profiles of all our team members. Major accomplishments this year include the initiation of a second project on sustainability of small-scale mining (https://miningsustainability.mines.edu/) and the receipt of additional National Science Foundation funding in the new INTERN program. This program supplements existing NSF funding (Elizabeth's CAREER award) to support the cost of student internships with federal agencies. Elizabeth took the fall semester off from teaching to welcome the birth of Charlotte Grace; James is a proud and happy big brother.

- **Nicole Hurtig** started her position as research assistant professor and PM program manager in June. She represented the Professional Master Programs at the SEG conference in Santiago Chile, in October with a booth. The new PM program options tailored to working professionals garnered a lot of positive attention and more than 80 people signed up for additional information. She also started two new research projects since joining Mines collaborating with Mines faculty and international researchers. She published two high impact peer-reviewed articles in Chemical Geology and Geochimica Cosmochimica Acta as a first author and co-authored three conference abstracts and an industry report. Further, she was invited to speak at the Porphyry workshop – Subduction zone magmas and their ore deposits, ANU, Canberra, Australia and gave a total of 13 guest and invited lectures in Canada (Halifax and Montreal) and the US (Colorado, New Mexico) throughout the year. She is also an Adjunct Professor at the Department of Earth and Environmental Science at New Mexico Tech.

- **Yvette Kuiper** fulfilled some important department needs on the teaching front: She took on the stable isotopes part in addition to the radiogenic isotope part in the graduate level Isotope Geochemistry and Geochronology course in Spring. She then taught a week of the undergraduate Field Camp in the Picuris mountains of New Mexico, involving mapping of deliciously ductilely deformed rocks. In Fall she took on a section of Earth and Environmental Systems for first year undergraduates, in addition to her Advanced Structural Geology course. As always Yvette and her students were busy in the field in Colorado, Massachusetts, Rhode Island and Connecticut, and in various laboratories across the US. In addition, Yvette started a new field project with Moroccan and Spanish collaborators in the 'West Saharan' part of Morocco. Her MS student Logan Powell earned a GSA graduate student research grant and a prestigious AGeS2 grant. Yvette continued service on the Colorado Geological Survey Geologic Mapping Advisory Committee and became Colorado Scientific Society Council member. She continued as editorial board member of the journal 'Geology'. She was elected as a member of the Mines Senate. She chaired three sessions at regional and national meetings and gave an invited presentation at AGU.

- **Thomas Monecke** taught three graduate courses in economic geology in 2019. He presented a short course on epithermal and volcanogenic massive sulfide deposits in Argentina and Ethiopia, respectively, and delivered an invited talk at the Irish Centre for Research in Applied Geosciences in Dublin. He and his students conducted extensive field work in 2019, which included mapping and drill core logging in Argentina, Brazil, Mexico, Peru, and Thailand. During Fall 2019, Thomas co-led a field trip examining ore deposits in Colorado that was organized by the SEG student chapter of the University of Leoben, Austria. In 2019, Thomas graduated three Ph.D. students who worked on gold, precious metal, and uranium deposits. Thomas students’ won prestigious research awards by the Geological Society of Nevada, the Society of Economic Geologists, Chevron, and SRK. Thomas authored a number of publications, including papers in Gondwana Research, Economic Geology, and Minerals. He also published a book chapter reviewing the occurrence of seafloor hydrothermal systems in the Tyrrhenian Sea in Italy, authored a map publication, and contributed to a field trip guidebook. He and his students attended several meetings presenting talks and posters, including the RoundUp meeting in Vancouver, PDAC in Toronto, SME in Denver, SGA in Glasgow, and GSA in Phoenix. Thomas continued to take a leadership role in the Center for Mineral Resource Science, a joint research center between Mines and the USGS, and the Center for Advanced Subsurface Earth Resource Models, which represents a collaborative research initiative between Mines and Virginia Tech that is supported by the National Science Foundation. Thomas currently serves on the editorial board of Mineralium Depositia and as a reviewer for the National Science Foundation, the Natural Sciences and Engineering Research Council of Canada, and the Swiss National Science Foundation.

- **Katharina Pfaff** has had a successful year. Katharina oversees the Mineral and Materials (MMC) Characterization Laboratory in the department and is still active in methods development, including but not limited to SEM and XRF-based automated mineralogy techniques. The laboratory expansion and the newly established partnership with Bruker will be a game changer not only for Katharina’s research and her group but also for the department. Research conducted by Katharina and her students focuses on mineralogical questions in the fields of igneous and metamorphic petrology, economic geology, methods development and the application of artificial intelligence to geologic datasets.
Moreover, we have made great advances improving our existing laboratory infrastructure:

The Thin Section Laboratory, managed by Jae Erickson, continues to expand its offerings and improve on throughput and quality. We added a new polisher and vacuum impregnation machine this year and are in the process of purchasing an ultraviolet glue curing station. Thanks again to the amazing donors who have made these upgrades possible. A special thanks to Rod Eichler who snuck in an incredible $25,000 gift for thin section equipment just before year’s end! New services include a much-requested variation on a doubly polished thick section with shortened turnaround time and a “quick and dirty” inexpensive option for standard thin sections marketed towards routine high-level petrography. We’re also very excited to see what new sample preparation avenues the UV-curing station opens up. Continued collaboration with other Colorado Universities has resulted in great new relationships and research endeavors, and the lab has received praise and recommendations from additional industry partners. We already have orders piling up from exploration companies and external researchers for abundant work in 2020. The lab continues to employ a fleet of highly skilled undergraduate students and look forward to training more bright minds next year!

The Mineral and Materials Characterization (MMC) laboratory, overseen by Dr. Katharina Pfaff, the cathodoluminescence and fluid inclusion laboratory, overseen by Thomas Monecke, and the X-ray diffraction laboratory, overseen by Ric Wendlandt are continuing to support a large variety of research activities in the department, across campus, nation- and world-wide. All of our students get hands-on training on our equipment and are actively involved in research using these state-of-the-art techniques. We are excited to announce that we installed a new color cathodoluminescence detector on our scanning electron microscope. The new detector was funded through a successful proposal to the National Science Foundation by Thomas Monecke, Katharina Pfaff, and Yvette Kuiper.

If you would like to make a difference for our undergraduate and graduate students in the Geology program, we are currently actively seeking high quality research grade microscopes with or without a camera that can be used for

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**New Laser Ablation LA-ICP-MS lab**

- 193nm laser
- Triple quad ICP-MS/MS

Contact: Zhaoshan Chang  chang@mines.edu
Department of Geology and Geological Engineering

- Trace element analysis of solid material
- U-Pb dating; Rb-Sr dating
- S isotope analysis
The Computational Geomechanics group (Dr. G. Walton & students) has continued to work on numerical modeling of rock damage and remote sensing techniques for monitoring of rock slopes. The group graduated its first two Ph.D. students this year: Lane Boyd, whose thesis was on applications of geostatistics to tunneling problems and who will start with Gall Zeidler consultants in Washington D.C. in the new year; and Deepanshu Shirole, whose thesis was on the use of geophysical tools to track the damage process in intact rocks at the laboratory scale (Dr. Shirole will be staying at Mines for a postdoc). We also have three new students: Isabella West, whose research is on the interaction between intact rock damage and pre-existing joints in controlling rockmass deformation; Rahel Dean-Pelikan, whose research is on stress transfer in underground mines during de-pillaring operations; and Brian Gray (a Mines GE Bachelors graduate), whose research is on the characterization of slopes using photogrammetric techniques. Collectively, the group is looking forward to the American Rock Mechanics Association symposium in 2020 (which will be held at Mines), and has submitted over a dozen abstracts.

Paul Santi’s group has focused on a variety of geohazard projects. PhD students Andrew Graber and Omid Arabnia continue their work on rockfall recurrence prediction and Grand Mesa landslide pre-history, respectively. MS student Kyle Radach is analyzing the Cedar Pass Landslide Complex in Badlands National Park, Cory Wallace is developing a rating system to predict susceptibility for long runout (and thereby more dangerous) landslides. Matt Tello is working with the USGS to better understand the landslides that occurred in Puerto Rico following Hurricane Maria in 2017. Sam Rumel is studying the change in erosion potential of soils that have been burned, as cohesive clays will sinter into non-cohesive and more erosive sand-sized aggregates. He is also looking at their recovery over time, meaning he has containers of burned soil in his backyard experiencing years of weathering! Several new students started in the fall as well: Lauren Herbert (debris flow avulsion in Death Valley), Julia Hawn (USGS project - how deep does wildfire penetrate into soils and what are the implications for erosion and debris flow generation), Claire VandeYacht (USGS project - infiltration effects on post-wildfire debris flow generation in Southern California), Zane White (climate change predictions for debris flow behavior and damage in southern California), and Ryan Coe (tailings dam stability and construction optimization). Paul is also working on two projects as part of the Center for Mining Sustainability he manages in Peru: analysis of the Zarzal Landslide that threatens both the PanAmerican Highway and a milk plant that provides the majority of Peru’s milk, and a regional geologic hazards analysis and remote sensing prediction system for 6 rural communities in Peru.

Student Awards: PhD student Andrew Graber was named the 2019 the Marliave Scholar, the highest student award given by the Association of Environmental and Engineering Geologists. Matt Tello received a Martin Stout Scholarship from AEG, Caleb Ring received a Beardsley-Kuper Field Camp Scholarship from AEG, and Andrew Graber and Kyle Radach received Lemke awards for their presentations at the Annual AEG Meeting. Corey Wallace received a Shlemon Scholarship from the Geological Society of America and grants from the Four Corners Geological Society and the Colorado Scientific Society.

Paul Santi is the director of the new Center for Mining Sustainability, which is a partnership with the Universidad Nacional de San Agustin in Arequipa Peru. The $6M center has 9 research projects aimed at improving the safety and environmental issues surrounding Artisanal and Small-Scale Mining in this region of Peru. Approximately 30 faculty from each of the universities are involved, along with numerous students, post-doctoral researchers, and research associates. Specific projects in the GE department include identification and management of geologic hazards, geomechanical evaluation of groundfall hazards for small-scale underground mines, and analysis and mitigation options for a large landslide that threatens both the PanAmerican Highway and a plant that supplies the majority of Peru’s milk.

The Geohazard and Geoinformatics group (Dr. Wendy W. Zhou & students) has continued to work on a variety of projects. The group graduated one PhD student and one Masters-Thesis student in 2019: Benjamin Lowry, whose dissertation was on “Terrestrial and satellite radar interferometry applications for ground deformation investigations in urban subsidence, detection, landslide velocity monitoring, and novel failure discovery”. Dr. Lowry is currently working for Sensemetrics in Denver; and Lauren Southerland, whose thesis was on “Landslide susceptibility mapping using a logistic regression approach: a case study in Colorado springs, El Paso county, Colorado”. Ms. Southerland is working for Yeh and Associates in Denver. We have six more students in the group who are still working on their degree in geological engineering diligently: PhD student Stephen Semmens, whose research is on advancing technology of using remote sensing to investigate sustainable levee’s interaction with natural environment; PhD student Kendall Wnuk, whose research is on using Interferometric synthetic aperture radar (InSAR) time series analysis to characterize ground deformation; PhD student Ashton Krajnovich, whose research is on adaptive, predictive 3D geologic modeling; PhD student Dorcas Idowu, whose research is on performance evaluation of an early flood warning system using gravity recovery and climate experiment (GRACE) flood potential index; PhD student Linan Liu, whose research is on investigating the Impact of underground excavation on above ground infrastructure; and MS student Justin Manning, whose research is on geohazards risk assessment in the Arequipa Region, Peru. Collectively, the group has published six ISI-citable journal articles in 2019 and gave multiple presentations at conferences, and workshops.
A NOTE FROM THE HYDROLOGY GROUP

The Reed Maxwell Research Group has had a great year presenting at many conferences in the US and abroad as well as graduating two students and welcoming three people into the group. They also hosted the MODFLOW and More 2019 conference at Mines. This year, the conference welcomed over 300 attendees from around the world.

Rachel Corrigan graduated this spring with her Master’s degree. Her work focused on creating an updated hydraulic conductivity map that can be used in the group’s ParFlow-CLM CONUS model. She is now continuing her graduate studies in hydrology at Virginia Tech as a PhD student.

Sarah Trutner also graduated this spring with their Master’s degree for work focused in The East River watershed. They built and analyzed a hyper-resolution model of a sub-basin in the East River and analyzed how loss of detail affects modeling results. They are now continuing their work in hydrology out west.
Jackson Swilley joined the group this August and is in the first year of his Master’s. His work thus far has been concerned with gathering and analyzing continental-scale, geologic datasets to inform an integrated hydrologic model of the contiguous United States. The majority of this work is focused on hydraulic conductivity and the vertical discretization of subsurface lithology. In addition to research, Jackson works as a teaching assistant in Applied Geographic Information Systems.

Danielle Tijerina has returned to Mines this fall to begin her PhD after working as a hydrologist for CUAHSI (Consortium of Universities for the Advancement of Hydrologic Science). She will continue her work started in her Master’s, comparing the performance and physical process representations of continental-scale hydrology models, namely ParFlow-CLM CONUS model (PF -CONUS) and the National Water Model (NWM). She is currently working with collaborators on the HydroFrame project to make continental-scale model data more accessible to other modelers, scientists, and educators, beginning with a web application to subset regions of PF-CONUS and NWM input domains.

Hoang Tran joined the group in March, working on the HydroFrame project. His role on the project is to develop the ParFlow model for the CONUS2.0 domain, specifically, creating sub-setting tools to provide model inputs for sub watersheds within the domain, compiling new forcing, subsurface datasets and testing various slope configurations. He also studies the connections between groundwater and streamflow in the Upper Colorado River Basins and was able to present some of the results at the MODFLOW and More 2019 conference and the upcoming American Geophysical Union meeting.
Anna Ryken is continuing her PhD work in the East River Basin. She received the DOE Office of Science Graduate Student Research Fellowship to continue her work on eddy covariance observations and model comparisons. Her work focuses on measuring evapotranspiration (ET) with an eddy covariance tower and comparing these measurements to modeled ET values from ParFlow-CLM. She is also interested in plant water use and is currently modeling a hill slope in the East River Basin to determine how ET and plant water use changes along the hill slope.

Lauren Thatch completed her first year of PhD research and successfully completed her PhD proposal defense and qualifying exams. Lauren’s research focuses on the impacts of water management, specifically groundwater pumping and irrigation activities, on water storage and availability in the California Central Valley. This year’s research focused on using remote sensing datasets, with an emphasis on water storage anomaly data from NASA’s Gravity Recovery and Climate Experiment, to constrain water management activities with her model over the recent drought. Lauren’s research is part of a collaborative project, funded by the National Science Foundation (NSF) and NSF China, to evaluate the vulnerabilities of the food-energy water nexus systems on opposite sides of the world.

Mary Michael Forrester’s PhD work this year has focused on hydrologic representation in land surface models (LSMs) and their applications. She is particularly interested in the role that LSM’s play as the lower boundary condition in meteorological models, and results from her research suggest that the incorporation of lateral subsurface routing may influence the development of anabatic winds in mountainous terrain by increasing moisture availability in valleys. LSMs are also often used in forward modeling approaches for signal attenuation corrections in remote sensing; Mary Michael has used continental-scale groundwater models to improve signal restoration methods for the Gravity Recovery and Climate Experiment, a satellite project that estimates fluctuations in subsurface water storage. Mary Michael works part time as a consultant in hydrogeology at Daniel B. Stephens & Associates.

We are excited for another year of scientific discoveries and hydrologic adventures here in Colorado!
The Kamini Singha research group has also had a great year.

Papers (# postdocs, *graduate student authors, +undergraduate students):


Kamini’s group also put out 16 abstracts to meetings this year.

Student Awards:

Fern Beetle-Moorcroft:
Colorado Ground Water Association Harlan Erker Memorial Scholarship (2019)

Ariel Rickel:
Best Poster Presentation, San Juan Mining and Reclamation Conference & Innovation Expo (2019)
National Science Foundation Graduate Fellow Honorable Mention (2019)
Geological Society of America Graduate Student Research Grant (2019)

Megan Doughty:
Association of Women Geoscientists (AWG) Outstanding Student Award (2019)

Kenny Swift Bird: Goldschmidt Travel Grant (2019)

Also, one of Dave Rey’s papers got coverage by NASA: https://landsat.gsfc.nasa.gov/landsat-permafrost-data-offer-insight-into-arctic-lake-dynamics/
Hello to you all!

2019 has been a year of travel! In January, I led a field party consisting of my doctoral students, colleagues from Moroccan universities and the government geologists to look at deposits in northern Morocco that were reported to be very deepwater-current deposited sediments associated with the closure of the straits of Gibraltar ~10 MY ago. We found that these deposits were NOT deepwater, but probably very shallow shelf water deposits, much to the consternation of some of my colleagues, but that is what science is about. My doctoral student Daan Beelen is writing up some of his findings and continuing to search for such deepwater sands.

Two of my MS students graduated in December 2018; Matt Huels (working with Exxonmobil) and Matt Steidtman (working with SM Energy in Midland), and another MS who graduated in May 2019, Mr. Enry Sihombing, who has returned to work in Indonesia. Enry continues to be successful, recently winning the award for Best Paper at the 2019 Indonesia Petroleum Conference. Last but not least, in August Mr. Hirofumi Kobayashi, successful defended his research to become Dr. Kobayashi, and my first doctoral student graduated from CSM.

December has seen the completion of Pengfei Hou to his doctorate. I currently have 11 great graduate students. In addition to Daan Beelen (previously mentioned), new doctorate programs by Alexis Wright and Forrest McFarlin are moving forward nicely. Alexis has been working with BP, who have provided immense amounts of data from the Gulf of Mexico areas as she investigates the nature of pre-failure and post-failure mass transport sediments in submarine settings. Forrest got quite a bit of field work done in the Green River Formation looking at mixed carbonate-clastic lakeslides before he headed up to Alaska for a summer internship with ConocoPhillips. Forrest led a field trip to the Green River Formation for our PetroChina supporters in October. These projects are all of great interest to companies everywhere as they realize the ubiquity of the occurrence of submarine failures in basins around the world. Not to mention the importance for people living in tsunami prone areas of the coast. 2020 will find us moving in to look at the debrites of the Permian Basin, another mixed carbonate-clastic system. I have tried to jump start this in January as the SWS AAPG Bill Hailey Memorial lecturer, teaching a one day course on mass failures in both Dallas and in Abilene. Lots of great people!
Personally, it has been a good year. I celebrated my Dad’s 85th birthday with him in Arkansas and he is spectacular. I spent time in Houston visiting ExxonMobil, BHP Billiton, BP and Repsol. Traveled to Colombia to spend time with EcoPetrol, and as I said, in the field in October with PetroChin. All of these companies support our students through their annual membership in our SAND consortium. In May, I was invited to present the 2019 SEPM Society of Sedimentary Geology Luncheon talk at the Annual Meeting in San Antonio. My talk was titled “Seismic Geomorphology: From the Earth’s Ocean Depths to the Distal Planets, a revolution in reconstructing landscape form and processes”, exploring how we image and interpret landscapes from the earth to the ocean to Mars. The luncheon sold out and it was a lot of fun! The SAND group presented five posters and talks at AAPG, then we all immediately went to Midland/Odessa where we had our annual sponsors meeting, a core workshop, and Dr. Zane Jobe and Mr. Wiley Walker (both colleagues at CSM and collaborators) led a short two-day field trip to the Bone Springs! It was great

In early June we hosted a working-sponsored program called community database of submarine tended by scientists from four dif-successful. It progressed into a sulting in a successfully funded to support CSM undergraduates this community database platforming summer was spent in Colombia, hosted a core workshop in Houston member companies, and I present-American Geophysical Union in flying to Canada in a week to Canadian Society of Petroleum-ry! It is nice to be invited to geos. The annual Weimer day December 5, and I was year to have Dr. John Grotzinger speaking. John is the Fletcher Jones Professor of Geology and currently holds the Ted and Ginger Jenkins Leadership Chair at CalTech in the Division of Geological and Planetary Sciences. John served for eight years as the Chief Scientist on the Mars Curiosity Rover missions. He was an amazing speaker and just an all-around great person and role model for young scientists. Bob Weimer was in the audience and we hope he will be for many years to come. We had nearly 200 persons in the audience and our thanks to John for making it a special evening.

I hope that if any of you are remotely close to Golden that you will stop in and visit. I have dropped over to visit Bob in Boulder for lunch, and know that he is always delighted to hear from old friends and make new ones! As many of you know, I play music on occasion. We had a great time at AAPG in San Antonio playing for a large and enthusiastic crowd of dancers. We play up here in Colorado on occasion and plan on making a reappearance at AAPG in Houston next year. Rick Fritz is the “promoter” and “manager” of that gig. We will look forward to seeing you at the Blaster Alumni function on Monday nights at AAPG in June 2020. Drop by, as we are always having an amazingly fun time!

On a final note, I had 67 students in my sophomore Geological Processes course and probably 90% say they are Geology Majors, so the undergraduate program looks healthy to me! Thank you so much for your generosity and ongoing support of all the CSM programs. A special thanks to you for empowering me to have such a great time as I work with incredible people in this amazing setting that is the geologic world!
Steve Sonnenberg’s research focuses on unconventional petroleum systems (from the micro-pore to outcrop scales). He runs the MUDTOC research consortium. 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/Carrier Bed 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 associate for the consortium.

Steve Sonnenberg is the Director/Manager of the Subsurface Core Laboratory.

Current Students Supervised MUDTOC:
Cankut Kondakci (PhD Niobrara project), Alexa Socianu (Mowry project), Carolina Mayorga (Haynesville project), Jenny Blake (Permian Basin project), Jacque Colborne (Permian Basin project), Chris Matson (PhD Niobrara thesis), Andrew Wood (Marcellus project), Josh Shaw (Marcellus project), Corey Milar (Turner Sandstone thesis), Courtney Bone (Turner Sandstone thesis), Brian Hankins (Mowry-Muddy-Skull Creek thesis), Rebekah Parks (Shannon thesis), Lisa Reeves (Parkman thesis), Nick Damon (Permian Basin thesis), Cahill Kellegham (Permian thesis), Scott Manwaring (Niobrara thesis), Ian McBride (Bakken thesis), Ryan Rogers (Bakken thesis), Patrick Sullivan (Skull Creek thesis), Adam Simonsen (Niobrara thesis), Sywei Yeap (Permian thesis)

Students Graduated 2019:
Walter Nelson (Niobrara thesis), Torell Stewart (Niobrara thesis), Cankut Kondakci (Niobrara thesis), Jeromie McChesney (Frontier Sandstone thesis), Joe Dellenbach (Frontier Sandstone project), Jingqui Xu (Bakken project), Ellen Fehrs (Bakken thesis), Jack Tidholm (Microbial carbonate thesis, Bakken), April Bievenour (Permian Basin project), Sy Luke (Marcellus project), Pablo Benitez (Vaca Muerta project),

Recently published papers:

Talks Presented:
Sonnenberg, S., 2019, Petroleum Geology of Finn-Shurley, a Turner Sandstone Field, Powder River Basin, RMS AAPG, Cheyenne, WY
Sonnenberg, S., 2019, Tepee Buttes, Methane Seeps, and Polygonal Fault Systems: RMS AAPG, Cheyenne WY

Posters Presented:

Sonnenberg Faculty Representative For:
IBA Team 2019
AAPG Student Chapter
CSM Subsurface Core Lab Director
Professional Masters Petroleum Reservoir Systems

Robert Weimer and PhD candidate, Jacqueline Colborne, taking a break during our yearly Weimer Trail clean-up
A NOTE FROM THE CHARLES BOETTCHER CHAIR AND DIRECTOR OF THE MUDROCKS AND TIGHT OIL CHARACTERIZATION (MUDTOC) CONSORTIA CONT’D
WRITTEN BY STEPHEN SONNENBERG

MUDTOC Consortium Sponsors 2019

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The Geology Core Library: Re-Opened Fall 2019

- Geology Core Library “Home” Fall 2017 – Summer 2019
- Geology Students and Dr. Steve Sonnenberg tackle the Core Chaos in order to re-open the Geology Core Library before start of Fall 2019 Semester!
- After almost 2 years of closure due to the Green Center Renovation, The Geology Core Library is again “Open for Business”! Fall 2019
Introduction:

As I find myself writing about field camp during fall finals week, I am filled with an overwhelming sense of gratitude for the experiences our class has been able to share. The six weeks we spent together brought us closer to each other, as well as our wonderful professors and teaching assistants, with each challenge. Trust me, there was no shortage of those.

Field camp is widely regarded as a transformative experience for geology students internationally, a discrete point in time after which someone can ask what your career is, and you are able to confidently respond with: “I am a geologist!” However, I am not sure many of us felt so confident and knowledgeable at the beginning.

To be effective in the field is to be comfortable with not knowing, at least for a time, what it all means. The good geologist will work through hypothesis, collect data, and put real effort into trying to prove themselves wrong to verify that their theory holds up. During week one, many of us were thankful just to have a bit of a theory to present. Inexperienced, inefficient, and feeling somewhat crushed we mapped on.

Week two iced our wounds with sleet and snow in Durango, week three we regained our footing, and a bit of confidence in White Mesa, week four we explored the Picuris Mountains, measuring every foliation in sight, and finally, we arrived at Trout Creek Pass for week five. The spring had been brutal, and the Molas Lake area we had initially planned on was still covered in snow. We showed up Saturday midday to Bruce Trudgill’s sing-song announcement of the sign-in sheet, shortly after which, he cheekily announced he had only been in the field area for a few days himself. The field area was pretty gargantuan, compared to the scales we had been working in, with elevation gain to spare. The map was going to be more complicated than the others as well, more units than we had seen on a map up to that point, with precambrian metamorphics, sedimentary units, and tertiary volcanics, which we had no experience mapping.

We began work on Sunday, and the questions piled up much higher than the answers did. By the end of Tuesday, we were bouncing ideas back and forth with Bruce as if we were equals. By Thursday afternoon, Bruce asked our mapping trio what we thought about a strange bedding measurement in the field. Friday afternoon I finished my stereonets, put the last bit of color on my map, wrote my report, and walked my smelly, unshowered self across camp to the instructors’ table. I don’t know if I have ever been more proud of a completed assignment in my life.

Turning in our notebooks that week, I realized how much I had come to understand, and how much I may never know. Working in those constraints is what makes a good field geologist. Then it hit me--I am a geologist.

Lauren Miller, BS Class of 2020
Week 1: Moab, Utah

As a whole, this week was a bit of a brutal wakeup call as to the caliber of work that would be expected. Prior to this week, we knew what we were supposed to be handing in on Friday, but we had not quite grasped the footwork and brainpower that it would take. We were quick to recover our deflated egos, and really, how much could we care in such a beautiful place? The majority of the week, we had the amazing opportunity to map in Arches National Park, and the end of the week was spent in the Mill Canyon area. Theme of the week: relay ramps and salt tectonics!

Week 2: Durango, Colorado

Out of the frying pan and...into the ice cold winter in Durango? We worked on sufical mapping of glacial deposits with Paul Santi this week, and I guess the weather was trying to make up for all of the wildfires of last year! For almost all of us, this was an entirely different sort of mapping, and it was a nice break to stretch out different brain muscles (and our legs a bit). We also had the opportunity to visit Lemon dam, where we were told the heroic story of the dam and the man who saved it! Theme of the week: ice--ancient and present.

Week 3: White Mesa, New Mexico

We headed back into the sun this week, with plenty of time for short sleeve shirts, if you had enough sunscreen! This was one of my favorite weeks, as things really began to click, and we all got into the swing of our new camping lifestyles. Showers were at an all-time low, but learning and smiles were high! A new addition to the field area this year gave us the opportunity to map on a section of a Native American reservation, adding logistical and geological challenges and opportunities. I also turned 21 this week, and we were in a beautiful area and campsite to celebrate in by...you guessed it, working on our maps until 11pm! Theme of the week: sunburns the colors of the rocks.

Week 4: Picuris Mountains, New Mexico

Just a hop, skip, and a jump away for week four, we camped outside the Sipapu ski area, and enjoyed the luxury of having a yurt to work in at night! This week was all about metamorphics, something new to map for almost everyone, and a lot of mineral identification within whole rocks that many of the geotech track students had not done before. Thus, one exploration student was typically paired with 2-3 geotech students this week. Due to this (and the extended lack of showers) tensions began to run a little high, but everyone was better for it at the end; the sound of Yvette hammering away the mountain could be heard for miles, and always brought a smile to our faces. Theme of the week: beautiful metamorphic minerals and so many samples collected I could barely pick my bag up.
Week 5: Trout Creek Pass, Colorado

Week five was our longest and most accomplished week. I think I can safely speak for everyone when I say these were the maps we were most proud of. The change of location allowed us to explore and map a new area simultaneously with our instructors, which is a hugely valuable experience. There was no one to push you in the right direction if you were confused this week. It was time to put on your big geologist pants and get to work. Theme of the week: success and smiles!

Week 6: Petroleum Exploration in Utah and Wyoming

Admittedly, week six for us exploration kiddos was more of a field trip than field work, but I learned more about sedimentary deposition and structures in one week, than I ever had in a classroom. We did not have partners as much this week, and we were allowed to work in kind of a big family with Steve Sonnenberg and Lee Shannon.

Starting in Vernal, Utah and traveling through Wyoming to Rocksprings, we had the opportunity to study world class petroleum outcrops courtesy of Anadarko, who allowed us onto their lands. We got to measure section, read logs, look at core, and simply discuss and learn about all of the mechanisms that play a part in creating traps and other plays in the oil and gas industry. Scott Kennedy and I were fortunate enough to ride in Lee’s car, and we got to pick his brain even more about the history of oil and gas in America, the Union Pacific, and the land Anadarko held as of the summer.

We explored outcrops of incised valleys, tidal environments, and expansive marine environments. Steve made sure we stopped at dinosaur national monument, a great area to discuss aeolian sands, but also to indulge your inner five-year-old and touch some dino bones.

This week was a classroom on steroids, with mini-labs and assignments, and lectures in the field throughout the day, and let me tell you, none of us have ever learned that much from a lecture before. An extra special thanks to the team that keeps making this week possible!
Conclusion:

I would like to send my heartfelt gratitude to everyone involved in making this year’s field camp possible. Without true practice of lecture skills, no one can hope to truly understand geology. Geology is so much more than understanding block models and computer programs. Without the field work to back it up, we could never hope to know what it is we are actually talking about. Geology is the dirt, experience, struggle, and exploration of the world around us, the world that is right outside our doors in the field.

I would like to leave you with three pieces of advice from a brand new geologist:

1) Keep the map in your tent, it is your most precious possession

2) Keep your food away from bears, the Dollar General doesn’t carry everything

3) Always, ALWAYS, carry toilet paper
The 5th Annual ConocoPhillips Student Research fair was held on February 21st in the Student Center Grand Ballroom. Approximately 50 students participated in the event ranging from undergraduate research to a broad selection of MS and PhD research in Hydrology, Geological Engineering, Petroleum Geology, Sedimentology/Stratigraphy, to Economic Geology. Each category received a cash prize and the winning PhD candidate was invited to give a talk during the Van Tuyl seminar series. This year’s winner was Kara Marsac for her research on Extending the Longevity of Produced Water Disposal Wells using Reactive Transport Modeling.

This valuable program, sponsored by ConocoPhillips, provides students the opportunity to present their research to judges from outside the Geology and Geological Engineering Department. The program would not succeed without these thoughtful individuals who volunteer to spend an evening interacting with students and giving them feedback on their research and presentation. This year we had 21 volunteers from the USGS, Colorado Geologic Survey, EOG, FEI, FractureID, Conundrum, BPX, Anadarko, and ConocoPhillips.
The Colorado School of Mines American Association of Petroleum Geologists (AAPG) Student Chapter aims to promote geology related to the energy and production (E&P) industry through four themes: education, industry, networking and community involvement. During the 2018 to 2019 academic year, 26 events were planned and hosted by the AAPG chapter to meet these objectives and would not have been possible without support from our AAPG corporate donors. Our chapter hosted 16 Lunch and Learns, where industry professionals and people from academia delivered technical presentations to educate our members. Other events include workshops, four community service events as well as two social and outreach events. Donor sponsorship also helped support our Imperial Barrel Award (IBA) Competition team that placed 1st in the Rocky Mountain Region and went on to compete at the international level receiving the 2019 Finals Honorable Mention. Donor allocations went towards helping the five students on the team with travel and conference costs.

The Colorado School of Mines AAPG student chapter had 61 registered student members in the 2018 to 2019 academic year.

The following are the events hosted by the AAPG chapter during the 2018-2019 academic year:

- Introduction to AAPG Lunch and Learn
- Anadarko Lunch and Learn titled “Greater Colombian Basin”
- EasyCore Software Demonstration Lunch and Learn
- Encana Lunch and Learn titled “Insights into the Evolution of an Intracratonic Foreland basin: A Regional Assessment of the Duvernay Formation”
- Saudi Aramco Dinner and Learn
- Applied Stratigraphix Lunch & Learn titled “10 Things You Should Know About Sed-Strat and the Oil Business”
- Strater Software Demonstration Lunch and Learn
- Coal Creek Resources titled “A Spectrum of Rocky Mountain Sandstone Tight Oil Plays, Western USA”
- Bayswater Lunch and Learn titled “Productivity of the Austin Chalk in Southern Texas and Louisiana”
- Dr. Marsha French Lunch and Learn titled “Top Ten Tips for Working in Industry”
- Permian Basin Lunch and Learn by Dr. Sarg, Wiley Walker and April Beiveniour
- Weatherford Lunch and Learn by Chris Matson
- Cimarex Lunch and Learn
- Bayless Oil Lunch and Learn
- Imperial Barrel Awards Practice Session

Companies that took the time to come in for our Lunch and Learns include the following: Anadarko, EasyCore, Encana, QEP, Saudi Aramco, Applied Stratigraphix, Strater, Coal Creek Resources, Bayswater, Weatherford, Cimarex and Bayless Oil. In addition, our chapter had a Python workshop with Matt Bauer from Paisano Energy Advisors, LLC.

Sincerely,
Vicky Yeap
The Society of Economic Geologists student chapter has had an active year. We have been busy planning numerous field trips, short courses, and lectures. The organization contains undergraduates through PhD students.

In the spring, we conducted a trip across the American Southwest for graduate students, professors, and professionals. This trip covered a range of deposit types from porphyry copper to epithermal gold and Carlin gold. In the fall we helped a student group from Austria plan a trip throughout Colorado and joined them on their tour of the Cripple Creek gold mine outside of Colorado Springs. This was a great opportunity to meet other students and make connections.

Additionally, we had a day trip to the Detroit City mine where they collect world class rhodochrosite gems. This trip was facilitated by CSM alum, Phil Persson who also presented a Lunch and Learn lecture about the geology of the area.

Over the past year we have held weekly 'Lunch and Learn' lectures with students, professionals, and professors giving 25 talks. These lectures have featured a wide range of experts from CEO’s to the SEG International Distinguished lecturer. The Lunch and Learn sessions have greatly benefited student members and allowed us to network with people for possible future field trips.

We have a busy spring semester planned with another dozen Lunch and Learns. We are also working to plan multiple field trips ranging from single weekend trips around Colorado to a multi-day international trip throughout Japan. We hope to see continued support from our student members and also to increase our active members for the coming year.
The AEG Mines chapter in 2019 continued to offer students industry networking and professional development opportunities. We were excited to host speakers with expertise in a myriad of subjects, including what to keep in mind when hiring drilling contractors, geotechnical analyses of the Bingham Landslide and Hidroituango dam failure, and much more. We maintain a healthy student participation in the Regional AEG chapter, and were excited to see several Mines students and past AEG Mines alumni at the national annual meeting this past September.

We also were happy to collaborate in Mitchell Elementary School's STEM Night, and designed a fun, model dam activity for the kids to get their hands dirty doing some geotechnical work (picture below)!
THESES AND DISSERTATIONS FROM MAY 2019

ABDRAKHMANOV, NURLAN - MP – PETROLEUM RESERVOIR SYSTEMS
(Adv. Dr. Sonnenberg)

DEDECKER, JOHN – PH.D. – GEOLOGY
Chlorite Alteration of Pre-Ore Pyrite at the Mcarthur River and Fox Lake Uranium Deposits, Athabasca Basin: Paragenesis and Possible Implications to Ore Deposition (Adv. Dr. Monecke)

KEEVIL, HALLEY – PH.D. – GEOLOGY
Geochronology and Metallogeny of the Hunjiang Basin, Northeastern China Block, with a Focus on the Genesis of the White Mountain Sedimentary Rock-Hosted Gold Deposit (Adv. Dr. Monecke)

ALQAHTANI, NAJM HUSSAIN – PH.D. – GEOLOGY
Sedimentology, Sequence Stratigraphy, and Diagenesis of the Lower Khuff C Reservoir, Ghawar Field, Saudi Arabia (Adv. Dr. Sarg)

ARNUSH, NICOLE – MP – MINERAL EXPLORATION (Adv. Dr. Monecke)

DELENGBACH, JOSEPH THOMAS – M.SC. – GEOLOGY
Reservoir Characterization and Petroleum Potential of the Upper Cretaceous Wall Creek Member of the Frontier Formation, Western Powder River Basin, Wyoming (Adv. Dr. Sonnenberg)

KINNEY, SARAH - MP – PETROLEUM RESERVOIR SYSTEMS
(Adv. Dr. Sonnenberg)

BENITEZ, PABLO EZEQUIEL – M.SC. – GEOLOGY
Analysis of Velocity Variation with Azimuth (Vvaz) for Natural Fracture and Stress Characterization, Vaca Muerta Formation, Neuquén Basin, Argentina (Adv. Dr. Sonnenberg/Co-adv. Dr. Turra)

KONDAKCI, EMRE – M.SC., - GEOLOGY
Geologic Reservoir Characterization of the Niobrara Formation in the Trabing Field, Western Powder River Basin, Wyoming (Adv. Dr. Sonnenberg)

BIEVENOUR, APRIL – M.SC. – GEOLOGY
Reservoir Characterization of the Bone Spring and Wolfcamp Formations, Delaware Basin, Ward County, West Texas (Adv. Dr. Sonnenberg)

LUKE, SY – M.SC. – GEOLOGY
Reservoir Characterization of the Point Pleasant Formation, Appalachian Basin, SE Ohio (Adv. Dr. Sonnenberg)

BINGHAM CHEE, MARY – MP – MINERAL EXPLORATION (Adv. Dr. Monecke)

MARSAC, KARA – PH.D. – HYDROLOGY
Investigations of Subsurface Mineral Precipitation Reactions Associated with Brine Injection (Adv. Dr. Sitchler/Co-adv. Dr. McCray)

BRUSAK, AMBER - M. ENGR. - GEOLOGICAL ENGINEERING (Adv. Dr. Zhou)

MCKEON, JEFFREY – M.SC. – GEOLOGY
Evidence for a Subseaﬂoor Replacement Origin of the Upper Cretaceous Palma Volcanogenic Massive Sulfide Deposits, Quillama Formation, Central Peru (Adv. Dr. Monecke)

CAYES, HANNAH – M.SC. – GEOLOGY
Formation of Topaz-Enriched Gneiss in the East-Central Colorado Front Range via Crystallization of Mesoproterozoic Halogen-Rich Granite Magmas (Dr. Palin)

NELSON, WALTER – M.SC. – GEOLOGY
Sequence Stratigraphy and Geologic Reservoir Characterization of the Niobrara: Northern San Juan Basin (Adv. Dr. Sonnenberg)

CONTRERAS, IAN – M.SC.(NT) – HYDROLOGY
(Adv. Dr. Singha)

FOSTER, ALLAN – M.SC. – HYDROLOGY
Scaling Physical Controls on Solute Transport from 1D Column to 3D Tank Experiments (Adv. Dr. Singha)

IRONS, AMANDA – MP – MINERAL EXPLORATION (Adv. Dr. Kuiper)

KAZANKAPOV, AIDOS – M.SC. – GEOLOGY

DREUGHTY, MEGAN – M.SC. – HYDROLOGY
Electrical Imaging of the Changes in the Extent of Hyporheic Exchange from Channel-Spanning Logjams (Adv. Dr. Singha)

FISHER, LYNDSEY – M.SC. – GEOCHEMISTRY
Characterization of the Mineralized Albitite Bodies at Biggejavri, Kautokeino Greenstone Belt, Finnmark, Northern Norway (Adv. Dr. Pfaff)

FOSTER, ALLAN – M.SC. – HYDROLOGY
Scaling Physical Controls on Solute Transport from 1D Column to 3D Tank Experiments (Adv. Dr. Singha)

KINNEY, SARAH - MP – PETROLEUM RESERVOIR SYSTEMS
(Adv. Dr. Sonnenberg)

INTEH, SY – M.SC. – GEOLOGY
Reservoir Characterization of the Bone Spring and Wolfcamp Formations, Delaware Basin, Ward County, West Texas (Adv. Dr. Sonnenberg)

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KAZANKAPOV, AIDOS – M.SC. – GEOLOGY
THESES AND DISSERTATIONS FROM MAY 2019
CONT’D

OLSEN, JULIET - M.ENG.R. - GEOLOGICAL ENGINEERING (Adv. Dr. Walton)

O’SHEA, PATRICK – M.SC.(NT) – HYDROLOGY
(Adv. Dr. Singha)

PALMER, ZACHARY – M.SC. – GEOLOGY
The Nature and Timing of Metamorphism within the San Isabel Granite Aureole, Wet Mountains, South Colorado (Adv. Dr. Palin)

PEARIGEN JR., ROBERT WESLEY – M.SC. - GEOLOGY
Pre-Laramide Salt Tectonics in the Eagle Basin: A New Paradigm for the Tectonic Evolution of Central Colorado (Adv. Dr. Trudgill)

PEHLIVAN, VICTORIA – M.SC. – GEOLOGY
Slope Channels on an Active Margin: A 3D Study of the Variability, Occurrence, and Proportions of Slope Channel Geomorphology in the Taranaki Basin, New Zealand (Adv. Dr. Plink-Bjorklund)

PERRY, EMILY – PH.D. – GEOLOGY
Rare Earth Element Signatures in Hydrothermal Calcite: Insights from Numerical Modeling, Experimental Geochemistry and Mineral Deposits in New Mexico (Adv. Dr. Gysi)

SAMIS, JACK – M.SC. - GEOLOGY
Breathing New Life Into Postmortem Analysis: The Testing and Formalization of a Methodology for the Identification of Key Failure Modes in Dry Holes (Adv. Dr. Milkov)

SHERMAN, JACOB – M.SC.(NT) – HYDROLOGY
(Adv. Dr. Benson)

SIHOMBING, ENRY HORAS – M.SC. - GEOLOGY
Form And Fill of a Transtensional Rift Basin, Lower Talangakar

Formation, Jatibarang Subbasin, Offshore NW Java, Indonesia (Dr. Wood)

XU, JINGQI – PH.D. – GEOLOGY
Depositional and Chemical Controls on Sedimentation, Sequence Stratigraphy, and Pore Development of the Pronghorn, Lower Silt, and Lower Shale Members of the Bakken Formation, Williston Basin (Adv. Dr. Sonnenberg)

SIHOMBING, ENRY HORAS – M.SC. - GEOLOGY
Form And Fill of a Transtensional Rift Basin, Lower Talangakar

ZELLMAN, KRISTINE – PH.D. - GEOLOGY
Investigating Links between Climate Perturbations, River Discharge Variability, and Fluvial Fans in the Paleogene San Juan Basin, New Mexico, USA (Adv. Dr. Plink-Bjorklund)

THOMAS, HELEN – M.SC. – GEOLOGY
Bulk Compositional Controls on Mineral Assemblages in Metamorphosed Ore Deposits: An Example from the Laronde-Penna Au-Rich Vms Deposit, Quebec, Canada (Adv. Dr. Kelly)

TIDHOLM, JACK – M.SC. – GEOLOGY
Geologic Significance of Microbialites and Microbially Influenced Sedimentary Structures of the Bakken Formation, Williston Basin, North Dakota (Adv. Dr. Sonnenberg)

TRUTNER, SARAH – M.SC. – HYDROLOGY
Understanding Scale Impacts of Heterogeneity and Topography on Water and Energy Fluxes in Mountain Meadows Using an Integrated Hydrologic Model (Adv. Dr. Maxwell)

WALKER, WYLIE – M.SC. – GEOLOGY
Clinof orm Architecture and Sediment Partitioning in the Mixed Carbonate-Siliciclastic Bone Spring Formation, Delaware Basin, Texas (Adv. Dr. Jobe)
BOYD, DAVID LANE – PH.D. – GEOLOGICAL ENGINEERING

The Application Of Geostatistical Methods For The Quantification Of Multiple-Scale Uncertainty Due To Aleatory Geologic Variability (Adv. Dr. Walton/ Co-adv. Dr. Trainor-Guitton)

COLBORNE, JACQUELINE – PH.D. – GEOLOGY

A Multi-Scale Approach to Reservoir Characterization of the Wolfcamp A, Delaware Basin, Texas (Adv. Dr. Sonnenberg)

HOU, PENGFEI – PH.D. – GEOLOGY

Facies Trend and Statistical Characterization of Deepwater Systems During Remnant Ocean-Early Foreland Transition: Lower Pennsylvanian of the Ouachita Mountains, USA (Adv. Dr. Wood)

KOBAYASHI, HIROFUMI – PH.D. – GEOLOGY

Sediment Movement and Basin Evolution and Fill In Deepwater Fold and Thrust Belts (Adv. Dr. Wood)

LOWRY, BENJAMIN W. – PH.D. – GEOLOGY


MACINTYRE, TIMOTHY J. – PH.D. – GEOLOGY

Geology and Geochemistry of the Kansanahi Cu-Au Deposit, Northwestern Province, Zambia (Adv. Dr. Gysi/ Co-adv. Dr. Hitzman)

MAHATMA, ASHA – M.SC. – GEOLOGY

The Proterozoic History of the Southern Half of the Mt. Evans 7.5-Minute Quadrangle: Evidence for a CA 1.4 Orogenic Event in the Central Front Range, Colorado (Adv. Dr. Kuiper)

MALENDRA, MARGARIETE – M.SC. – GEOCHEMISTRY

Analysis of Anorthite Dissolution at the Microscopic Scale (Adv. Dr. Sitchler)

MCCHESNEY, JEROMY – M.SC. – GEOLOGY

Reservoir Characterization Of The Frontier Formation, Powell Field, Powder River Basin, WY (Adv. Dr. Sonnenberg)

MCGUINNESS, JAMES – M.SC. – HYDROLOGY

Experimentally Determined Solute Release Rates From Variably Metamorphosed Shale: Implications For Weathering In The East River Watershed, CO (Adv. Dr. Sitchler)

MORGAN, JOHN - MP – PETROLEUM RESERVOIR SYSTEMS

(Adv. Dr. Sonnenberg)

PIERRE, SAMUEL – PH.D. – GEOLOGY

Geochemical Controls on the Fluid Evolution of Submarine and Subaerial Ore-Forming Hydrothermal Systems (Adv. Dr. Monecke)

SCHADE, DECLAN - M.ENGR. - GEOLOGICAL ENGINEERING

(Adv. Dr. Santi)

SOUTHERLAND, LAUREN - M.SC. – GEOLOGICAL ENGINEERING


SUN, PENG – MP – MINERAL EXPLORATION (Adv. Dr. Monecke)

VAN HOOZEN, CHRISTOPHER J. – M.SC. – GEOCHEMISTRY

The Hydrothermal Solubility of Monazite Rare Earth Element Endmembers (Adv. Dr. Gysi)
Geology and Geological Engineering needs your help to support field experiences for our students!

Alumni, friends of Geology and Geological Engineering,

We are excited to be writing to you about another #idigmines day—Thursday February 6th. This year, like always, we are planning on using our #idigmines funds to help support field experiences for our students.

Were you inspired by the field work you did? Did it have a major impact on your professional path? Are field experiences important for our students? We hope the answers are yes and yes, but the last is definitely YES!

The field work geologists and geological engineers do is essential. Our students absolutely need field experiences, just like doctors need on-the-job training. Being treated by a doctor who got their training from a textbook is not high on our list. Likewise, students need to be in the field to understand the complexity of the Earth and the challenges we face.

Undergraduate Lauren Miller said it best; “Without field work..., we could never hope to know what it is we are actually talking about. Geology is the dirt, experience, struggle, and exploration of the world around us, the world that is right outside our doors in the field.”

We would be thrilled if you would join us by giving to #idigmines Geology and Geological Engineering.

Department head Wendy Bohrson and her geologist husband, Jeff Lee, have made a matching gift for students who donate, so hey students, if you can give, then your donation will go farther. Everyone who donates helps us get closer to winning other bonus money as well. Every gift is highly valued and helps us offer important field experiences for our students.

If you’ve already made your gift, many, many thanks. You can continue to help us by sharing your love for Geology and Geological Engineering using the tools on our social sharing page (https://idig.mines.edu/pages/home-2020-1#/welcome)

Thank you for showing your Mines love for field work and our students!

Sincerely,

Steve Sonnenberg and Wendy Bohrson
LOCATION:

Location

We are located in Berthoud Hall on the Colorado School of Mines campus. The building is at 1516 Illinois Street at the intersection of 16th Street and Illinois Street in Golden, Colorado. Click here for a printable campus map and directions to campus on Google Maps.

Directions

From Denver International Airport: It is most convenient to take the shuttle or to rent a car (car rentals: Avis, Budget, Enterprise, and Hertz). Take I-70 west, exit Highway 58 to Golden. Exit Washington Street and turn left to enter into downtown Golden. Turn right on 13th Street and left on Maple to enter campus.

From Denver: Take 6th Avenue and head west into Golden. Turn right on 19th Street. Turn left on Elm Street to enter campus.

From Boulder: Take Highway 93 into Golden. Turn left onto 19th Street. Turn left on Elm Street to enter campus.