GEOLOGY & GEOLOGICAL ENGINEERING

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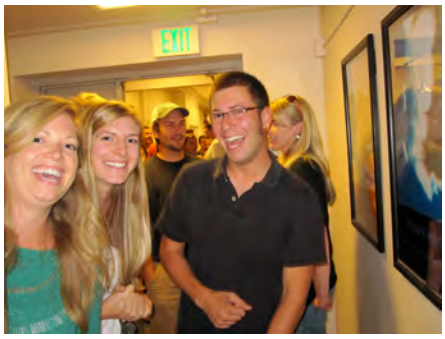
COLORADO SCHOOL OF MINES
EARTH • ENERGY • ENVIRONMENT

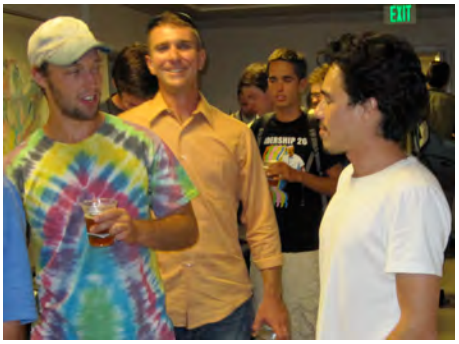
Greetings from Berthoud Hall!



As we welcome the new year of 2013, the Department extends to you our most sincere greetings and warmest wishes. It gives us great pleasure to publish and distribute this year's *Newsletter* of the Department of Geology and Geological Engineering. This is our opportunity to share with you the 2012 activities of our highly active and engaged faculty, students, and staff. As you'll read in this *Newsletter*, we've had another exceptional year and we're proud to show it off in this issue! There have been some exciting changes in the Department and the School, as you will see.

What we do in the Department continues to be in very high demand. As we have seen for the past few years, the Department continues to grow, with record-high student numbers. For the first time ever, we have over 200 graduate students enrolled and about 150 declared majors in our sophomore, junior, and senior classes. This puts stress on our physical space here in Berthoud, as well as impacts teaching loads. However, Berthoud Hall is bustling, and it's nice to have the problem of too many students, rather than too few! For graduate study, we typically get on the order of 250 applicants; about 40 new grad students chose to study with us this year. We are seeing similar or greater applicant numbers this year. Overall this means quality continues to increase; our graduate students are the cornerstone of our departmental research efforts.

The continued interest in the Department, and in the geosciences and geoengineering in general, is likely the result of increased awareness of just how important the Earth and its resources are for today's globally integrated society. Colorado School of Mines is strategically positioned to answer society's call for rational scientific analysis and politically and socially adroit engineering solutions. Of course, the School's focus areas of Earth, Energy, and Environment place Geology and Geological Engineering at the forefront of the School's efforts.



It seems like every year brings changes to our staff. For a present "snapshot" at the end of 2012, we have 18 academic faculty, 11 research faculty, 2.3 teaching faculty, and 7 support staff. Graham Closs completed his transitional appointment and is now fully retired (but still teaching for us this Spring semester). John Curtis continues on his transitional appointment. In a high-profile position for the Department,

Wendy Harrison accepted the position of Director for the Division of Earth Sciences at the National Science Foundation. Significantly, we welcomed three new faculty starting the beginning of this academic year. Dr. Kamini Singha (hydrogeology) joins us as a tenured Associate Professor – she was previously at Penn State, and we're delighted to have lured her to the Rockies. Dr. Alexis Sitchler (aqueous geochemistry) joins us as an Assistant Professor. Alexis is one of our own, having obtained her Master's degree here before gaining her Ph.D. at Penn State and completing post-docs at University of Wyoming and CSM. Dr. Elizabeth Holley (economic geology) completed her Ph.D. here in the Department and joins us as an Assistant Teaching Professor. Elizabeth will help build the Professional Master's program in Mineral Exploration. Please join me in welcoming all three to the Department! Note that our last four faculty hires have been women, helping to support our significantly higher percentage of female students than the School as a whole.

In the spring, Piret Plink-Bjorklund was awarded tenure and Chris Shorey was promoted to Teaching Professor. Congrats to them both!

The Department faculty and staff continue to work to make Geology and Geological Engineering at CSM a pillar of excellence. We are ranked as the 25th best graduate geoscience program in the nation by "US News & World Report". Research funding for the Department was again very strong for the year, with awards of over $5.0M. There are very active research groups and industry consortia that bring strong recognition to the Department.

As the School has continued to grow, so has the challenge in managing the enterprise. Just over a year ago, the School put a college structure into place. Geology and Geological Engineering is part of one of three colleges – we are the College of Earth Resource Sciences and Engineering, along with five other departments/divisions. As you might expect, we are teamed with the Departments of Geophysics, Mining Engineering, and Petroleum Engineering. Added to this "Earth-oriented" group is the Division of Liberal Arts and International Studies (strength in water and energy policy) and the Division of Economics and Business (strength in mineral and energy economics). We're excited about the prospects of the new college. Dr. Ramona Graves, former Department Head of Petroleum Engineering, is now the Dean of the new college. Look forward to future reports and news from this partnership.

As for me, I continue on as Department Head and am now in my seventh year in this position. It is truly an honor to represent this fantastic Department. I greatly appreciate the tremendous help I get from Debbie and Marilyn – we all know who really runs this place. In a move that frightens us all, Marilyn will be retiring from CSM this summer, after 40-plus years of dedicated service. She is the longest standing classified staff member at CSM!

The Department is on sound financial foot, due in large part to the continued support from you and your companies. While the administration has needed to cut budgets for the departments, Geology and Geological Engineering has made up for those cuts with your generous donations. All of us in the Department wish to extend our gratitude for your generosity and belief in our efforts.

The Department is strong and sound and, as you'll read in this issue, many exciting developments are underway. Please accept my best wishes to you and your families for a safe, healthy, and prosperous New Year. Please also continue to maintain your ties with the Department – we love to hear what our alums are up to! I encourage you to send us comments, suggestions, or just a friendly email. And please come visit us when you can. All the best from all of us at the Department of Geology and Geological Engineering.

John D. Humphrey
Department Head

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Department News

Elizabeth Holley

I'm delighted to join the Economic Geology program as teaching faculty. I recently completed my doctorate in a collaborative arrangement between the University of British Columbia and Colorado School of Mines. My research focuses on hydrothermal fluid evolution in the porphyry-epithermal environment, and the solubility and surface chemistry of sulfide and sulfate minerals. I find teaching very rewarding, and I'm looking forward to working with CSM students in the classroom, the lab, and the field. My primary role is to further enhance the existing Professional Master in Mineral Exploration degree program, and I will be developing several new courses which will be available to these students and our traditional thesis-based graduate students in the coming years.

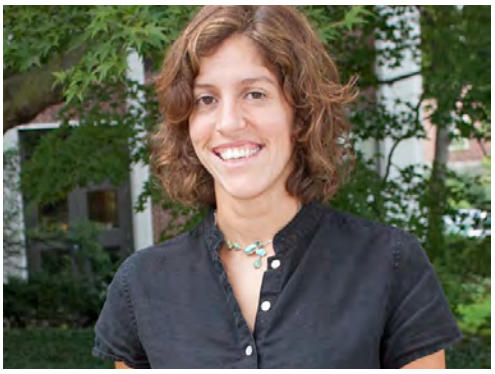
After completing my MSc at the University of Otago in New Zealand, I spent several years exploring for mineral deposits all over the world. In my encounters with geologists from soil sampling camps in the jungle to drilling programs in the outback, I observed a strong demand for enhanced higher education opportunities in our field. Mineral exploration is a science and an art, and the best successes come from a combination of practical experience and a thorough understanding of geologic processes and exploration techniques. There are very few degree programs designed for industry professionals, and the CSM Professional Master in Mineral Exploration fills a much-demonstrated need. This non-thesis program is designed to be completed in one year of full-time study or two years of part-time study, with a combination of regular graduate courses and modular courses designed specifically for the needs of working professionals. Students can take courses in our Department, as well as in Chemistry & Geochemistry, Economics & Business, Geophysics, Metallurgical & Materials Engineering, and Mining Engineering. We strongly encourage students to complete an independent study research project as a component of the degree.

I also serve as the coordinator for the Society of Economic Geologists education and training program, which offers workshops, short courses, and field trips for students and industry professionals. The SEG headquarters and conference center are located in Littleton, about twenty minutes from campus. Through collaboration with SEG, I aim to make this educational content more available to CSM students. Earlier this semester, eight students in my CSM course "New Developments in the Geology and Exploration of Ore Deposits" were able to attend a lecture series on sediment-hosted Pb-Zn deposits at SEG. My students were in the midst of writing research proposals on a related topic, and by engaging with leaders in the field and examining a world-class sample suite at SEG, they were able to hone their research ideas and greatly improve their proposals. Stay tuned for further opportunities for CSM students!

I'm looking forward to giving back to the Department and to our profession by expanding the SEG professional development program and our CSM Economic Geology offerings in the coming years, and I welcome your inquires about both programs.

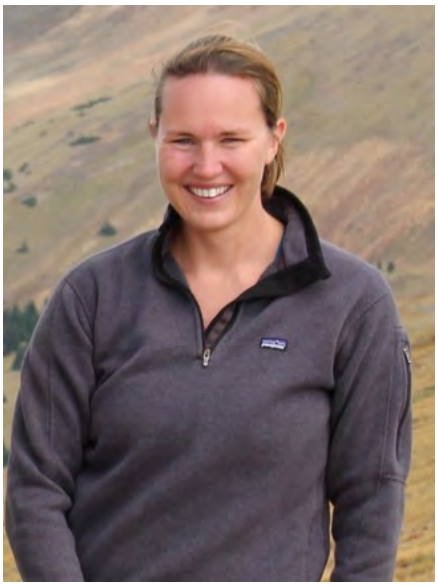
Kamini Singha

It's a pleasure to join the faculty here at Mines. I'm somewhere between a hydrogeologist and an environmental geophysicist, and happily wear both hats. I work on a variety of topics, including determining the operation of parameters controlling fluid flow and solute transport in porous media, fractured rock and groundwater-surface-water interactions. I enjoy working with others, which has led me to work on some fun projects, including disease associated with water quality degradation in Ghana and imaging moisture dynamics in desert ecosystems, and I'm starting new work with colleagues here in CO exploring changes in the hydrologic cycle after fire. I arrived here last August, after seven years on the faculty at Penn State University, and moved here to be part of the truly outstanding Hydrologic Science and Engineering program, which has grown significantly over the past few years and is, in my mind, positioning itself to be the very best in the nation.



I grew up on the east coast (New York, West Virginia and Connecticut), the child of a travel agent and a professor of plant science, perhaps determining my future as someone who loved both travel and science. I completed my undergraduate degree in Geophysics at the University of Connecticut, and worked as a field technician for the U.S. Geological Survey for three years during that time. It was at the USGS that I found my love of geophysics as applied to hydrologic problems, which caught my interest enough that I wanted to go to graduate school to ask my own questions. I went to Stanford University, where I completed a PhD in Hydrogeology with Steve Gorelick. I was lucky enough to be hired in the Geosciences Department at Penn State shortly before I finished my PhD, and was tenured there about a year ago. The opportunity to be around 25 other faculty thinking about water was too much to pass up, however, so I recently moved to Mines, and I'm delighted to be part of such a dynamic university with such exceptional students. I'm teaching Groundwater Engineering, which Eileen Poeter taught for many years – it is an absolute delight and challenge to try and fill her shoes – as well as Field Methods in Hydrology. I'm looking forward to developing new courses on data analysis and an honors course on Water in the West. It's also nice to be back in the beauty of the west, and I look forward to a long career here at Mines.

Alexis Navarre-Sitchler



I am so happy to be a part of the Geology and Geological Engineering faculty. While this is my first semester as an assistant professor, this is not my first time being a part of the Colorado School of Mines community. I am an alumnus of the Department of Geology and Geological Engineering where I earned an MS degree in geochemistry prior to earning a PhD at The Pennsylvania State University. I came back to Colorado School of Mines because of the ability to reach across disciplines and departments to do amazing research and for the opportunity to teach geochemistry to amazingly smart undergraduate and graduate students!

I spend my research time investigating the stability of minerals in the presence of water through chemical descriptions of water-rock interactions. I am drawn to systems where hydrology and geochemistry are coupled and have found an incredible group of colleagues in the Hydrologic Sciences and Engineering Program. I use a variety of advanced characterization tools and numerical reactive transport models to investigate water-rock interactions in experimental and field systems. My research has taken me to weathering granite in the Sierra Nevada Mountains, basalt outcrops in Costa Rica, state of the art isotope laboratories in France, and experimental nuclear reactors in the US where I bombard rocks with neutrons to learn about their internal pore structures. I love my job!

My husband and I love to spend time outside with our son, Isaac, and when not in my office or lab, you can find me hiking, running, biking, or skiing in the mountains or bbq'ing in my backyard with family and friends!

Student Numbers

Total Undergraduate = 146

Female = 63

Male = 83

Total Graduate = 201

Ph.D. – Female = 18; Male = 30

M.Sc. – Female = 39; Male = 98

Professional Master – Female = 4; Male = 12

Engineering Geology and Geotechnics

Paul Santi, Jerry Higgins, and Wendy Zhou

It's an exciting time to be involved in engineering geology and geotechnics! Companies are hiring, offering a huge array of interesting projects and, like the rest of the department, our program is bursting with students at the undergraduate and graduate levels, and our research programs continue to receive strong funding support from agencies and industry. Drs. Jerry Higgins, Wendy Zhou and Paul Santi continue as full-time faculty, and Dr. Keith Turner (retired) continues his active involvement with the program.

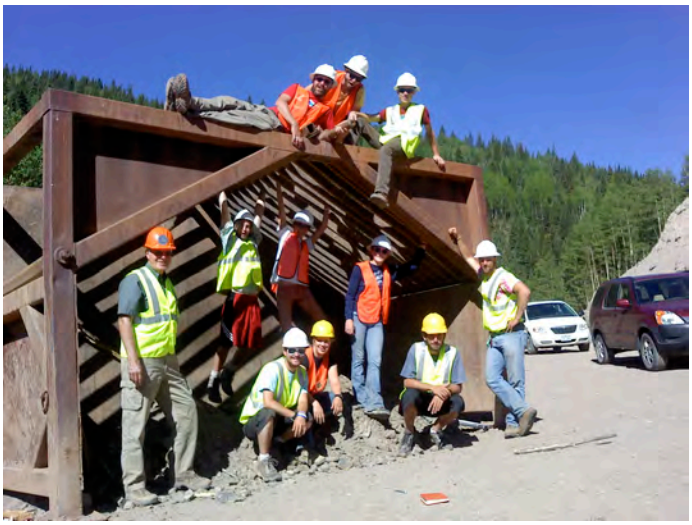
Dr. Santi continues to focus the bulk of his research on debris flow analysis and mitigation. Two recent projects include minimizing the social and economics impacts of post-wildfire debris flows, sponsored by the National Interagency Fire Center, and analyzing the role of wildfire and debris flows at the Great Sand Dunes National Park, sponsored by the National Science Foundation. His Ph.D. students are Joe Gartner (working on debris flow prediction and planning, with support from the USGS), Holly Brunkal (integrating climate change and peak debris flow rate prediction with the design of drainage brake systems), and Kevin McCoy (working on the NIFC project). MS students include Evan Friedman (working on the Sand Dunes project, now graduated and employed by Hach Mott MacDonald), Casey Dowling (compiling and analyzing geologic and socioeconomic parameters related to debris flow fatalities), Ian Donovan (probabilistic prediction of debris flow volumes), Mack McClain (effects of decaying root strength on slope stability in areas of wildfire and beetle kill), and Chris Pederson (rapid field assessment of post-wildfire debris-flow hazards). Dan Pratt is finishing his thesis on a Landslide Hazards Rating System for CDOT and expects to graduate in May. Santi also advises two students in the Hydrologic Sciences and Engineering MS program: Michael Sweetenham (modeling precipitation, percolation, and ground-water flow in the design of shallow tunnels) and Blaire MacAulay (water balance of post-wildfire debris flows).

Dr. Santi has been elected as the 2012-13 Secretary for the Association of Environmental and Engineering Geologists, which begins a five-year commitment as an officer in the Association. He serves as the department representative to the new Center for Underground Construction and Tunneling on campus, and he is one of the organizers for an NSF-funded workshop to be held at CSM on integrating geosciences into engineering curricula.

Dr. Higgins has been busy this past year teaching the senior-level Engineering Geology and Geotechnics and Geological Engineering Design courses and the graduate-level Landslides and Advanced Engineering Geology courses. He was also involved with writing the "self-study report" submitted to ABET, Inc. last summer and organizing the program inspection visit in October.

Dr. Higgins' research group finished two projects in 2012 and a new group of students are beginning new projects. Chris Leibli (ME) completed a project supported by the USACE Risk Management Center on an assessment of the Castlewood Dam failure using a

Erik Swanson, Nate McClain, and Dan Schur prepare to map after a long morning of picking rice.



Field Camp Week 6 engineering geology students relax on a grizzly screen for separating rockfall material to be hauled near Silverton, CO.

quantitative analysis of scour induced failure. Arun Parsons (MS) completed a site investigation manual for the Federal Highway Administration. Lindsey Margolies (ME) is currently adding some additional chapters to the manual. Brett Arpin (MS) is working on rock fall barrier testing standards funded by the NCHRP in cooperation with Yeh & Associates in Denver. Former Ph.D. graduate, John Lupo (Director of Geotechnical & Hydrological Engineering for Newmont Mining Corporation) is working with our group coordinating projects for three students. Carlos Hernandez is developing a geological model of the Carlin Formation for a deep, open pit mine in Nevada. Paige Cybulski is evaluating the rockfall hazard and evaluating mitigation schemes for a 700m highwall at an open pit mine. Mason Kreidler is evaluating the feasibility of several slope stabilization schemes in a deep, open pit mine.

Dr. Higgins has served another year as the chair of the Landslide Working Group and as a member of two additional committees for the Association of Environmental and Engineering Geologists. He also serves as an ABET accreditation evaluator for geological engineering and applied geology programs.

Dr. Zhou is currently advising six graduate students. One of her Ph. D. students, Matt Minnick, is working on a DOE funded project entitled "GIS- and Web-based Water Resource Geospatial Infrastructure for Oil Shale Development," focused on the Piceance Basin in northwestern Colorado. The products of this project include a relational geodatabase for various data sets related to oil shale development, a 3D geological model, a WARMF surface water model, a MODFLOW groundwater model, a dynamical system model, and a web-GIS mapping site. Ph. D. student Eric Anderson is completing geological analysis of aeromagnetic signatures to aid in exploration of the world class Pebble porphyry deposit in southwestern Alaska (with support from USGS). Ph. D. student Ben Lowry is working on high resolution displacement monitoring of a slow velocity landslide in Granby, CO using ground based radar interferometry, and he is also using ground-based LiDAR and radar at the IJkdijk facility in the Netherlands to test levees/dikes and to develop sensor network technologies for early warning systems. His research is part of the NSF funded SmartGeo program. He is also working as an intern at the UNAVCO, a non-profit university-governed consortium, which facilitates geoscience research and education using geodesy. M.S. student Jordan Garrett is working on landslide susceptibility analysis of Western Colorado Springs using GIS. M.S. student Jake Massey is assisting Groundwork Denver (GWD) in developing a comprehensive watershed plan and assessment for the Lower Bear Creek Watershed.

Dr. Zhou had one M.E. student, Elif Acikalin, graduate in the summer of 2012, and she also added one new M.S. student, Ben Haugen, to her group. Ben's thesis topic is still to be determined. One possibility is to work on the newly funded NSF PIRE project entitled "Advancing Earth Dam and Levee Sustainability through Monitoring Science and Condition Assessment." There are four research goals in the project. Dr. Zhou is a Co-PI of the project and is in charge of Goal 2 (Use Remote Sensing to Investigate Sustainable EDL Interaction with Natural Environment) and overall data management of the project.

Finally, our graduate students have presented their research at several national meetings, including the 2012 AEG Annual Meeting in Salt Lake City (Elif Acikalin, Casey Dowling, Evan Friedman, Kevin McCoy), and at the 2012 Oil Shale Symposium and the 2012 AGU fall meeting (Matt Minnick). We also cleaned up on awards once again: undergraduate Hayden Fischer received the AEG Beardsley-Kuper Field Camp Scholarship, and Brett Arpin and Casey Dowling won AEG Stout Scholarships.

Hydrology

Dave Benson

The hydrology group within Geology and Geological Engineering had two new hires this year: aqueous geochemist Alexis Navarre-Sitchler and hydrogeologist Kamini Singha.

Newly hired hydrogeophysicist Kamini Singha (Ph.D. 2005 from Stanford University) is an associate professor who comes to us after seven years as a professor at Penn State University. Her research contributes to understanding of hydrologic processes by integrating geophysical techniques, hydrologic tools, and mathematical simulation, allowing the development of improved predictive models. Her theoretical work concentrates on quantifying the "geophysical footprint," or the impact of spatially and temporally varying measurement physics, on using geophysical data to constrain the operation of parameters

NEW EQUIPMENT

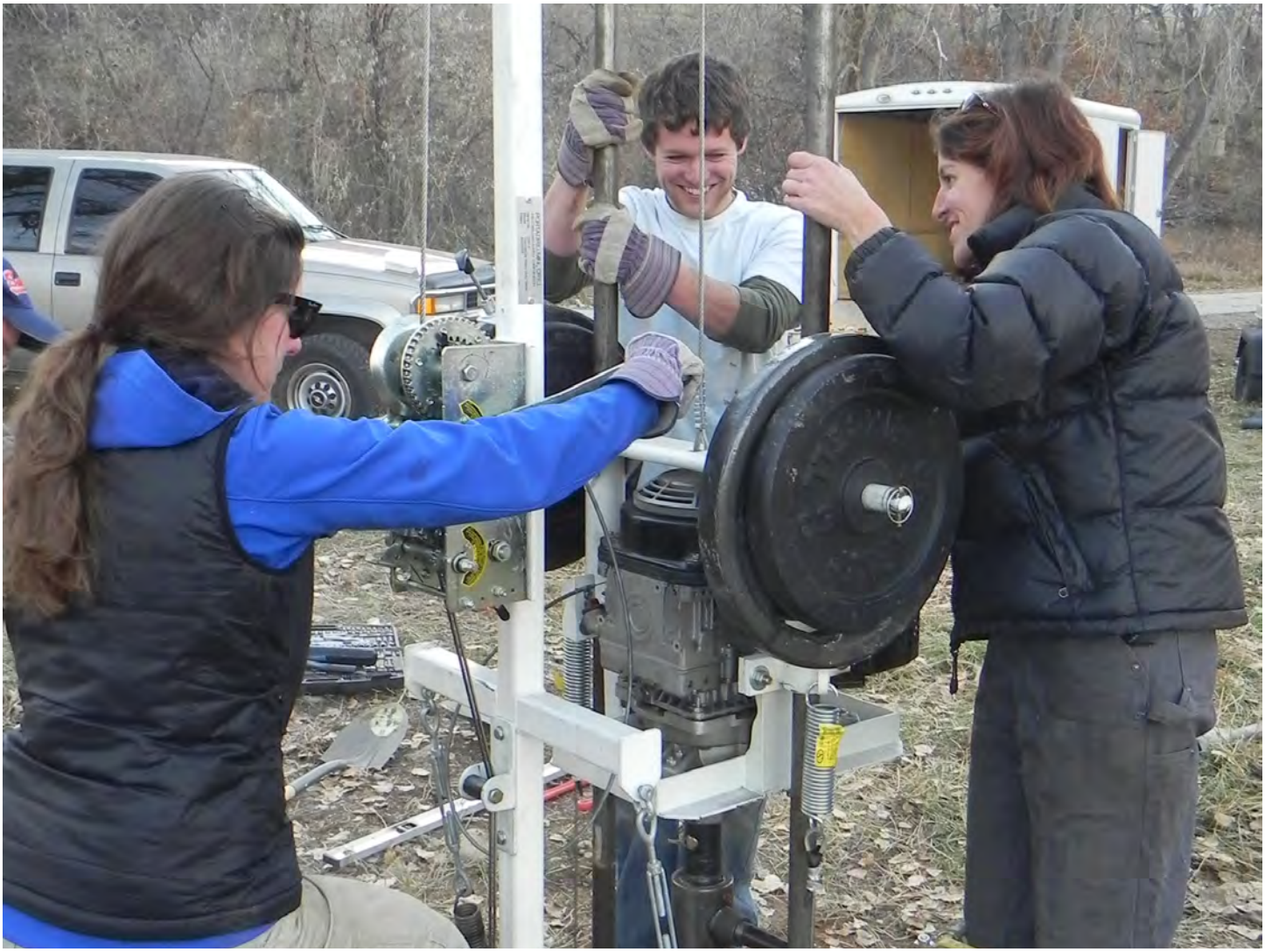


Figure 1. New portable rotary drill rig operated by (L-R) Jackie Randell, James Priestly, and Kamini Singha.

controlling fluid flow and solute transport in a variety of settings. She explores processes associated with fluid flow and contaminant transport in porous media and fractured rock as well as groundwater-surface-water interactions. She has also collaborated on a variety of multidisciplinary projects, including linking water quality degradation and human behavior, imaging moisture dynamics in desert ecosystems, exploring changes in infiltration after fire, and quantifying kinetics of iron reduction given electrical measurements.

Dr. Singha and her research group (PhD students: Ryan Swanson and Katy Gerecht; MS students: Anthony Actis, James Bethune, Emmanuel Padilla, Rachael Pinkoski and James Priestley; Research Associate: Jackie Randell) are developing new collaborations and field sites with their recent move to Colorado in August. Besides carrying forward their previous research from Penn State, they've started new projects imaging acid mine drainage issues at Peru Creek (with CSM and USGS collaborators), exploring changes in the hydrologic cycle associated with the Four Mile Canyon Fire (with CU collaborators),

and drilling in the Boulder Creek Critical Zone Observatory (with CU collaborators). They're particularly excited about a portable drill rig they've purchased, which rolls into place with 4 or so people and can be operated single-handedly on a very small footprint (Figure 1), which allows them access to sites where traditional drill rigs can't travel. The rotary rig supports air, water, or mud circulation and so far has seen

Figure 2. Alexis Navarre-Sitchler (L) and student Katie Mouzakis (R) getting beam time at Oak Ridge National Laboratory studying porosity changes to shale caprock under CO_2 injection conditions.

action in the Mines well field near the football stadium and at a National Science Foundation site above Boulder.

Dr. Singha began her teaching at Mines last Fall by taking over Eileen Poeter's venerated Senior-level class "GEGN 467: Groundwater Engineering" with a terrific response from the students.

Newly hired aqueous geochemist Alexis Navarre-Sitchler (Ph.D. 2008 from Penn State University) is an assistant professor who completed postdoctoral research appointments at the University of Wyoming and in Civil and Environmental Engineering at Mines. Her research is focused on understanding processes that control the geochemical evolution of geological systems through integration of observation, experiments, and numerical simulation at multiple scales. She integrates reactive transport modeling and characterization of natural materials using multiple techniques including X-ray diffraction, scanning electron microscopy, neutron scattering (Figure 2) and X-ray computed tomography to investigate how hydro-geochemical coupling impacts solute fate and transport and long-term evolution of rock chemistry and mineralogy in geochemically active systems. Her multidisciplinary projects include studies of storage and sequestration of carbon dioxide, pore network evolution with geochemical reaction, and extrapolation of laboratory geochemical data to field systems. Alexis Navarre-Sitchler has students working on a variety of multi-disciplinary projects ranging from studies of geochemical aspects of CO_2 sequestration to hyporheic zone biogeochemistry. She recently led a field trip to the Old Rifle (CO) uranium processing site (Figure 3), where she, Reed Maxwell, and co-workers at Lawrence Berkeley National Laboratory are working on the geochemistry and transport of uranium and arsenic among other compounds.

Alexis Navarre-Sitchler has HSE students working on a variety of multi-disciplinary projects ranging from studies of geochemical aspects of CO_2 sequestration to hyporheic zone biogeochemistry.

Reed Maxwell and his research group (Post-docs Nicholas Engdahl, Sonya Lopez, Brian Kirsch; PhD Students John Williams (grad. Fall 2012), Adam Atchley, Steven Meyerhoff, Erica Siirila, Lindsay Bearup and Laura Condon (grad. MS Fall 2012); MS Students J. Joe Beisman, Michael Sweetenham, Colin Penn, Kimberly Bandy-Baldwin (grad. Fall 2012), Sophia Wolfenden (grad. Fall 2012) and William Loopesko (grad. Fall 2012) continued a wide range of topics that broadly fit into the theme of "integrated watershed-scale modeling." Dr. Maxwell's group published 14 papers in high-eschelon peer-reviewed journals. Dr. Maxwell was a principal or co-principal investigator on four new high-profile grants from the National Science Foundation (NSF), Department of Energy (DOE) and the U.S. Geological Survey (USGS):

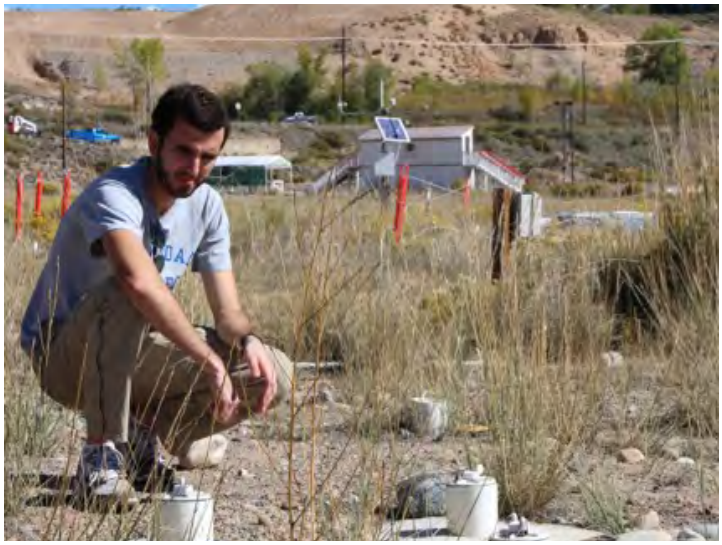


Figure 3. Rodrigo Prugue checking the dense well placement at the Old Rifle site.

Water Quality and Supply Impacts From Climate-Induced Insect Tree Mortality and Resource Management in the Rocky Mountain West, WSC-Category 2 Collaborative grant from the NSF Water Sustainability and Climate Program, $2.9M with Colorado State University.

Integrative Graduate Education and Research Traineeship: Climate Change, Water and Society, NSF IGERT program, $3.2M with U.C. Davis.

Water Quality Impacts of the Mountain Pine Beetle Infestation in the Rocky Mountain West: Heavy Metals and Disinfection Byproducts, NIWR/USGS National Competitive Grant Program, $140K.

Coupling of PARFLOW and CrunchFlow for High Resolution Reactive Transport Modeling of Variably Saturated Flow, US DOE/ LBNL $126K.

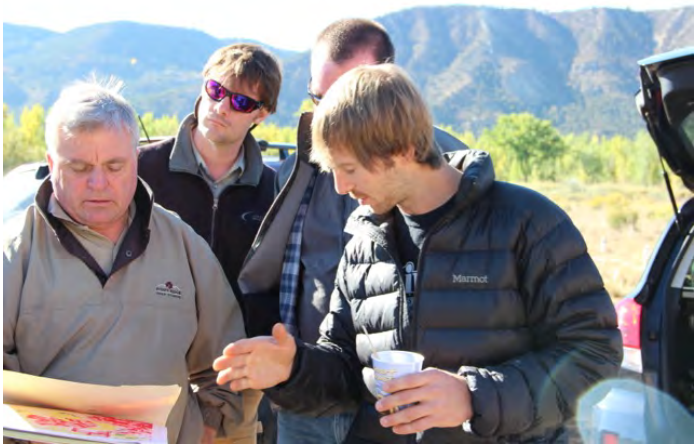
David Benson and his research group (PhD student Dong Ding, MS students Arianne Dean (MS 2012), Hamed Ibrahim, Morgan Stumb, Joel Barber) continued work on projects as varied as the fundamental mathematical physics of mixing-limited chemical reactions; anomalous contaminant transport at the laboratory- to the field-scales; and the performance of generic evapo-transpiration storage landfill covers for the State of Colorado.

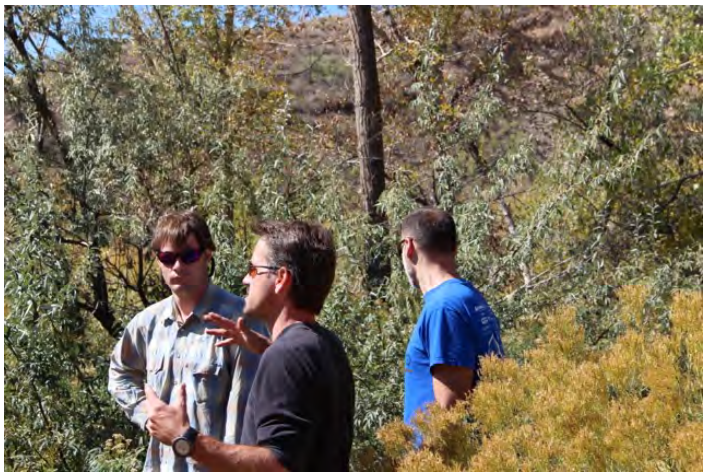
Several of the students were supported by Benson's NSF grant "Collaborative Research: A Comparison of Local and Nonlocal Transport Theories."

As Director of Mines' Hydrologic Science and Engineering Program, Dr. Benson also supervises another 15 non-thesis Master's students.

Reed Maxwell and Dave Benson with a few of the Fall 2012 Hydrology Graduates. Group on the left: Reed, John Williams, Bill Loopesko, Ryan Tolene, and Sophia Wolfenden. Group on the Right: Dave, Kim Bandy-Baldwin, Blaire MacCauly, and Dan Weathers

Field trip to Rifle Field site. Below left Adam Atchley and Joe Beisman and below right Adam Atchley and Reed Maxwell in discussions with Lawrence Berkeley National Lab staff members discussing hydrogeology of the field site.





Geology Museum Musings

Bruce Geller

Activity in our Geology Museum continues at a rapid pace. My fifth year at the helm of the Museum has seen more change and improvements. I'm proud to announce that we were recently selected by Tripadvisor.com as the #2 ranked tourist attraction in Golden, in terms of visitor satisfaction, out of 28 Golden attractions, and were awarded their Certificate of Excellence. This resulted from the help of our Advisory Council, Student Aids, staff, Friends of the CSM Geology Museum (FCSMGM), donors, volunteers, specimen loaners, visitors, visiting researchers, CSM faculty, administrators, and students who support us in so many ways.

Here is the year in review. Our Advisory Council has met monthly. Among other things, we ratified an optical instruments protocol. Continuing projects include improving our database and cataloguing many new donations in two warehouses.

I have met monthly with our twelve Student Aides. Eight Aides are currently geology majors, and five are women! I've written many graduate school recommendation letters this past year for those who have graduated from our program.

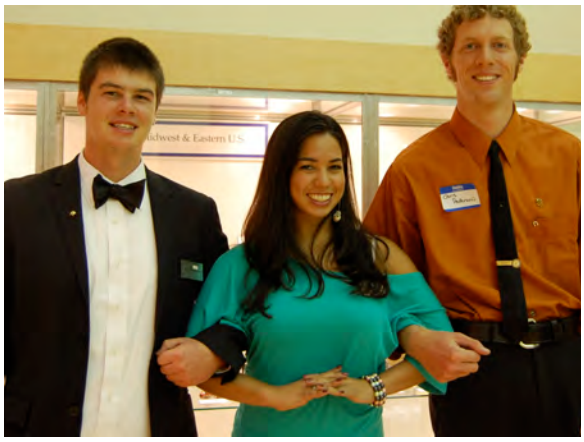
I held weekly meetings with our Collections managers and volunteers. These are the folks who maintain our collection, prepare new displays, and keep our Gift Shop well stocked. Our volunteer ranks have now risen to roughly 52. They created a marvelous display for the Denver Mineral Show last September. As far as I know, this was the first time that a group of museum volunteers has erected a display of their own collections in a major mineral show in North America.

Our facebook fans number 647 (an increase of 34% over last year). Attendance in 2011 (the last complete year we have data for) was up 22%. We had over 20,000 visitors from all 50 states and 62 foreign countries. Gift Shop revenues increased by 34%, donation box proceeds have grown by 35%, and "Friends" memberships have grown by 52%. These results were possibly related to the reprinting and distributing of 20,000 museum brochures through the generosity of Jane and Marshall C. Crouch III. We are also grateful to have received grants from the Golden Civic Foundation and the Greater Denver Area Gem and Mineral Council.

Our support group known as the "Friends of the CSM Geology Museum" now has over 120 members from around the world. They have generously provided several stunning pieces for our collection and became members of the Rocky Mountain Federation of Mineral Societies. The Friends have ratified their new logo, are currently reviewing their by-laws, and are investigating becoming recognized as a 501c(3) organization. During the past year, they ran very popular field trips to the Royal Ontario Museum in Toronto, Marty Zinn's mineral collection, the Henderson Mine, North Table Mountain, Lake City, the Picketwire Canyon dinosaur trackway, and two trips near Socorro, NM in conjunction with the New Mexico Minerals Symposium. They are planning a trip to an undetermined, out-of-town geology museum next year. Friends members receive 20% discounts in our Gift Shop, and an e-mail newsletter. An application form can be found at: http://issuu.com/csmgeologymuseum/docs/friends_app.

Some other tasks that I was involved with since my last communication included processing numerous donations, identifying many specimens, and securing many impressive loans. Our fifth Museum Book Sale combined with our next Garage Sale last February was very well attended. We held a sealed bid auction of 13 high-end specimens that was a mild

Geology Museum Student Aides Neil Pearson and Chris Pederson in foreground at our Annual Open House.



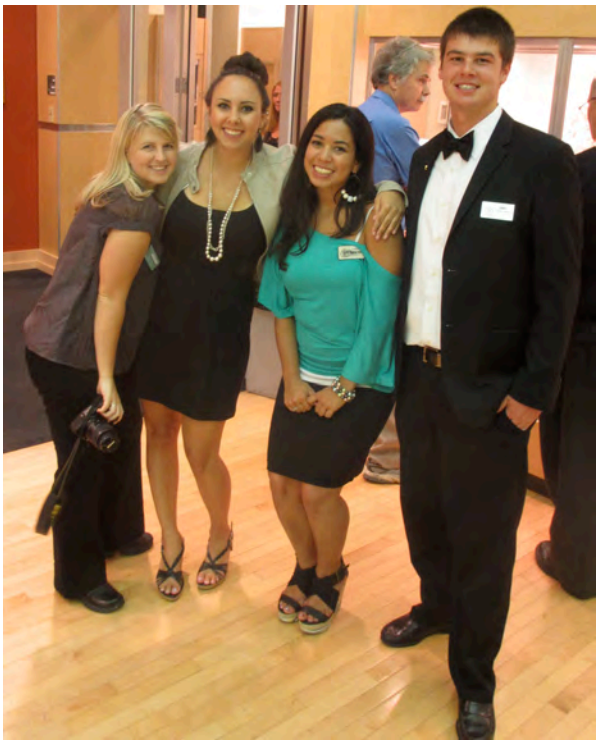
Geology Museum Student Aides Jay Wahlbrink, Amanda Ayala, and Chris Pederson at our Annual Open House.

Geology Museum Student Aides Jenna Lente and Lauren McIver at our Annual Open House.

success. Our geology trail continues to be enjoyed by our guests. We received full ownership of over 8000 specimens given to us in 1965 by the Colorado State Historical Society. An EPICS team of CSM students did a fine job installing new digital controls for our UV display and a remote control device for our tour guides to use. Five of our staff graduated in May, which created many staffing challenges, but some really great rookies have done a fine job as their replacements. I gave a paper in August in Dresden, Germany at an international conference for mineral museum curators, about the people that help run our Museum, which was well received.

Our Annual Open House last September was an overwhelming success. Over 283 guests enjoyed our refreshments, music from the CSM string quartet, and our ten new and three updated exhibits. We are innovatively using a new generation of LEDs in six exhibits. The ten new exhibits include: Vasily Konovalenko's gem carving entitled "Gold Prospectors" on loan from the Denver Museum of Nature and Science, Mexican minerals from Kerith Graeber, Arizona minerals from Les Presmyk, American turquoise from John Haney, Copper minerals from Marty Zinn, Elmwood Mine specimens from Stephen Neely, Chinese snuff bottles from an anonymous collector, Petrified wood identified by specie from Melvin and Bertina Lentz, Self-collected specimens from one of our Collections Managers named Tom Hughes, and Colorado barite specimens from many local collectors. Our three updated exhibits involve fossils, micromounts, and mining artifacts. In late September, I gave two lectures at the Baltimore Micromount Symposium. Our Garage Sale last November 3rd was very popular.

As for upcoming events, we look forward to another combined book and garage sale in February during the week of President's Day. Prices will decrease daily throughout the week. (We gladly accept your book, journal, and specimen donations throughout the year). Our Annual Open House is scheduled for September 11, 2013 from 6 to 9 P.M.



Geology Museum Student Aides Brianna Svoboda, Jenna Lente, Amanda Ayala, and Jay Wahlbrink at our Annual Open House.

In conclusion, I strongly encourage you to visit our Museum. We are located two blocks north of Berthoud Hall at 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. Admission to our Museum is free (donations are greatly appreciated), 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

Economic Geology

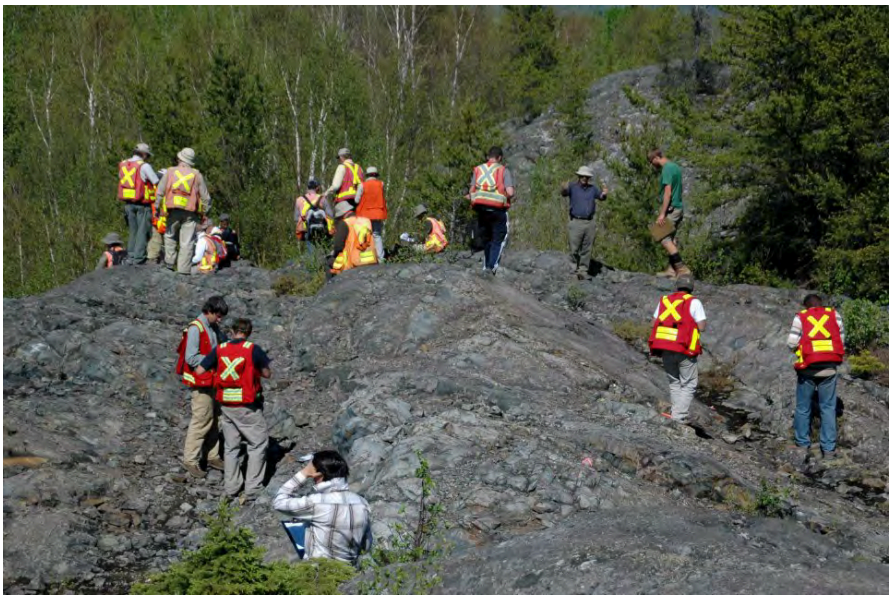
Thomas Monecke, Steve Enders, Murray Hitzman, Elizabeth Holley, Nigel Kelly, Yvette Kuiper, and Katharina Pfaff

It is the time of the year when we all are grading around the clock and reading the theses of students who are trying to graduate before the end of the year. But the end is in sight, and we want to take this opportunity to update you, the alumni and friends of our Department, on recent developments and with what turned out to be an exciting year for the economic geology faculty (Graham Closs, Steve Enders, Richard Goldfarb, Murray Hitzman, Karin Hoal, Elizabeth Holley, Karen, Kelley, Nigel Kelly, Yvette Kuiper, Thomas Monecke, Katharina Pfaff, Jim Reynolds, Stuart Simmons, and Richard Wendlandt). As you may have noticed, a lot of personnel changes have occurred in recent years with some of our senior faculty leaving for retirement and new faculty being hired. The transition is going smoothly. The program is growing, both in terms of faculty and student numbers. Applicant numbers to the program are at record levels. We continued improving our analytical facilities and increased our research volume. We are one of the premier centers of education and research in economic geology worldwide.

Last year, we announced the hire of a new structural geologist, Yvette Kuiper, who replaced Eric Nelson. Yvette hit the ground running and had a very busy and productive summer in the eastern Massachusetts Appalachians and in Yukon, Canada. Field work in Massachusetts was supported by her NSF CAREER grant. The educational part of the project involved a field research course, which was held for three weeks in May. Students learned how to design a project, formulate hypotheses and test them through field work. In Yukon, Yvette and one of her students worked on an industry-funded research project on Canada's only known Carlin-style deposit in the Rackla Gold Belt. She came back excited as the rocks were all complexly deformed and contained gold!

There have been two new hires this year. In January, Katharina Pfaff joined us as the new laboratory manager of the QEMSCAN facility that moved into our Department the year before. Katharina did her PhD at the University of Tuebingen in Germany. She brings with her a strong background in mineralogy and mineral chemistry. Katharina has also worked extensively on carbonate-hosted base metal deposits. Welcome Katharina! The QEMSCAN laboratory she is managing offers fully automated SEM-based analyses that provide quantitative mineralogical and textural data. The instrument contains a custom-built electron-beam platform equipped with four energy-dispersive X-ray spectrometers for rapid and accurate mineral identification. The focus of the laboratory is to provide improved understanding of materials in order to better predict their management, development, and the effective recovery of resources. The laboratory is equipped with a fully operational sample preparation facility that is overseen by Carla Sanchez. Automated state of the art equipment ensures the efficient and safe preparation of a variety of materials, from dust-sized particles to centimeter-sized rocks. Matthew Dye, who is working on a Master of Science project at Cripple Creek, re-joined the team as a part-time lab assistant in October 2012. Next time you are in Golden, you should stop by the Department and get a tour of the QEMSCAN laboratory.

In August, Elizabeth Holley started as a new faculty member. Her primary role is to manage our Professional Master in Mineral Exploration degree program, which is designed for working professionals who want to increase their knowledge and skills, while gaining a thorough up-date of advances across the spectrum of economic geology, mineral exploration techniques, and mining geosciences. Elizabeth has recently completed her doctorate on a collaborative research project between the University of British Columbia and Colorado School of Mines. Her research primarily focused on the hydrothermal fluid evolution in the porphyry-epithermal environment. Read her article in this *Newsletter* to learn more. Let's all welcome Elizabeth to the team!



We continue to build stronger collaboration with the U.S. Geological Survey. Karen Kelley and Richard Goldfarb have become Visiting

Professors in our Department, and they are also involved in the committees of several graduate students.With our new faculty, graduate student numbers in Economic Geology have increased again. At last count, we have ten Professional Master in Mineral Exploration students, twenty-six students pursuing as Master of Science in geology degree, and nine PhD students. Quite a few students graduated this year:

- Sophie Hancock defended her PhD on the geology and geohydrology of the Lost Creek roll-front uranium deposit, Wyoming (supported by UR Energy);

- Elizabeth Holley obtained a PhD for her study on the Veladero high-sulfidation epithermal Au-Ag deposit in Argentina (supported by Barrick);

- Gloria Lopez defended her PhD research on the El Espino iron copper gold district, Coastal Cordillera of Central Chile (supported by Teck and NSF). What a great job she did in finishing up while taking care of her young daughter;

- Elisabeth Easley conducted geochemical analyses at the Waunita Hot Springs in Gunnison County Colorado (supported by the landowner of Waunita Hot Springs);

- Robert Nowak graduated after completion of a thesis on the metamorphosed Izok Lake deposit in Nunavut, Canada (supported by MMG);

- Danielle Schmandt completed her thesis on the stratigraphy and mineralization of the newly discovered, giant Kamoa copper deposit in the Democratic Republic of Congo (supported by Ivanplats);

- Andrew Ritts obtained a MS with his thesis research focusing on the texture and composition of pyrite contained in the mudstone host of the Eskay Creek deposit, British Columbia (supported by Camiro and Geoscience BC); and

- Laura Garchar worked on the geochemistry of a volcanic hydrothermal system at Mount Spurr, Alaska (supported by Ormat and the State of Alaska).

- Before this *Newsletter* goes to print, the following students will defend their thesis:

- Jeffrey Edelen who worked on the geology of the Cerro Jumil gold skarn deposit in Mexico (supported by Esperanza Resources);

- Erik Tharalson who studied the Serpentine Cu-Ni deposit in the Duluth Complex of Minnesota (supported by Encampment Minerals); and

- Tim Stockhausen who studied the Sierra Mojada Ag-Zn deposit in Coahulia, Mexico (supported by Silver Bull Resources).

- Amelia Sterling, Kari Oakman, Michael Lobato, and Judith Hughes graduated with a Professional Master in Mineral Exploration this year. We hope that all of these outstanding students will have successful careers in the mineral industry. Stay in touch!

Some of our students received prestigious awards in support of their graduate studies. Michael Berger, Timothy Gross, Michael Hendrickson, Justin Palmer, and Anne Rahfeld received Society of Economic Geologists Foundation Graduate Student Fellowships. Andrew Ritts was awarded with a Society of Economic Geologists Foundation Research Award. In addition, Anne Rahfeld was awarded one of the highly competitive German Academic Exchange Service fellowships to fund her studies at Mines, which follows on from another prestigious award (Fulbright fellowship) the previous year.

Most of us travelled around the world this year to advise students in the field and gather field data for our own research. Faculty and students presented at a number of national and international conferences, including:

the RoundUp in Vancouver (Thomas Monecke and students from Murray Hitzman's 2011 advanced ore deposits class who presented their original research on Kiruna-type deposits in central Zambia supported largely by BHP Billiton);

the International Geological Congress (Steve Enders, Murray Hitzman, Thomas Monecke, Nigel Kelly);

the Structural Geology and Tectonics Forum (Yvette Kuiper and student Wes Buchanan);

the Gordon Conference (students Harry Hanneman and Mitchell Bennett);

the Society of Economic Geologist's 2012 meeting in Lima (students Eric Anderson, Tim Gross, Harry Hanneman, and Ryan Taylor);

the Geological Society of America Northeastern Section Meeting (Yvette Kuiper and PhD student Ben Frieman);

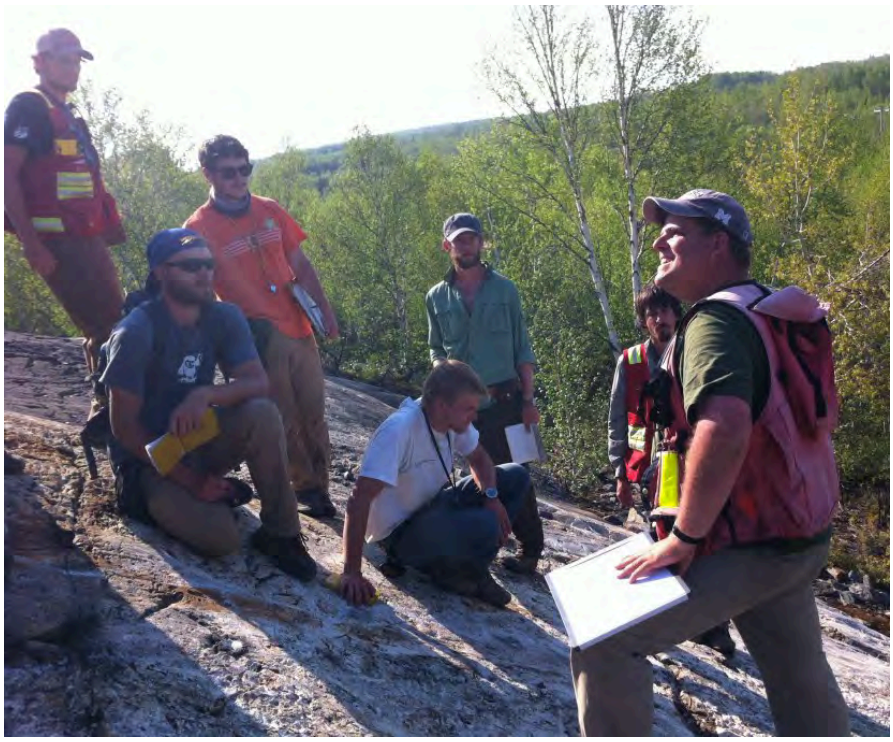
the annual meeting of the Geological Society of America (Murray Hitzman, Nigel Kelly, Yvette Kuiper and students Julie Leibold and Corey Meighan); and the American Geophysical Union (Murray Hitzman).

Murray Hitzman was on leave during the Spring 2011 semester to work in Washington, D.C. on policy issues related to natural resources including critical minerals and induced seismicity of energy technologies. He chaired a report on induced seismicity by the National Research Council that was released in June and then testified on the subject before Congress. Stuart

Simmons and Steve Enders presented a short course on epithermal deposits at the Society of Economic Geologist's 2012 meeting in Lima.

Much of our focus is on training our students and providing them with the right background for successful careers in industry, academia or government. We not only cover a wide range of topics in our classes, but also take our graduate students in the field as much as we can. As in previous years, Thomas Monecke took a group of twelve students to the Abitibi greenstone belt in Ontario and Quebec to learn about Archean geology and metallogeny. This course was financially supported by GoldFields, which allowed students to participate at a very low cost. Thanks to GoldFields for their generous support! See the separate article on the field school in this *Newsletter* for more details. Other highlights include two short courses that were taught in collaboration with the Society of Economic Geologists. In the spring, Mark Hannington from the University of Ottawa and our own Thomas Monecke delivered a short course on the metallogeny of modern and ancient submarine arcs. In the fall, David Leach and Peter Megaw gave a course on sedimentary-hosted zinc deposits. Both courses were a great success, allowing students to learn from the experts on the respective deposit types and to network with professionals participating in the courses. Nigel Kelly developed a new graduate course that taught students all about geochronology and what different techniques they could use as part of their research.

In addition to regular course work, we have a very active student chapter of the Society of Economic Geologists, which was the first student chapter of the Society! Over the past year, the student chapter has invited a number of speakers to the Department to talk about different aspects of economic geology, ranging from fundamental research topics to giving them a perspective on how to raise money on the stock markets to move an exploration project forward. The student chapter organized a highly successful GIS short course this fall to raise funding for a field trip to Columbia taking place early next year. They also visited the Marble Quarry in Colorado as well as Rare Element Resources' Bear Lodge REE project in Wyoming and Goldcorp's Wharf Mine in South Dakota. Read the article in this *Newsletter* for more details.



Thomas Monecke giving a lecture to students on a hill near Noranda, Quebec.

We received an extraordinarily generous donation from Goldcorp with which we will support three undergraduate students in our Department and three undergraduate students in the Department of Mining Engineering. This multi-year commitment for support of our brightest undergraduate students highlights that industry recognizes our efforts to train highly qualified students. We appreciate Goldcorp's generous support of our undergraduate program. Newmont recently committed to a three-year extension of their support of the Center for Innovation in Earth Resources Science and Engineering at Colorado School of Mines, which is directed by Steve Enders. This multi-year commitment facilitates graduate student research on topics ranging from exploration to recovery. Colorado School of Mines simply is the place to do undergraduate and graduate studies!

We have continued to expand and upgrade our analytical facilities. Much of the focus this year was on the Mineral Separation Laboratory that is now equipped for separation of accessory minerals for U-Pb geochronology and/or geochemistry. The first samples have been processed through the lab and zircons and other accessories were successfully separated. The lab includes a jaw crusher, disc mill grinder, Wilfley wet-shaking table, a heavy liquid set-up, a Frantz magnetic separator, and a picking microscope. Undergraduates Robert Duran and Jack Krantz were of

tremendous help getting the lab up and running. We are looking forward to processing many more samples for a wide variety of projects.

In addition, we continue to improve the Ransome room collection. Under-graduate student Alex Borchert worked with Thomas Monecke and Murray Hitzman throughout the year to continue cataloguing donations. At the end of the year, we moved to purchase new rock cabinets with funds from the Fogarty Endowment to better house the collection. The world-class Ransome ore collection is an incredible resource for our teaching and research. We encourage any of you visiting to check it out.

Last but not least, we published some of our research in a number of papers in peer-reviewed international research journals. Here are just some examples to give you a flair of the breadth of research topics we are covering. Murray Hitzman and graduate students published papers in *Economic Geology* on ore deposits in Alaska, Montana, and China during the year. If you want to learn all about recrystallization of the dateable mineral monazite, both at high-temperatures during metamorphism and during hydrothermal alteration, look up a paper by Nigel Kelly and co-authors published in *Chemical Geology*. Thomas Monecke and coauthors published a paper on explosion craters associated with shallow submarine gas venting off Panarea Island, Italy, in the *Bulletin of Volcanology*. What a tough place for field work was that?

We wish you, the alumni and friends of our Department, all the best for the upcoming year! Let's hope the next year will be as productive and inspiring as this one.

Abitibi Field Course

Tim Gross and Justin Palmer

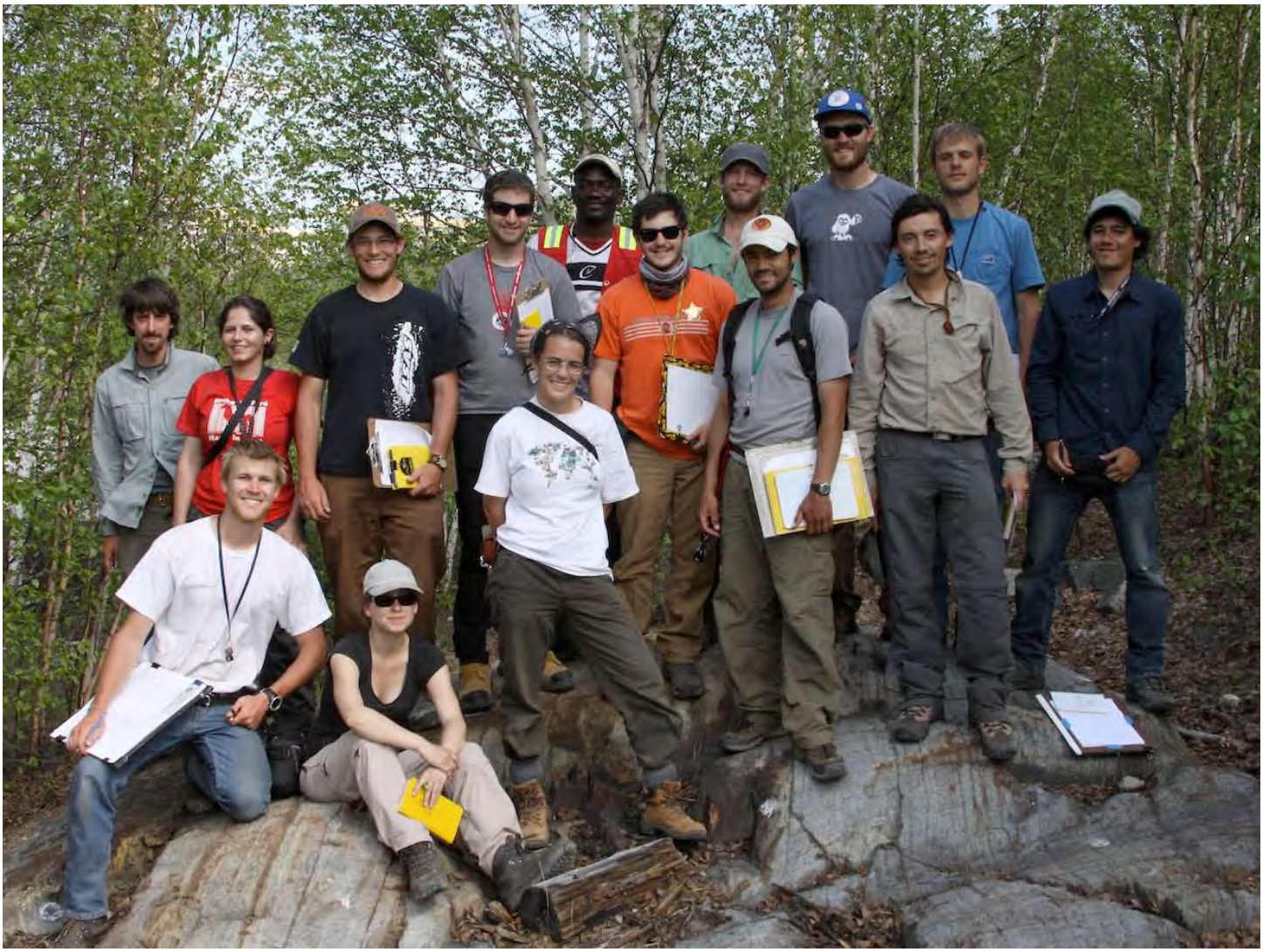
In May 2012, our Department offered a two-week graduate level field school studying the metal endowed Abitibi greenstone belt of northern Ontario and Quebec. Twelve students from CSM, one student from University of Ottawa, and several geologists from GoldFields, the sponsor of the field trip, were given the opportunity to learn about Archean greenstone architecture, volcanic-hosted massive sulfides, and orogenic gold deposits. Professors Thomas Monecke from CSM and Mark Hannington from University of Ottawa, who collectively have over 25 years of experience in the Abitibi belt, led the exemplary field course. Through mapping of key outcrops, logging of exploration drill core, and guided tours of underground and open pit mines, we learned the fundamentals of exploration geology and mine production.

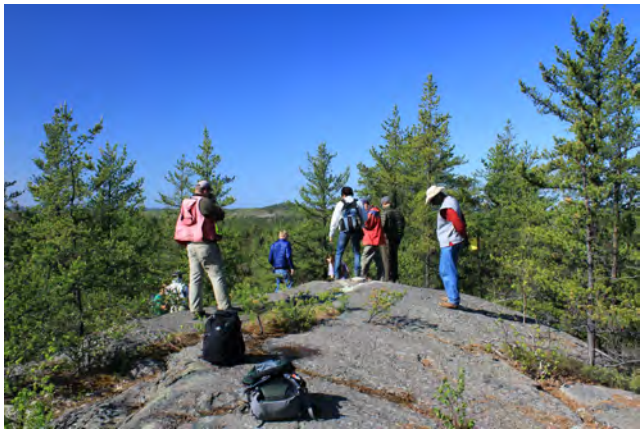
The trip began in the town of Cobalt, Ontario, where we learned about structural controls on the formation of silver veins and how to identify the variety of Archean lithologies present in the region. Next we visited the Timmins gold camp of northern Ontario. With historic and modern gold production totaling 2,150 metric tons, it is the largest known Archean orogenic lode gold camp on Earth. While establishing the camp stratigraphy, we mapped komatiite flows with some of the world's finest spinifex texture and studied ancient submarine volcanic rocks. Moving east, we learned more about the Archean subaerial successor basins in Kirkland Lake and what it means to map some truly deformed volcanic rocks. After escaping a major forest fire, more volcanology awaited us in Rouyn-Noranda where we spent several days mapping the host rock successions of synvolcanic massive sulfides.

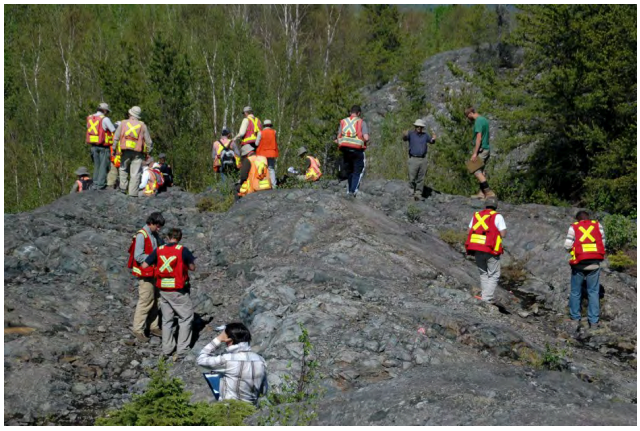
In addition to learning about Archean geology, we had the unique opportunity to visit and study several world-class base and precious metal mines throughout the region. Goldcorp allowed access to their Dome underground operation in Timmins where we practiced mapping structures and lithological units underground. Xstrata Copper organized a core logging exercise, allowing us to establish the mine stratigraphy of the Kidd Creek massive sulfide deposit. Afterwards, we were given a tour and explanation of their open pit and underground operations. We visited the Potter mine and looked at some of the exploration core with David Gamble. Patrick Mercier-Langevin from the Geological Survey of Canada gave a tour of Agnico-Eagle's LaRonde-Penna mine, which included mapping and core logging exercises aimed at teaching us how to discover a gold-rich massive sulfide deposit. Lastly, Osisko gave a tour of their intrusion-centered Malartic deposit, which included a visit to their giant open pit to view operations followed by a tour of their brand new core facilities and a viewing of the discovery core.

We express our appreciation to all of our tour leaders for their time and generous contributions to the field school. Specifically we thank GoldFields, the L'Institut Canadien des Mines, de la Métallurgie et du Pétrole, and the CSM Department of Geology and Geological Engineering for their generous sponsorship of the field course. Without their support this course and learning experience would not have been possible.

ABITIBI FIELD COURSE





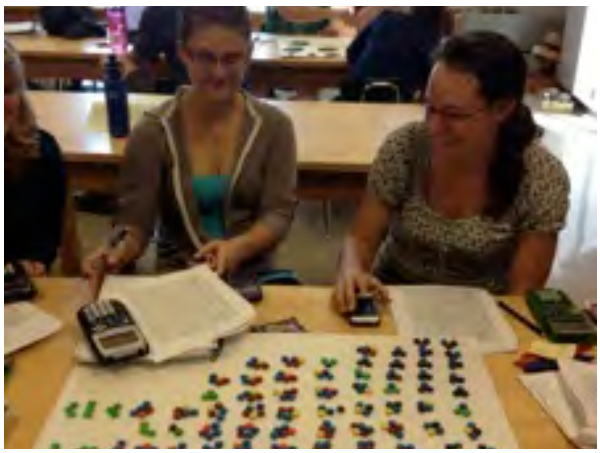


GEGN212

PETROLOGY FOR GEOLOGICAL ENGINEERS

Magma Chemistry

Alexis Sitchler-Nararre's first class Fall semester 2012 was GEGN212 - Petrology for Geological Engineers. In order to give them more hands on experience, she adapted a popular laboratory where the students make magma chambers out of different colored M&M's on a poster board and then step through fractional crystallization of the magma chamber to explore how magma chemistry evolves and influences mineralogy of the crystals that form through time.



Rebecca Borst, left, and Erica Beck, right, in front of the poster board

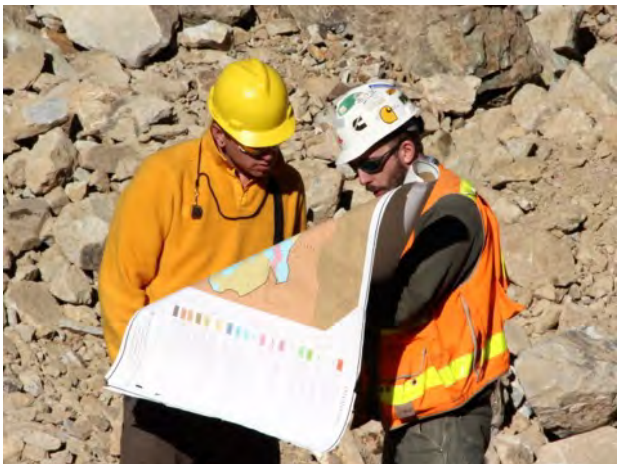
Cripple Creek / Victor Gold Mine

She then took the students to visit the Cripple Creek / Victor Gold Mine where they met with one of the exploration geologists at the mine, Dave Green, and learned about wall rock failure, mine pit construction and stability, and the mineralogy and ore emplacement history of the mine.

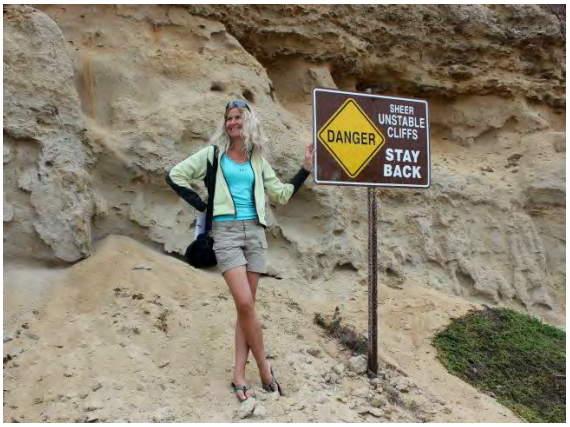
Student Comments

Students in the class appreciate Dr. Sitchler's approach: "The hands-on approach to mineral fractionation helped us understand not only what minerals crystallize first, but also how to apply the theoretical information from lecture. While it was an unorthodox lab assignment, it is certainly one that many of us remember and still talk about!"

"The trip to Cripple Creek Mine exposed students to the importance of good technical engineering in a mine environment. The wall failure reinforced how important sound engineering and mine safety are in any operation. It was certainly an enlightening trip that I would love to do again."



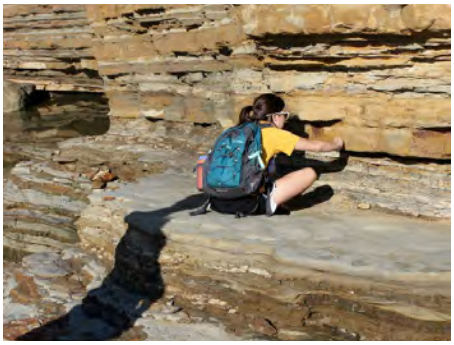
Student Dave Green, left, James Halverson, Exploration Geologist, right



GEOL501 Field Trip to Southern California!

In early October, the Geology 501: Applied Stratigraphy class took a trip to Southern California. The entire trip was very generously sponsored by Statoil. The purpose of this trip was to study turbidite outcrops and tectonic influences on sedimentation as well as modern coastal depositional processes. Dr. Piret Plink-Björklund led the trip. Here is a brief overview of our activities.

Day 1

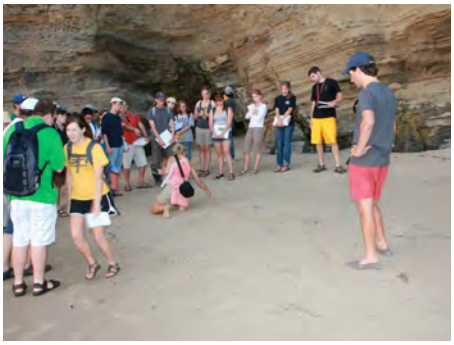


Olivia Oseguera examining grainsize and composition in a distal turbidite fan deposit.

We met at DIA and traveled to LAX without leaving a single person behind! Here we met up with Nathan Weber, a geophysicist from Statoil. After a slight hang up with van rentals, we proceeded to our first stop, the Gatchell Road Beach Cliffs. There we measured sections of a distal turbidite lobe deposit in the Cretaceous Point Loma Fm. We also discussed various trace fossils as the sun began to set over the ocean.

Before we called it a day, we moved a few miles down the beach to the Sunset Cliffs to examine by-pass slope deposits of the Point Loma Fm. After a long day of traveling and geology, the whole group was very ready for chips and salsa and margaritas!

Day 2

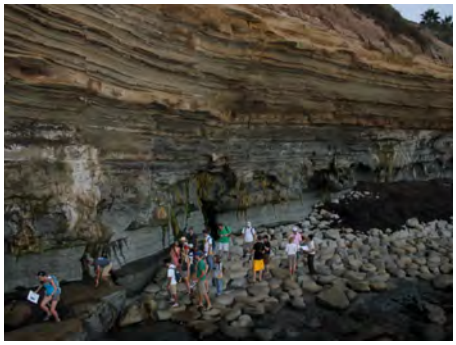


Dr. Plink-Bjorklund explaining sedimentation concepts by drawing diagrams in the sand.

On the second day of the trip we investigated how active margins affect sedimentation. We spent the morning measuring outcrops and describing the architecture of channel facies along San Clemente Beach. After observing immature conglomerate packages and subaerial breccias, we concluded that the processes of deposition are very closely related to the strike-slip tectonics along the Californian coast.

On our final stop of the day, we were able to examine middle fan facies as wells as slumping and soft sediment deformation features along the beautiful coastline in La Jolla, CA.

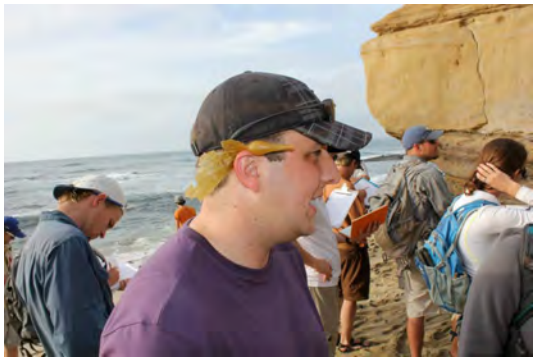
Day 3



Class discussion and debate over by-pass feeder channel deposits.

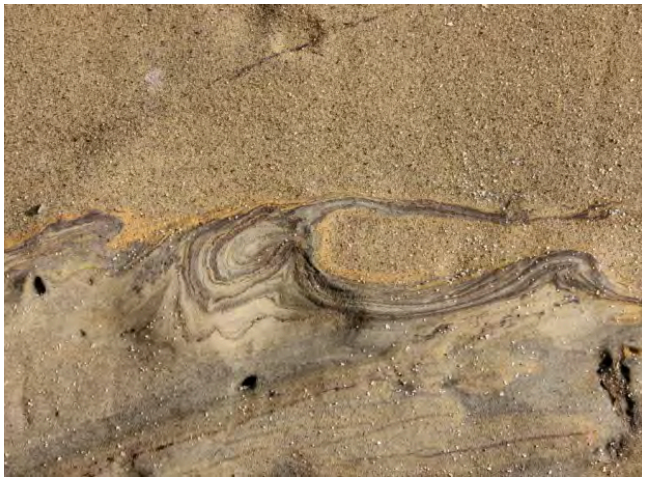
We spent the entire day traversing across Torrey Pines State Reserve. Our first class discussion focused on shoreline facies and lithostratigraphic versus chronostratigraphic correlations. As we proceeded along the beach, we observed facies geometries and lateral relationships. After a lunch break and a quick swim, we observed modern processes in an intertidal environment and seagulls attacking our lunches on the beach! For the majority of the afternoon, we traversed across a nude beach, which was very awkward. Unfortunately, this was the location of some of the best demonstrations of submarine channel infill geometries and facies. Canyons along the beach allowed us to examine a subaerial unconformity, sediment gravity flow deposits, as well as more conglomerates associated with the

active margin tectonics. Our day concluded after observing Miocene dikes just before arriving at the Scripps Institute of Oceanography.



Nick Nelson modeling beach fashion

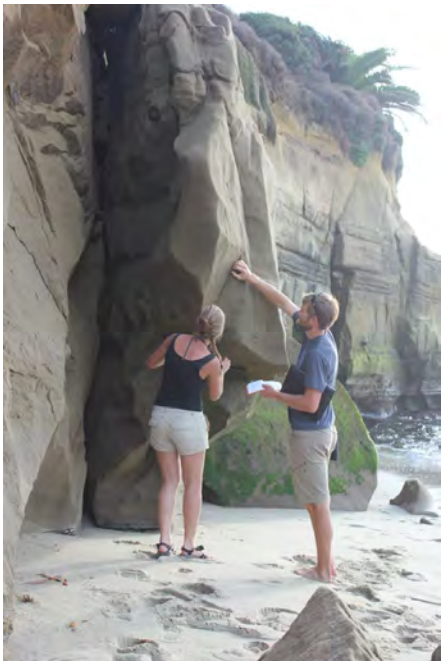
Example of slump features in fan sands



Day 4

Close-up of unusual cross-cutting relationships of channelized facies

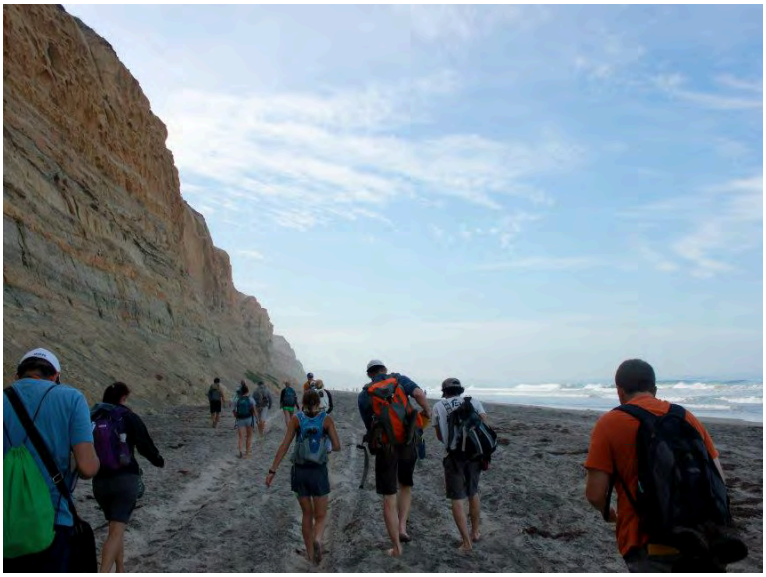
Jena Long and Justin Palmer observing turbidite fan facies



On our last day of the trip, we visited Tourmaline Beach where we took one last look at the turbidite systems we had been studying. We reviewed our trip and discussed similarities and differences between outcrops as well as lateral variability. We reluctantly returned to LAX and made our way back to Denver after a successful trip.

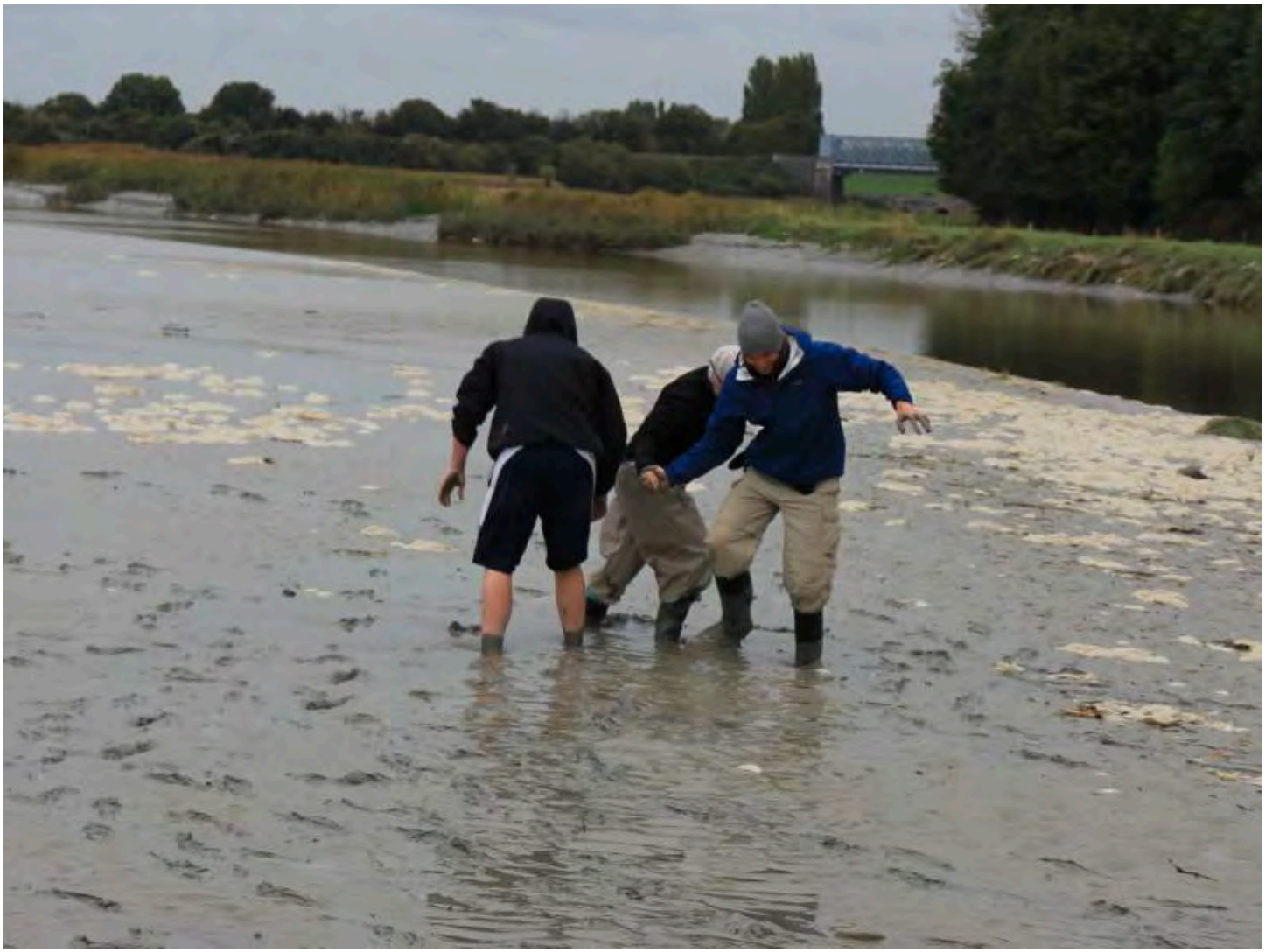
We extend a special thanks to Statoil for making this trip possible and to Nathan Weber for sharing his insights and knowledge over the course of the trip!

Article written by Alyssa Franklin and the GEOL501 class of 2012.



Setting out across the Torrey Pines Reserve

GEOL610 GOES TO FRANCE

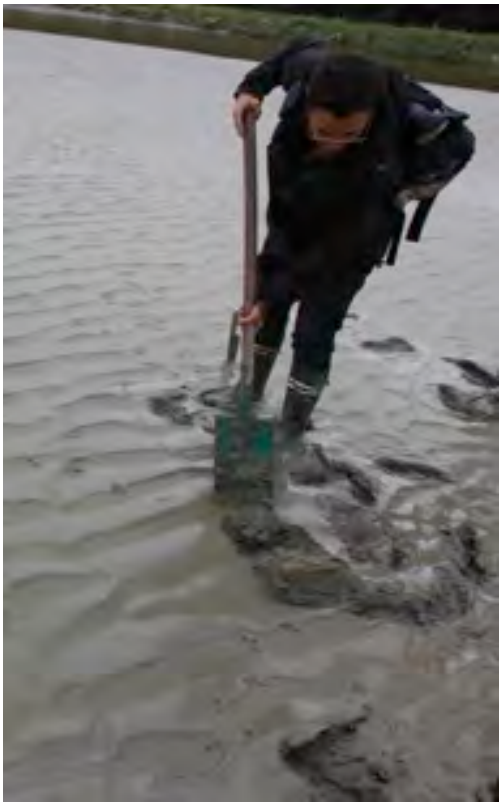


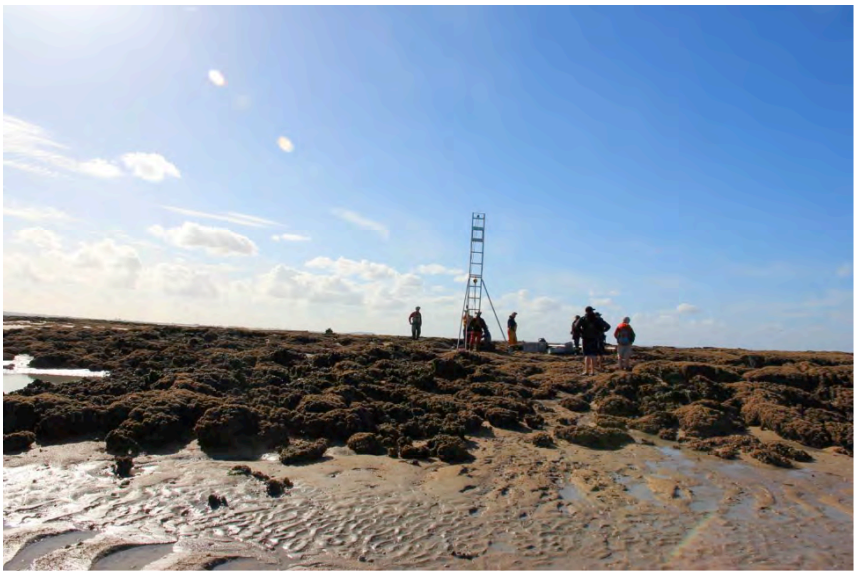
Field Trip to Mont Saint Michel, France

Students of the graduate-level Advanced Sedimentology 610 class had the great opportunity to travel to the Bay of Mont Saint Michel in Normandy, France. Dr. Piret Plink-Björklund instructed the semester-long class and led the field trip. The students were generously funded by Statoil, BP, OXY, Chevron, Newfield, Devon and John Robinson!

The Bay of Mont Saint Michel has the strongest tides in Europe and the second largest tidal range in the world, second only to the Bay of Fundy. The bay contains an aggrading and prograding central tide-dominated estuary flanked by a tide-dominated coast to the west and a regressing wave-influenced to wave-dominated coast to the north.

On their second day in France, the students walked 14 km, traversing the Bay and observing the modern sedimentary processes in the outer estuary tidal bars. They forded tidal channels, braved quicksand, and complained for the next six days that they strained the muscles in their feet walking over multitudes of dunes and ripples. One day was spent

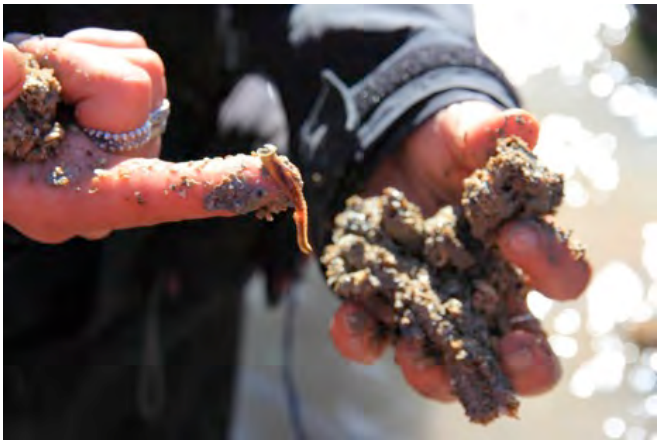




Left: Prof. Bernatette Tessier demonstrates correct trenching techniques

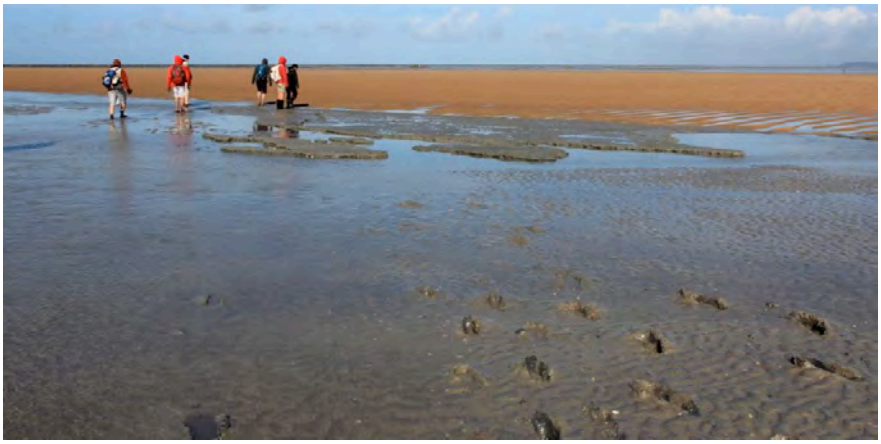
Vibrocoring

observing the back-stepping sand dunes on the northern wave-dominated coast. A day was spent doing several traverses from supratidal to lower-intertidal, moving laterally towards the outer estuary with each traverse. On this day the students had a life-changing encounter with thigh-deep, organic-rich fluid muds (see photo). Other trip highlights included trekking across intertidal sand and mudflats in the outer estuarine environment to observe the worm-built bioherms of the Banc des Hermelles and the rarely exposed oyster farms in the lower intertidal zone, following a tidal channel inland to observe the inner-estuary sedimentary processes, and witnessing a tidal bore.



Above: Annelid worms that build reefs

Doctoral student Evan Jones testified “The trip to Mont Saint Michel gave me a chance to experience different zones of a tide and wave dominated estuary. It is one thing to read about it, but it is something fundamentally different to get to touch it and even be stuck in it. I will never forget the feel of fluidized muds again!”



Petroleum Geology Master candidate Allen Frierson wrote “The Bay of Mont-Saint-Michel offers a geologically-diverse environment that few, if any, other places in the world can offer. Seeing and observing a modern tide-dominated estuary-embayment system helped link these systems to what we observe in the rock record. My favorite day of the trip was walking across the intertidal flats by Chapelle Sainte-Anne to the Banc du Hermelles to see vibrocoring with Prof. Bernadette Tessier (Universite de Caen, Caen, France). Thank you all very much!”

Tidal flats!

Friends of the Department

We gratefully acknowledge contributions and research funding received in the past year from our Friends and Supporters. Contributions include funding, data, software, materials, and access to areas needed for classes and research. Endowed funding continued to show better earnings. Industry giving continued to be strong this past year.

Whether people designate their funds as discretionary or for specific purposes, the funds are used accordingly. Most of the activities highlighted in this *Newsletter* are funded with this money. It pays for field trips connected to classes including vehicle rentals, lodging, and airfare, field camp expenses, classroom materials, lab materials, lab and classroom equipment, software, computer purchases, fellowships, and many other necessities. Many of our supporters enhanced their giving by using their companies' matching gift programs.

The Senior Class Gift competition for 2012 was vigorous. The metrics were percent of class participation and overall dollars donated to the department by the graduating seniors. If you recall, we had 100% of our GE seniors contribute to the Department in 2011. Well, for 2012, we had 97% of our graduating seniors donate to the Department, with a total departmental gift of $1,917! We still beat every other department on campus - by far. President Scoggins matched that gift amount ($2,824) for a total gift to the Department of $4,741.

We are humbled by the dedication, devotion, and selflessness that our seniors have shown toward the Department. The funds were deposited in our Geology Education Fund, which is used in diverse ways to improve the educational experience for our students as stated above. We graciously salute and thank our seniors! They ROCK!!!

Geology Endowment – Three years ago, the Enhancement Committee embarked upon an ambitions goal to build a discretionary endowment fund to support the Department. The school will continually face decreasing State support. We still feel it is imperative to take the funding situation into our own hands to build a secure financial future. We are proactively working toward our goal.

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Whiting Petroleum Corp.
Terril Wilson
Travis J. Wokasch
William D. Zogg

Faculty News and Activities

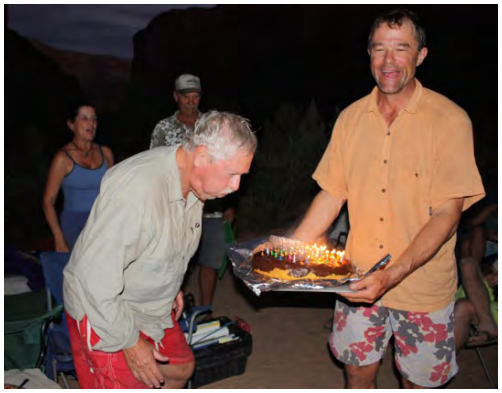
Nigel Kelly was voted Faculty of the Year Award by the Geology and Geological Engineering senior class of 2012.

Kati Tanavsuu-Milkeviciene and **Rick Sarg** received the President's Certificate for Excellence in Presentation (Poster Presentation): EMD Presentation Winners for Long Beach 2012 AAPG Annual Convention – Poster Presentations for their paper: K. Tanavsuu-Milkeviciene, J.F. Sarg, J. Feng, S. Huang, and Y. Bartov, Sequence Stratigraphy, Climate, and Organic-Richness: Green River Formation, Piceance Creek Basin.

Paul Santi has been elected as the 2012-13 Secretary for the Association of Environmental and Engineering Geologists, which begins a five-year commitment as an officer in the Association. He serves as the department representative to the new Center for Underground Construction and Tunneling on campus, and he is one of the organizers for an NSF-funded workshop to be held at CSM on integrating geosciences into engineering curricula.

Steve Sonnenberg is being awarded the Michel Halbouty Leadership award by AAPG in 2013.

John Warme – In late August 2012, Professor Emeritus John Warme led his 50th geologically-oriented trip down the Colorado River in the Grand Canyon, Arizona. Photo shows freshly baked camp cake with 50 candles presented by the crew, with John attempting to blow them all out with one breath. Over 1,000 adventurers have accompanied John on the River, starting with trip 1 over Thanksgiving in 1969, which was the Centennial Year of the first passage through the Canyon by John Wesley Powell and company. Trip 50 included Professor Emeritus Sam Romberger, Research Associate Professor Donna Anderson and husband Larry, and several CSM Alumni. John continues research on an unusual massive landslide in the Canyon that crossed the ancient River and ran 800+ feet up the opposite side, as explained in last year's Newsletter article. John plans two more trips in 2013.



Research Activities

Steve Sonnenberg

Steve Sonnenberg's research includes sequence stratigraphy, tectonic influence on sedimentation, and unconventional petroleum systems. His current research focuses on the Bakken Petroleum System in the Williston Basin and Mancos Niobrara Petroleum system in the Rocky Mountain basins. Steve and several other faculty members started a new consortium on the Vaca Muerta source bed in the Neuquen Basin.

The Bakken project is focused on the stratigraphy, structure, diagenesis, burial history, mineralogical distribution and petrophysical properties of the Bakken Petroleum System. The research is funded by a 30-company industry consortium. Geology students working on the Bakken include: Cosima Theloy, Rebecca Johnson, Paul Schietinger, Alyssa Franklin, Tony Rios, Claudia Gutierrez, Dylan Cobb, Henriette Eidsnes and Hui Jin. Ginny Gent finished her thesis projects in 2012.

The Niobrara industry consortium was started in September 2010. The Niobrara project is focusing on stratigraphy, structure, fracturing, diagenesis, burial history, and petrophysics. There are 35 companies involved in the study. Niobrara students include: Tofer Lewis, Kelly Bruchez, Tom Arthur, Martin Krueger, Elena Finley, Armagan Kaykun, Nick Matthies, and David Underwood. Melanie Peterson, James Taylor, Craig Kaiser, Teresa Malesardi, Mike Collins, and David Thul finished their thesis projects in 2012.

The Vaca Muerta project was started in September 2012. The project is focusing on stratigraphy, structure, fracturing, diagenesis, burial history, and Petrophysics. Students working on the project are Ted Kernan and Alex Betancur.

Kathy Emme continues as a research associate to help with consortium projects. She is paid through the three consortium accounts.

Graham McClave finished his thesis on a Heath shale thesis in Central Montana. Olusanmi (Tunde) Emmanuel is working on a PhD thesis with a research topic as the Marcellus Shale. Ken Pacheco is working on a thesis in the Paradox Basin.

Steve presented talks at the Tulsa Geological Society (January 3), North America Shale Plays Conference (Jan. 11), SW Section AAPG and Permian Basin SEPM (Jan. 17), University of Wyoming (January 23), CO Section AIPG (Feb. 21), Denver Explorers Club (March 15), SEG Geophysical Society Houston (April 11), AAPG Annual Meeting Long Beach (April 23), Stanford Investment Committee (April 27th), DUO Conference (May 15), Hanson Wade Migration Conference (May 30), Bakken Tight Oil Congress (May 31), Rotary Club Aurora (June 27), Hydraulic Fracturing Conference (July 30), GTW Conference (Aug. 13), RMS AAPG meeting (Sept. 10).

Field trips conducted by Sonnenberg included multiple Mines Geology Trail trips and one geologic raft trip in the Grand Canyon for CSMAA. He also led a trip to Iceland for CSMAA.

He is being awarded the Michel Halbouty Leadership award from AAPG in 2013.

He was elected to the RMAG Foundation Board in 2011 and served as president of the Colorado Section of AIPG. He is also being awarded the Long Service Award by the AAPG House of Delegates. Both awards will be presented in May 2013.

Papers submitted for publication in 2012 include:

Polygonal Fault Systems – A New Structural Style for the Niobrara Formation and Pierre Shale, Denver Basin, CO: *Mountain Geologist* in press (David Underwood is co-author)

The Niobrara Formation, Southern Powder River Basin, Wyoming (James Taylor is the senior author), *Mountain Geologist*

Center for Oil Shale Technology and Research (COSTAR)

by Jerry Boak

The Center for Oil Shale Technology and Research (COSTAR) has completed its second two-year phase, with ExxonMobil and Total continuing to support the research program. The COSTAR team has made major strides in assembling an integrated geologic framework for the Green River Formation in the Piceance Basin and Uinta Basin. The team also improved understanding of the Greater Green River Basin, and had a fruitful collaboration on the Uinta Basin with researchers at the University of Utah and the Utah Geological Survey.

Kati Tänavsuu-Milkeviciene, working with Rick Sarg, has published a discussion of the stratigraphic framework that divides the history in Colorado into six major stages that correlate well to existing stratigraphic units, and provide a consistent interpretation of the relationship of rich and lean zones within the formation to cyclical patterns of lake evolution, as well as clear connection to the climate history of the early Eocene. This framework has been extended to all three lake basins (Colorado, Utah, and Wyoming). Additionally, two other papers about Piceance basin and Uinta basin stratigraphy, the connection between two basins, as well as new ideas about the lake sequence stratigraphy are in process of being published.

Sheven Poole is nearly complete on her M.S. Thesis on mineralogical data from the reference sections in Douglas Pass and in core from the deeper basinal oil shale. Her work identifies three major mineralogical units that are related to the six stages of the lake evolution. We have submitted two manuscripts to a volume on the Green River Formation summarizing the stratigraphic and mineralogical interpretations. Ryan O'Hara is making progress on his work on a major sand body within the Green River Formation in the Uinta Basin in Utah that describes architecture of the conventional lake sandbodies.

Based on knowledge build up in recent years, a new Green River consortium (ConocoPhillips, Devon, EGO, Bill Barrett, Newfield, Anadarko, and Platte River Associates) is underway and will be led by Rick Sarg, Kati Tänavsuu-Milkeviciene, Jeremy Boak and Piret Plink-Björklund. The consortium will focus on stratigraphic and sedimentologic studies of the Green River Formation related to oil production in the deeper basin.

Kati Tänavsuu-Milkeviciene and Rick Sarg partnered with Paul Wright of BG Group on a field course titled Sedimentology and Stratigraphy of Lacustrine Systems: Reservoir and Source Rocks, Great Salt Lake and Green River Formation (Utah and Colorado, USA) for Nautilus World Limited of Houston. Jeremy Boak also was an invited moderator of a discussion group at the Jordan International Oil Shale Symposium at the Dead Sea in Jordan in May.

Additional work from external participants at Binghamton University (Deidra LaClair and Elliot Jagniecki) has characterized the similarities and differences in the development of evaporitic minerals like halite, nahcolite, trona, and shortite in the Colorado and Wyoming lakes that reveal characteristics of the lake evolution, and have redefined the stability field for shortite. Shortite requires temperatures of >50°C to form, and hence provides an indication of the depth of burial of sediment in which it occurs. University of Wisconsin researchers under Alan Carroll have focused primarily on the clastic lithostratigraphy of the Wyoming Basins and have identified important tectonic influences on lake stratigraphy there.

In addition, the Geomechanics team in COSTAR has advanced understanding of the physical properties of oil shale and begun development of models to understand how the shale will fracture under the stresses of in situ pyrolysis of oil shale. Mike Batzle (Geophysics) and students are now ready to measure seismic velocities of oil shale at ambient and elevated temperatures, as well as the anisotropic rheologic properties of oil shale samples. John Berger and Graham Mustoe (Engineering) have supervised two students (Steve Geer and Carissa Unrein) working to create Discrete Element Method models of fracturing and heat flow at small scale and on bringing a fluid flow model to the suite.

32nd Oil Shale Symposium

by Jerry Boak

The 32nd Oil Shale Symposium held at the Green Center at the Colorado School of Mines from October 15-17 highlighted significant progress in research and development of oil shale resources in the U. S. and around the world. More than 270 delegates from 19 countries and 23 states in the U.S. attended the two and one-half days of sessions on science, engineering, environmental, socioeconomic and policy issues relating to potential production of oil from oil shale.

On the opening day, Mitchell Leverette of the U.S. Bureau of Land Management reported on the status of Federal programs for oil shale leasing, especially the Programmatic Environmental Impact Statement for Commercial Leasing of Oil Shale and Tar Sands in the western U.S. Samantha Julian, Director of the Utah Office of Energy Development, summarized Utah's approach to oil shale and other energy developments. Symposium Co-Chair Jerry Boak presented a challenge to numerous oil shale myths entitled *Oil shale leasing policy – what are we really waiting for?* Jason Hanson of the Center of the

American West at UC Boulder reviewed the history of boom and bust energy cycles in the West. The plenary session continued with a panel discussion on the status and future of oil shale development involving representatives of government, industry, academia, international companies and environmental NGOs that was a hit with many of the attendees.

The technical sessions included presentations from international oil and oilfield service companies like ExxonMobil, Shell, Total, and Schlumberger, from national laboratories (Los Alamos and Idaho National Laboratories), from companies and universities in Estonia, China, Jordan, Israel, Canada, Australia, and Morocco, from U.S. universities and independent oil shale companies, and from the U.S. and Utah geological surveys.

World production has increased to 30,000 BOPD, and further increases are likely over the next 2-5 years. Total is partnered with two smaller American companies to test both surface retorting and in situ methods for production in the U.S. Israel Energy Initiatives (whose Chief Technical Officer is Yuval Bartov, formerly a GE oil shale researcher) presented a number of papers on their large prospect in Israel. Enefit, the Estonian national energy company, presented papers on efforts in Estonia, Jordan, and the U.S.

The U.S. Geological Survey presented results of analysis of their assessment of Western U. S. oil shale resources. These indicate that, while total resources are >4 trillion barrels, resources >15 gal/ton (a reasonable economic limit) amount to about 1/4 of the total and the most likely resources (>25 gal per ton) represent less than 10% of this total. Water use remains a hot topic for oil shale, although Jerry Boak presented a revision of a previous widely quoted estimate that substantially reduced the expected water requirements for in situ oil shale production.

News from Rocky Mountain PTTC (Petroleum Technology Transfer Council)

by Dr. Mary Carr

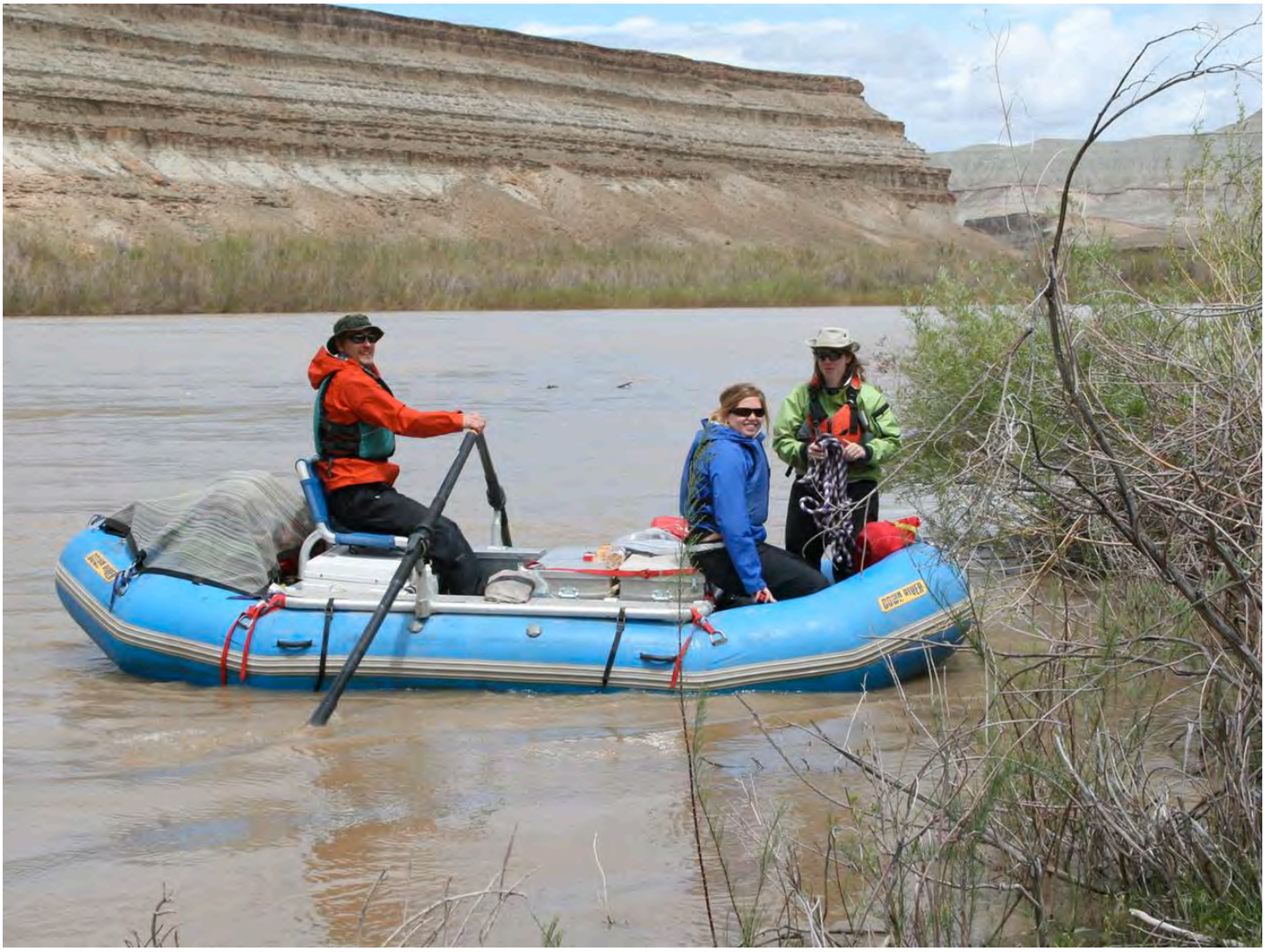
Next year, PTTC will be celebrating its 20th anniversary, and the PTTC Rocky Mountain region will be celebrating 18 years of service to the Geologic and Engineering community. The Rocky Mountain PTTC has had another great year providing 16 workshops to approximately 700 people. We have continued our close relationship with the Rocky Mountain Association of Geologists as well as the Montana Geological Society by helping to put on successful workshops. PTTC has also been working with the Research Partnership to Secure Energy for America (RPSEA) to provide access to timely research funded by the Department of Energy. PTTC actively participated in the RMS-AAPG meeting in Grand Junction, providing a workshop on Petrophysics of Unconventional Resources workshop as well as being an exhibitor.

The National PTTC organization has been undergoing several changes over the past year. The separation of PTTC from AAPG provided an opportunity to reevaluate the By-Laws of the organization and its organizational structure. The organization has transitioned from six regions to five regions headed up by Directors committed to seeing the organization thrive. The five directors are also serving as board members, along with two industry representatives. The primary goal for these changes is to move PTTC toward a self-sustaining model. Because the Rocky Mountain region has been a leader in pushing for a self-sustaining model for the national organization, I was chosen along with Jeremy Viscomi as the new Co-Executive Directors for PTTC. These changes took effect November 16, 2012. We are in the process of evaluating ways to reduce costs and increase non-governmental revenues. Department of Energy is still providing funding to our National office, which helps defray the cost of staff and the maintenance of our National website and newsletter. We look forward to maintaining a strong relationship with DOE to provide technology transfer for their many high caliber research studies.

Shale Gas and Tight Gas Sand Reservoirs of Utah, Core Workshop held in Salt Lake City

The Futures in Energy program is returning to Colorado School of Mines June 17-21, 2013. This will be an opportunity for 20 High School Juniors and Seniors to learn about employment opportunities in the Oil and Gas industry. For several years, the Rocky Mountain PTTC has enjoyed the unwavering support of volunteers and sponsors involved with the Futures in Energy program. The program takes students from outcrops to drilling rigs giving them an opportunity to experience many aspects of the industry. It will be exciting to have the program back on the CSM campus to show off the new facilities that have been built over the past few years. For more information on how to contribute to the 2013 Futures in Energy program, visit our website at www.pttcrockies.org.

CENTER OF RESEARCH EXCELLENCE



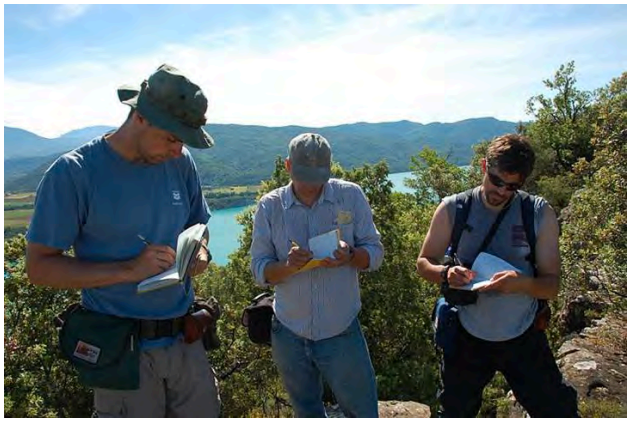
CoRE team rafting to field area in Desolation Canyon, Utah. From left to right: D. Pyles, K. Sendziak, and G. Ford

By Jane Stammer, Cathy Van Tassel, and David Pyles

The Chevron Center of Research Excellence (CoRE) is an innovative industry-academic partnership between Chevron's Energy Technology Company (ETC) and Colorado School of Mines (MINES). CoRE research focuses on addressing the challenges faced by Chevron in their exploration, production, and development of deepwater, fluvial, and shallow marine petroleum reservoirs. The CoRE program was established in 2003, and is directed by Dr. David Pyles.

2012 was a year of exciting changes and additions within CoRE. Charlie Rourke retired in July after 9 years as CoRE's Program Manager and was replaced by Cathy Van Tassel. Before joining CoRE, Ms. Van Tassel served for 15 years as the Program Assistant to the Director of Arthur Lakes Library at Mines. Mark Kirschbaum joined CoRE as a part-time Research Associate after retiring from the USGS where he worked for 33 years. Mr. Kirschbaum is a world-class stratigrapher, and he is working

with Dr. Pyles to develop CoRE's shallow marine research program. Grace Ford successfully completed her PhD degree; her dissertation focused on fluvial stratigraphy and cyclicity within the Middle Wasatch Formation, Utah. Grace has two articles in submission, and is currently working as the head geologist for Sundance Energy in Denver. Kassandra Sendziak successfully completed her MS degree; her thesis focused on stratigraphic hierarchy and architecture of the Lower Wasatch Formation, Utah. Kassandra has one article in submission and, in 2013, will be starting as a geologist with Anadarko Petroleum in Denver. Jesse Pisel and Timothy O'Toole, two new Masters students, joined CoRE this Fall. Jesse and Tim hold undergraduate degrees in geology from Western State College and the University of Colorado – Boulder, respectively. Jesse's research focuses on fluvial channel-belt clustering in the Lower Wasatch Formation, Utah. Tim's research focuses on stratigraphic architecture of the deepwater Towsley Formation, California. Throughout 2012, undergraduate students Mary Snooks, Bradley Nuse, and Geraldus Listiono continued to assist CoRE in numerous research capacities. Linda Martin, part-time Research Associate, continues to support CoRE's research projects and manages the CoRE website.



CoRE team conducting field work in the Ainsa Basin, Spain. From left to right: J. Moody, Dr. Julian Clark (Chevron ETC), and G. Gordon

Overall, the research team led by Dr. Pyles was very successful in their academic pursuits. In 2012, Dr. Pyles and his students published 5 peer-reviewed articles (2 cover articles), have two articles accepted and in press, have two articles in review, and four articles in submission. Additionally, the research group presented talks and posters in 19 conferences and meetings throughout the U.S. and internationally, and gave 5 talks at invited lectures at Mines and other universities.

Gregory Gordon, Jeremiah Moody, and Jane Stammer continued to advance their PhD research throughout 2012. Greg had one paper published on the Eel River Basin, California, and submitted another for peer-review on his research of the Guaso turbidite system in the Ainsa Basin, Spain. Additionally, Greg was invited to speak at three geological society lectures, lead numerous field trips, and completed his field research in the Modelo Formation, Eastern Ventura Basin, California. Jeremiah Moody finished another field season on the fluvial to shallow marine Escanilla Formation, Ainsa Basin, Spain. Jeremiah also published the October cover article in AAPG Bulletin on the deepwater Morillo Formation, Ainsa Basin, Spain. Jane Stammer spent six weeks collaborating with Dr. Kyle Straub at Tulane University in New Orleans, where she completed three physical experiments in the Deepwater Basin. Jane also co-authored an article in submission on an experimental pilot study of mineral fractionation in turbidity currents. Over the summer, Jane and Jeremiah co-taught the two week Petroleum Engineering field school. They taught geology to 75 PE undergraduates, and focused on stratigraphy, sedimentology, structure, and mapping within Colorado and Utah.

Jane Stammer collaborating with Dr. Kyle Straub on tank experiments in Tulane University's Deepwater Basin. From left to right: Dr. Kyle Straub (Tulane University) and J. Stammer

Dr. Pyles continued to conduct research at the forefront of the geosciences. Dr. Pyles was an author on four peer-reviewed journals, including the December cover article in the Journal of Sedimentary Research. Dr. Pyles also presented at numerous conferences throughout the year, and was an invited lecturer for two Mines' Van Tuyl lectures, and a lecture at UT-Austin.

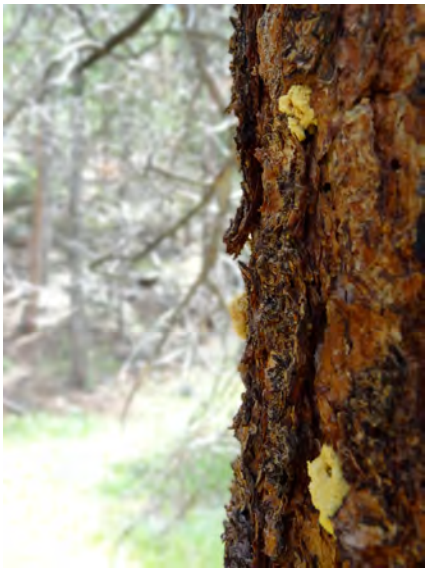
In 2012, CoRE extended its research influence throughout the Geology and Geological Engineering Department as well as outside the Mines campus. The CoRE Education Series brought in world-class speakers to the department including Dr. James Syvitsky of the University of Colorado – Boulder, and Dr. Bryan Bracken of Chevron ETC. Additionally, CoRE teamed up with the Hennenbach Lecture Series and the McBride Honors Program to produce a screening of Scott Tinker's "Switch", a widely

acclaimed movie about the world's energy future. Learn more about the Switch Energy Project at: www.switchenergyproject.com.

CoRE research and education continues into 2013. In the Spring, Dr. Pyles, Gregory Gordon, and Jeremiah Moody will teach a field-based class on tectonics and sedimentation in the Ainsa Basin, Spain. This class is the culmination of many years of research conducted by CoRE students on fluvial, shallow marine, and deepwater settings within the basin. The CoRE team will be joined by Dr. John Humphrey, Department Head of Geology and Geological Engineering, and Dr. Julian Clark, a renowned Ainsa Basin specialist who works for Chevron's clastic stratigraphy team.

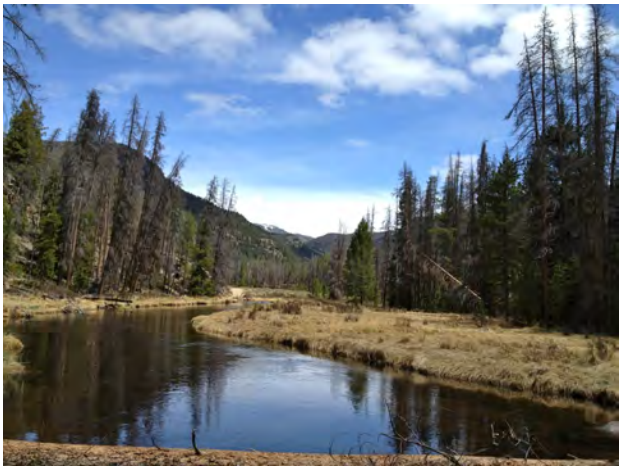
Reed Maxwell

A five year, $3 million National Science Foundation Water Sustainability and Climate program grant has been awarded to Geology and Geological Engineering professors Reed Maxwell and Alexis Navarre-Sitchler to examine the impact of the pine beetle devastation on vital watersheds in the Rocky Mountain west. The project will be led by Mines in collaboration with research partners from Colorado State University.



Close-up of "pitch tubes," the holes pine beetles bore into trees to lay their eggs.

Researchers estimate beetle-killed trees will alter hydrologic and biogeochemical processes that govern water quantity and quality in forested headwater catchments, potentially affecting downstream user demands and challenging ecological and human health. This study's findings will help towns and cities in the American west manage water rates and effectively improve watershed health.

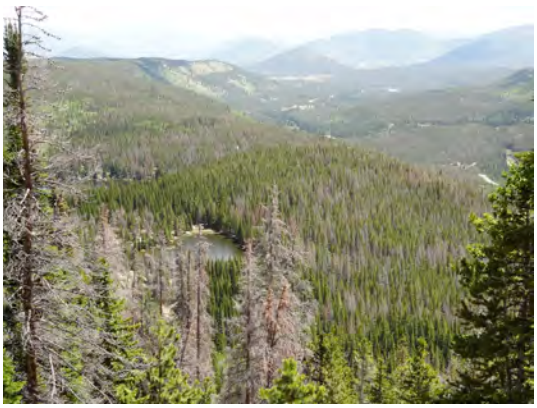


Field site to study beetle impacts on the Western side of Rocky Mountain National Park.

According to principal investigator Reed Maxwell, Mines associate professor of hydrology in the Department of Geology and Geological Engineering and director of the Integrated Groundwater Modeling Center, the study will examine the potential water resource changes resulting from the mountain pine beetle epidemic by examining changes in climate, forested ecosystems altered by pine beetle impacts, biogeochemical processes and resource management practices.

The project abstract states: "More than four million acres of forest in Colorado and Wyoming are dying due to the ongoing mountain pine beetle infestation. While the visual impact of the dying and dead forests is stunning, the invisible changes to the water cycle in vital watersheds in the Rocky Mountain west, including the Platte and Colorado River headwaters, may be a longer lasting legacy."

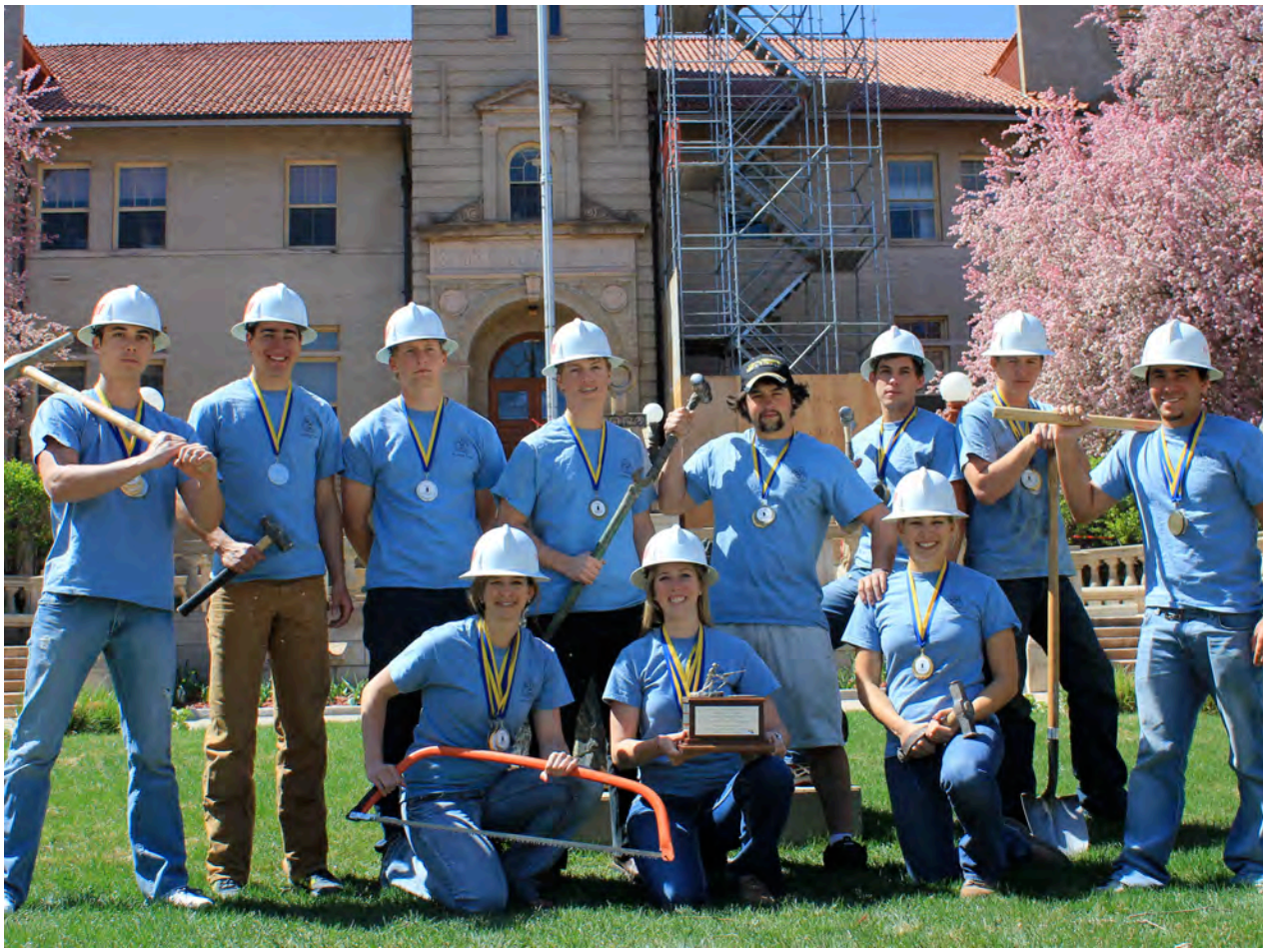
Mines will receive $2.3 million from the NSF, research partner Colorado State University will receive $600,000. The Colorado Higher Education Competitive Research Authority is providing $375,000 in matching funds. Co-principal investigators at Mines include Jonathan Sharp, assistant professor of environmental engineering, Alexis Navarre-Sitchler, assistant professor of aqueous geochemistry and Eric Dickenson, assistant research professor of environmental engineering. Collaborative work at CSU will be led by John Stednick, professor of watershed science in the Department of Forest and Rangeland Stewardship, Warner College of Natural Resources, CSU.



Large scale impacts of the mountain pine beetle epidemic are shown in Rocky Mountain National Park.

Student News and Activities

CSM TAKES 1ST AT THE 34TH INTERNATIONAL MINING GAMES



By Patricia Capistrant

Patty competing in the Jackleg event with Levi Bates assisting

The Colorado School of Mines Mining Team returned to Golden on April 3rd as world champions. The 34th International Inter-collegiate Mining Games were held in royal style by the Camborne School of Mines (the other CSM) from March 29-April 1. Thirty-six teams representing 16 different schools from around the United States and around the world gathered for competition at the historic King Edward Mine in Cornwall, England. Pasties and "chips" were consumed by both participants and spectators as teams competed in each of the seven events throughout the three days of competition. And live music, cider, and even fireworks were the reward after each day's competition.

The Colorado School of Mines Mining Team was able to send two teams; a men's and a co-ed. Representing the men's team was Jordan Oxborrow (MinE), Fausto Moreas (MinE), Doug Simpson (MinE), Tim Brueggeman (MinE), Chris Halsema (MinE), and Eric Levonas (MinE). Although not in

Men's team in England after Hand Steeling Doug Simpson, Tim Brueggeman, Jordan Oxborrow, Fausto Moraes, Eric Levonas, Chris Halsema

first place, the men's team had a good showing taking third in the Suede Saw event. Representing the co-ed team was Luke Van Zyl (PetE), Paige Cybulski (GeoE), Levi Bates (MinE), Hannah Brinkmann (MinE), Scott Fedel (MinE), and Patricia Capistrant (Geol). The co-ed team did especially well, taking first place in both Hand Steel and Hand Mucking. Co-ed also took top three in six out of seven of the events, and first place overall in the co-ed division! Trophies and medals won by both teams were worn and carried with pride on both trains and planes the whole way home!

Paige showing off her plethora of medals at the awards banquet

Mining competitions have been an integral part of the student experience at the Colorado School of Mines for decades. In the last three years, a renewed interest has perked with Mines competing in the International Intercollegiate Mining Games. While CSM has a long history of students competing in mining competitions throughout Colorado, the Intercollegiate games are something bigger to be a part of. The International Intercollegiate Mining Games started in 1978 as a way to honor the 91 miners that died in the Sunshine Mine disaster 6 years prior. As the competition has evolved, mining schools throughout the world alternate hosting the event each year. Teams represent universities throughout the United States, Canada, Australia, England, Germany, and Holland.

The competition comprises seven events including Track Stand, Ore Muck, Suede Saw, Gold Pan, Hand Steel, Jackleg, and Survey. Track Stand consists of a team putting on an additional section of rail in as little time as possible. Ore Mucking involves a team quickly filling an ore cart and running it down a track. A team of five takes turns cutting through a 6"X6" timber in Suede Saw. Hand Steeling, an event of shear will-power, strategy, and stamina is composed of a team single jacking for 10 minutes in order to drill the deepest hole. The Jackleg competition involves using a pneumatic drill to advance the greatest number of holes in a concrete block in 3 minutes. And finally, the Survey event tests the knowledge and use of a theodolite in order to turn angles and determine the distance between different points.

The team hopes to build on the success of this year's team in 2013 as they prepare to host the 35th International Intercollegiate Mining Games at the Colorado School of Mines in Golden over spring break. It is an honor to have the opportunity to host such an event and planning has already begun. As a school with a long legacy in mining, the team hopes to put on an event that offers a truly Colorado experience. And just to make sure the Mines team makes its mark ...the Mining Team has already begun training!

Co-Ed team in England after Hand Mucking Paige Cybulski, Scott Fedel, Luke Van Zyl, Levi Bates, Patty Capistrant, Hannah Brinkmann

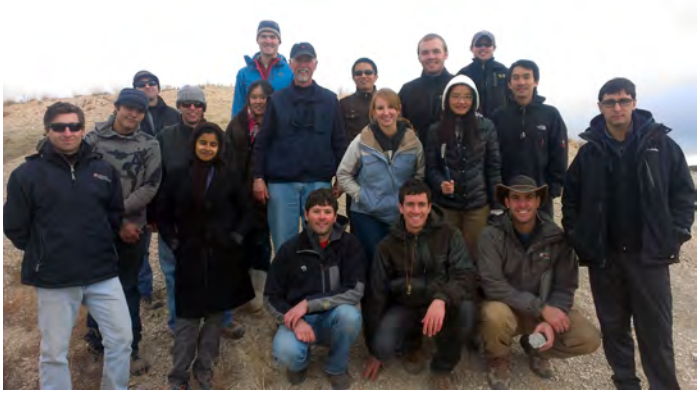
Paige competing in Hand Steel with a judge watching closely to the left

American Association of Petroleum Geologists

by Martin Krueger, President

Accomplishments last academic year, including 3rd place in the international IBA competition finals and field trips to San Salvador, Bahamas, and Alamo, Nevada, set the bar high for the Colorado School of Mines American Association of Petroleum Geologists (AAPG) Student Chapter. The student organization is well on its way at the half way mark this year in upholding the standard set the year before. To date, more than twenty events have been sponsored or co-sponsored by the chapter. This includes nine lunch-&-learn style presentations from industry and academic professionals such as Ron Blakey, Northern Arizona University, and Bryan Bracken, Chevron. The chapter also made a significant effort to bring in cross-discipline speakers from petroleum engineering and energy economics.

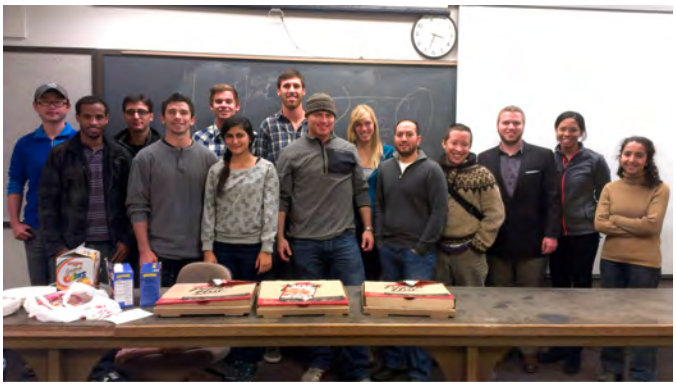
The CSM *Switch* screening, Geochemistry Workshop, and Niobrara Regional Field Trip were three larger events sponsored and promoted by the AAPG Student Chapter this semester. All three were great successes. The CSM *Switch* screening is the largest to date in the country. The original allotment of 1,100 tickets had been claimed more than a month before the viewing by organization email and word of mouth advertising. To insure a packed house a second allotment of 200 additional tickets was made available. More than 1,000 of the 1,300-ticketed individuals attended the viewing with Dr. Scott Tinker in attendance. Chapter members acted as ambassadors to promote the event and volunteered during the event to coordinate with the primary sponsor, Chevron Center of Research Excellence (CoRE).



In late October, the chapter sponsored an organic geochemistry workshop and invited the CU-Boulder AAPG chapter members to attend. A total of 16 people attended the workshop, which was run by David Thul from Dolan Integration Group. The workshop ran for a full day and covered fundamental types of source rock geochemical data, highlighting the truths of geochemical datasets and discussing, through real world data, interpretations and errors associated with them.

In early November, Tofer Lewis and Dr. Sonnenberg led our first regional field trip of the year to Niobrara and other Cretaceous Outcrops in the Pueblo/Canon City area of southeast Colorado. Students in attendance viewed type section as well as lesser-known locales of Front Range Cretaceous stratigraphy. Stratigraphic illustrations of sea level and climate controlled carbonate cycles were a highlight of discussion.

Other AAPG Student Chapter events included Bob Weimer Mines Geology Trail Clean-Up, member recruitment and social events. Plans for next semester include promotion of the Ainsa Basin Field Seminar, bi-monthly presentations, service events, social events, a second technical workshop, and a second AAPG sponsored field trip. All involved are looking forward to what can be accomplished throughout the remainder of the academic year in pursuit of Outstanding Student Chapter recognition at the AAPG Annual Convention and Exhibition in May. If alumni are interested in attending any events or would like to give a presentation to the student chapter, please don't hesitate to contact any of the current officers directly or through the chapter email (csmaapg@gmail.com).



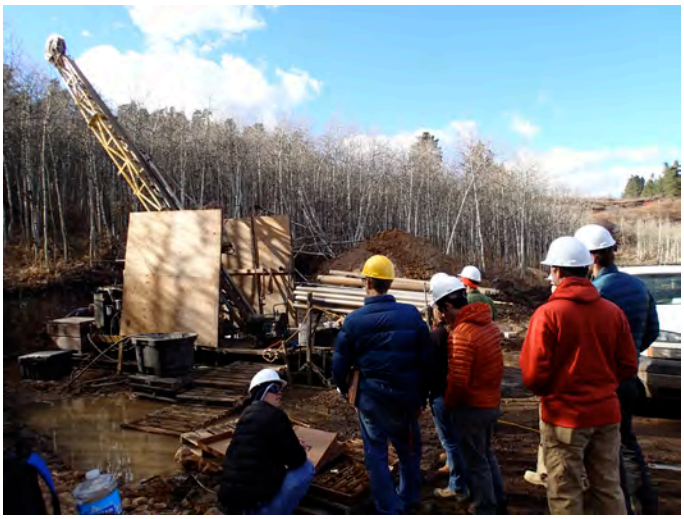
President: Martin Krueger (makruege@mines.edu),Vice-President: Vivian Lin (vlin@mines.edu), Secretary: Rebecca Johnson (rebjohns@mines.edu), Treasurer: Evan Jones (evjones@mines.edu)

Society of Economic Geologists

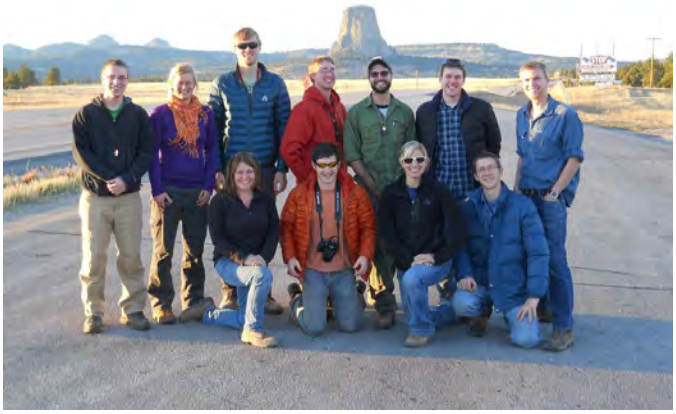
By Tim Gross, President

The Colorado School of Mines Society of Economic Geologists Student Chapter kicked off the academic year with a Fall semester full of activities. Within this multifaceted department, we're all very busy with our own schedules and personal agendas and, as a result, many people unfortunately are not able to attend the wonderful SEG chapter meetings. We'd like to take this opportunity to give an overview of what the chapter has been up to lately and hopefully, by the end, influence the many of you interested in Economic Geology to join and get involved!

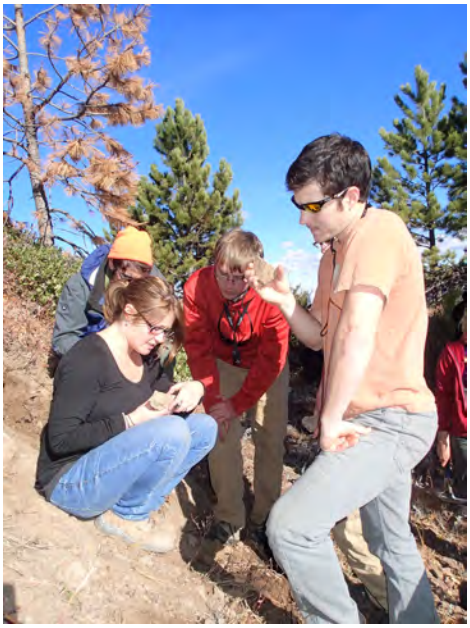
The fall semester began with a wide array of excellent lunchtime guest speakers who presented on topics ranging from ore deposit geology and the social issues facing mineral exploration to the applications of mineral commodities in the use of alternative energies. For example, Dr. Odin Christensen, past Chief Geologist of Newmont Mining Corp., gave a presentation titled, "Bolivia – Geology and Mineral Exploration in the Central Andes." His discussion of Central Andean geology and the socio-economic problems faced at the Kori Kollo and Kori Chaca deposits highlighted the importance of sustainable development in the minerals industry. Also, Dr. Jim Burnell from the Colorado Geological Survey gave a lecture on "Resource Demands of Alternative Energy Technologies." Dr. Burnell demonstrated how mineral resources are vital to the alternative energies industry, which included an overview of the minerals explored for and their specific applications. This was supplemented by a discussion about the role of policy makers and their awareness, or lack thereof, of the minerals industry. These speakers' expertise coupled with the audiences' inquisitive questions promotes informative conversations about current topics facing the mineral and mining industry. Keep an eye out for upcoming lectures this Spring and make sure to attend – Thursday's BH109 @ 12pm!



Most recently and perhaps most beneficial, the chapter has had the unique opportunity to meet with industry professionals through company meet-and-greets and get hands-on field experience during fieldtrips to active exploration and mining operations. Several senior members from Osisko, a mid-tier gold producer, visited CSM to meet with students and discuss their expanding exploration efforts. Field experience for chapter members has included an underground quarry tour of the Marble Mine in Marble, CO and visits to the Bear Lodge REE deposit and Wharf Gold Mine in the Black Hills of South Dakota and Wyoming. A highlight of this year will be an international trip organized by Wesley Hall to visit the Middle Cauca Belt of central Colombia. The trip will occur at the beginning of the Spring Semester with a goal to better understand the transition between porphyry and epithermal environments.



We'd like to conclude by thanking everyone for making our chapter and it's activities possible. This includes, but is not limited to: faculty advisors Dr. Thomas Monecke and Dr. Murray Hitzman, our remarkable support staff Debbie Cockburn and Marilyn Schwinger, everyone at SEG, Mandi Reinshagen for coordinating the Wyoming-South Dakota trip, the Bear Lodge, Wharf, and Marble personnel, and



especially all of the sponsors and guest speakers that give their time and support to our chapter. Also notable are the collaborative efforts between AAPG, SME, and DREGS organizations. We hope you attend some of our future activities and events….after all….he who sees the most rocks wins!

If you would like to contact the Chapter, you may contact me at tigross@mymail.mines.edu

http://www.segweb.org/SEG/Students/Student_Chapters

It was 20 years ago today...

1. Robert Schaut
2. Bill Brewer
3. Jason Hellman
4. Steve Kulinski
5. Ric Wenzel
6. Tim Piwowar
7. Tim Vidra (U.AZ)
8. John West
9. Dave Kenley
10. Mark Vessely
11. Don Reimer
12. Jeff Brown
13. Brandi Fisher
14. Peggy Ganse
15. Kyle Cannon
16. Don Pederson
17. Dave Best (CU)
18. Bob Schwering
19. Andrew Ross
20. Miles Arbogast

Where are they now?

Thesis Completed 2012

ACIKALIN, ELIF – M.ENGR
GEOLOGICAL ENGINEER (Non-Thesis)
(Adv. Dr. Zhou)

ALMANZA, ADRIAN
M.SC.-GEOLOGY
Integrated 3D Reservoir Model of the Devonian Bakken Formation, Williston Basin: Elm Coulee Field, Richland County
(Adv. Dr. Sarg)

BANDY-BALDWIN, KIMBERLY
M.SC.-HYDROLOGY
Investigation of Surface Water Groundwater Interactions at Selected Sites along the Rio Grande
(Adv. Dr. Maxwell)

BRUNHART-LUPO, MARIA
PH.D.-GEOLOGY
Geomorphological and Stratigraphic Evolution of the Great Sand Dunes National Park and Preserve, Colorado – 10,000 YBP to Present
(Adv. Dr. Plink-Björklund)

BUBB, MARY
M.SC.-GEOLOGY
3D Facies Variation in Shelf-Margin Deposits: Kookfontein Formation, South Africa
(Adv. Dr. Plink-Björklund)

CHAIT-MOLINA, ENRIQUE A.
PROFESSIONAL MASTER – MINERAL EXPLORATION
(Adv. Dr. Holley)

CHALAK, AMANBAY ALI
PROFESSONAL MASTER – PETROLEUM RESERVOIR SYSTEMS (Non-Thesis)
(Adv. Dr. Curtis)

COALSON, EDWARD
PH.D.-GEOLOGY
Producibility of Almond Formation "Tight" Gas Sandstones, Washakie Basin, Wyoming
(Adv. Dr. Curtis)

COLLINS, MICHAEL DOUGLAS
M.SC.-GEOLOGY
Natural Fractures in the Niobrara Formation, Front Range, Colorado
(Adv. Dr. Sonnenberg)

CONDON, LAURA E.
M.SC.-HYDROLOGY
The Impact of Subsurface Conceptualization on Land Energy Fluxes and Regional Water Budgets
(Adv. Dr. Benson)

DANIELE, NICHOLAS PAUL
M.SC.-GEOLOGY
Reservoir Characterization and Modeling of Fluvial "Tight" Gas Sandstones of the Upper Mesaverde Group
(Adv. Dr. Aschoff)

DAVEY, HEATHER
M.SC.-GEOLOGY
Geomechanical Characterization of the Montney Shale, Northwest Albert and Northeast British Columbia, Canada
(Advs. Drs. Davis/Curtis)

DUVERNAY, KEVIN
M.SC.-GEOLOGY
Architecture and Facies Distributions of a Bypass Dominated Slope Fan System, Eocene Juncal Formation, California
(Adv. Dr. Dykstra)

EASLEY, ELISABETH
M.SC.-GEOCHEMISTRY
Geochemical Characterization of the Waunita Hot Springs Geothermal Reservoir, Gunnison County, CO
(Adv. Dr. Wendlandt)

FORD, GRACE
Ph.D.-GEOLOGY
Scale-Dependent, Compensationally Driven Cyclicity Defined in Part by a Hierarchical Framework for Evaluating Fluvial Systems: A Field Study of the Middle Wasatch Formation, Uinta Basin, Utah and The Stratigraphic Manifestation of a Fluvial-Lacustrine Basin-Fill Succession: A Field Study, Desolation Canyon, Utah
(Adv. Dr. Pyles)

FRIEDMAN, EVAN QUELLE
M.SC.-GEOLOGICAL ENGINEERING
Debris Flow Hazard Assessment and Monitoring Within the Medano Fire Burn Area, Great Sand Dunes National Park and Preserve, Colorado
(Adv. Dr. Santi)

GARCHAR, LAURA
M.SC.-GEOLOGY
Geochemistry of a Volcanic Hydrothermal System at Mount Spurr, Alaska
(Adv. Dr. Wendlandt)

GENT, VIRGINIA
M.SC.-GEOLOGY
Facies Interpretation and Tidal Analysis of the Middle Bakken Member, Sanish-Parshall Field, North Dakota
(Adv. Dr. Sonnenberg)

GRAHAM, GARTH
PH.D.-GEOLOGY
Geologic and Stable Isotopic Investigations of the Sheep Creek Cu-Co-Ag Deposit and Comparison to other Sedex to Epigenetic Deposits in Mesoproterzoic Basin
(Adv. Dr. Hitzman)

HANCOCK, SOPHIE
PH.D.-GEOLOGY
The Geology and Hydrogeology of Lost Creek Roll Front Uranium Deposit, Sweetwater County, South-Central Wyoming
(Adv. Dr. Hitzman)

HOLLEY, ELIZABETH
PH.D.-GEOLOGY
Alteration, Mineralization, and Quartz Paragenesis at the Veladero High-sulfidation Epithermal Au-Ag Deposit, Argentina
(Adv. Dr. Monecke)

HUGHES, JUDITH
PROFESSIONAL MASTER – MINERAL EXPLORATION (Non-Thesis)
(Adv. Dr. Monecke)

ISIKALP, UMUT
M.SC.-GEOLOGY
Seismic Interpretation and Restoration of a Forearc Basin System Offshore New Zealand
(Adv. Dr. Trudgill)

KAISER, CRAIG ANTHONY
M.SC.-GEOLOGY
Petroleum Potential of the Graneros-Greenhorn Petroleum System: Greater Wattenberg Area, Denver Basin, CO
(Dr. Sonnenberg)

KLEPACKI, DOUGLAS
M.SC.-GEOLOGY
Facies Driven, Seismic Inversion Based Property Modeling, for Flow Simulation of Delhi Oil Field, Louisiana
(Advs. Drs. Sonnenberg/Davis)

LEIBLI, CHRISTOPHER LEE
M.ENGR.-GEOLOGICAL ENGINEER (Non-Thesis)
(Adv. Higgins)

LOBATO, MICHAEL
PROFESSIONAL MASTER – MINERAL EXPLORATION (Non-Thesis)
(Adv. Dr. Monecke)

LOPEZ, GLORIA
PH.D.-GEOLOGY
The El Espino Iron Copper Gold District, Coastal Cordillera of Central Chile
(Adv. Dr. Hitzman)

MacAULAY, BLAIRE L.
M.SC.-HYDROLOGY (Non-Thesis)
(Adv. Dr. Benson)

MALESARDI, TERESA
M.SC.-GEOLOGY
Petroleum Geology of Silo Field, Laramie County, Wyoming
(Adv. Dr. Sonnenberg)

McCLAVE, GRAHAM
M.SC.-GEOLOGY
Stratigraphy and Source Rock Analyses of the Health Formation in Fergus, Garfield, Golden Valley, Musselshell, Petroleum, and Rosebud Counties, Central Montana
(Adv. Dr. Sonnenberg)

NOWAK, ROBERT
M.SC.-GEOCHEMISTRY
The Nature and Significance of High-Grade Metamorphism and Intense Deformation on the Izok VHMS Alteration Halo and Deposit
(Adv. Dr. Kelly)

OAKMAN, KARI L.
PROFESSIONAL MASTER – MINERAL EXPLORATION (Non-Thesis)
(Adv. Dr. Monecke)

OGUNDELE, OLUSEGUN JOSEPH
PROFESSIONAL MASTER – PETROLEUM RESERVOIR SYSTEMS (Non-Thesis)
(Adv. Dr. Sonnenberg)

PARSONS, ARUN
M.SC.-GEOLOGICAL ENGINEERING
A System for the Identification and Characterization of Geologic Hazards to Engineering Works
(Adv. Dr. Higgins)

PETERSON, MELANIE
M.SC.-GEOLOGY
Tectonic Signatures Within and Above the Niobrara Formation in Cherry Creek Field, Eastern Denver Basin
(Adv. Dr. Sonnenberg)

PRACHAKVEJ, SURINA
M.SC.-GEOLOGY
Petrographic Study of the D Sandstone, Lilli and Sooner Fields, Denver Basin
(Adv. Dr. Sonnenberg)

RITTS, ANDREW
M.SC.-GEOLOGY
Texture and Composition of Pyrite Contained in the Mudstone Host of the Eskay Creek Sulfide and Sulfosalt Deposit, British Columbia
(Advs. Drs. Monecke/Kelly)

SANER, PHYLICIA
M.SC.-GEOLOGY
Microbial Analysis of the Niobrara Formation for Microbial Enhanced Oil Recovery (MEOR) and Contaminant Tracing Application
(Advs. Drs. Humphrey/Spear)

SAPARDINA, DESSY W.
M.SC.-GEOLOGY
Contrasting Facies in Slope and Basin-floor Deposits that Correspond to Rising and Flat Shelf Edge Trajectories, Lewis Shale, Washakie Basin, Wyoming
(Adv. Dr. Plink-Björklund)

SCHIMMING, DERRICK
M.SC.-GEOLOGICAL ENGINEERING
Yield Rates for Debris Flows in Burned Areas in the Western United States
(Adv. Dr. Santi)

SCHMANDT, DANIELLE S.
M.SC.-GEOLOGY
Stratigraphy and Mineralization of the Kamoa Copper Deposit, Katanga, Democratic Republic of Congo
(Adv. Dr. Hitzman)

SCHROEDER, ADAM
M.SC.-HYDROLOGY (Non-Thesis)
(Adv. Dr. Benson)

STERLING, AMELIA T.
PROFESSIONAL MASTER – MINERAL EXPLORATION (Non-Thesis)
(Adv. Dr. Monecke)

STOUT, LAUREN
M.SC.-GEOLOGY
Carbon Isotope Chemostratigraphy of the Niobrara Formation, Denver Basin, Colorado
(Adv. Dr. Humphrey)

TAYLOR, JAMES
M.SC.-GEOLOGY
Petroleum System Analysis of the Niobrara Formation in the Southern Powder River Basin, Wyoming
(Adv. Dr. Sonnenberg)

THUL, DAVID
M.SC.-GEOLOGY
Niobrara Source Rock Maturity in the Denver Basin: A Study of Differential Heating and Tectonics on Petroleum Prospectivity Using Programmed Pyrolysis
(Adv. Dr. Sonnenberg)

WEATHERS, DANIEL C.
M.SC.-HYDROLOGY (Non-Thesis)
(Adv. Dr. Benson)

WILLIAMS, JOHN L.
PH.D.-HYDROLOGY
Building a Better Wind Forecast: A Stochastic Forecast System Using a Fully-Coupled Hydrologic Atmospheric Model
(Adv. Dr. Maxwell)

WOLFENDEN, SOPHIA
M.SC.-HYDROLOGY
Watering the Central Valley: A study in modeling the Central Valley, CA for flow and irrigation using Parflow
(Adv. Dr. Maxwell)

Student News

Undergraduate Hayden Fischer received the AEG Beardsley-Kuper Field Camp Scholarship

Alyssa Franklin's poster: "Regional Stratigraphic Analysis of the Three Forks Formation, Williston Basin, USA" was given an Award of Excellence for a top ten presentation. Dr. Stephen Sonnenberg is the co-author. The poster was presented at Long Beach AAPG, April, 2012. Total posters presented at the AAPG were 500.

Brett Arpin and Casey Dowling won AEG Stout Scholarships.

Graduating Senior Awards

Students were nominated for these awards by the faculty in the Department who also voted on and approved these awards. From all of us in the Department, we congratulate these awardees for their exemplary scholastic achievements and enthusiasm for geology.

The Outstanding Graduating Senior Award: Ryan Neilson
The Brunton Award in Geology: Chris Pederson and Matthew Lemke
The Hutchinson Award: Rebekah Simon
The Neal J. Harr Memorial Pick: Rebekah Simon

In Memoriam

David Trippett died at the age of 37 on May 5, 2012, in Denver. He was enrolled in the Professional Master in Mineral Exploration program. He described himself accurately as a continental drifter, a climber, a structural geologist and a Ridgeback lover (especially his dog Obi!). We admired him for his enthusiasm, drive, curiosity and willingness to help others. We also miss his energy and sense of humor in the Department.

Student Support

Our students are fortunate to be in a program that companies, alums, and friends of the Department believe in and support financially and with computer programs, equipment, and data. This support for students is critical to progress in their programs and the ability to afford the cost of their education. We gratefully acknowledge all sources of student support.

Mohammed Al Duhailan	Bakken Consortium, Saudi Arabia Government
Eric Anderson	U.S. Geological Survey
Caitlin Arnold	Fred Meissner Scholarship
Brett Arpin	Department Teaching Assistant Fund, Yeh & Associates
Tom Arthur	Niobrara Consortium
Adam Atchley	U.S. Environmental Protection Agency
Amanda Ayala	Robert Dimelow Scholarship
Kim Bandy-Baldwin	U.S. Geological Survey, NSF
Aaron Bazzell	Bakken Consortium
Lindsay Bearup	U.S. Geological Survey
James Beisman	DOE
Mitchell Bennett	F. Steven & Gayle Mooney Scholarship
Michael Berger	Department Teaching Assistant Fund
Alex Betancur	Vaca Muerta Consortium, Department Fellowship Fund
James Bethune	Department Teaching Assistant Fund
Alex Borchert	Frank & Peter Andrews, David Bolin, GE Faculty, and Maxwell Gardner Scholarships, John S. Phillips Fellowship
Peter Brice	Endeavour Mining Corporation
Kelly Bruchez	Niobrara Consortium, Newfield Exploration
John Buchanan	Department Teaching Assistant Fund, NSF Career Grant
Patricia Capistrant	First Quantum Mining & Operations, Ltd.
Franki Carver	Marathon Oil Fellowship
Dylan Cobb	Bakken Consortium
Laura Condon	National Science Foundation, Engineering Research Center
Ty Conner	Department Teaching Assistant Fund, U.S. Geological Survey
Ian Donovan	Harold Hickey Fellowship
Casey Dowling	Department Teaching Assistant Fund

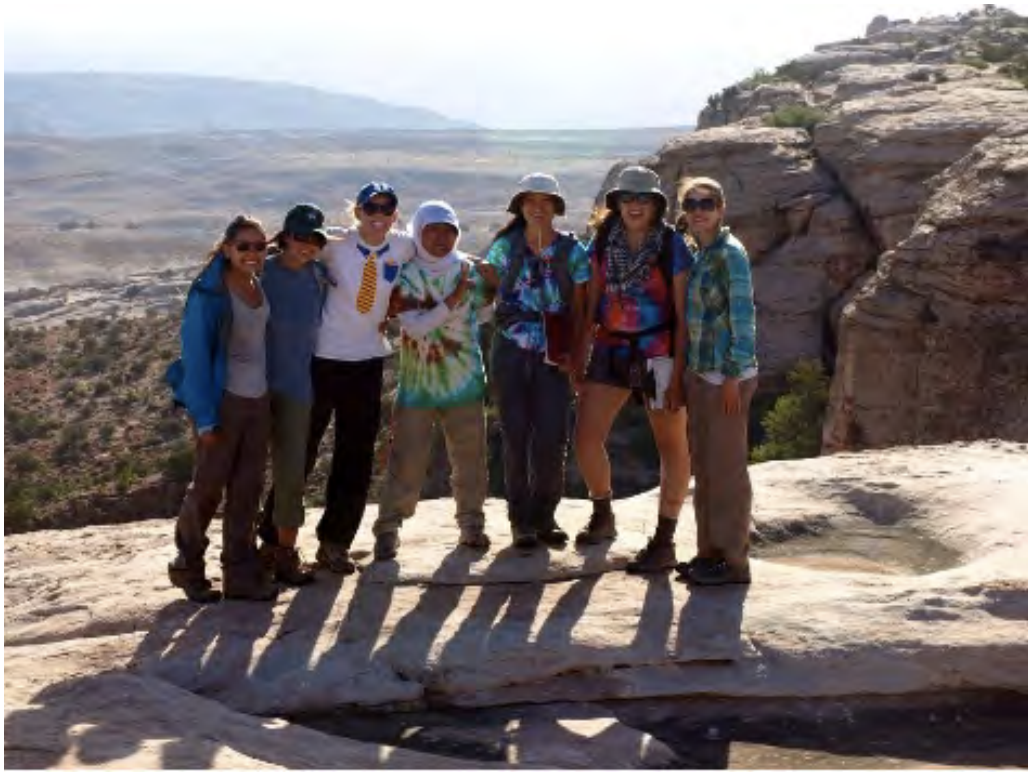
Nigel Kelly conducting field work in the Alaska Range

Robert Duran	Department Funding
Matthew Dye	Cripple Creek & Victor Mining Company
Jeffrey Edelen	Esperanza Resources
Henriette Eidsnes	Bakken Consortium
Rebecca Errington	Robert Allardyce and Rex Monahan Fellowships
Ellen Fehrs	Bakken Consortium
Elena Finley	Niobrara Consortium
Ida Fischer	Department Teaching Assistant Fund
Alyssa Franklin	Bakken Consortium
Evan Friedman	National Science Foundation, U.S. Geological Survey
Ben Frieman	Department Teaching Assistant Fund
Allen Frierson	BP Fellowship, Devon Fellowship, Newfield Exploration Co. Fellowship
Laura Garchar	Epis Graduate Student Fellowship, Ormat Technologies, Inc.
Jordan Garrett	Department of Energy, Department Teaching Assistant Fund
Joseph Gartner	U.S. Geological Survey
Alex Gibson	Anadarko Petroleum Fellowship
Greg Gordon	ConocoPhillips SPIRIT Scholarship, Chevron ETC and Chevron University Partnership Program funding
Timothy Gross	Society of Economic Geologists, Kiska Metals
Claudia Gutierrez	Bakken Consortium
Mario Guzman	James L. & Arlene H. Payne Fellowship
Wesley Hall	Discovery Metals
Sophie Hancock	Ur-Energy USA, Inc.
Benjamin Haugen	Department Teaching Assistant Fund
Thomas Hearon	BP Fellowship, ConocoPhillips SPIRIT Scholarship
Lindsay Hefton	John S. Phillips Fellowship
Elizabeth Holley	Barrick
Zachary Hollon	Chevron Fellowship
Zane Houston	Niobrara Consortium
Hui Jin	Anadarko Petroleum Fellowship, Bakken Consortium
Tiffany Jobe	ConocoPhillips SPIRIT Scholarship
Rebecca Johnson	Bakken Consortium
Teresa Johnson	MMG

Evan Jones	Devon Fellowship
Macy Jones	Questar Fellowship
Armagan Kaykun	Government of Turkey
Ted Kernan	Vaca Muerta Consortium, Department Fellowship Fund
Nicholas Kerr	Teck Ireland, Ltd.
Katherine Kirsch	DOE
Katie Kocman	QEP
Jack Kranz	NSF Career Grant
Mason Kreidler	Harold Hickey Fellowship
Martin Krueger	BP Fellowship, ConocoPhillips SPIRIT Scholarship, Devon Fellowship, Niobrara Consortium
Kelly Lange	Questar Fellowship
Fabien Laugier	BP Fellowship, Rio Mar Consortium
Julie Leibold	Cameco
Jenna Lente	Questar Fellowship
Chris Liebli	Risk Management Center, USACE
Vivian Lin	Niobrara Consortium
Jena Long	Department Teaching Assistant Fund
William Loopesko	Edna Bailey Sussman Fellowship
Ben Lowry	UNAVCO
Jessica Matthews	NSF
Nicholas Matthies	Lawrence A. & Kay Carol McPeek Fellowship, Department Teaching Assistant Fund
Nathan McClain	Paul S. Pustmueller Fellowship
Courtney McGinn	C. Richard Wagner Scholarship
Teresa Malesardi	Niobrara Consortium
Lindsay Margolies	Ginger Dodson, Sam Goldich Fellowships
Ryan Marsters	Department Teaching Assistant Fund
Kevin McCoy	National Interagency Fire Center
Corey Meighan	F. Steven & Gayle Mooney Scholarship, First Quantum, Ltd., Charles Franklin Fogarty Chair Fellowship
Seth Meisel	William Klett Scholarship, Field Camp Fund
Steve Meyerhoff	National Science Foundation
Matthew Minnick	Department of Energy
Jeremiah Moody	ConocoPhillips SPIRIT Scholarship, Chevron ETC and Chevron University Partnership Program funding
Katherine Mouzakis	EPA
Ryan Mulhall	Department Teaching Assistant Fund
Kazumi Nakamura	Whiting Oil & Gas Fellowship
Dipanwita Nandy	Bakken Consortium
Andrea Nolting	Fred Meissner Fellowship
Robert Nowak	MMG
Bradley Nuse	Frank & Peter Andrews Scholarship
Olivia Oseguera	Department Teaching Assistant Fund
Tim O'Toole	Chevron ETC and Chevron University Partnership Program Funding
Justin Palmer	ATAC Resources, Ltd., SEG Graduate Student Fellowship
Arun Parsons	Federal Highway Administration
Colin Penn	National Science Foundation
Melanie Peterson	EOG
Rachel Pinkoski	Department Teaching Assistant Fund
Jesse Pisel	Chevron ETC and Chevron University Partnership Program funding
Claire Pless	Department Teaching Assistant Fund
Rodrigo Prugue	DOE, Marathon Oil Scholarship
Anne Rahfeld	German Academic Exchange Service, Society of Economic Geologists, Cripple Creek & Victor Mining Company

Mandi Reinshagen	John & Carolyn Mann Graduate Fellowship, Rare Element Resources, Ltd.
Tony Rios	EOG
Andrew Ritts	Camiro and Geoscience BC
Amanda Rock	Department Teaching Assistant Fund
Carla Sanchez	Pan American Fellowship, Chevron AWG Fellowship
Phylicia Saner	Niobrara Consortium, Department Fellowship Fund
Paul Schietinger	Bakken Consortium
Danielle Schmandt	Ivanplatz
Kassandra Sendziak	Chevron ETC and Chevron University Partnership Program funding
Erica Siirila	DOE, NETL/U.S. Environmental Protection Agency
Jane Stammer	Chevron ETC and Chevron University Partnership Program funding
Timothy Stockhausen	Silver Bull Resources, Inc.
Lauren Stout	Whiting Oil and Gas, Department Fellowship Fund
Michael Sweetenham	Center for Underground Tunneling and Construction
Erik Tharalson	Stewart R. Wallace Fellowship, Encampment Minerals
Cosima Theloy	Bakken Consortium
Helen Thomas	Department Teaching Assistant Fund
David Thul	Niobrara Consortium, Department Fellowship Fund
David Underwood	Niobrara Consortium
Justin Wagner	Greater Denver Area Gem & Mineral Council Fellowship
Mitchell Weller	BP Fellowship, Marathon Oil Fellowship
John Williams	University of Colorado – CREW DOE Wind Energy
Sophia Wolfenden	Edna Bailey Sussman Fellowship, HSE Fellowship
Kristi Zellman	Daniels Graduate Fellowship, ConocoPhillips Fellowship

FIELD SESSION

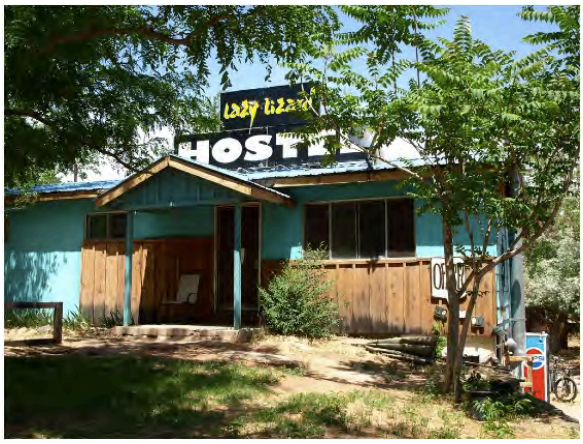


by Andrea Nolting

Awaited, and highly anticipated, all Colorado School of Mines students in the Geological Engineering Department must endure and conquer the right of passage known as Field Session. Each student from the Junior class (graduating 2013) prepared differently; internal pep talks were given, large amounts of baby wipes were stockpiled, and the Mickey Mouse sleeping bag was ditched for the warm down variety. We had been taught all the necessary skills leading up to our departure, but all feared that we were in for a rude awakening. As mentally and physically prepared one can get after finals ending several days beforehand, the class of 2013 embarked on Field Session, an experience one never forgets.

Moab, Utah. Week one (May 13th-18)

After a peaceful and scenic drive to Moab, one of the largest groups ever to embark on Field Session trickled into the Lazy Lizard Hostel and Campground. Hostel rooms were inspected, settled upon and filled to the brim with all the necessary, and unnecessary, gear. The groups that arrived early lounged around pretending to be oblivious to the impending workload, while the last stragglers rushed in to unload their gear. At 5PM sharp, Dr. Bruce Trudgill, Professor Mary Carr, and TAs Thomas Hearon and Claire Pless descended upon the Lazy Lizard. Our class assembled on the front lawn, where we were introduced to Moab's geology (sedimentary formations affected by salt tectonics) and given our first official mapping assignment.

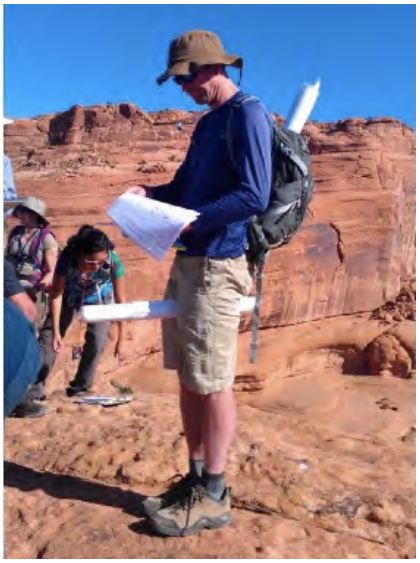


Our home away from home. The Lazy Lizard in all its glory.

After a relaxed evening, the temporary residents of the Lazy Lizard began to stir at the bright and early hour of 5:30AM. Water bottles and CamelBaks were filled, a hardy breakfast of oatmeal savored, lunches packed, and generous amounts of sunscreen were applied. We gathered in the parking lot of the local credit union for our morning briefing, where we were given a broad overview of Arches National Park. The first half of the day consisted of an introduction to the mapping area and geological (mappable) units, and participating in a group measured section. By midday the class was beginning to heed Trudgill's warnings about dehydration and heat exhaustion. Exhaustion, and possibly a tad bit of sheer terror, had set in by the finish of Day One. We were beginning to comprehend what we were going to be tackling in the coming six weeks.

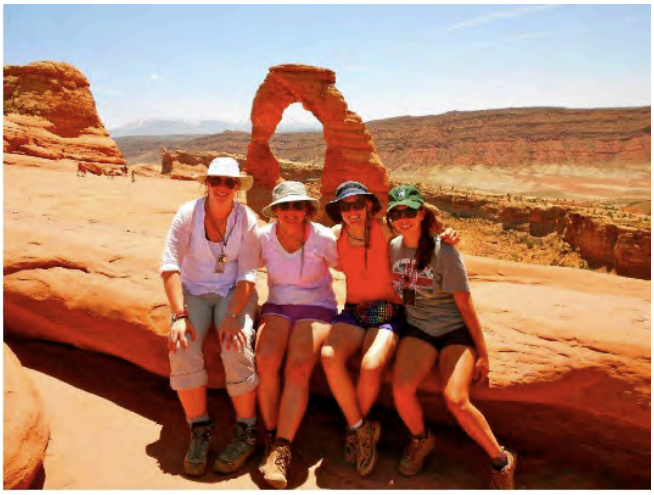
Bathroom Break anyone? Moab week 1

The mighty Bruce Trudgill loaded down with maps.



As the week progressed, blisters were nursed and then ignored while maps slowly came to life. Mapping was in full force, and scratches, scrapes, and bruises went unfelt as we focused on understanding and catching all of the structural complexity within the mapping area. Those that choose to bypass the jump across the large gap in the formations trekked around to the north. Those braving the gap all have different stories as to how large the actual gap is, and whether jumping or not was really all that good of an idea.

To further our familiarity with JLO (The Juana Lopez Formation) many students worked their way south. Many students walked along the road until they reached the edge of the mapping area, then cut south. However, a select few (under the advisement of Trudgill) choose to cut directly through the bushes to reach the desired location. However, the stream was indeed running, and who knew that bamboo grew that tall in the desert. Trudgill's shortcut proved to be not so short, and not all that easy, but the students did come out barely scathed, and laughing. By early Wednesday afternoon, most mapping teams were done with mapping the area around Delicate Arch, and



Break from mapping to take in the view from Delicate Arch.

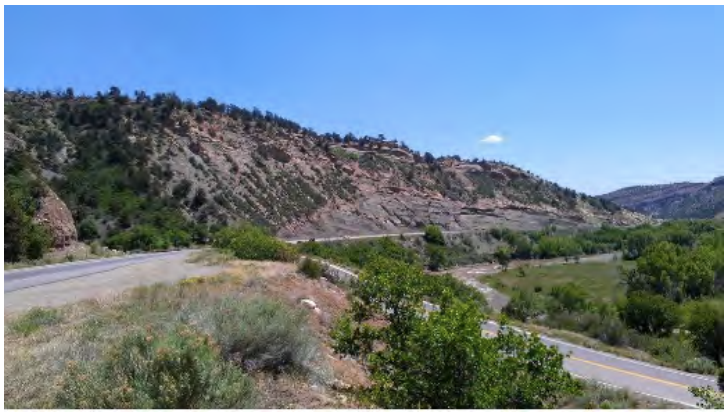
began to slowly build their maps while utilizing the parking lot as their classroom. All maps were turned in by 10PM that evening, few were turned in early, but most were right on time.

Thursday and Friday were spent in Mill Canyon, a new location, which meant a new map. For the most part, students were left to their own devices, compiling their maps using their trusty geological tools: compass, aerial photographs, and various colored pencils. Thomas or Bruce were likely to be on the nearest hill or cliff; watching the students map and flounder just a bit. All was going well until Trudgill popped over a ridge and, just as he had assumed, caught students "clumping". All persons within the canyon felt Trudgill's wrath and proceeded to "declump" immediately. Mill Canyon was riddled with faults, high cliffs, and world-class scenery. Again our final field maps were due by 10PM on Friday night. The atmosphere in the hostel was one of diligence, perseverance and possibly a tad bit of delusion and hysteria. All maps were turned in, and the entire class breathed a sigh of relief as Week One of Field Camp came to a close. A "small" celebration was had at the Lazy Lizard, where Trudgill, Pless, and Hearon joined in.

Durango, Colorado. Week Two (May 20th- 25th)

After our somewhat shocking introduction to Field camp, many students passed the hours in between assignments soaking in Ouray, Colorado's relaxing hot springs, while others went directly to Durango and enjoyed the beautiful college mountain town. We had the luxury of staying in Fort Lewis College's dormitories, with showers and kitchens included, true five star accommodations. This week we were be joined by Dr. Jerry Higgins, Dr. Wendy Zhou, Dr. Paul Santi, and TAs Casey Dowling and Bret Arpin. As pointed out at our Sunday night meeting, this week's focus was going to be drastically different from any other week; we would be working primarily with paleoglacial deposits, using "urban" geological mapping in combination with stereopairs.

Sporting our fashionable orange safety vests, on Monday morning we were introduced to the city of Durango and its subtle geology. Glacial moraines were difficult to see upon first inspection, but as our eyes were trained to look for the rounded boulders within a fine-grained muddy matrix, they became more apparent. Glacial outwash proved to be more difficult; looking similar to moraines themselves, we often relied on the proximity to the moraines, as well as the degree of maturity of the deposit for identification.

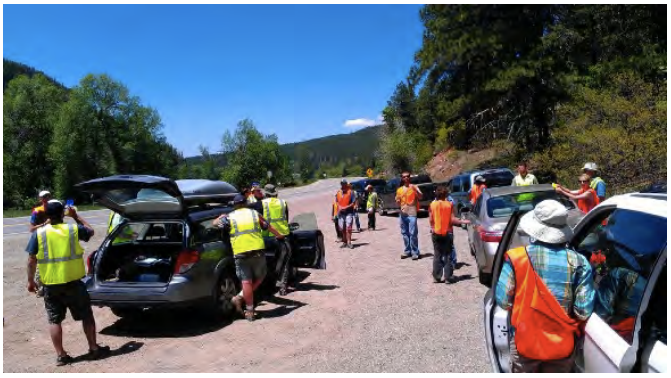


View of glacial moraines, from the side of the highway.

Our mapping was divided between mapping in the field, often wandering through driveways and fields, and using steropairs to help identify the typical "mound" morphology of the glacial moraines. Our evenings consisted of delicious local food, basketball, or the next fun activity while filling in our maps as best we could. While mapping on the side of

Group photo - Lemon Dam.

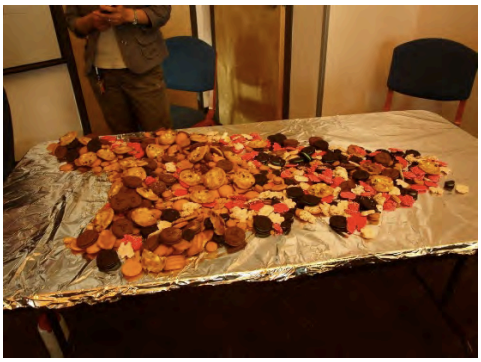
Highway 550, our class had the privilege of good timing, watching the carnival roll into town. Paul and Jerry informed us this has happened for several years, and you can time their arrival down to the minute. Our final day of mapping



Urban Geology - mapping by car (viewing a landslide site on the side of the road).

(for most students) consisted of mapping by automobile; a new geology experience for many, and we developed the phrase "mapping gravel while we travel". In the car, you could determine if you were on a moraine if you went over a large dip in the road. It was quite obvious the majority of Durango was built on glacial moraines.

Our mid week BBQ was very welcome, complete with a table covered in various delicious cookies. These cookies were strategically placed on the table to resemble the placement and shape of moraines within Durango.



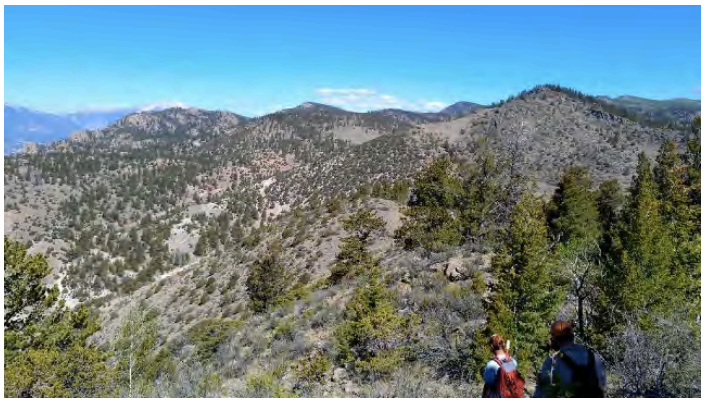
Cookie moraines. Our BBQ desert that sustained us all week long.

On Thursday, the class participated in a field trip where we were immersed in the natural hazards of Durango. We viewed areas that had been affected by rock fall hazards, wild fires and landslides. We were also privileged enough to visit the Lemon dam, where John Iey spoke to us about the incredibly innovative and ingenious geotechnical techniques that were used to preserve the dam's integrity after a wildfire ravaged the area and compromised the stability of the slope directly behind the dam.

Our maps were completed Thursday evening, including a resources map for aggregate materials. Friday morning all materials were turned in, and we moved out of our five-star accommodations. We bid farewell to Higgins, Zhou, and Arpin; and prepared to head to Salida for our first week of roughing—camping.

Salida, Colorado. Week Three (May 28th-June 1st)

Our first introduction to hardrock, so many of the students were ready for Week Three to begin. Our first priority, however, was to set up our individual camps (up wind from the freshly delivered port-o-potties), and erect the group

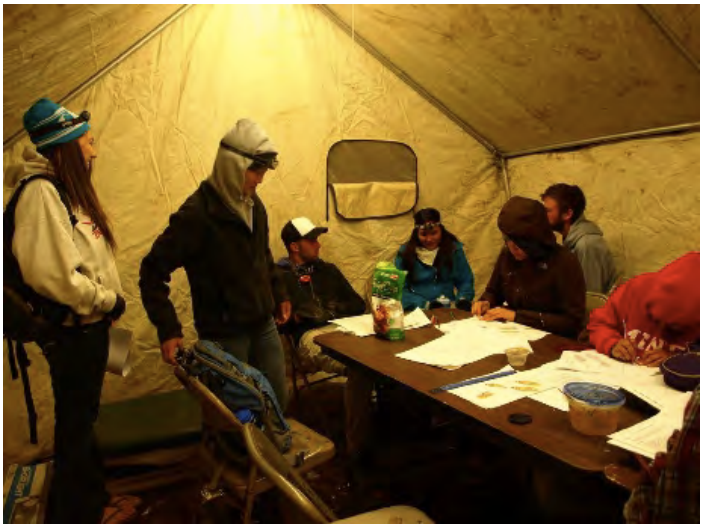


View from the peaks around Calumet Mountain.

work tents. This week we were joined by Dr. Paul Santi, Dr. Ric Wendlant, Dr. Nigel Kelly, and TAs Casey Dowling, and Jess Matthews. We received our maps, outlining our mapping area and received a brief geological introduction to the area. Our first night in camp was a rude, cold awakening; we were no longer in warm Utah, nor our luxurious dorms in Durango. We would be going shower-free for a week's time, learning the joys of the babywipe shower, and repeated applications of deodorant.

Our first day consisted of the customary tour through the mappable geological formations, their stratigraphic order, and their morphology. Ric and Paul set a quick pace, leaving no time for dillydallying. Our lunch location provided

Late night work in the Group Tent.



spectacular views, away from crowded streets and congestion of the city; this is what Field Session is all about. We were left to our own devices (mostly) for the rest of the week. By the end of Day One, many students were starting to understand the importance of the Parting Formation as a marker bed.

We spent Tuesday morning on top of the world, mapping at elevation where we got to experience spectacular skarn deposits with large garnets. From there, we worked our way down south, along the flanks of the ridges, mapping the contacts along the way. By mid-week we had adopted the mantra of "follow the Parting", using the formation as an indicator for stratigraphic relative location as well as structural controls on the area. We enjoyed a mid-week BBQ that included a cake decorated with a "No clumping" emblem to commemorate our week with the mighty Bruce Trudgill. We were also provided with a glorious spread of ingredients for the gourmet hotdogs. Week Three proved to be challenging. Our formations were often difficult to identify, the area was structurally complex, and there were zones of intense alteration. It became important to pay close attention to the small details, mapping in-place rocks (even when float was more prevalent).

The Mohawk cutting commences. Dave Simpson sporting this week's trend.

The men of our group decided to cut their hair into mohawks and shave off their beards and leave mustaches. However, one lucky man's mohawk got trimmed poorly, giving him a lopsided mohawk that was uneven for the rest of Field Session. Our first week of camping was going well, dinners were cooked over camp stoves or eaten cold. Campfires provided welcome warmth as the nights proved to be quite chilly.

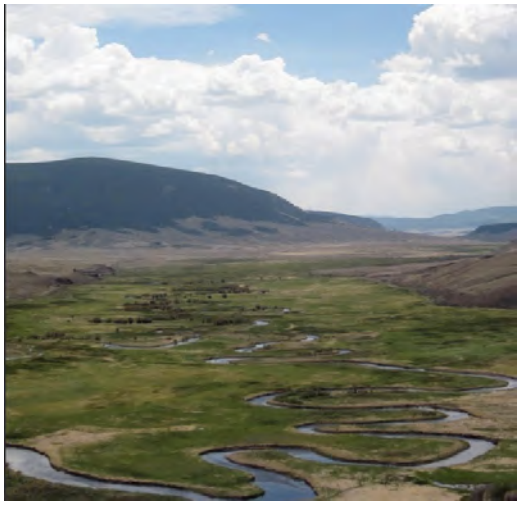
The week progressed and our maps started to come together, showing a logical stratigraphy that included the structure of the area and the necessary "V" for streams. On Thursday, we got shuttled up to the top of Calumet Mountain, slowly working our way towards the ancient iron (magnetite) mine. At the mine, we took a scenic break and spent a good chunk of time rock hounding. Students found some stunning epidote samples hosted in calcite. We also became witness to one perturbed Australian professor's wealth of vocabulary when he broke a particularly nice epidote sample. We continued to map, more often than not by float, and built representative maps of the area.

Friday morning arrived quickly, and provided only a few hours to compile our final maps. Our maps included a resources evaluation and construction route for power lines. The deadline approached and students became more rushed, colored with less precision, and hastily added last details to maps and cross sections. The few that were done early began to break their personal camps, preparing for their first return home in three weeks, or for the trek down to Saguache. We held our final group meeting, where we got a look at some accurate geologic representations of the area and reflected on what we did right and what could have been improved upon.

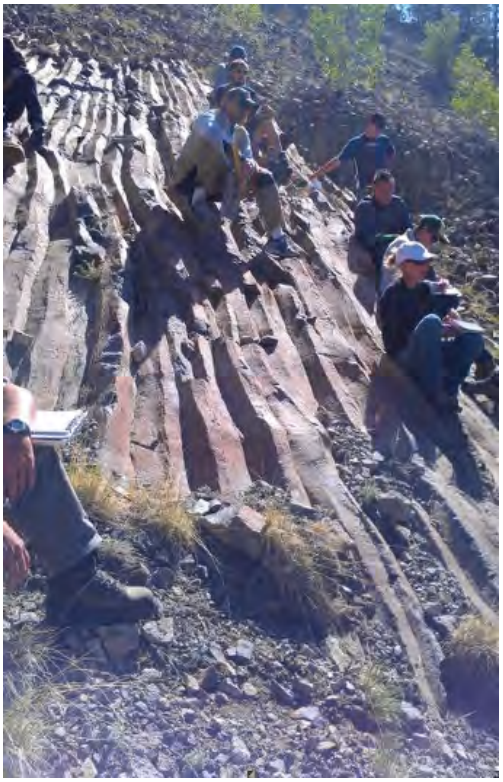
Week Three was concluded with the break down of our group tents, and saying farewell to Dr. Paul Santi. We had just completed our first week of camping, and had officially made it to the halfway mark of Field Session. However, lingering in the back of our mind was the close arrival of Week Four, supposedly the hardest week of field session.

Saguache, Colorado. Week Four (June 4th-8th)

Drifting in the afterglow of our completion of Week Three, freshly showered, and well rested, we slowly arrived at the camping grounds, erecting our homes for the coming week. We experienced our first bout of "rain" on Sunday evening, it was gone before it really ever arrived, and we were extremely thankful. This week we were to be led by Dr. Ric Wendlandt, Dr. Sam Romberger, Dr. Nigel Kelly, and TAs Casey Dowling and Jess Mathews; a wealth of knowledge held between all. Our Sunday evening meeting commenced with all persons accounted for (we hadn't had a single person throw in the towel… yet). We received a packet of bound materials; valuable resources to be used when mapping difficult volcanic geology with a high degree of variability.



Area just outside of Sagauche.



Morning introduction to Saguache mapping area. Columnar Jointing.

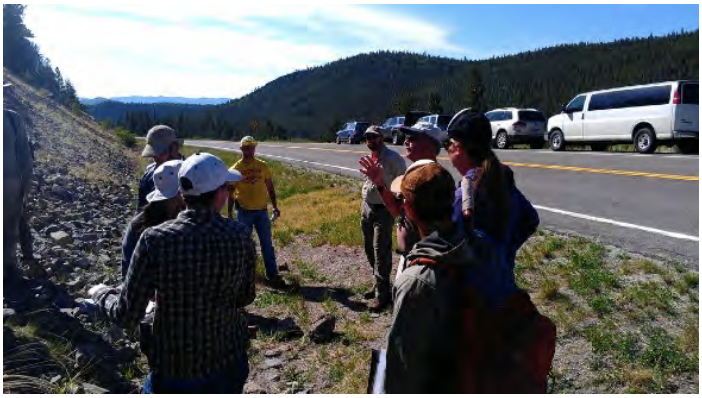
This week we were to map a 12 square mile area, too large for two people; so we were grouped into bunches of four. Two safety partners would cover the more structurally complex northern half, while the other two partners would trek across the physically challenging southern half.

Monday morning brought bright skies and warm temperatures; perfect mapping weather. We spent the first half of our day getting introductions to the different units and they were oftentimes difficult to tell apart, being similar in color and mineralogy. By mid-afternoon, we enjoyed our lunch overlooking our mapping area before splitting into the north and south mapping groups. By the end of the first day, we found that volcanic deposits behaved erratically and there was no "standard" stratigraphic order, as units pinched and swelled in different locales. We longed to hear the "plunking" of the Fish Canyon formation, for it was easy to identify. Yet again, by the end of Day One exhaustion had set in, along with a healthy dose of nerves and anxiety.

That evening, attack plans were formulated and maps were inspected. By Tuesday, safety teams were well on their way to starting to build a comprehensive map. While the northern mappers navigated the stream, the southern mappers had a battle to the top of Mountain 9519. Who would be the first to reach the top? A note was left after one safety team reached the summit in under an hour, to gloat just a bit. The south portion of the mapping area also proved to be the land of the rattlesnakes, where approximately 20 rattlesnakes were seen.

By Wednesday, maps were becoming legible with colors and structure represented. The group also learned the value of sealable containers for food after an entire three-pound bag of peanut M&M's, among various other food items, was consumed by a resident rodent. Our group descended upon and devoured bratwursts with vigor while taking a welcome break for our mid-week BBQ.

On Thursday morning, the northern mappers were shuttled to the top of the mapping area and dropped off to explore the north and eastern most mapping boundary. Ric Wendlandt accompanied this group, mapping with silent determination and familiarity. For the northern mappers, the section provided some much needed clues to build an accurate picture of the area. Thursday afternoon was spent working



More roadside geology. Receiving a talk from Sam Romberger.

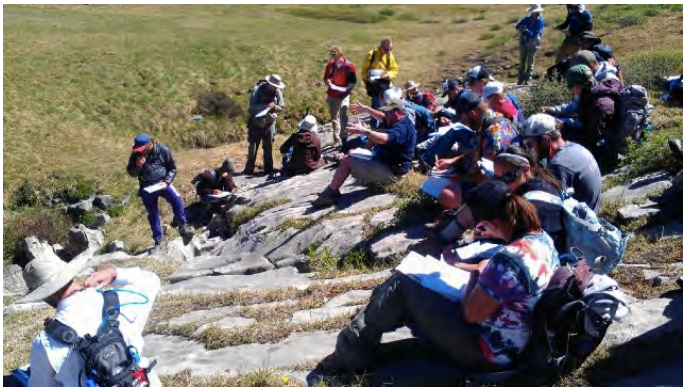
with your composite partner from the south to verify and agree upon the geology in the "cross over" area. The mapping ended on Thursday afternoon with only minor injuries, stiffness and blistered feet, and an excitement unparalleled in the weeks preceding. Thursday evening was dedicated to working with both your safety partner to verify information in your area as well as working with your composite partner to build your final map. We also enjoyed the late night

Bonfire and smores before the mapping begins on Monday morning.

bonfires, celebrating the completion of mapping for Week Four.

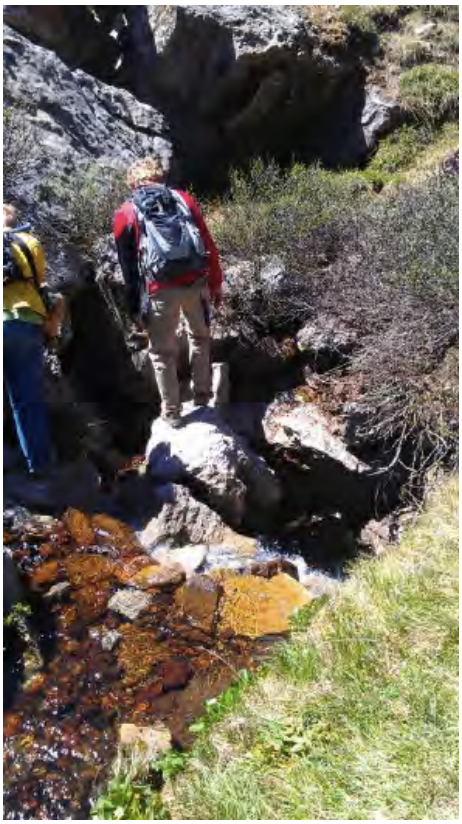
Friday morning was used to put the finishing touches on all the maps, composing a resources report as well. All maps were turned in (most were complete…) to have our discussion about the area and grade our own maps for accuracy. We broke camp and said goodbye to our mentors for the week, and proceeded to begin preparing ourselves for Week Five. First on the to-do list was shower, of course!

Molas Lake Pass, Colorado. Week Five (June 11th-15th)
Our last week of "roughing" it came faster than we thought. We arrived at our highest elevation mapping location yet, ready to be a little oxygen deprived and cold. Sunday evening provided us with the routine of setting up camp, and the customary introduction to the area. This week we were joined by Dr. John Humphrey, Dr. Steve Sonnenberg, Dr. Donna Anderson, and TAs Casey Dowling, and Rebekah Simon. This week, we were surrounded by amazing scenery, the freshest crisp air around, and challenging geology. Our goal for the Fifth Week: finish with a bang and enjoy Molas Lake Pass. Humphrey's goal: to make the Fifth Week the best yet, and coin the phrase "this is how we do it Fifth Week".



Humphrey's lecture by the disappearing stream.

We readied ourselves on Monday morning after a cold first night. We would be taking the customary hike through local stratigraphy, but at this elevation the hike was harder than most. We were notified that to successfully complete Week Five, any student who encountered a fossil was required to perform Humphrey's "fossil dance". On our challenging hike the first fossils were encountered, and the fossil dance ensued. We walked through pristine scenery until we reached a natural phenomenon: a disappearing stream. We sat on the hill and listened to a lecture on karsting and its occurrences and, in the afternoon, we measured our first section. We worked from the bottom up, using our compasses as a Jacob's Staff (a technique that often required refining).

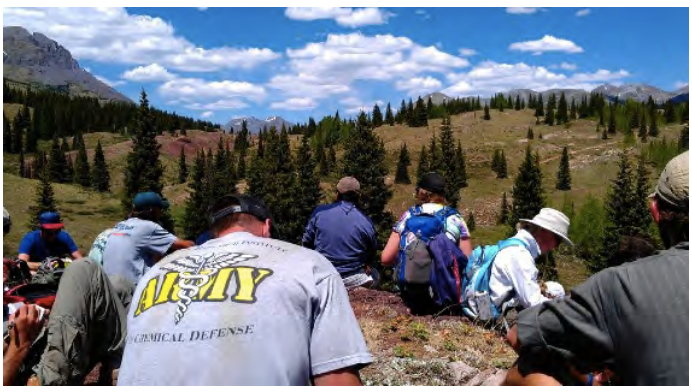


Disappearing stream

On Tuesday, we began the day by mapping the area around the campground, then working our way up to the road. We mapped along the highway, stopping at a fantastic outcrop riddled with fossils. The fossil Dance was performed, on the side of the highway, for all to see; there is no shame while on Field Session! That afternoon and into Wednesday we were left to our own devices. We mapped the various formations, measured sections and pondered the structural complexity of the area. Wednesday afternoon we received Humphrey's "sermon on the mount", an enlightening lecture on the context of the area, and its significance. Fifth Week is a week of stunning beauty and good times, and the area surrounding the waterfall was explored and mapped.

We learned the phrase "this is how we do it fifth week" when the Wednesday night BBQ rolled around. Humphrey

Sermon on the Mount

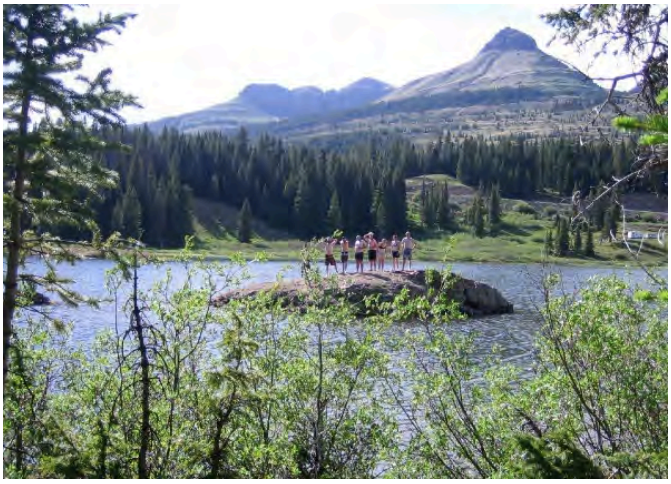


Group picture on the side of a cliff.

accomplished his goal of making the BBQ the best of Field Session. A game of wizard's staff began; for those of legal drinking age, the goal was to build the tallest staff composed entirely of beer cans. Needless to say, the "BBQ" continued well into the night, with no casualties. The next morning (for some) came a bit too soon with Humphrey bearing the wounds of a lost battle with tortilla chips, and some students mapping Qv. We lunched at one of the most breath taking points in all of Molas, atop a cliff, overlooking the surrounding mountain ranges. From there, we were led through the "swamp" by Humphrey. The trek took longer than normal, as Humphrey got us lost on the edge of a cliff, in the middle of a swamp. We ended up zig zagging until we spotted an old flag that designated the intended location. There is no doubt, with Humphrey leading the way, the trail is bound to be an experience.

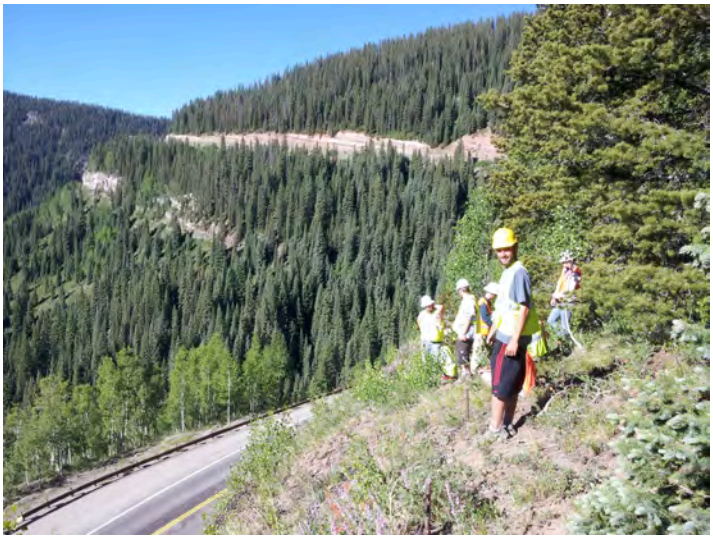
Thursday evening marked the final day of mapping in Molas, and many students celebrated by swimming in the lake, or showering in the bitter cold waterfall; a cleansing of sorts. The professors took actual showers, and prepared for the onslaught of questions to come. Final maps were worked on, resources maps were prepared and a geologic history compiled.

Friday marked the final day of camping, where finishing touches were made to maps, individual camps were broken down, and the camaraderie continued. This would be the final day when all 41 students on Field Session would be together. Our final maps were turned in, a discussion was had where we evaluated resources, and finished by grading our own work. The final break down of camp was bittersweet, as Field Session was drawing to a close, and our group would not be together again. From here, three mapping options were available for students to partake in: geotechnical mapping in Silverton, underground mine mapping in Idaho springs, and petroleum systems in Green River, Wyoming.



Celebrating the completion of mapping. Swimming in Molas Lake.

Silverton, Colorado. Week Six (June 18th-22nd)
Students joined Dr. Jerry Higgins to map the geotechnical hazards present within the city limits of Silverton, Colorado. Battling marked private property signs and suspicious neighbors, students mapped from afar. They focused their mapping to talus slopes, debris flows, avalanche chutes, and flood plains. Students worked evenings in the local library, where the staff provided them with homemade fresh baked goods. Students got to enjoy the local flavor by eating dinner, and gracing the Shady Lady Saloon. On Friday, the students were able to visit a dam in Durango that holds the water for Farmington, New Mexico.



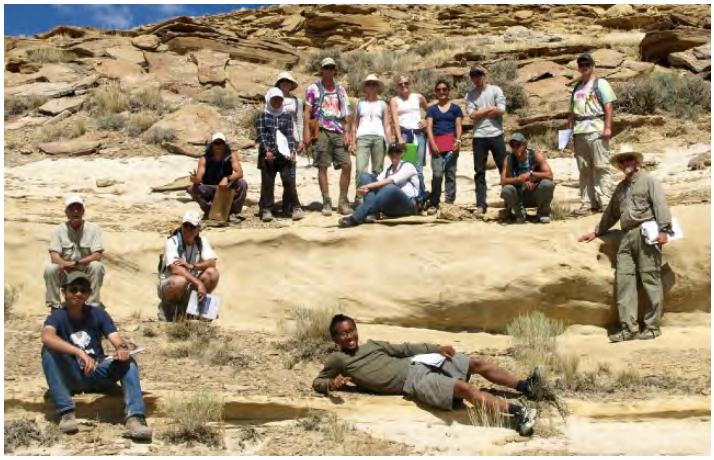
Checking out rock fall mitigation along US 550 near Molas Pass.

Idaho Springs, Colorado. Week Six (June 18th-22nd)
Many students opted to stay a little closer to home and work in the Edgar mine, working on underground mine mapping with Dr. Graham Closs. The focus was to map vein structures within a designated section of the mine. Several students also participated in a course that was developed by the army for mine rescue teams. They climbed through a course in a completely blacked out shaft, relying on their senses to maneuver their way to the finish. The group also got to visit the Cripple Creek mine to see how a large open pit mine works.

Underground in the mine.

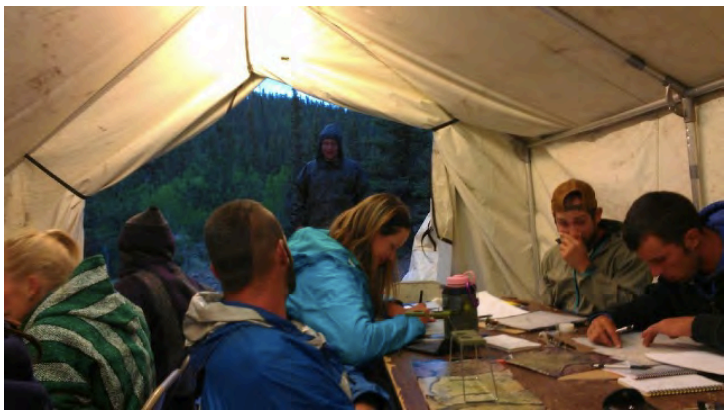
Green River, Wyoming. Week Six (June 18th-22nd)
Anadarko sponsored Week Six for students interested in petroleum geology. Dr. Steve Sonnenberg led Week Six along with three knowledgeable individuals from Anadarko, Mr. Lee Shannon, Dr. Russell Stands Over Bull, and Mr. Logan MacMillan. The students looked at marine depositional environments and their relation to hydrocarbon potential, and parasequences, deep-sea turbidites, and typical well response logs were studied. We drove to location in the van dubbed the "Dragon Wagon" with name plaque intact! The pace of the week was low-key and allowed for free evenings filled with delicious dinners, ice cream cones, and relaxing hot tubs. An immense amount of information about petroleum geology was learned, and a drill rig was visited, finishing off Field Session with a bang.

With the close of Field Session, each student breathed a huge sigh of relief as they had made it through the best time of their lives that they never want to have again and were inching closer to graduation. Everyone learned while at Field Session, and they applied their knowledge and grew as a person; preparing them for life after graduation. A special thanks to everyone involved in making Field Session happen, and to all faculty who provided us with what we thought were impossible tasks; but could actually be completed, and maybe enjoyed… a little bit.



Huge scale cross bedding, Wyoming.

Above: The completion of field session celebrated with McDonald's ice cream. Below: Field camp tents are packed away until next year.



Alumni News and Activities

Ann Grau

(PhD '00) is the recipient of AAPG's John W. Shelton Search and Discovery Award for her 2011 contribution titled, "Characterization of the Bakken System of the Williston Basin from Pores to Production; The Power of a Source Rock/ Unconventional Reservoir Couplet". The Shelton Award is given for the best contribution to Search and Discovery. The award will be officially presented at next year's Annual AAPG Meeting in Pittsburg, PA, May 19 – 22, 2013.

Jim Emme

(MSc '81) received the Melvin Coolbaugh Award from the CSMAA in May, 2012.

Diogo Rosa

Hi Debbie,

It´s been a while so it´s likely you won´t remember me, but I just got hold of a copy of the department´s newsletter so I decided I should report back about my endeavors since graduating at Mines.

But, first of all, sorry for such a long time without news!

Anyways, I graduated in 2001, so I hope you and Marylin have been doing well. Upon my graduation I returned to Portugal where I worked at the Portuguese Geological Survey for 10 years, mostly doing mineral exploration in the southern part of the country. Since the beginning of this year, however, I have been working for the Geological Survey of Denmark and Greenland and will next week go for the first time to Greenland, to explore for zinc during the short Artic Summer season. So, I´m still working in exploration, but at a very different latitude. Other than that, I have now a 7 month old daughter, called Alice. Little Alice and her mom, Silvia, joined me here in Copenhagen, Denmark. Life is good and Denmark a delightful country, but I miss Colorado a lot.

I hope I have the chance to go to Golden sometime and catch up with as many people as possible but, for the time being, I hope that this short note on what I have been up to can possibly be added to a future edition of the newsletter.

Thanks a lot.

Best regards for you and everyone that was around when I was there and may still be there,
Diogo Rosa
Researcher, Economic Geologist

The *Newsletter* is compiled once a year for alumni and friends of the Department of Geology and Geological Engineering, Colorado School of Mines.

Editor: D. Cockburn
Department Head: John D. Humphrey
Faculty: D.A. Benson, J. Duncan, W.J. Harrison, J.D. Higgins, M.W. Hitzman, E.A. Holley, N.M. Kelly, Y.D. Kuiper, R.M. Maxwell, L. Meckel (Adjunct), T. Monecke, P. Plink-Björklund, P.M. Santi, C.V. Shorey, K. Singha, A. Sitchler-Navarre, S.A. Sonnenberg, B.D. Trudgill, R.F. Wendlandt, W. Zhou
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Support Staff: D. Cockburn, L. D'Epagnier, M. Schwinger, J. Skok, C. Van Tassel

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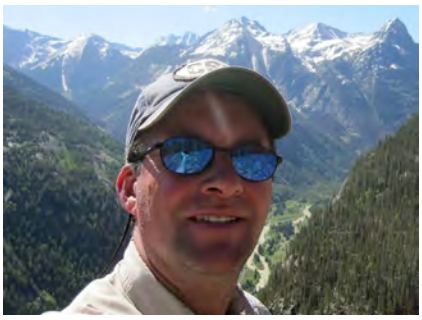


John Humphrey

Facilitators

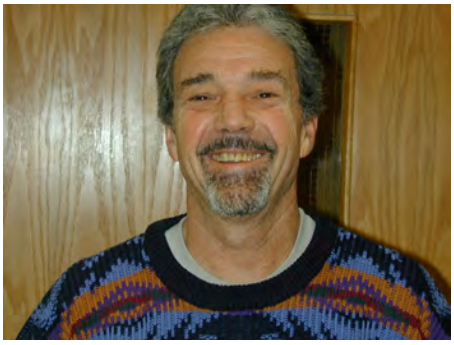
Here are the people in the Department who keep things running.

Department Head: John Humphrey
Assistant Department Head: Christian Shorey
Program Assistant to Department Head: Debbie Cockburn
Administrative Assistant: Marilyn Schwinger
Lab Technician: John Skok
Program Assistant Potential Gas Agency: Linda D'Epagnier
Program Manager Chevron Center of Research Excellence: Cathy Van Tassel
Research Associate Integrated Ground Water Modeling Center: Sophia Seo
Research Assistant: Kathy Emme

Debbie Cockburn

Marilyn Schwinger

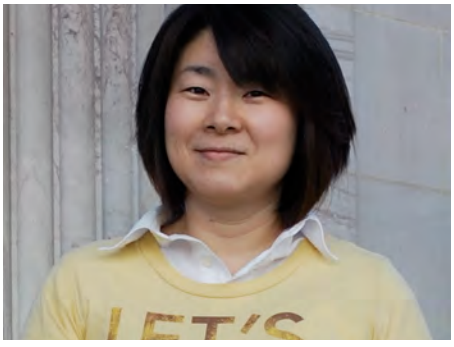
John Skok



Linda D'Epagnier

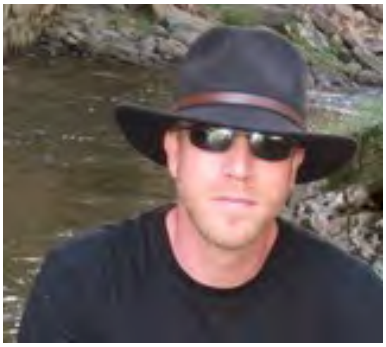
Cathy Van Tassel

Sophia Seo



Kathy Emme

Christian Shorey



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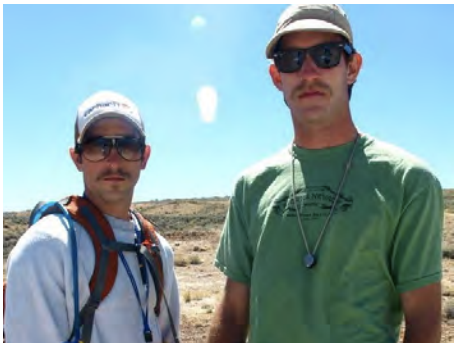

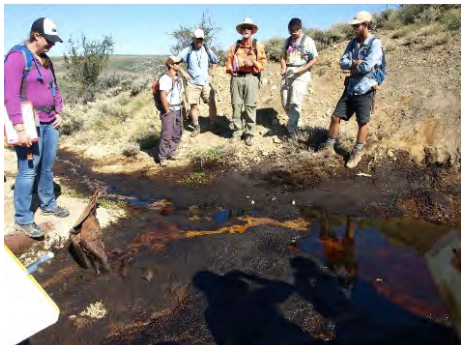

Mission Statement

The mission of the Department is to

- integrate basic and applied research in educating undergraduate and graduate students with the knowledge and skills needed for leadership across disciplines in a professional career in the earth sciences and geological engineering;
- deliver degrees in the earth sciences (graduate) and geological engineering (undergraduate and graduate);
- conduct world-class research in the earth sciences and geological engineering, with a focus on applied problems; and
- provide service and leadership toward local, regional, and global stewardship of the earth.