



Message from our Interim Department Head,
Dr. M. Stephen Enders

Welcome back to our Departmental Newsletter. The last issue was published in December 2014, and a lot of change occurred since then. For those of you wondering what happened, the Department went through quite a transition, and has come out even stronger than before and hell-bent on getting even better. This issue of the Newsletter focuses on news over the last year, and is still a work in progress. There are probably some things you'd like to see us cover in subsequent newsletters, so please let us know.

Ramona Graves, Dean of the College of Earth Resource Sciences and Engineering, asked me to take on the Interim Department Head position when Paul Santi stepped down to re-focus on his teaching and research interests in mid-May. Paul did an outstanding job leading the Department through some rough times and re-establishing a healthy and invigorating culture. On behalf of the faculty and staff, I want to thank him again for all he has done for the Department and wish him great success in his teaching and research programs ahead.

I am absolutely delighted to be the Interim Department Head. Some of you may know that I'm an alum of our Department having graduated with a BSc in 1976, and I'm honored to have been asked to take on the Department Head role. I have enjoyed a 40-year career in the mining business; and prior to joining the Department, I had been a Research Professor in the Mining Engineering Department with a joint appointment in GE since 2009. During that time, I was the Director of the Center for Innovation in Earth Resources Science & Engineering sponsored by the Newmont Mining Company.

It has been many years since an undergraduate alum served as Department Head for GE, and because of the deep appreciation I have for the value of my education, I bring a unique motivation to tackle the challenges this job offers. I plan to channel this motivation to make this department even better and a leader in geology and geological engineering education and research in the 21st century! Although we will be initiating a search for the GE Department Head in Spring 2017, I'm approaching this job from the perspective of a long-term commitment rather than from a short-term interim role.

We held a departmental "retreat" in August before the Fall 2016 semester started and a "funshop" in October. As a result, we have refocused our Vision and Mission, and have set out five key Objectives that we would like to accomplish in the next one to three years:

Vision: At the forefront of discovery, understanding and education in geoscience to smartly engineer Earth's resources.

Mission: To create and disseminate knowledge to society through compelling research, excellence in teaching and engaging outreach by creating a welcoming and vibrant community that cultivates critical thinking, intellectual curiosity, and integrity.

Key Objectives:

To make the GE Department the easiest department to work in and work with on campus.

To replace and increase faculty lines.

To improve the curriculum and pedagogy for both the undergraduate and graduate programs.

To initiate drives to fund more endowed chairs, particularly in hydrology/hydrogeology and engineer geology/geological engineering.

To get the USGS Mineral Resource Group co-located on the CSM campus by Jan 1, 2020.

These are ambitious objectives and there is a lot more that I could say about them. You will read about some of our progress in the following articles, and we will continue to update you as we progress.

My education at Mines has had a profound positive impact on my life. I trust that our alumni and students have the same experience. Thanks!

GENERAL NEWS AND HIGHLIGHTS

This year was full of new and exciting events for the department. This excerpt includes just a few of the things included in the newsletter. Firstly, we are excited to announce three new faculty members; a little information is included about them in the following pages. Additionally, we had a number of outstanding faculty and student achievements including awards, sponsorships, publications, and presentations at conferences which are also detailed in the following pages.

Furthermore, we have a few program updates we would like to note. For instance, Jae Erickson has been working hard to implement serious change in the thin section lab via some helpful outside funding. They are now making high quality thin sections, and are filling internal (CSM) and external (industry) orders. Keep an eye out for an updated website which will include new order forms, lab policies, student resources, and price sheets. In the meantime, stop by BE147 and talk to Jae for more information!

We are also excited to announce a new course to our graduate program called Petrology of Fine Grained Rocks (GEOL 598). This course will implement core, thin section, and SEM analysis to study mudrocks on the macro- and micro- scale. Steve Sonnenberg, Donna Anderson, Marsha French, Wendy Harrison, and Ric Wendlandt are excited to participate in teaching this course in Spring 2017.

This year we hosted 26 Van Tuyl Lecture Series speakers. These Thursday lectures are invaluable to the faculty and often act as an extra class (with free pizza) for the students. Some of the lectures we hosted this year included: AAPG Distinguished Lecturer- Pete Rose, David Moecher from University of Kentucky, Lisa Stright from CSU, Michael Abrams from Imperial College- London, and Mason Dykstra from Statoil, to mention a few.

This summer we were also visited by CSM's President Paul Johnson, Ph.D. This was the first time he was able to tour Berthoud Hall since the onset of his Presidency last year. We were excited to show off our extensive laboratory facilities including our: student computer laboratories, QEMSCAN and new SEM labs, geochemical laboratories, and student microscope and petrology lab.

Our student chapter field trips this year created opportunities for department involvement and interaction. AAPG and SEG went on number of field trips this year. They also added a combined AAPG-SEG field trip to the itinerary during Fall 2016. This field trip acted as an Introduction to Colorado Geology. They visited the Argo Mine tunnel in Idaho Springs, stopped in Wolcott to check out the Niobrara Formation, and toured the Henderson Mine specifically focusing on morphology of molybdenum deposits as well as environmental reclamation for underground mines.

We would also like to mention our very own Susann Stolze is the new editor of the American Quaternary Association (AMQUA), which is produced twice a year. The newsletter is available on the AMQUA website and features happenings, events, and awards which go on within the AMQUA community!

The department held an exciting field session for Juniors this summer! Students visited locations around Colorado and Utah in order to build their field skills. This is always an exciting event for the department and a way to get everyone connected and involved.

The 2016 school year was an absolute success and we are excited to update you on all that went on this year. Read the rest of the newsletter to find achievements, student spotlights and awards, thesis and dissertation completions, program updates and more!!



Jae Erickson showing President Johnson off updates to the Thin Section Lab.



President Johnson visiting our geochemistry labs with student and Alex Gysi.



Week 6 of Field Camp in Rock Springs, WY



WELCOME DR. GABRIEL WALTON

Dr. Gabriel Walton obtained a Bachelor's degree (2011) and Ph.D. (2014) in Geological Engineering from Queen's University in Kingston, Ontario, Canada. Based on his doctoral research, Gabriel was recently named runner-up for the 2017 ISRM Rocha Medal, an international prize for the best thesis worldwide within the field of Rock Mechanics. Gabriel's research interests include numerical modeling of underground works, rockmass characterization and moni-

toring based on remote sensing data, and applications of geophysics to problems in Geological Engineering and tunneling. He is currently working on a number of industry-sponsored research projects and is the lead PI for a \$1.25 Million awarded to the Colorado School of Mines for research on mine ground control by the National Institute for Occupational Safety and Health.



WELCOME DR. ZANE JOBE

Zane Jobe is the new Director of the Chevron Center of Research Excellence (CoRE) program at Mines. Zane received his Ph.D. in Geology from Stanford University in 2010, and worked for Shell Oil for 6 years prior to joining Mines in May 2016. His research interests include the stratigraphic architecture, scaling relationships, and sediment dispersal patterns of fluvial and deep-marine depositional systems. Zane strives to perform fundamentally important scien-

tific research that also solves business-critical questions for the energy industry. He is excited to use outcrops, subsurface data, and modern (extant) depositional systems in California, Texas, and the Rocky Mountains to answer these research questions. He is also interested in interdisciplinary collaborations with the Geophysics and Petroleum Engineering departments.

WELCOME DR. ALEXEI MILKOV



Dr. Alexei V. Milkov is a Full Professor and Director of Potential Gas Agency at Colorado School of Mines. After receiving Ph.D. from Texas A&M University (2001), Dr. Milkov worked for three E&P companies (BP, Sasol and Murphy Oil), explored for conventional and unconventional oil and gas in 30+ basins on six continents and participated in the discovery of 4 Billion BOE of petroleum resources. He has deep expertise in

exploration risk analysis, resource assessments, petroleum systems and oil & gas geochemistry. Dr. Milkov has 130 publications (including 43 peer-reviewed articles) and received several industry awards for his contribution to petroleum geosciences.

2016 ACHIEVEMENTS

FACULTY

Alexis Stichter, Ph.D., is an assistant professor focusing in geology and geochemistry in the department. Most recently she was the only one awarded the NSF Early Career Award by the NSF Low-T Geochemistry program. Additionally, she has been selected as the keynote speaker at the 15th International Water-Rock Interaction Conference in Portugal.

Donna Anderson, Ph.D., is a research associate professor focused in petroleum geology in the department. In October 2016 she received the 2016 Rocky Mountain Section AAPG Distinguished Service Award which recognizes long-term beneficial service to RMS-AAPG.

Kamini Singha, Ph.D., is a professor in the Department of Geology and Geological Engineering and the associate director of the Hydrologic Science and Engineering Program at the Colorado School of Mines. She was chosen this year to be the National Groundwater Association's Darcy Lecturer in 2017! Additionally, she participated in 16 publications during 2015 and 2016.

Paul Santi, Ph.D., completed a term as the President of the Association of Environmental and Engineering Geologists. Part of his responsibilities included travel to give technical presentations at 24 different venues around the country, including 13 local AEG sections, 10 universities, and one talk for a CSM alumni association meeting.

Reed Maxwell, Ph.D., was named Rowlinson Professor of Hydrology. This chair will last 3 years and provides the holder \$20k/yr in discretionary funding. During this 3-year appointment, Reed and Steve Enders will be working with Dean Graves, the CSM Foundation, and the GE Enhancement Committee to build an endowment to sustain a permanent chair in hydrology.

Stephen Enders, Ph.D., was awarded the Ralph W. Marsden Award from SEG. This award is to honor outstanding service to the Society.

Steve Sonnenberg, Ph.D., is a Professor and Charles Boettcher Distinguished Chair in Petroleum Geology. This year Steve was awarded Honorary Member of the House Award AAPG and Life Member Award Division of Professional Affairs AAPG.

STUDENTS

Brandon Conaway completed an undergraduate thesis!

Emilie Gentry was the recipient of the National Science Foundation EarthScope AGeS Grant and the GSA Graduate Research Grant!

Moad Nassif and Wiley Skewes were fully funded to participate in the SEG Foundation-Sponsored Student Field Trip in August 2016 concerning Porphyry Systems of Central and Southern British Columbia.

Jingqi Xu a Ph.D. student studying petroleum geology was awarded the Best Poster for Rocky Mountain Section AAPG 2016.

Kenny Swift Bird was selected as an American Indian Science and Engineering Society Lighting the Pathway to Faculty Careers for Natives in STEM Fellowship.

Amy Rice received the Association of Women Geoscientists (AWG) Chrysalis Scholarship in 2016.

Emily Voytek was chosen to have the Best Talk as the Symposium of the Application of Geophysics to Engineering and Environmental Problems in 2016. Also in 2016, Emily received the Association of Women Geoscientists (AWG) Outstanding Student Award.

Timothy MacIntyre was selected to receive the Copper Club/Phelps Dodge scholarship in the amount of \$2,500. Special mention is due to First Quantum Minerals for supporting his PhD as well.

Sebastian Cardona was awarded the Stephen E. Laubach Structural Diagenesis Award during GSA's 2016 Annual Meeting for his research which exemplifies an interdisciplinary focus by integrating multiple types of data like seismic, well log, outcrops and microscopic data in order to understand the sealing properties of mass transport in deep water settings.

Michael Berger and Michael Hurth received the Fogarty Research Fellowship.

Timothy Wyatt and Dante Huff both received a GSA Graduate Student Research Grant.

Halley Keevil and Grainne Byrne both received SEG Student Research Grants.

Lyndsey Fisher and Timothy Wyatt received support from the Microanalysis Society Topical Conference— Electron Probe Microanalysis: Early Career Scholar (ECS) Financial Award Program.

Ethan Faber spent over a year in Guatemala City, Guatemala, developing a program to assist communities in identifying and reducing landslide hazards to poor residents. This included setting up an NGO to prepare training materials, and working with previous department graduates Alex Strouth (BGC Engineering, Golden CO) and Edy Manolo Barillas-Cruz (United Nations OCHA, Guatemala City). MS student David LaPorte will continue this work as part of a Fulbright Fellowship to Guatemala in 2017. Both Ethan and David are advised by Dr. Paul Santi.



Steve Sonnenberg (right) receiving award from AAPG.



Sebastian Cardona with his advisor Lesli Wood.



Field Trip lead by Murry Hitzman and Thomas Monecke.

A NOTE FROM THE ECONOMIC GEOLOGY PROGRAM

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

GENERAL NEWS AND WELCOME:

We encourage those interested in or working in the economic geology field to visit us in the Department to see what we are up to. Remember that our world-class Ransome room collection of ore specimens from around the world and our analytical facilities are available to help those in the exploration and mining sectors.

Steve Enders is enjoying his new role as department head, and he also taught Ore Deposits this fall. This year Steve received the Marsden Award from the Society of Economic Geologists for his contribution to the profession. We congratulate Murray Hitzman on his new position as the Associate Director of Energy and Minerals for the USGS, though his presence will be sorely missed on campus. We are currently seeking a new hire to fill Murray's position as the Fogarty Professor of Economic Geology at CSM. We have successfully concluded a search for a new metamorphic petrologist and look forward to the arrival of a new faculty member joining our group in the fall. Ric Wendlandt spearheaded the submission of an NSF "I/UCRC" proposal for a new CSM-industry research center focused on mineral exploration; if funded, this would be incredibly exciting for our group. The Professional Master in Mineral Exploration program is doing well, with ten students currently enrolled. The thin section lab has received a makeover and is now up and running, with Jae Erickson (MS, '15) at its helm. Our SEG student chapter has been busy with field trips and short courses, and this month they hosted SEG Distinguished Lecturer Jeremy Richards.

GSA IN DENVER

This year's GSA conference was successful with a total of 6 students presenting posters, and 7 students giving oral presentations. We also hosted two oral sessions on ore deposits in Economic Geology, namely, 'Micro-Analytical Techniques in Ore Deposit Research', chaired by Katharina Pfaff and 'Magmatic hydrothermal Ore Deposits, chaired by Thomas Monecke. Alexander Gysi presented the new MINES database, and his PhD student Emily Randall Perry presented her REE partitioning experiments with many fruitful discussions and networking opportunities. Alex also gave an invited talk in the session on microanalytical techniques, where he presented his new manuscript recently published in Economic Geology (Gysi et al., 2016a). Michael Berger presented his MS thesis on the Pajarita eudialyte-bearing syenite in the critical metals session, and Tim McIntyre gave a talk on salt dome cap rocks associated to his PhD project with Murray in the African Copper belt. Elizabeth Holley's students all gave talks on their MS thesis studies: Dante Huff (thermochronology of Carlin-type deposits), Johana Pedraza (Geology of the Wharf deposit), Justin Lowe (Geology of the Lone Tree deposit) and Lauren Foiles (Geochemical vectoring in Alaska).

ALEXANDER GYSI'S RESEARCH GROUP

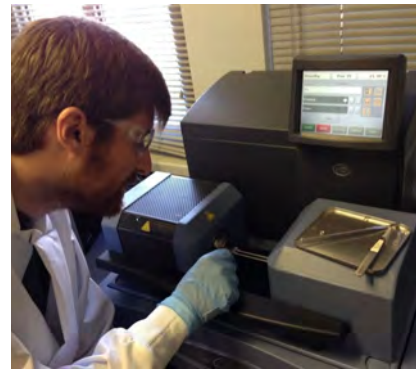
The crustal fluid research group has grown considerably with a total of 8 students! We study crustal fluids and ore forming processes by combining laboratory, field observations and numerical simulations.

The MINES 16 thermodynamic database was recently launched and can be downloaded at <http://tdb.mines.edu>. This project is an initiative to generate a revised internally consistent thermodynamic dataset for simulating geochemical processes at hydrothermal conditions in the upper crust (≤ 5 kbar and ≤ 600 °C) with focus on ore forming processes. The webpage also contains a set of tutorials to use the database with the GEMS code package (<http://gems.web.psi.ch>). Alex joined the GEMS development team in August, and was invited by Dr. Dmitrii Kulik for a seminar talk at the Paul Scherrer Institute at the Laboratory for Radioactive Waste Management in Switzerland to present the new MINES 16 database and his research group. The [GEMS code package](#) provides the next generation of free and versatile geochemical tools taking advantage of modern computational methods and the Gibbs energy minimization (GEM) technique to solve problems of geochemical, petrological, material science, and chemical engineering applications. To better promote this research area, Alex was invited to be lead guest editor for a special issue in the journal *Geofluids* that will be published in September 2017. The title of the issue will be "Advances in Numerical Simulations of Hydrothermal Ore Forming Processes", the description can be found at <https://www.hindawi.com/journals/geofluids/si/538384/cfp/>.

The crustal fluid rock interaction experimental lab has generated a new publication (Gysi et al., 2016b), which presents the first evidence that the mineral xenotime-(Y) forms a non-ideal solid solution with other REEs, how exciting! The experiments were undertaken in 2015 collaboration with an undergraduate student (Deusavan) from the Brazilian Mobility program who learned new calorimetric methods in our lab. Emily Perry Randall, PhD student, just tested our new high pressure and temperature hydrothermal equipment to synthesize calcite and study the partitioning of REE between fluid/minerals. David Sutterfield, a new MS student, just started his lab project work-

ing on the synthesis of REE phosphates. This summer, Alex was invited to give a guest lecture presenting some experimental work and numerical modeling work at the ISSP 17 (international Symposium on Solubility Phenomena and Related Equilibrium Processes) organized by the International Union of Pure and Applied Chemistry (IUPAC) in Geneva, Switzerland. The title of this talk was "Numerical simulations of CO₂ sequestration in basaltic rock formations: Challenges for optimizing mineral-fluid reactions".

We have several exciting field projects we are involved with. PhD student Tim McIntyre, and MS student Michael Hurth, just joined the team with a collaboration on the African Copper Belt deposits with Murray Hitzman. Lee Alford just joined Alex's group to start his MS field project on the historic Central City hydrothermal Au-Te-veins mineral deposit located about 20 min away from Golden, in Gilpin County. Alex and his MS student Carolyn Pauly started a new field project on pegmatites and miarolitic pockets in the California Blue Mine, which is described in the field trip news section. More details on field work will be presented in the next Newsletter, stay tuned!



Photograph of David Sutterfield working on our new differential scanning calorimeter in the crustal fluid-rock interaction lab.

KATHARINA PFAFF'S RESEARCH GROUP

The two newly acquired SEMs (a tungsten-filament SEM for automated mineralogy and FE-SEM) are fully up and running and our partnership with TESCAN on automated mineralogy is a success. Students and researchers from the department, across campus and other universities from the Front Range are using the electron beam facility to do their research in different areas from classic geology like Economic Geology, Oil and Gas, Sedimentology and Planetary science to Climate research and industry

applications. Katharina and her four MS. students work in the general field of mineralogy as it applies to research in the areas of economic geology, and igneous and metamorphic petrology. Katharina is also active in methods development for automated mineralogy and is successfully beta-testing TESCAN's automated mineralogy software solution TIMA. On a personal note, Katha and Garth welcomed baby Margo this spring.

THOMAS MONECKE'S RESEARCH GROUP

Thomas has had a busy year of teaching and research. In the spring, he taught a graduate level course in Hydrothermal Geochemistry. In this course, students learn all about the phase relationships in the water-salt system and get exposed to the study of fluid inclusions. Graduate students also learn about the fluid evolution in magmatic-hydrothermal systems forming porphyry and high-sulfidation epithermal deposits and get exposed to the models explaining the formation of low-sulfidation epithermal deposits by geothermal liquids. Together with Murray Hitzman, Thomas organized a field trip for the SEG student chapter to New Zealand. During this spectacular trip, students visited the active arc volcanoes White Island and Mount Ruapehu and studied the geothermal systems and their surface manifestations in the Taupo Volcanic Zone. During the fall, Thomas taught a graduate course focusing on the metallogeny of modern and ancient volcanic arcs. This course focuses on the formation of volcanogenic massive sulfide deposits, their volcanic host rock successions, and alteration characteristics. Students also learn about plate tectonics and volcanic processes occurring along modern convergent plate margins. In the fall, Thomas helped the SEG student chapter to run a short course on 3D modeling using the software package Leapfrog.

In addition to classroom instruction at CSM, Thomas Monecke delivered a short course on

volcanogenic massive sulfide deposits at the Geological Society of Peru in Lima in August. He also presented a short course on the same topic at the University of Medellin in Columbia in November.

Research conducted by Thomas and his group of 10 Ph.D. and M.S.-Geol. students focuses on the formation of hydrothermal ore deposits, with case studies being located close to home and far away, ranging from Alaska, Canada, China, Colorado, Chile, Italy, New Mexico, to the Philippines and Wisconsin. Thomas is currently setting up new graduate student projects in Japan, Papua New Guinea, and Peru. His Ph.D. students John DeDecker, Halley Keevil, Samuel Pierre, and Subaru Tsuruoka are getting closer to finishing their degrees and have started writing papers to be published in *Economic Geology* and other journals. In 2016, Thomas has authored or co-authored seven research papers and 17 conference abstracts.

Since January, Thomas has been serving as an Associate Editor of *Mineralium Deposita*. He continued serving on the Natural Resources Strategic Projects Panel of the Canada's Natural Sciences and Engineering Research Council. He also is the editor of a new *Reviews in Economic Geology* volume that will focus on the geology of the prolific base metal and gold deposits of the southern Abitibi greenstone belt in Ontario and Quebec.

MURRY HITZMAN'S RESEARCH GROUP

Although Murray is now working with the USGS in Reston, VA, he continues to advise students in his research group via Skype and monthly visits. Prior to starting work with the USGS he spent several months with his students conducting research in southern Africa and spent a month in Australia and Myanmar as the SEG International Lecturer. During the year Murray's students Mandi Hutchinson and Nicole Allen completed their M.S.-Geol. degrees. Grainne Byrne is nearly finished with her M.S.-Geol. thesis dealing with the 3-D geometry and supergene Cu-Co mineralization of halokinetic breccias at the Mashitu Mine in the Congolese Copperbelt. Michael Berger is nearing completion of his M.S.-Geol. thesis on REE mineralization in the Pajarita Mountain alkaline-syenite complex in New Mexico while Michael Hurth is finalizing his work on Rapitan-type iron formations and ironstones in the Central African Copperbelt and northwest Botswana. Lisa Lesar is working on an M.S.-Geol. project dealing with sulfide mineralization in apparent salt dome caprocks in the northern Congolese Copperbelt while Helen Twigg has started her M.S.-Geol. on the ore deposits in the Kakanda diapir of the Congolese Copperbelt. Wes Hall is approaching completion of his Ph.D. that utilizes both high-quality aeromagnetic datasets and geochronological research to better constrain the timing and location of mineralized zones in the Kalahari Copperbelt of Botswana-Namibia. Tim MacIntyre continues his exciting work on the genesis of the world-class Kansanshi Cu-Au deposit in the Domes region of northern Zambia. Murray served as a co-editor of an SEG publication on rare earth and critical elements of ore deposits and a special issue on *Economic Geology* published in the fall on the IOCG-IOA deposits of southeast Missouri and the Great Bear Lake area of Canada.

ELIZABETH HOLLEY'S RESEARCH GROUP

This has been a productive and happy year for my group of 8 students. We are wrapping up industry-funded research projects at Cripple Creek in Colorado (funded by Cripple Creek & Victor Mining), Wharf in South Dakota (Coeur Mining), and Lone Tree in Nevada (Newmont). My two PhD students continue to make exciting progress on their projects (robotic mapping, and characterization of thermally generated microfractures). My newest project is funded by the National Science Foundation, testing the utility of a new thermochronology method for Carlin-type gold exploration in Nevada. So far this year my students and I have already published two journal articles and 12 conference abstracts. We have three more journal articles coming out shortly, including an invited contribution for a reviews volume on Carlin-type gold: stay tuned!

I have several new and exciting research collaborations here on campus. I'm working with Mining Engineering faculty on an NSF-funded project examining thermal damage of rock as a possible pre-treatment for excavation and comminution. I'm a proud member of the team that has recently been awarded a NIOSH Capacity Building grant focused on ground control, so I

look forward to working with Gabe Walton (Geological Engineering), as well as Mining Engineering faculty, and we plan to recruit several top-tier PhD students for the project. I'm pleased to be a senior advisor for an NSF-funded workshop on science, society and technology for underground resources. I'm also working with a team of social scientists and engineers on a new project on artisanal gold mining and mercury contamination in South America that we hope will be funded by an NSF PIRE grant.

On the teaching front, I've been tasked with revising the geology curriculum for mining engineers. I spent part of the summer working on this curriculum revision with CSM's new Trefny Institute for Innovative Teaching and Learning, and I look forward to employing cutting-edge pedagogical techniques in the classroom. As part of the Mining Geology graduate course last spring, I took a group of graduate students on another fantastic field trip to Northern Nevada (see field trip section). I continue to serve as the Education and Training Program coordinator for the Society of Economic Geologists, and in that capacity I have organized more than 75 professional development short courses to date.

On a personal note, Evan and I welcomed the arrival of baby James in June. I look forward to new adventures in teaching and research in 2016; stay in touch!



PhD student Miguel Nassif documenting core at the Garrison Property, eastern Ontario.

YVETTE KUIPER'S RESEARCH GROUP

Yvette spent time in the field with Alli Severson, Emilie Gentry and Tammy He in the eastern New England Appalachians and with Miguel Nassif in the Abitibi greenstone belt. Ben Frieman and Wes Buchanan are working away at their PhD theses and Ben submitted his first manuscript to Precambrian Geology. Madi Lytle finished and defended her MS thesis on the Proterozoic history of the Idaho Springs-Ralston shear zone in central Colorado.

ALEXIS NAVARRE-SITCHLER'S RESEARCH GROUP

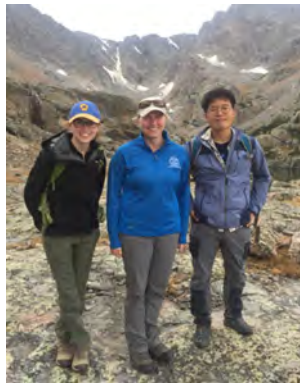
Alexis Sitchler, Assistant Professor, focuses her research on complex coupling of geochemical and hydrological processes in natural systems at scales from pores to basins. Her research falls into two areas of specialty: reactive transport in heterogeneous materials and effects of scale on geochemical reaction rates and geochemical controls on water quality. She advises students in three programs: Hydrological Sciences and Engineering, Environmental Biogeochemistry, and the Geology Program. She currently is advising 4 Ph.D students and 1 masters student. Her students are working at solving a long standing question in geochemistry- "How do we use results from laboratory experiments to inform predictions of how earth surface systems will change with perturbations?" They are adapting and developing very novel technologies from material science and physics applications to measure rates of geochemical processes and developing and using advanced numerical simulation techniques to advance our understand of how rocks turn into soil. She participated in 5 publications this year, was awarded NSF Early Career Award, and will act as the Keynote Speaks at the 15th International Water-Rock Interaction Conference in Portugal! Here are some pictures of work her group did this year:



PhD student Helen Malenda (Advisor: Kamini Singha) ensuring she gets detailed notes while sampling Mancos Shale for geochemical analyses in the East River Watershed, Crested Butte Co.

Left: Undergraduate students in Dr. Navarre-Sitchler's Petrology for Geological Engineers class learning about high-wall stability and alkaline igneous rocks from a Cripple Creek & Victor Mine geologist.

Below: Prof. Navarre-Sitchler with MS student Hannah Podzorski (left) and PhD student Heewon Jung (right) plan a new field research project in the Loch Vale watershed Rocky Mountain National Park.



Above: Profs. Singha and Navarre-Sitchler with MS student Bonnie Sams and Research Associate Jackie Randall (from left to right) post tracer injection to analyze complex ground-water and surface exchange in East River.

Left: PhD student Elanor Heil gives instructions to MS students Hannah Podzorski and James MacGuinness (students' advisor Navarre-Sitchler) and USGS scientist Rich Wanty for geochemical sampling on a snowy day in Keystone Gulch, CO.





Appalachian Field Research course, taught in May in Massachusetts. From left to right: Randia Eldam, Yvette Kuiper, Tammy He, Emily Randall, Alli Severson and Emilie Gentry.



CSM graduate students get ready to go underground at Turquoise Ridge a field trip with Dr. Elizabeth Holley's "Mining Geology" course.

FIELD TRIP NEWS

In March, Thomas Monecke and Murray Hitzman took a group of 21 members of the Society of Economic Geologists Student Chapter for a nine-day field trip to New Zealand. The group travelled from Auckland to the Taupo Volcanic Zone and the Tongariro National Park. It was a spectacular trip providing students with insights into economic geology, volcanology, and the production of geothermal energy. You can read more about the trip in the newsletter article prepared by the students of the SEG Student Chapter.

Also in March, Elizabeth Holley took a group of graduate students on another fantastic field trip to northern Nevada. During this trip, which forms part of her Mining Geology graduate course, students visited the underground and open pit operations at Comstock, Turquoise Ridge, Marigold and Twin Creeks. In April, Thomas Monecke taught his graduate course in Hydrothermal Geochemistry. As part of the course, students collected geothermal liquids from the hot springs in Steamboat Springs, which they subsequently analyzed for their cation and anion compositions.

Yvette Kuiper taught her Appalachian Field Research course to five CSM graduate students in May. The course formed part of her NSF CAREER grant. It focused on geological field work through inquiry-based research and hypothesis-testing. It was geared towards students who will be conducting thesis research involving a significant structural mapping component. In the first week, students wrote a brief research proposal including hypotheses, tests and a work plan for the next two weeks. They studied appropriate literature and took an introductory field trip to the field area. The second week focused on fieldwork. In the third week, students prepared a geological map and appropriate cross sections, and a report presenting rock descriptions, structural analysis, a geological history, and interpretation of results in the context of the hypotheses posed in the proposal.

In October, Alexander Gysi and his M.S.-Geol. student Carolyn Pauly started a new field research project at the California Blue Mine in the Yucca Valley, California. This natural laboratory presents fantastic exposures of pegmatites, especially in Dave Schmidt's mine in which several miarolitic pockets with gem quality topaz, aquamarine, and large quartz crystals were uncovered. The new field area is likely to become the playground of the crustal fluid-rock interaction group for studying the geochemistry of crustal fluids at the field scale, and the genesis of LCT (lithium-cesium-tantalum) type pegmatites. This 5 day field trip led to three buckets full of rocks, many nice crystal specimens, and a collaboration with a senior field geologist Ian Merkel, the mine owner Dave, and several respected mineral collectors. Lance Ruffel gave a donation to the Mines Foundation supporting this exploratory work, which is much appreciated!

SEG STUDENT CHAPTER FIELD TRIP: TAUPO VOLCANIC ZONE, NEW ZEALAND

In March 2016, 21 members of the Colorado School of Mines SEG Student Chapter left the snow-covered Rockies for a nine-day field trip to the North Island of New Zealand. Thomas Monecke (SEG 2003 F), Jeff Hedenquist (SEG 1986 F), and Murray Hitzman (SEG 1978 F) led the group of students from Auckland to the Tongariro National Park to learn about active volcanic arcs, ore-forming processes, and geothermal systems.

The Taupo Volcanic Zone consists of a typical andesitic arc to the east and zone of bimodal volcanism in the back-arc to the west. The andesitic arc constitutes a favorable environment for the formation of high- to intermediate-sulfidation epithermal deposits, whereas the back arc is famous for its many active geothermal systems considered to be representative of the low-sulfidation epithermal environment. The comparison of these two contrasting environments was the focus of the trip, along with visits to epithermal deposits and an active volcano.

The two first days were spent in the Coromandel Peninsula, a relic volcanic arc that was active during the Miocene and Pliocene. We visited the Martha and Karangahake low-sulfidation Au-Ag deposits. At the Martha mine, operated by OceanaGold, the group viewed the open pit before examining drill core showing outstanding epithermal ore textures. Outcrops at the Karangahake deposit illustrated zoning of the alteration halo to the quartz veins of this epithermal deposit.

The group embarked the following day on a boat cruise to White Island, an active andesitic stratovolcano located on the volcanic front offshore of North Island. The visit to this amazing location provided the opportunity to study the environment of formation of advanced argillic lithocap alteration that may host high-sulfidation epithermal ores. Surface features included an acidic (pH<0) crater lake, high-temperature fumaroles, native sulfur precipitates, and mud pots. We also examined lahar deposits formed in 1914. In a fun coincidence we met students as well as David Cooke and Jocelyn McPhie from the University of Tasmania on the crater rim.

On the next day, we visited the Waimangu and Waiotapu geothermal systems, south of Rotorua, to examine surface features and discuss fluid evolution in the active analogue to the low-sulfidation epithermal environment. Hydrothermal features include numerous hot springs, locally enriched in precious metals such as at Champagne Pool, sinter terraces, and mud pools. During the following two days, geologists and geochemists from Contact Energy and Mighty River Power companies led the group to their geothermal energy operations, including Ngatamariki, Ohaaki, Rotokawa, and Wairakei. This constituted a fantastic opportunity to learn the dynamics of a geothermal reservoir from both geological and engineering perspectives.

The next day, Julie Rowland from the University of Auckland joined the group to give us an overview of the structural controls governing hydrothermal fluid flow in the main rift axis of the Taupo Volcanic Zone. Emphasis was placed on the formation of epithermal vein deposits, with a field exercise at the Orakei Korako geothermal area.

The last two days of the field trip were spent in the Tongariro National Park. We hiked the Tongariro crossing, affording us some spectacular views of the cone-shaped Mount Ngauhuroe, and the following day climbed to the top of Mount Ruapehu. During these hikes, the group made observations on the physical characteristics of andesitic arc volcanoes and learnt more about the geochemical composition of crater lakes and the high-sulfidation epithermal environment. The group left New Zealand with many photographs and memories of this exceptional adventure.

This trip would not have been possible without the patience, knowledge, and generosity of our guides Thomas Monecke, Jeff Hedenquist, and Murray Hitzman. We would also like to thank the staff from OceanaGold, Contact Energy, and Mighty River Power, plus Julie Rowland for instructions in the field on the structural evolution of the Taupo Volcanic Zone. The Colorado School of Mines SEG Student Chapter gratefully acknowledges Goldcorp, Apache, the SEG Student Chapter Stewart R. Wallace Fund, and the Denver Region Exploration Geologists' Society for their generous contributions.

SEDIMENTARY ANALOGS DATABASE AND RESEARCH GROUP (SAND)- A NOTE FROM LESLIE WOOD

SAnD is doing well. We have enjoyed a great year of recognition with numerous competitive grants being awarded to SAnD student researchers from proposals submitted to GSA, AAPG, and SEPM to name a few. We presented talks and posters at AAPG in Calgary, GSA in Denver, and at AGU in San Francisco, and we had a very well received consortium meeting in Houston in April hosted by SAnD member company Repsol, as well as a great field trip to the deepwater deposits of the Ouachita Foreland Basin of Arkansas. We have worked hard to maintain five major companies sponsoring our research program including: bhpBilliton, ExxonMobil, Tullow Oil, INPEX and Repsol. In this time of contracting budgets, we really appreciate the support. SAnD has always been a student based research program. We currently have 13 masters and doctoral students working in the group, who are at various stages of their research into basins and sedimentary processes all over the world. These projects fall in to a variety of themes but most center around the primary research direction of the SAND consortium:

- Seismic geomorphology of clastic systems
- Submarine mass failure processes and deposits
- Reservoir modeling of clastic systems

Many projects cross over between these three themes. Sebastian Cardona continues his work in examining the sealing capacity of deepwater mass failures in outcrop, core and seismic, winning the prestigious 2017 Laubach Award from the Structural and Sedimentology Divisions of GSA. Mimi Do wrote a successful proposal to utilize a state of the art hyperspectral imaging tool in outcrops in New Zealand and has been accepted to present her work at a SPEI conference in Los Angeles this spring. Hang Deng has established a great collaboration with Dr. James Syvitski's research group up in Boulder to utilize SEDPACK modeling software to look at how gravity flows interact with the complex top topography of mass failures, resulting in healing phase turbidite reservoirs. Hang received a grant to attend an IODP workshop in London the summer of 2016, and finished the year presenting his work at the 2016 AGU meeting in December. Hirofumi Kobayashi has successfully passed his written and oral exams in the fall of 2016 and continues to become the authority on deepwater gravity processes in the Sabah fold and thrust belt of offshore Borneo. Pengfei Hou continues to make advances in his field-based study of the deepwater deposits of the Atoka Formation in the Arkoma Basin, and Xiaoxue Liuzhuang has a really nice masters study of slope evolution along the northwest shelf of Australia that she will present at the upcoming AAPG meeting in Houston. Kherlan Bathbayar received a significant contribution of rock samples from basins in Mongolia. These unique data are all thanks to Kherlan's hard work and tenacity working toward her master's degree in these understudied basins.

We received a significant 3D data contribution from Repsol that was acquired off the Guyana margin. This 3D seismic data, currently being worked by master's student Obianuju Ugwu-Oju, image the Berbice Canyon, a major feeder canyons to ExxonMobil's recently announced Liza Discovery. Doctoral student Lei Welcome will be attending and presenting a poster at the GEOPRISMs workshop in Sante Fe, New Mexico in February, along with Dr. Rob Gawthorpe. Rob has been a Visiting Scientist with our Department in Fall 2016 and will continue at CSM through summer 2017. Rob is an expert in rift basins and will be running the CSM AAPG Student Field Trip to the Gulf of Corinth in Greece



Darrin Burton (Affiliated Faculty) and Andrew Reisdorf (MS Student) work the outcrops of the Middle Atoka in Webo Quarry Arkansas, building a database to condition a reservoir model of this complex prograding deltaic body.

in June 2017. We plan to continue collaboration with Rob as part of our rift basin studies program. Finally, our studies in shelf clastic systems continues to be strong with Alex Cheney's work in the San Juan Basin, New Mexico and Andrew Residorf completing his masters work in reservoir modeling a unique cored quarried system in the Middle Atoka deltaic deposit in Arkansas. Additionally, Dr. Darrin Burton continues as an Affiliated Researcher with SAnD working with students both in the field and in the reservoir modeling lab.

SEDIMENTARY ANALOGS DATABASE AND RESEARCH GROUP (SAND)- A NOTE FROM LESLIE WOOD (CON'T)

We have added two new student researchers to the SAnD program in 2016, Matt Steidtman who is performing detailed outcrop and subsurface studies of the Parkman Sandstone around the Teapot Dome area of Wyoming, and Matthew Huels who is examining the nature and value of small mature fields in the Illinois Basin area of the U.S. Both gentlemen have great applied skills and a strong interest in the business of hydrocarbons.

For myself, I continue to work to keep companies funding our research program in these tight times. I currently write this from London, where I am giving a keynote address to the Deepwater Systems: Advances and Applications conference at the Royal Geological Society of London. I am continuing to teach Seismic Geomorphology, which is a unique course to our school, as well as co-teaching Integrated Exploration and Development, a course once taught by Bob Weimer that continues to be a collaboration with Petroleum Engineering and Geophysics. My teaching is rounded out with a sophomore level course that I teach each year. I continue to serve on the DOE oversight board for the Illinois CO₂ research program, as well as representing CSM on the REPSEA Board of Directors. I also try to do service to our societies, serving on the editorial boards of Interpretation and GEOSPHERE, as well as reviewing papers for a variety of journals. I have contributed to four publications this year, and served as a co-editor on a Special Lacustrine Seismic Geomorphology section of Journal of Marine and Petroleum Geology.

AAPG STUDENT CHAPTER FIELD TRIP: TRINIDAD WEST INDIES

The sand! The surf! The sediments! May 2016 saw CSM taking the first field trip ever to the hydrocarbon-rich Caribbean island of Trinidad. Trinidad, located off the north-eastern margin of Venezuela and immediately in front of the Orinoco River and Delta offered students a chance to see the huge Tertiary-age deltas that are producing immediately offshore, outcropping along pristine beaches, as well as a chance to experience mud volcanos, to sample one of the richest source rocks in the world; the Point-a-Pierre and Gauthier, and to visit a working LNG plant in Port Fortin. Along the way, the young CSM Geoscientists were able to see a cultural collision influenced by US occupation during WWII, the native Carib culture and the imported cultures of India. Lei Welcome (PhD candidate and native Trini) did a spectacular job of organizing the trip and ensuring the safety of everyone, as well as wrangling her mother into providing the group a hugely authentic dinner of Trini delights at the Caroni Swamp Tour. Students foot a lot of the bill for these trips, but alumni and corporate support are always welcome to offset the costs. This year's trip is being designed to take advantage of Dr. Rob Gawthorpe's seminal research in the Gulf of Corinth, Greece, where students will study rift basin sedimentation and structure. Funding is being raised for this trip right now by the AAPG Student Chapter. Contact Matthew Huels (mlhuels@mymail.mines.edu) for sponsorship opportunities.



Leslie Wood standing in a group of students discussing the coarse-grained reservoirs that outcrop in the Trinidadian

Day 5 tour along the Northeast coast of the island looking at structure and stratigraphy at the Fishing Pond Manzanilla section.

THE CHEVRON CENTER OF RESEARCH EXCELLENCE (CORE)

The Chevron Center of Research Excellence (CoRE) has many new faces in 2016! Zane Jobe is the new Director who started in May 2016. Lauren Shumaker is a post-doctoral research associate (joined Septmeber 2016) who is working on scaling relationships for submarine channels. There are three new graduate students: Luke Pettinga (PhD), Rosie Fryer (MS), and James Smith (MS). Finally, Mary Carr (research professor here at Mines) has joined the CoRE family in a part-time role to assist in accounting, logistics, and university relations. In addition to these tasks, she acts as an informal advisor to many CoRE students and will likely serve on students' committees.

Stephen Schwarz successfully defended his MS thesis in late December. Alyssa Charsky (MS student working on stratigraphy and geomechanics of the Bakken Formation) and Jianqiao Wang (PhD student working on fluvial deposits in the Uinta/Piceance basins) are both scheduled for spring or summer 2017 graduation. James Smith and Rosie Fryer (MS students) have completed their first season of field work in California, and collected field data (measured sections, 3D models derived from drones) in the Modelo Formation (submarine channel-lobe transition zone, James' project) and the Point Loma Formation (submarine lobes, Rosie's project). Pengfei Hou (PhD student working on the stratigraphy of the Atoka Formation) and Luke Pettinga (PhD student working on submarine channel-lobe scaling) are hard at work in the CoRE office, making sure to have hot coffee available at all times.



The CoRE group on a field trip to the Modelo Formation in November 2016. Left to right are: Jeremiah Moody (CoRE alum), Zane Jobe, Lauren Shumaker, Pengfei Hou, Luke Pettinga, James Smith, Rosie Fryer, and Dessy Sapardina.

AN UPDATE FROM INTEGRATED GROUNDWATER MODELING CENTER (IGWMC)

At the Integrated GroundWater Modeling Center (IGWMC) our faculty members and students actively participate in developing and leading outreach events throughout the year. This year, we have worked hard to expand our reach in the community, both on campus and off. We started off the summer by attending River Watch Colorado training, where volunteer groups from across the state become “citizen scientists” by monitoring water quality parameters that are used by the state in decision-making processes. Our goal is to develop this activity further and to engage local K-12 students to participate. Look for more on this in the months ahead.

We had another busy fall, participating in many science and engineering nights at local elementary and middle schools in the region. At these events, volunteers demonstrate hands-on activities to get kids excited about science and engineering. Although we focus on teaching hydrology, we are expanding our toolbox in order to engage more students at each of these events. Overall, the IGWMC participated in 6 STEM nights this fall. These events are always in need of volunteers, so if you are interested please contact Lisa Gallagher (lgallagher@mines.edu).

The IGWMC also worked with Kamini Singha to develop and organize the Mining for Talent event, a field trip opportunity for high school students. Applicants have an opportunity to tour CSM campus, visit labs to understand ongoing research in geosciences, and participate in lab experiments to teach them about techniques used in geology, hydrology and other fields. We hosted this event in March of 2016. The event was very successful, so we hosted a second event in December 2016.



Mike Morse and Lisa Gallagher doing some River Watch field work in Bellvue, CO.



Lastly, Reed Maxwell, Mike Morse and Lisa Gallagher taught a McBride Honors course this fall entitled, “Naked Trees, Killer Beetles, and Dirty Water.” This was a collaborative honors course at CSM and CSU that examined current physical and social science research on the effects of the Mountain Pine Beetle on regional social and ecological systems in the Rocky Mountain West. Students became beetle experts, then used their expertise to develop lessons and activities for 6th grade students at Windy Peak Outdoor Lab (Bailey, CO). This course was well received and we hope to offer it again for Fall 2017.

We are continuing to develop our education and outreach program at the IGWMC. As we look ahead to 2017, we are very excited about what’s to come. Come check us out on Facebook (www.facebook.com/igwmc/) or Twitter (@IGWMC).

Left: Mike Morse captivating students with groundwater model tanks at Kyffin Elementary School.



Above: Lisa Gallagher teaches Alameda International High School students about chemical precipitates. Left: Fall 2016 McBride class at Windy Peak Outdoor Lab.

GEOLOGY MUSEUM MUSINGS

My ninth year directing the Museum has seen a record number of guests, volunteers, and donation box proceeds. Kelsey Lewis (GE '16) compiled our attendance data from 2015, which show that we had over 38,000 guests last year, or an increase of 1.4%. Guests came from 47 states and 42 foreign countries.

I'm proud to announce that as of this writing, we are ranked by Tripadvisor.com as the #3 tourist attraction in Golden, in terms of visitor satisfaction, out of 56 "Things to do" in Golden, and received the coveted Tripadvisor Certificate of Excellence once again. In 2015, our display at the Denver Mineral Show received the Chirnside Award for the best museum display (of 24 museum entries, including the Smithsonian), and the Friends of Mineralogy Award for the best educational display by an institution.

The Museum's Advisory Council has met roughly bi-monthly. It oversaw the completed installation of UV-filtering mylar on all of our exterior windows. At our January meeting, we were told that the specimens in one of our warehouses would be moved to another Campus building, which eventually was completed in May, but it took a lot of work and a team of professional movers. Work on a Strategic Plan commenced. I gave a talk at the Society of Mineral Museum Professionals meeting in Tucson, AZ about the connection between museums and those who loan specimens to museums.

I held weekly meetings with our Collections Managers and volunteers. One of our Collections Managers, Ed Raines, provided some research specimens to Alex Gysi to help with his research on Campus. Our volunteers have been busy keeping our Gift Shop well stocked. Our 2016 Gift Shop sales through early November were up 36% over the previous year. Our volunteer ranks have now risen to roughly 80. Our facebook fans are up 16% over last year. Ron Wolf (GE '69) has visited a few times and took more sensational photos of our specimens.

Our Student Aides have led a vast majority of our tours again, rented our teaching and fossil kits, helped with our Garage Sales, and rung up all of our Gift Shop sales. In May, six of our Student Aides graduated, so I hired nine Student Aides out of 14 applicants. Six are geologic engineers, one is a geophysicist, one is a petroleum engineer, and one

is a civil engineer. That makes our staff 87% geoscientists, 56% women (nearly twice the female demographic on campus!), and 6% graduate students.

Mandi Reinshagen Hutchinson (M.S. GE '16) spent a great deal of time creating new displays on our lower floor for the Critical Materials Institute (CMI). Most of these feature rare earth minerals, but there are also tellurides and lithium minerals (Figure 1). This was funded by the CMI and involves many departments on Campus. The exhibit was officially dedicated on February 3, 2016. Since then, two large solar panels were installed on the south side of our building. These are converting solar energy into the electricity needed to power part of our CMI display, and are currently the only solar panels installed on campus.

Our Friends of the CSM Geology Museum (FCSMGM) now has 160 paid memberships. The Friends prepared and conducted our two successful Garage Sales in April and October (Figure 2). Our Spring Garage Sale was terrific, smashing all previous records. We brought in nearly \$9700 during the April 29th to May 1st weekend. Thanks to Mandi Hutchinson (M.S. GE '16), Phil Persson (current GE masters student), Jacob Smith (GE '16), and seven other SEG students for helping to set up the sale. At the Spring Show in Denver, the Friends coordinated an auction to benefit our Museum, amidst a daunting blizzard. In a few hours, they raised \$4276. The Friends also bestowed several fine specimens to our collections. Our new board was recently elected and two of the board members are Lew Kleinhans (GE '91, Ph.D.) and Phil Persson (current GE masters student). As always, FCSMGM members receive 20% discounts in our Gift Shop. Application forms can be found at: http://issuu.com/csmgeologymuseum/docs/friends_app.



Mandi Reinshagen Hutchinson (M.S. GE '16) explaining the Critical Materials Institute display in our Museum December 2015.

GEOLOGY MUSEUM MUSINGS (CON'T)

In early June, Bill Nesse photographed our splendid amazonite/smoky quartz specimen known as “The Legend” for the cover of the third edition of his Introduction to Mineralogy textbook, which is due out later this year by Oxford University Press. In July, the Friends co-sponsored the Second Eugene E. Foord Pegmatite Symposium in Berthoud Hall. Over 130 participants from several continents registered. We were fortunate to have the world’s leading experts in pegmatite research on Campus to share two days of talks and two days of field trips with over 130 international registrants. This was an extremely stimulating event that occurred with very few setbacks.

You may have heard about some regrettable vandalism in the Colorado State Capitol building on August 4th to one of our two displays outside the House Chambers. One specimen was stolen, and several were damaged severely when the large display cabinet was flipped on its side. We did not expect this to happen in such a seemingly “secure” building, but it caused us to remove our loaned contents from both display cases. No suspects have been identified yet, but police reports were written, and insurance claims filed. A photo of the stolen specimen was sent to hundreds of mineral dealers, but it has not reappeared as of now.

In August, we received the largest mineral and cash donation to the Museum during my time at CSM. It came from the Hilja K. Herfurth Estate and includes roughly 800 minerals, gems, and meteorites. A small portion of these donations is featured in one of the new displays erected this summer. Additionally, there was a major gift from the Estate to the general CSM scholarship fund. This gift was the subject of a Denver Post article in October. In November, Dr. Stephen Enders (GE '76 and Interim department



Abdula Eljalafi (GE '15 + current GE masters student) all dressed up and ready to go at the AAPG student chapter special semester-end party



Cal (GE'73) and Kerith Graeber assembling exhibit, September, 2015.

Bill Rehrig (GE '59) preparing books for our spring book sale



head) lectured at the annual general meeting of the Friends.

Some recent donations to our Museum included specimens and/or books from Clare Dunning (GE '84, B.S.), Terry Klein (GE '80, Ph.D.), Bruce A. Miller (GE '63, B.S.), Chuck Shultz (GE '61), Kelsey Zabrusky (GE '09 B.S., M.S. '11); and significant funding from Mr. and Mrs. William Gibbs, Jr. (GE '76), and Mr. and Mrs. Robert E. Smith (GE '55). We gladly accept geological book, map, and specimen donations throughout the year.

In 2016 we displayed our specimens at mineral shows in Tucson, Fort Collins, Colorado Springs, Denver, and Socorro. We are currently preparing an exhibit for the Tucson Gem and Mineral Show next February. Our Annual Open House was attended by a record of roughly 325 guests, where they saw fourteen new exhibits and three updated exhibits.

As for upcoming events, we will tentatively hold another famous (infamous?) Garage Sale next

GEOLOGY MUSEUM MUSINGS (CON'T)

As for upcoming events, we will tentatively hold another famous (infamous?) Garage Sale next spring in the Conference Room across the hall from our Museum entrance. Prices will drop frequently throughout the event on most items. The Friends of the CSM Geology Museum and the Museum are two of four sponsors of the Colorado Precious Metal Symposium, which will be held on Campus July 21-24, 2017. Please phone me if you would like to help plan this symposium. There will be two days of lectures and two days of field trips. Anyone interested in planning this symposium is invited to contact me. Our Annual Open House is scheduled for September 13, 2017 from 6 to 9 P.M.



Bill Rehrig (GE '59) preparing books for our spring book sale.

In conclusion, please visit our Museum. Our address is 1310 Maple Street. We are open Monday – Saturday 9 A.M. to 4 P.M., Sundays 1 P.M. – 4 P.M., except for certain legal and school holidays. You will notice that nearly all our display lighting is LEDs! Admission to our Museum is free, but parking fees are required in our lots and on campus streets Mondays through Fridays before 5 P.M. Further information is available on our website (http://www.mines.edu/Geology_Museum), Facebook page (<http://www.facebook.com/pages/Colorado-School-of-Mines-Geology-Museum/168875179736>), or phone me at 303-273-3823.

Cordially,

Bruce Geller, Museum Director



Rachel Bierma (GE '17), Paul Bertsch (GE '16), David Lane Boyd (GE '16), and John "Wes" Buchanan (current GE PhD student and GE lecturer) examining interesting minerals, December, 2015.

AAPG STUDENT CHAPTER

The **Colorado School of Mines American Association of Petroleum Geologists (AAPG) Student Chapter** mission statement is to promote geology related to the energy and production (E&P) industry through four themes: education, industry, networking and community involvement. We also intend to give students the opportunity to develop key leadership and interpersonal skills and serve as a focal point for developing a sense of professionalism through industry exposure.

Our Chapter is in its 36th year of existence and continues to be one of the most active chapters in the nation, promoting world class exposure to research and experience in connection with the petroleum industry. The chapter has experienced nearly exponential growth on a consistent basis and contains a legacy of achievement in providing beneficial services to its members while also being an organization that strives to give back to its school and the local community. In June of this year, the chapter was awarded *AAPG Outstanding Student Chapter Honorable Mention* at an international level. We continue to build upon the past success to make the 2016-2017 academic year one to remember.

AAPG strives to be the most active organization on campus through the execution of consistent events in which our members can serve, be served and benefit from interaction with their peers and exposure to the oil and gas industry. Our core activities consist of 1) weekly lunch and learn series 2) technical workshops 3) service events 4) field trips 5) distinguished lectures/seminars and 6) social events. Another notable activity of the chapter is the annual Imperial Barrel Award Competition. This year, the IBA competition team placed 1st in the Rocky Mountain Region and went on to compete at ACE in Calgary where they placed 3rd internationally and were awarded the *Stonely Medal* and \$5,000 which was put towards future chapter activities.

Lunch & Learns

The chapter hosts weekly lunch and learn sessions throughout the entire school year. Local and regional speakers from industry and academia present hour-long talks on different disciplines related to petroleum geology and the industry. So far this year, AAPG has hosted 9 L&L's and is planning a full schedule for the Spring semester. (Pictured: Lunch & Learn Anadarko, *Geomodeling*, Fall 2016)



AAPG Distinguished Lecturers

On top of our weekly lunch and learns, we intend to host a number of AAPG distinguished lecture to cover relevant, and groundbreaking advancements in petroleum geology. These lecturers speak to a larger audience including students from the Geology & Geological Engineering, Geophysics, and Petroleum Engineering departments. (Pictured: AAPG Distinguished Lecturer Pete Rose, *Cognitive Bias, The Elephant in the Living Room" of Science & Professionalism*, Fall 2016)

Short Courses & Technical Workshops

Members are offered the opportunity to develop new skills by attending a number of short courses offered by the chapter each year. Each short course provides in depth technical overview of the course topic led by a local subject expert. Last year's topics included sedimentary geology, core workshops, and software technology workshops. This Fall, the chapter held a Mudrock workshop hosted by Dr. Donna Anderson and is planning at least 2 for next semester, including a core fracture workshop and software workshops (Pictured: Dr. Donna Anderson instructs students during 1 day Mudrock workshop, Fall 2016)



AAPG STUDENT CHAPTER (CON'T)

Field Trips

Both the domestic and an international field trips run by the chapter each year are highly sought after and well attended member events. Previous trips included sequence stratigraphy of the front range, Monterey Shale, stratigraphy of the Paradox Basin, Trinidad, and modern carbonates in Belize. These field trips allow members to view modern and ancient depositional environments, and open students' eyes to geologic systems outside their research focus. This year, we have already taken an overnight trip to the front range we plan to take a trip to the Guadalupe Mountains and Greece. (Pictured: AAPG+SEG Joint Field Trip, Front Range, CO, Fall 2016)



Imperial Barrel Award Competition

In Fall of 2016, 4 members of CSM-AAPG competed on the CSM IBA competition team and won first place for the rocky mountain region and continued on to place 3rd at the international level where they competed at ACE in Calgary. The competition and class are offered annually. (Pictured: 2016 IBA Team, from left to right: Matthew Bauer, Abdulah Eljalafi, Sarah King, Michael Harty, Evan Allred, Summer 2016)

Community Service & Outreach

Staying involved and maintaining a positive relationship with our surrounding community is important to our chapter and we accomplish this by placing community outreach and service as a top priority. So far this Fall, the chapter has held or participated in 3 separate service events: the annual Weimer Trail Cleanup, Mitchell Math & Science Night and a Habitat for Humanity Build in downtown Denver. (Pictured: Habitat for Humanity Build, Fall 2016)



Videos

For the 2016-2017 academic year, the AAPG Student Chapter in conjunction with Dr. Lesli Wood of CSM are creating a video compilation of interviews featuring prominent geologists and their use of sequence stratigraphy to be shown at the 100th anniversary ACE event in Houston, TX. The goal of the video is to honor the past and the shoulders on which we stand on to show how sequence stratigraphy has influenced how we think geologically. The chapter is also helping to create a fundraiser video for the department for the I Dig Mines Fundraiser event in February 2017.

Social Events

The chapter organizes social events throughout the year to promote teamwork and collaboration amongst members. Often events are organized between two or more clubs such as the Society of Petroleum Engineers student chapter (SPE), the Society of Economic Geologists (SEG), and Student Society of Geophysicists (SSG). One such event was Film on the Rocks held at the nearby Red Rocks Park and Amphitheatre. This December (12/1) we will hold our annual *Mustachio Bashio* social event at the Table Mountain Inn. (Pictured: students in costumes for 2015 Mustachio Bashio event)



We encourage you to get involved! If you would like to join our chapter or become more active please contact us by email at: cmaapg@gmail.com or contact Joshua Payne (chapter president) at: joshuapayne@mines.edu.

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THESIS AND DISSERTATIONS FROM 2015 & 2016

May 2015:

BRUNKAL, HOLLY – PH.D. – GEOLOGICAL ENGINEERING

Analysis of Post-Wildfire Debris Flows: Climate Change, the Rational Equation, and Dewatering Brake Design (Adv. Dr. Santi)

CHARNOCK, ROBERT – M.SC. – GEOLOGY

Structural and U-Pb Zircon Geochronology Investigation of Selected Units of the Eastern Merrimack Belt, Massachusetts: Tectonic and Post-Acadian Deformation Implications (Adv. Dr. Kuiper)

CONDON, LAURA – PH.D. – HYDROLOGY

Understanding the Role of Regional Scale Water Management in Natural Systems: Connections, Interactions and Feedbacks (Adv. Dr. Maxwell)

CONNER, DOUGLAS TYNAN – M.SC. – GEOLOGY

Geology of the Bornite, Carbonate-Hosted Copper-Zinc-Cobalt Deposit, Southwestern Brooks Range, Alaska (Adv. Dr. Hitzman)

DAY, JOSHUA – M.SC. - GEOLOGY

Stratigraphy of the Eocene Green River Formation, Uinta Basin, Utah – Outcrop to Subsurface Correlation (Adv. Dr. Sarg)

DYE, MATTHEW D. – M.SC. - GEOLOGY

Mineralogical Characterization and Paragenesis of the Cripple Creek Deposit, Colorado (Adv. Dr. Kelly)

ELGHONIMY, RANA – M.SC. – GEOLOGY

Petrophysics, Geochemistry, Mineralogy, and Storage Capacity of the Niobrara Formation in the Aristocrat PC H11-07 Core, Wattenberg Field, Denver Basin, Colorado (Adv. Dr. Sonnenberg)

ERICKSON, JAE – M.SC. - GEOLOGY

Rare Earth Element Mineralization And Formation Of The Iron Hill Carbonatite Complex, Gunnison County, Colorado (Adv. Dr. Pfaff)

FEIST, RACHEL – M.SC. – HYDROLOGY

Determining the Influence of Transpiration on Soil Moisture Pathways Using Electrical Resistivity Imaging (Adv. Dr. Singha)

FITHIAN, MATTHEW – M.SC. - GEOLOGY

Geology, Geochemistry and Geochronology of the Marigold Mine, Battle Mountain-Eureka Trend, Nevada (Adv. Dr. Holley/ Co-adv. Dr. Kelly)

HARPER, JOHN ROSS – M.SC. - GEOLOGY

Organic and Inorganic Geochemical Characterization of the Juana Lopez and Montezuma Valley Members of the Lower Mancos Shale, Piceance Basin, Colorado (Adv. Dr. Sonnenberg)

HEFTON, LINDSAY – M.SC. – GEOLOGY

Diagenesis of the B Chalk, B Marl and the Fort Hays Member of the Niobrara Formation, Denver Basin, Colorado (Adv. Dr. Humphrey)

HERNANDEZ, CARLOS – M.SC. – GEOLOGICAL ENGINEERING

Diagenesis of the B Chalk, B Marl and the Fort Hays Member of the Niobrara Formation, Denver Basin, Colorado (Adv. Dr. Higgins)

HOGAN, JAMES. D. – M.SC. - GEOLOGY

Calibration of Log Response Using Core and Outcrop Data in the Eastern Uinta Basin to Allow Correlation from Outcrop Belts into the Subsurface (Adv. Dr. Sarg)

JACOB, DAYNA – M.SC. - GEOLOGY

Investigating the Effectiveness of using Basement Heat Flow as a Tool for Modeling the Thermal History of a Basin In A 1 D Basin Model (Adv. Dr. Boak)

JOHNSON, TERESA – M.SC. - GEOCHEMISTRY

Petrology and Geochemistry of the Mafic and Ultramafic Dikes and Intrusions in Carlton, Pine and Aitkin Counties, Minnesota (Adv. Dr. Wendlandt)

KENWELL, AMY – M.SC. – HYDROLOGY

Using Geochemical Indicators to Distinguish High Biogeochemical Activity in the Subsurface (Adv. Dr. Navarre-Sitchler)

LEHMAN, KATIE – M.SC. - GEOLOGY

Three-Dimensional Modeling of Complex Salt Wall Terminations in the Paradox Basin: Implications for Salt Structure Evolution, Compartmentalizing Fault Trends and Petroleum Exploration (Adv. Dr. Trudgill)

LOGAN, SARAH K. – M.SC. – GEOLOGY

Lacustrine Lithofacies and Depositional Processes of the Uteland Butte Member, Green River Formation, Eastern Uinta Basin, Colorado and Utah (Adv. Dr. Sarg)

MCLAIN, MICHAEL – M.SC. – GEOLOGICAL ENGINEERING

Estimating Debris Fan Compensation Index and Avulsion Tendency Using Borehole Data (Adv. Dr. Santi)

MEUZELAAR, TOM – PH.D. - GEOLOGY

Hydrothermal Alteration of Carbonaceous Mudstones Hosting the Eskay Creek Au Deposit, British Columbia (Adv. Dr. Monecke)

MURRAY, C. DEVIN – M.SC. – GEOLOGY

Mechanical Stratigraphy and Sonic Log Relationships using the Proceq Bambino in the Niobrara Formation, Denver Basin (Adv. Dr. Sonnenberg)

NAKAMURA, KAZAUMI – PH.D. – GEOLOGY

Chemostratigraphy of the Late Cretaceous Western Interior, Denver Basin, CO, USA (Adv. Dr. Humphrey)

NEWNAM, ZACHARY J. – M.SC. – GEOLOGY

Reservoir Quality of the Upper Three Forks Formation, Fort Berthold Reservation, Williston Basin, North Dakota, U.S.A. (Adv. Dr. Sonnenberg)

THESIS AND DISSERTATIONS FROM 2015 & 2016

O'BRIEN, KIMBER – M.SC. – GEOL-
OLOGY

Stratigraphic Architecture of a Shallow-Water Delta Deposited in a Coastal-Plain Setting, Neslen Formation, Floy Canyon, Utah (Adv. Dr. Pyles/ Co-adv. Dr. Humphrey)

O'NEAL, DENTON – M.SC. - GEOLO-
GY

Chemostratigraphic and Depositional Characterization of the Niobrara Formation, Cemex Quarry, Lyons, CO (Adv. Dr. Sonnenberg)

PRIBULICK, CHRISTINE E. – M.SC. -
HYDROLOGY

A High Resolution, Integrated Approach to Modeling Climate and Vegetation Change Impacts to a Mountain Headwaters Catchment Using Parflow (Adv. Dr. Maxwell/ Co-adv. Dr. Carroll)

RIETMAN, JENNIE MARIE – M.SC. -
GEOLOGY

Petrographic and Biostratigraphic Assessment of the Niobrara, Wattenberg Field, Weld County, Colorado (Adv. Dr. Sonnenberg)

ROLFS, SPENCER – M.SC. – GEOLO-
GY

Integrated Geomechanical, Geophysical, and Geochemical Analysis of the Bakken Formation, Elm Coulee Field, Williston Basin, Montana (Adv. Dr. Sonnenberg)

SYMCOX, CARL – M.SC. - GEOLOGY

Stratigraphy, Diagenesis, and Mineralogy of the Carbonate Marker and D Marker Units, Lower Green River Formation, Uinta Basin, Utah (Adv. Dr. Sarg)

TIMBEL, CARTER B. – M.SC. - GE-
OLOGY

Uncompahgre Thrust Geometry: A Seismic, Field, and Gravity Study near Nuclea, Colorado, Paradox Basin, USA (Adv. Dr. Trudgill)

TORTOPOGLU, BULUT – M.SC. –
GEOLOGY

Structural Evolution of the Northern Carnarvon Basin (Adv. Dr. Trudgill)

WELLER, MITCHELL – M.SC. - GE-
OLOGY

The Tectonostratigraphic Evolution of the Offshore Gippsland Basin, Victoria, Australia – Results from 3D Seismic Interpretation and 2D Section Restoration (Adv. Dr. Trudgill)

WILSON, SYDNEY – M.SC. – HY-
DROLOGY

Groundwater-Surface Water Exchange within Montane and Alpine Regions of the Front Range and Rocky Mountains, Colorado (Adv. Dr. Singha)

December 2015:

ANDRESEN, MATTHEW – M.SC. –
GEOLOGY

Three-Dimensional Stratigraphic Architecture and Evolution of an Ancient River-Dominated Delta, Iles Formation, Book Cliffs, Colorado (Adv. Dr. Pyles/ Co-adv. Dr. Humphrey)

BALL, STEFFEN – M.SC. – GEOLO-
GY

Hydrothermal Nickel Sulfide Hosted in Neoproterozoic Carbonate and Evaporitic Rocks of the Menda Central Prospect, Democratic Republic of Congo (Adv. Dr. Hitzman)

BISHOP, KYLA – M.SC. – GEOLOGY

Mechanical Stratigraphy of the Vaca Muerta Formation, Neuquen Basin, Argentina (Adv. Dr. Sonnenberg/ Co-adv. Dr. Davis)

FABER, ETHAN – M.SC. – GEOLOGI-
CAL ENGINEERING

Development of a Landslide Risk Rating System for Small-Scale Landslides Affecting Settlements in Guatemala City (Adv. Dr. Santi)

HAUGEN, BEN – M.SC. – GEOLOGI-
CAL ENGINEERING

Qualitative and Quantitative Comparative Analyses of Lidar Point Cloud Based Landslide Displacement Field Measurement Methods (Adv. Dr. Zhou)

HUFFORD, GREGORY – M.SC. –
GEOLOGY

Tectono-Hydrothermal Evolution of the Neoproterozoic Abitibi Greenstone Belt,

Canada: New Insights from the Timiskaming Assemblage (Adv. Dr. Monecke)

GUZMAN, MARIO – M.SC. – GEOLO-
GY

Geology, Vein Petrography and Mineral Chemistry of the North Amethyst Deposit, Creede Mining District, Creede, Colorado (Adv. Dr. Monecke)

NUSE, BRADLEY – M.SC. – GEOLO-
GY

Continuity of Sandstone within Fluvial Channel Belts: A Three-Dimensional Outcrop Study of the Cedar Mountain Formation, Utah (Adv. Dr. Pyles/ Co-adv. Dr. Humphrey)

MCCOY, KEVIN – PH.D. – GEOLOGI-
CAL ENGINEERING

A Method for Quantitative Economic Risk Assessment of Post-Fire Debris Flows (Adv. Dr. Santi)

PISEL, JESSE – PH.D. – GEOLOGY

Multi-Scale Stratigraphic and Statistical Analysis of Allogenic and Autogenic Controls on Fluvial Systems (Adv. Dr. Pyles)

TAYLOR, RYAN – PH.D. – GEOLOGY

Orogenic Gold Formation and Tectonic Evolution of the Grass Valley Gold District and Temporal Correlations of Gold Deposits in California (Adv. Dr. Monecke)

WU, LONG – PH.D. – GEOLOGY

Foreland Flexural Extension and Salt Diapir Reactivation in Oblique Extensional Systems (Adv. Dr. Trudgill)

May 2016:

BANDLER, AARON – M.SC. – HY-
DROLOGY

Geophysical Constraints on Critical Zone Architecture and Subsurface Hydrology of Opposing Montane Hillslopes (Adv. Dr. Singha)

BOGENSCHUETZ, NICOLE M. –
M.SC. – HYDROLOGY

The Effect of the Mountain Pine Beetle on Slope Stability, Soil Moisture, and Root Strength (Adv. Dr. Maxwell/ Co-adv. Dr. Bearup)

THESIS AND DISSERTATIONS FROM 2015 & 2016

- CROSS, LAUREN – M.SC. – GEOLOGY
Structural Evolution of the Oil Well Flats/ Dinosaur Flats Detachment System Canon City Embayment, Colorado (Adv. Dr. Trudgill)
- DELLENBACH, BENJAMIN ARTHUR – M.SC. – GEOLOGY
An Outcrop to Subsurface Stratigraphic Analysis of the Niobrara Formation, Sand Wash Basin, Colorado (Adv. Dr. Sonnenberg)
- DURKEE, HANNAH – M.SC. – GEOLOGY
Reservoir Characterization and Geomechanical Evaluation of the Greenhorn Formation In The Northern Denver Basin, Colorado (Adv. Dr. Sonnenberg)
- GARY, ISABEL – M.SC. – GEOLOGY
Petroleum Geology of the B Chalk Benches of the Niobrara Formation; Wattenberg, Silo, and East Pony Fields, Northern Denver Basin, CO/ WY (Adv. Dr. Sonnenberg)
- GRAHAM, ANDREW – M.SC. – GEOLOGY
Integrated Analysis of Waulsortian-Type Bioherms of The Lodgepole Formation: Stark County, North Dakota And Bridger Range, Montana (Adv. Dr. Sonnenberg)
- HERNANDEZ BILBAO, EIDER – PH.D. – GEOLOGY
High-Resolution Chemostratigraphy, Sequence Stratigraphic Correlation, Porosity and Fracture Characterization of the Vaca Muerta Formation, Neuquén Basin, Argentina (Adv. Dr. Sarg/ Co-adv. Dr. Sonnenberg)
- HINRICHER, MARCUS – M.SC. – GEOLOGY
A Geologic Comparison of the Oil Window and Dry Gas Window Within the Tow Creek Member of the Niobrara Formation in the Piceance Basin of Northwestern Colorado (Adv. Dr. Sonnenberg)
- HODAN, MARTA – M.SC. – GEOLOGY
A Fluvio-Lacustrine Stratigraphic Correlation of the Renegade Tongue, Green River Formation, Uinta Basin, Utah (Dr. Piret Plink-Bjorklund)
- HUTCHINSON, MANDI – M.SC. – GEOLOGY
REE Enrichment in Weathered Carbonatite, Bull Hill: Bear Lodge Mountains, Wyoming (Adv. Dr. Richard Wendlandt/ Co-adv. Dr. Murray Hitzman)
- JEFFERSON, JENNIFER – PH.D. – HYDROLOGY
Exploring Sensitivities of Latent Heat Parameterizations Using a Coupled, Integrated Hydrologic Model (Adv. Dr. Maxwell)
- JOHNSTON, ALLISON – M.SC. – HYDROLOGY
An Integrated Geophysical and Geochemical Approach to Characterizing the Flow of Acid Mine Drainage Water from an Inactive Mine to a Headwater Mountain Stream in Colorado, USA (Adv. Dr. Singha)
- LISTIONO, GERALDUS – M.SC. – GEOLOGY
Mixed Siliciclastic-Carbonate System of The Middle Member of The Bakken Formation, Williston Basin, North Dakota (Adv. Dr. Sonnenberg)
- LOCKWOOD, THOMAS – M.SC. – GEOLOGY
Outcrop, Petrographic, and Subsurface Analysis of The Sappington Member, Three Forks Formation, and Cottonwood Canyon Member, Lodgepole Formation, Central Montana (Adv. Dr. Sonnenberg)
- NEGRI, JACQUELYN – M.SC. – GEOLOGICAL ENGINEERING
Evaluation and Validation of Multiple Predictive Models Applied to Post-Wildfire Debris-Flow Hazards (Adv. Dr. Santi)
- QUIGLEY, ASHLEY KAYE – M.SC. – GEOLOGY
Geologic Setting Of Volcanogenic Massive Sulfide Deposits In The Paleoproterozoic Penokean Volcanic Belt, Lake Superior Region, USA (Adv. Dr. Monecke)
- QUIGLEY, PATRICK – M.SC. – GEOLOGY
The Spectrum of Ore Deposit Types, Their Alternation and Volcanic Setting in the Penokean Volcanic Belt, Great Lakes Region, USA (Adv. Dr. Monecke)
- RAMIRO RAMIREZ, SEBASTIAN – M.SC. – GEOLOGY
Petrographic and Petrophysical Characterization of the Eagle Ford Shale in La Salle and Gonzales Counties, Gulf Coast Region, Texas (Adv. Dr. Sonnenberg)
- SEMMENS, STEPHEN NELSON – M.SC. – GEOLOGICAL ENGINEERING
An Examination of the Natural Environment's Impact on Levee Sustainability (Adv. Dr. Zhou)
- SKEWES, WILEY BOULDEN – M.SC. – GEOLOGY
Evolution of Magmatic-Hydrothermal Systems Below Boiling Conditions: Evidence from the \square öpler Au-Cu Deposit, East Central Turkey (Adv. Dr. Monecke)
- STAMER, JOHN – M.SC. – GEOLOGY
Geologic Reservoir Characterization of The Codell Sandstone: Central Wattenberg Field, Colorado (Adv. Dr. Sonnenberg)
- STEWART, JOSHUA – M.SC. – GEOLOGICAL ENGINEERING
Developing Remote Sensing Methods for Bedrock Mapping of the Front Range Mountains, Colorado (Adv. Dr. Wendy Zhou/ Co-adv. Dr. Paul Santi)
- WESCOTT, AMANDA LEE – M.SC. – GEOLOGY
Reservoir Characterization of the Middle Bakken Member, Ft. Berthold Region, North Dakota, Williston Basin (Adv. Dr. Sonnenberg)

I DIG MINES CAMPAIGN

The Department of Geology and Geological Engineering is uniquely focused on the discovery and dissemination of knowledge for society through compelling research, excellence in teaching, and engaging outreach by creating a vibrant community that cultivates critical thinking, intellectual curiosity, and integrity. Our faculty, staff and students work in a number of areas important to earth, energy and the environment, ranging from minerals and energy exploration, to ice sheet dynamics, natural hazards, and water quantity and quality.

Our world-class teaching and laboratory facilities and field sites provide students with hands-on, real-world experience. Colorado and the Rocky Mountains offer an outstanding number of natural laboratories, which we augment with research sites and field trips around the world. We take education seriously and expect our students to become some of the world's future leaders in engineering solutions to the most pressing natural resource problems and opportunities.



Your gifts will support:

- Field Emission Scanning Electron Microscopes and Integrated Mineral Analyzers
- Scholarships for undergraduates and fellowships for graduate students
- Field trips to Belize, Morocco, California, Bahamas, Ontario, Utah and Western Colorado
- Sending students to GSA, AAPG, AEG, AGU and other conferences
- Field camp tents, tables, generator, lights and other gear
- Field camp scholarships
- Field water testing equipment
- New workstations for 3-D seismic dataset analysis
- And much, much more!

Keep our department strong!

Gift Levels:

- **\$25**-Field camp scholarships
- **\$100**-Laboratory needs
- **\$250**-Fellowships and faculty support

The **\$25,000** bonus will be spent on enhancing the student field trip experience to fulfill our mission of training students to be expert stewards of earth's most precious resources.

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Join us in supporting our department on #idigmimes Giving Day, Feb. 9. The department with the most donors at the end of the day wins \$25K! Check out all of the causes and make your gift at <http://c-fund.us/idigmimes/>

What we are supporting:

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- Field Emission SEM and Integrated Mineral Analyzer
- Scholarships for undergraduates and fellowships for graduate students
- Field trips to Belize, Morocco, California, Bahamas, Ontario, Utah and Western Colorado
- Sending students to GSA, AAPG, AEG, AGU and other conferences
- Field camp tents, tables, generator, lights and other gear
- Field camp scholarships
- Field water testing equipment
- New workstations for 3-D seismic dataset analysis
- And much, much more!

How you can join our mission:

Highest Priority Needs:

- Printers and tables for student computer labs (\$3,000)
- Replacement equipment for thin-section preparation (\$3,000)
- Post-field camp undergraduate research (\$5,000/yr. per student)
- Unrestricted funds (variable)

Next Tier Needs:

- Student travel to conferences (up to \$10,000 annually)
- Furniture for graduate student offices (up to \$20,000)
- Rock powder fusion system for XRF analysis (\$37,000)
- Cathodoluminescence detector for SEM (\$100,000)
- Distinguished Ph.D. fellowship (\$20,000 annually per student)

Additional Needs:

- Field camp equipment (up to \$10,000)
- Field camp scholarships (\$25,000/yr.)
- Faculty conference support (\$24,000/yr.)
- Graduate fellowships (\$25,000 -- \$40,000 each, annually)



Long-term Commitment Needs:

- Endowed chair in Hydrology
- Department endowment
- Laboratory rebuilds

\$25,000 Bonus

If the department wins the \$25,000 bonus, the funds will be spent on field camp equipment and scholarships

Gift Levels:

\$25 gifts can aggregate to field camp scholarships

\$100 gifts can aggregate to laboratory needs

\$250 gifts can aggregate to fellowships and faculty support

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.

AAPG Recreational Ice Skating Outing



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Josh Payne, Lauren Bane, Jacquie Colborne, Ruth Weimer, Bob Wiemer, and Steve Sonnenberg during a tour of the Bob Wiemer Geology Trail