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Cover Photo:

This years Regional Studies class exploring Dumont Dunes in the Mojave Desert just 31 miles north of Baker, California. Photo by Christine Siddoway.

The Precambrian Basement
2013-2014

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Hello and welcome to a new edition of the Precambrian Basement! I know it is hard to believe that I am still writing these Chair letters - shouldn't someone else be in charge by now? - but no one seems to mind much. I definitely don't mind since I know I am fortunate to be the (titular) leader of such a great group of people who make it enjoyable to come to work. With this in mind, I thought I would give you a little tour of the people and places that make up my day.

Most days start with me coming into the department to find that Mandy Sulfrian and Steve Weaver have already been working for an hour or so, and that they were nice enough to leave coffee in the pot. As usual Mandy checks her list to make sure I am doing all the paper-signing that I am supposed to do, and that I am not missing any meetings with the Deans or other Important People, and I check to make sure that the snack jars are full. Steve usually gives me a run down of upcoming software up-dates or nitrogen deliveries, or he just says hello as he heads over to Tutt Science to get the XRD or microscopes ready for students to use.

As I head to my office I often have to move aside as paraprofs Dirk Rasmussen and Sarah Geisse run by on their way to get vans, make copies or otherwise work to get ready for classes. Similarly I might look into the offices of Paul Myrow, Eric Leonard or Christine Siddoway to see them getting stuff together for a lecture or a field trip. Or if it is not one of their teaching blocks, I may see them working on a committee report, a manuscript, a GIS project or a computer model; as you will read in their individual updates, our faculty are being as productive as ever both in the classroom and as members of the broader academic community. Further down the hall there is likely to be a student or two waiting to meet with Christian Schrader to talk about an igneous petrology assignment. Christian is with us for a second year as a visiting professor, and he has done a great job of getting our students in the field and excited about igneous rocks. Furthermore he has done some serious work as a research advisor, and we welcome his help and involvement.

Speaking of students, as I head down the hallway to get a drink from the water fountain I am likely to see a bunch of them milling around outside of Palmer 15 or 16, chatting away like they haven't seen each other in months (when in fact they were up until midnight together staring at stereonets or drafting strat columns). When not in classes many of them are involved in research projects, either with CC faculty, with the Keck Geology Consortium, or with other REU (Research Experience for Undergraduates) groups. Many have, or soon will, present their results at meetings of the GSA and the AGU. Seniors took a trip to the eastern Sierra Nevada Mountains in California as part of their Regional Studies/Capstone experience, and many other great field trips have taken place over the last several blocks (as usual). It is also exciting to know that we have another large sophomore class of majors to join the large junior class.

As I head back to my office, I wonder where the hell Megan Anderson and Jeff Noblett are. Both are enjoying sabbatical leaves this year, Megan after being awarded tenure and Jeff after retiring from 8 years in the Dean's office. Maybe they will disclose their locations and what they have been doing in their updates. In any case, we look forward to having them back with us next year.

After completing this early morning tour, I go back to my office, settle down in front of the ol' computer, and say to myself that this really is a special place, a special group, and I am thankful for all the time and energy that everyone commits to making it so. It also makes me happy to think that all of you alums have taken a little bit of this 'specialness' out into the real world with you, and I hope you send a little bit of it back to us periodically by sending updates on your careers, interests, home lives, etc.

OK, enough of my yackin'. Enjoy this edition of the Precambrian Basement, and have a great year moving forward!

Henry Fricke
Geology Department Chair



MEGAN ANDERSON
(Geophysics)

My big news of the year was of course being awarded tenure in the spring of '13. Thanks to all of the students and alumni who wrote on my behalf for the review—it

is so appreciated!! Because of this event, my sabbatical started in the summer, and I have goals to do a lot of paper writing during this year. However, I did go to the field in the summer for a small project. I again traveled to Costa Rica with a student (John Swisher '15) to assist Esteban Gomez from the Anthropology department pre-surveying new archeological sites on the Nicoya Peninsula. We attempted to use electrical resistivity to do our imaging this year, and we will be comparing our results to the magnetic data collected last year for John to present at Geoday.

I took some time this summer and fall to travel with my husband Tom and my parents. The highlight of the summer was a week-long backpacking trip that Tom and I took in the Emigrant Wilderness, in the high Sierra Nevada. The wildflowers were like carpets in the meadows, and we camped on glacial lakes that we had entirely to ourselves. However, I couldn't help but geek out when we came upon the coolest basement rocks I've ever seen: enclaves of metamorphic rock frozen in the process of assimilating into the intrusive granites!! I'd love to take a class there some day.

In the fall, I traveled to Seattle to complete some fieldwork with my buddy at the Washington Department of Natural Resources. Alum Maddie Jones joined me in the field as an assistant and we spent a week doing urban (Seattle) and not so urban (Cascades foothills) gravity surveying in support of the next two year's worth of geologic mapping. Not long after arriving back in Colorado, I

traveled to Durango to complete my *first* marathon! A bunch of alums know I have been working towards completing a marathon for about 10 years now, and the day finally happened! It was a nice race, following the Animas River for a good portion of the route and I saw 2 tarantulas on the run (I guess it was their migration season, so we were both on the run :)). I also traveled to the east coast in the fall to visit colleagues and friends, so I didn't attend AGU—I really missed meeting up with old friends and alum...I'll have to see you next year!

This winter I'm holing up in Colorado, but this spring will be in the San Francisco Bay area for 7 weeks—if you are in the region and want to meet up for a Sierra Nevada and sour-dough pretzel, please let me know!



HENRY FRICKE
(Geochemistry)

Hello All! 2013 began with a semester-long sabbatical during which I gave some research talks at other schools (e.g. University of Cincinnati and University of Colorado-Boulder), and spent time writing in a 'hidden' office in a secret part of campus that I didn't know existed. I also visited the University of Florida Natural History Museum for an extended period of time. The goal was to begin a new project investigating how seasonal variations in temperature and precipitation may have changed during the Paleocene-Eocene hyperthermal event, and we sampled a whole bunch of mammal teeth and fish scales to get this process started. The rest of the semester was spent on family-centric activities. The kids were 9 and 11, and I wanted to enjoy as much 'pre-teen' time as possible with them on the slopes, camping, hiking, etc.

Over the summer I undertook more

epic adventures with the family (e.g. we drove from Colorado to Boston over a three week period, visiting lots of friends and family along the way), and I also spent time in Wyoming and Colorado collecting samples as part of ongoing projects there. The focus is on one of the smaller hyperthermal events, ETM2, which we have nailed down using carbon isotope chemostratigraphy. Now we (student Molly Broom and I) are in the process of using a variety of novel methods to determine how temperature and precipitation changes during these events. Other research over the summer involved working with a climate modeler to study paleoelevation of the Rocky Mountain region during and after the Laramide orogeny, and working with Brennan O'Connell on her Keck project which focused on climate and paleoelevation in Alaska during the Paleogene (topics near and dear to my heart!). I also came up with a list of new projects I would like to work on, which is sort of a bad habit when there is so much prior research left to write up.

In the fall I got back into the classroom, or at least the CC version of a classroom, by co-teaching the GY445 Regional Studies course with Christine. We took the seniors to the central and eastern Sierra Nevada Mountains region in California, and it was a great trip. Using the topic of 'paleoelevation' as a framework for the course we had students reading papers, developing hypotheses, and considering both features they could see and features that they had to infer had existed in the past. This was my first time teaching GY445 without having to worry about leaving Erin alone with the kids (i.e. no diapers to change), and it was a great experience (thanks to my colleagues for giving me this break from Regional while the kids were little!). Following Regional Studies I got back to the world of rocks and minerals in our newly renamed GY211 'Earth as a Chemical System' course for sophomores (24 of them!!). This course has a lot of the content from our old Mineralogy and Introduction

to Petrology offerings mixed in with a lot of local projects that were developed as part of GY210 'Fundamental Geological Methods & Rocky Mountain Evolution'. Jeff and I will teach this course on alternating years, and so I am trying to learn more igneous petrology to keep up with him, and he is trying to figure out what a carbonate is.

Mixed in with the teaching over the fall was the annual GSA meeting in Denver. Although giving my talk was OK, the highlight of the meeting was definitely the alumni/reunion event we held at Rock Bottom Brewery. There must have been 60 or so people there at the peak, and there were still a bunch of us left at 2 a.m. when we were finally kicked out. I have been at CC long enough now to see former students become professors, and seeing them successful in these endeavors - not to mention learning about all the other cool things people are doing - was truly fantastic.

OK. I will finish up now. In any case I need to go home and give Buddy his heart medicine; even at 16 the darned dog just won't quit!



PAUL MYROW
(Sedimentology/
Stratigraphy)

Greetings! The last year went by quickly, which means a lot was going on. A highlight from last spring is that I had a postdoctoral fellow from China, Jitao Chen (Nanjing Institute), in the department. He and I worked on Cambrian soft-sediment deformation features from the Dotsero Formation in Glenwood Canyon and wrote a paper, which is in review in *Sedimentology*. We estimate that faults in the canyon had > 7 magnitude earthquakes at that time. I hope to have Jitao back to CC later this spring and summer

to continue our collaboration.

In May, I went to Namibia to look at terminal Proterozoic sections, which I had last visited in 1994! The country was more beautiful than I remembered and the sections were simply spectacular. We holed up at the fanciest remote lodge I can ever imagine staying at, and ate five-star quality meals every night. Most excellent indeed! In July I returned to Inner Mongolia, this time with student Anne Hakim, for field work on Ordovician strata. We met up with Jitao Chen and we looked at rocks filthy rich in spectacularly preserved trilobites. The sections were wonderful and we collected a lot of conodont and isotope samples. We also spent a few days measuring part of a thick Proterozoic section with great sedimentary structures. In August I took a trip to northern India, visiting a part of the high Himalaya I had not visited since 2000. The views were spectacular and the accommodations were less than spectacular, unless you like rat urine in your bed and giant spiders on the wall! My colleagues and I looked at Neoproterozoic glacial deposits and I was able to visit what must be the largest turbidite groove marks in the world. Amazing.

I spent a week up in Montana looking at latest Devonian and Mississippian rocks with CC student Anne Hakim, looking at the same latest Famennian interval of rock that I have worked on for the last eight years. I also spent a week looking at a Triassic to Jurassic section in the Comanche National Grasslands with Anne and student Alex Hager. These include spectacular dinosaur footprints in oolite. We found some ash beds and Alex traveled to MIT to process the samples for U-Pb dating. Student Lauren Dangles has been working on age-equivalent sections here in Manitou Springs and Garden of the Gods, and an interesting story is developing. We have new pollen data from a section on Rt. 24, and we hope to provide good age constraints for these sections.

This year my past student Tim Gibson

and I finally published a paper based on his senior thesis, which describes sections he studied in Mongolia on a Keck project. I also published a paper with CC students Annie Hanson, Anna Phelps, JC Creveling, and Justin Strauss in Paleo-3 this year. I published a paper with colleagues on Precambrian rocks in Rajasthan in Precambrian Research, and another one on an unusual carbonaceous tubular body fossil Shaanxilithe from the Lesser Himalaya of India. I began an interesting collaboration with a German oceanographer from Adelaide, Australia. We have written four papers together, one of which is in press and the others are in review.

On a personal front, I started a new band with a young drummer and a great bass player here in town, and have been playing at Rico's (Poor Richards wine bar) and Front Range Barbeque in Old Colorado City. I am adding a saxophone/keyboard player to the mix for the next show. I may have a 12 piece band by the time I leave on sabbatical next year! Those of you who did not order a copy of my last CD contact me or download the songs from iTunes, CD Baby, or Amazon, or just to listen to it on Rhapsody. Speaking of my sabbatical, next school year I hope to be in Barcelona, so if you are in Europe you can find me at the University of Barcelona. Best wishes to everyone and keep in touch!

I still sell my music for anyone interested: 1. Order a CD or individual songs online at CD Baby, iTunes, or Amazon. 2. Send me a check (\$15 per CD and \$3 for shipping = \$18) to my department address.

**ERIC LEONARD
(Geomorphology)**

Well, 2013 was another busy year, but generally a good one. I finished up my first year as Director of the Southwest Studies Program – two more to go.

As a result, I've been teaching only half time in Geology. Southwest Studies has been interesting and challenging, but sometimes I miss the constant intensity (and insanity) of the Geology Department.

Let's see what have I been up to? I actually taught only three classes in 2013 – Physical Geology, Introduction to Global Climate Change, and the Southwest Studies Junior Research Seminar. No wonder I'm missing Geology a bit. Next year all of my teaching will be in the Department.

I've been making headway on several research projects, although again this year most of my work focused on Rocky Mountains glacial geology. Last summer we finished up fieldwork on an NSF-funded project patterns of glaciation and climate change during the last glacial maximum (LGM) and subsequent deglaciation along the crest of the Rockies, with several days of sampling for cosmogenic radionuclide (CRN) surface-exposure dating. We've recently gotten back a first large suite of CRN ages and are anticipating getting most of the remaining ages any day. We'll soon have the first ages for the LGM in New Mexico and detailed LGM and deglaciation chronologies for the Colorado Sangre de Cristos and the Snowy Range of Wyoming, as well as LGM and deglaciation ages from two ranges in Montana. Glacier/climate modeling is keeping apace with some very interesting results coming out. It looks like it was very cold and dry in the northern Rockies, cool and very wet in far southern Rockies at the LGM. Our initial project results have been presented in nine

talks and posters at GSA, AGU, and other meetings, and our first manuscripts are now underway. My related work on the Denver Museum of Nature and Science Snowmastodon Project is also reaching fruition with a paper in press in a special volume of Quaternary Research dedicated to the project. After several years, I now have U-series and Sr-isotope ages I have been waiting for from Chile. Along with collaborators at the USGS and University of Delaware, I am beginning work on a manuscript discussing the implications of these ages for determining coastal uplift rates and the timing of changes in the tectonic stress regime.

In late summer I traveled to Paris to present work on landscape evolution of the Front Range at the International Association of Geomorphologists meeting. The meeting was followed by a six-day field trip in the eastern Pyrenees, followed in turn by a few days of R&R – well at least the relaxation part, if not the rest part – in Barcelona. Later in September, Steve Weaver, Lisa, and I led a block break CC Alumni trip to the Canadian Rockies. We took 16 alums and spouses for four days of hiking, geology, photography, and yoga at what was supposed to be the peak color season in Alberta. Instead we got four days of snow – but being geologists we still hiked, geologized, photographed, and did yoga. Unlike “real” geologists we slept and had meals in a wonderful, remote, lodge so no one had to sleep in an icy tent, eat Eiler Stew, or do yoga in the snow. It was a great time.

The family -- Julia moved to Washington, DC in February and soon landed a real job, doing exactly what she wants to do – new media work for a political consulting firm (on what I consider the correct side of the political spectrum). Amazing. Susan got through the college-application process and has now finished up her first semester at Bates College in Maine. Winter hasn't really hit up there yet, but I'm sure it will. Lisa ditched one of her two jobs, but picked up another – so

she's still working way too hard – as a community-outreach nurse. She did, however, manage to get a theater trip to London in a few weeks ago (I'm jealous).



JEFF NOBLET
(Igneous Petrology)

Survival- eight years in the Dean's office- over a thousand faculty salary reviews, hiring of hundreds of short and long-term visitors, mentoring of fifty or so new tenure-track faculty, oversight of course scheduling, general education programs, first-year experience, international programs (reviews of five hundred programs we consider for participation) and development of new models for financing international studies), and of interdepartmental programs; guesstimated ten-thousand hours or so in committee meetings (too frightening to calculate the real number) many of which I had never heard of as a faculty member; travels to meetings in the US with other deans (DC, San Francisco, Seattle, Chicago, Knox College,...) and reviews of programs in Brazil and Tanzania; chaired searches for a dozen or so director-level staff positions; developed and led new chairs' workshops, new-faculty programming, and faculty leadership workshops; as a few highlights. I was grateful to hear such a list read off at the last faculty meeting of the year last spring and some very kind remarks from the new dean about my support during the transition year.

And now I am on one of those lovely faculty moments- my first-ever (and last) year-long sabbatical. Since July, I have been focused on re-creating/revising/renewing all of my courses- since they are all changed over the last decade (well the rocks haven't moved, but roads have and ideas about them have evolved- not to mention new

technologies for delivering a class). Almost to a point where I think I will be ready for the classroom next fall but hearing strange rumors about this new generation of students and their approach to learning. For the spring and summer, I hope to focus on two research projects that need to be completed- a local volcanic field area for which I now have extensive geochemical data and a project in magma mingling with which a student will be helping in the final step. But the highlights will be planned trips to visit volcanic sites in southern Arizona and New Mexico, along with Hawaii and Iceland! Jenny will be joining me on the latter two. I am looking forward to working closely with our students again- from those bright-eyed first-years in their first college class to the seniors ready for research. Hope to see you all in the department in the near future.



CHRISTINE SIDDOWAY
(Structure)

The best kind of news is Geology news, right? Have I ever got some for you! The news is of a new sandstone formation in Colorado Springs that is representative of a time interval nowhere else represented in the Front Range of the Rockies. Neoproterozoic, that is! The 'new' formation has attracted the attention of geologists since 1893, but the context has defied understanding because the sandstones form intrusions within Proterozoic basement rocks. Many Geology alums probably are acquainted with these astonishing features, from their days at CC! The enigma of the age and origin of the intrusions has been diminished lately – by detrital zircon provenance analysis that I've carried out at University of Arizona, with the aid of CC students (see abstract, below). The informal name, Tava sandstone,

references Tavakaiv (Pikes Peak), since the sandstones skirt the base of the massif. Together with the students, our two intrepid Labradors, Pearl and Bessie, are big contributors to the project-- hiking and reconnoitering with them off trail, in Cheyenne Canon/ Cheyenne Mountain areas, has led to discovery of many new sites! Meanwhile, Antarctic activities are alive and well, also. On the 'recreational' side, CC Alumni Relations will offer a travel cruise to Antarctic Peninsula this year (see p. 17 of the newsletter for info!). On the research side, I am working with colleagues on a new proposal for a Ross Ice Shelf survey using IcePod (ldeo.columbia.edu/res/pi/icepod/), and I've been invited to work on the new international ANDRILL project in 2018, doing core characterization at the drill site at Coulman High (<http://andrill.org/science/ch>). I'll be looking to all of you economic geology types for guidance on core description! Lots of new moves afoot in teaching, as well -- especially in developing new courses that emphasize GIS, both in Geology (e.g. Senior Seminar: Digital Mapping) and in multidisciplinary, liberal arts realms (via a team-taught course, Intro to Geodesign, with Studio Art professor Carl Reed).

A vestige of the Neoproterozoic comes to light: Detrital zircon provenance for basement-hosted injectites and remobilized sands, Colorado Front Range

GSA Abstracts with Programs Vol. 46, No. 5, Abstract no. 238381

Abstract: Detrital zircon (DZ) provenance analysis is used to resolve the time of emplacement of remobilized sandstones hosted by Mesoproterozoic plutono-metamorphic rocks of the Colorado Front Range (CFR). Informally named Tava sandstone, the formation represents a foremost example of sedimentary injectites within a non-sedimentary host, due to the scale of the system. Basement-hosted sandstones occur over a distance ≥ 75 km, with single dikes up to 6 me-

ters in width, dike sets up to 7 km long, and putative parent bodies with volumes $\geq 6 \times 10^6$ m³. Introduced to the geological community 130 years ago by Cross (1894), the sandstone dikes have been attributed to nearly every geological time period, including the Holocene, however paleomagnetic attributes constrain the dikes' emplacement to Pennsylvanian or older. DZ attributes may be used to refine the age brackets yet further, under the assumption that proximal, same-aged siliciclastic units contain similar diagnostic age distributions. To this end, U-Pb DZ ages were obtained for three Tava sandstone dikes and one parent body, to be compared with new U-Pb DZ ages for mature sandstone beds from four Paleozoic units of differing age. All samples are mature quartz arenite, with grain size and shape distributions suggestive of mixed fluvial and aeolian origin.

All four Tava samples exhibit a dominant broad peak of 0.93 - 1.31 Ga in normalized relative age probability curves, indicative of detritus of the Grenville orogen that is prominent in mid-Cryogenian strata of the western USA. Two CFR samples exhibit pronounced peaks at ca. 1.45 and ca. 1.72 Ga, attributable to proximal sources in the Berthoud and Routt plutonic suites, that are absent in the other two samples. The DZ data from four CFR Paleozoic quartz arenite beds yield contrasting results. Basal Cambrian sandstone lacks DZs < 1.30 Ga. Upper Paleozoic samples contain ca. 430 Ma zircons that are absent from remobilized sandstones, and only a small group of 0.97 - 1.30 Ga recycled zircons. The lack of correlation in DZ characteristics allows a proposed Paleozoic age for sandstone remobilization to be ruled out. A statistical similarity to published DZ distributions for Cryogenian strata in the western USA suggests instead that the remobilized sandstones' ancestry can be traced to the interval 770–740 Ma in Rodinia, opening avenues to deeper understanding of continental paleoenvironments and paleogeography of the time.



STEVE WEAVER
(Technical Director)

It has been another great year as Geo Tech Director supporting faculty and students in many class and research endeavors. Student and faculty field and lab

based activity remains high with the analytical facilities getting lots of use. The chemistry department has acquired a new ICP-Atomic Emission Spectrometer that we will be using for a number of classes.

In other news, Eric Leonard and I led a very successful alumni trip to the Canadian Rockies over the block break after block one. We stayed and dined well at the Mt Engadine Lodge in Kananaskis country and had some great hikes and photography opportunities.

I continue to be active with my photography and once again I was one of the organizers of the Geological Society of America's photography contest. At the 125th Anniversary GSA meeting in Denver, I co-lead a successful "geo-photography" fieldtrip/ workshop to Roxborough State Park with CC grad Marli Miller, and fellow photographer Ellen Bishop. As always you can check out my work at my website: www.stephen-weaver.com, and follow me on Facebook and Google+.



MANDY SULFRIAN
(Staff Assistant)

Wow! Can't believe another year has passed by...spending time in the basement of Palmer is sure fun and you know what they say...

Our family is well and happy. We've spent lots of time in the

past year visiting with our kids and grandkids and loving having time with them. No big trips this year, just family time, which can be better sometimes – although the beaches in Hawaii call to me occasionally!

This year was Charlie's 40th reunion at Colorado College and we hosted a bunch of his friends during Homecoming weekend. It was wonderful and everyone picked up as if they had never been apart! Pretty amazing what kind of friendships come out of college times...

This has been another great year getting to know all the up and coming geology majors. They are so great and enthusiastic! It's always fun hearing about where they're from and what they'll be doing over block break, winter break, or half block. And occasionally we have an alum stop by to say hi and it's always fun catching up!

Stop by the basement in Palmer when you're in Colorado Springs.



CHRISTIAN SCHRADER
(Igneous Petrology)

I am enjoying my second year teaching here at Colorado College. Over the summer I worked with students Avery Potter and Andrew

Pontrbriand in the Raton-Clayton Volcanic Field in New Mexico. I received a Benezet grant from CC to fund this work and it has so far yielded an AGU abstract authored with Andrew. I also worked as the onsite advisor for a Keck project to two CC students – Alexandra Freeman and Andrew Gregovich – on a geoarchaeology project in New Mexico. I have been keeping my hand in the planetary geology field as well, and I am working with student Josh Feldman and colleagues at the USGS to analyze lunar samples returned by the Apollo astronauts. This work is funded

in part by the CC Research and Development Board. Also on the planetary front, my colleagues and I published a paper in Earth and Planetary Science Letters on the Martian mantle.

I have just finished teaching Igneous Petrology again and we travelled to Big Bend National Park and northern New Mexico to see a variety of volcanic and plutonic rocks. In the Fall I took my Ore Deposits class to Nevada and Arizona to visit and study historic and active mines. There were some long drives and cold mornings but I think it was more than worth it in the end.

This will be my final year here and Jeff Noblett returns in the Fall. I am very glad for my time here and I'm particularly pleased to have had two years so I was able to work with student research. I'm looking forward to my next position, wherever that will be.

Department Publications and NSF Grants

Megan Anderson

Richardson, T., Ridgway, K. D., Gilbert, H., Martino, R., Enkelmann, E., Anderson, M., Alvarado, P., 2013, Neogene tectonics of the Eastern Sierras Pampeanas, Argentina: Active intraplate deformation inboard of flat-slab subduction, *Tectonics*, v. 32, no. 3, p. 780-796.

MacDougall, J. G., Fischer, K. M., Anderson, M. L., 2013, Seismic anisotropy above and below the subducting Nazca lithosphere in southern South America, *Journal of Geophysical Research*, v. 117, no. B12306, doi: 10.1029/2012JB009538.

Dragovich, J. D., Littke, H. A., Mahan, S. A., Anderson, M. L., MacDonald, J. H. Jr., Cakir, R., Stoker, B. A., Koger, C. J., Bethel, J. P., DuFrane, S. A., Smith, T., Villenueve, N. M., 2013, Geologic map of the Sultan 7.5-minute quadrangle, King and Snohomish Counties, Washington: Washington Division of Geology and Earth Resources Map Series 2013-01.

Paul Myrow

Kaempf, J., and Myrow, P.M., in press, High-Density Mud Suspensions and Cross-Shelf Transport: On the Mechanism of Gelling Ignition: *Journal of Sedimentary Research*.

McKenzie, N.R., Hughes, N., Gill, B.C., and Myrow, P.M., in press, Plate tectonic influences on Neoproterozoic-Early Paleozoic climate and animal evolution: *Geology*.

Myrow, P.M., Ramezani, J., *Hanson, A.E., Bowring, S., Racki, G., and Rakoci?ski M., in press, High-precision U-Pb age and duration of the latest Devonian (Famennian) Hangenberg event, and its implications: *Terra Nova*.

*Gibson, T., Myrow, P.M., MacDonald, F., and Minjin, C., 2013, Sedimentology, depositional history, and detrital zircon geochronology of the Lower Devonian Tsakhir Formation, Shine Jinst, Mongolia: *Geological Society of America Bulletin*, v. 125, p. 877-893.

McKenzie, N.R., Hughes, N., Myrow, P.M., Banerjee, D.M., Deb, M., and Planavsky, N.J., 2013, New age constraints on the Aravalli-Delhi successions of India and their implications: *Precambrian Research*, v. 238, p. 120-128.

Myrow, P.M., *Hanson, A., *Phelps, A.S., *Creveling, J.R., *Strauss, J.V., Fike, D.A., and Ripperdan, R.L., 2013, Latest Devonian (Famennian) global events in western Laurentia: Variations in the carbon isotopic record linked to diagenetic alteration below regionally extensive unconformities: *Palaeogeography, Palaeoclimatology, and Palaeoecology*, v. 386, p. 194-209.

Siddoway, C., Myrow, P.M., and Diaz, E.F., 2013, Strata, structures and enduring enigmas: a 125th anniversary appraisal of Colorado Springs geology: *Geological Society of America Annual Meeting Field Guide*.

Tarhan, L.G., Hughes, N.C., Myrow, P.M., Bhargava, O.N., Ahluwalia, A.D., and Kudryavtsev, A.B., 2013, Occurrence and form of the enigmatic tubular body fossil Shaanxilithes ningqiangensis from the Precambrian-Cambrian boundary interval in the Lesser Himalaya of India: *Palaeontology*, p. 1-16; doi: 10.1111/pala.12066.

Eric Leonard

PAPER IN PRESS

Leonard, E.M., Plummer, M.A., Carrara, P.E., in press, Numerical modeling of the Snowmass Creek paleoglacier, Colorado: implications for climate in the Rocky Mountains during the Bull Lake glaciation (MIS 6). *Quaternary Research*.

ABSTRACTS OF MEETING PRESENTATIONS (presenter or coauthor)

Leonard, E. M., McMillan, M.E., Ouimet, W.B., 2013, The

Department Publications and NSF Grants

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GRANT

National Science Foundation, Division of Earth Sciences, Geomorphology and Land-Use Dynamics grant EAR-1024838 (\$110,866 to CC), Collaborative grant with Dr. Benjamin Laabs, State University of New York - Geneseo (\$89,466 to SUNY), Glaciation and Paleoclimate in the Rocky Mountains During the Last

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CC Geology Student Abroad: Mongolia

Virginia Hill ('15)

Like many of my fellow classmates, I found myself on a plane bound for “abroad” this past fall. My “abroad” destination—Ulaanbaatar, Mongolia—is not typically an international tourist hotspot though. For most of us, the word Mongolia conjures up images of endless steppe, empty blue skies, and herds of sheep and goats. My arrival at the Ghengis Khaan International Airport immediately juxtaposed these images against the bustling, post-Soviet city of Ulaanbaatar that holds almost half of Mongolia’s three million people.

My program was entitled “Mongolia: Geopolitics and Development”, and unfortunately the “geo” in the title referred to geographical politics, not geologic politics. However, because of mining, geology is a major player in Mongolia at the moment and has been for a number of years. Following Bronze Age mining, the first major copper mine in Mongolia, the Erdenet Mine, began production in 1978. As a joint Soviet-Mongolian venture, the project is developed on a sulfide porphyry deposit and is expected to have another 42 years of production left. Following the peaceful Democratic Revolution of 1991 Mongolia gained an additional 1% share in mine, making it the majority shareholder. Mongolia suffered a major economic contraction in the early 1990s after the Democratic Revolution. The Erdenet mine provided 20% of the government’s revenue, during that time, according to a mine employee. Since Mongolia has become more financially stable, that number has dropped, but it is still a very significant portion of the government’s budget.

Erdenet has been dwarfed, however, by the Oyu Tolgoi project. Oyu Tolgoi is a copper mine currently under construction located in the south Gobi region of Mongo-

lia. When finished, it will be one of the largest copper mines in the world and is expected to account for 20% of Mongolia’s GDP, making the Mongolian economy extremely reliant on copper pricing. Oyu Tolgoi is 66% owned by the Australian-British company Rio Tinto and 34% by the Mongolian government. Because the project has such major implications for Mongolia’s development it is at the forefront of discussion. The Mongolian government is attempting to encourage economic development while still maintaining the pristine natural environment that is so much at the heart of the Mongolian people. In a country where 30% of the population is still semi-nomadic herders, the countryside is the true soul of the people.

It is difficult to encompass all of the issues surrounding mining in Mongolia in a couple of paragraphs, but it is at the center of Mongolia’s future. Will the country be able to develop economically without creating a large wealth gap, or will the massive influx of foreign investment only benefit a few? In 50 years will Mongolia find itself better off than it is now, or will the foreign mining companies wreak environmental havoc and remove all of the profits from the country? The answers to these questions remain to be seen, but they make Mongolia an interesting country to keep an eye over the next couple of decades. Whatever happens, it will certainly happen in a large way.



Virginia Hill (second from the left) visited the open-pit Erdenet mine and its equipment.

A Geologic Freshman Year Experience: It's Juicin'!

Alexie Millikin ('17)

Starting out at Colorado College I had great, and somewhat romantic, expectations. I anticipated tons of fieldwork, close interactions and strong relationships with my professors, meaningful experiential work, and adventures.

Although I knew nothing about geology besides basic plate tectonics and the rock cycle, I decided to go all-in and wager my 20 points on Physical Geology and Introduction to Global Climate Change. I hoped that this class could satisfy some desire for adventure, and would allow me to spend the first couple months of college outdoors learning about and enjoying one of Colorado's biggest draws, it's landscape.

As is the nature of the block plan, we jumped right into a camping trip the first weekend. While others were experiencing their first Friday night on campus, the Geology FYE was caravanning up Almagre Mountain on an "exciting" road. We ate prize-winning chili and Geo-Sauce around a campfire, woke early for a summit sunrise hike, and of course did some geology field work.

These adventures only increased over the following 2 blocks with our profes-



Geology FYE field trip to the top of Pikes Peak where they learned about tree line movement with Miro Kummel from the EV department.

sor, Christine Siddoway, and paraprof, Dirk Rasmussen. We were lucky enough to have collected data from an alluvial fan on the first day of the course. When the torrential downpours swept the Springs during the recent flooding, we were able to track the geological changes and see the fan in action. One particularly memorable visit took place around 9 pm during which we coined our class catch phrase: "it's juicin'!" I'll never forget the thrill of being knee deep in flooded rivers during our research.

The last week of our Geology block was spent in New Mexico in the continental rift where we learned about faults, precipitant minerals, metamorphic rocks, searched for fossils and enjoyed world-class hot springs. Highlights included lunch in a carwash and chasing a storm down all the way to Albuquerque in our attempts to outrun it.

When Christine departed for California with an upper level class, we welcomed our second block professor, Eric Leonard. We started off second block, Intro to Global Climate Change, by gaining an understanding of the Earth's systems, how they impact climate, and what climate data can reveal. With an established groundwork, we ventured on yet more fieldtrips. In Baca we spent all day in the sand dunes, found some stylish clothing at the FreeBox, and enjoyed the



The Geology FYE class at the Rio Grande Gorge during first block on their trip to New Mexico.

start of a hike up to a glacial moraine before getting snowed out. The class culminated in a group research project about climate change in the Southwest.

When I think about my Geo FYE it exceeds all the expectations I had for CC. Although I can't say that we will all continue on to be Geology majors, I feel I can safely say that every member of the FYE class will have fond memories of our learning and adventures with geology.

To me the CC Geology department is exactly what I wanted to get of my first year of college and exemplifies why I chose Colorado College. I got to know my professors well, I did research and work that I found to be interesting and meaningful, I went on crazy adventures during class, spent weeks in the field, and above all I found a community of people within the college who are passionate, excited, knowledgeable and quirky.



The Geology FYE class enjoying the Great Sand Dunes National Park.

Geology FYE Blogs

Geology Fieldwork at The Fan By Isabelle Febvre and Emelie Frojen

Year one, block one, day one of class at Colorado College, and we are already getting our hands dirty. Our professor, Christine Siddoway, greeted us first-year students eagerly and told us to get our sun hats and tennis shoes, and to get ready for an active field afternoon at our study site at The Fan. Confused glances were exchanged across

the room as we thought, this is our first day of college?, but Christine's enthusiasm was contagious. Our trek began at 1:00pm when the 18 of us – 16 students plus the professor, Christine, and the paraprofessional, Dirk Rasmussen – piled into two glossy, white vans with tinted windows that looked like they were built to endure James Bond missions. Our first trip to The Fan provided a window for us to see what learning on the block plan was truly like. In groups of four, our geology class explored the alluvial fan, a geological feature at the base of Cheyenne Cañon Mountain covered in opaque, pink gravel with sloping walls leading into The Fan. With little instruction and lots of curiosity, our class of novice geologists witnessed an active geological feature and were instructed "figure out what happened in the area and why." The afternoon and the following day consisted of exploration, observation, data collection, and lots of sun blocking. Trees at the base of the fan seemed buried under layers of cobble as evident by the lack of showing roots. A few broken branches scattered around the base of the fan were stripped of bark and pointing downward. Mini channels, no more than a few inches in width and depth, ran down the inside of the structure. Further up The Fan, the walls grew taller, reaching up over our heads in some areas and exposing soil, rock, and roots. The ravine curved in some areas and sloped steep and straight in others. The dimensions, rock sizes, and mini channels all varied, but we diagnosed the color and type of rock to be consistent. By the end of those two days, we'd developed a few different comprehensive hypotheses that weren't too far off! Torrential rainfall had created dynamic channels of all sizes that eventually open and pour into the shallow and wide base of the alluvial fan. The floods rapidly carved out the streams and channels, deposited gravel at the base of The Fan and around the pines, and eroded the rounded rocks. After two intense field days we were definitely not novice geologists anymore!



During September flooding, FYE students observed fluvial processes and measured erosion in Cheyenne Canyon. Results of this work are to be presented at GSA in Bozeman in May.

Just a little over a week after our investigation at The Fan, Colorado Springs residents woke up to backyards, homes, and roads that had been flooded and closed during early hours of the morning. Creeks almost instantly turned into rivers that were roaring downstream, moving boulders, and overflowing into surrounding communities. Our plans for the class that day rapidly changed! Our original plan of an all-day field trip to Denver and Golden, to perform fieldwork and attend a lecture given by our professor at the Colorado School of Mines, was canceled due to the severe weather. When the class met later on that morning, we unanimously voted to return to The Fan to see our hypotheses in action! Back into the two James Bond vans, we eagerly headed back to our study site. By the time we arrived that morning the gushing water was already gone, but it did leave spectacular evidence showing what occurred earlier on the morning of September 12th. Carved out walls and channels, eroded and tumbled rock, and newly exposed roots were all over The Fan. Travelling up The Fan we got our hands dirty once again while experimenting with clay/silt and discovering sediment transportation. Further up the channel we were stunned at how deep the study site has gotten. Two students, Greg Sayles and Rayna Nolen, gave perspective as to exactly how deep the chan-

nel has reached.

The hands-on study continued through-out the rest of the day. We returned to our professor's house to view her creek-turned-river. The change from the first time we saw her backyard was immense. Large rapids were moving huge boulders, and all of this occurring right before our eyes in her backyard! Christine had a rain gauge that increased from less than an inch to seven inches over night! We were able to witness, first hand, the study of sediment transportation in high precipitation events. We continued the learning experience at Red Rocks! A short lecture was given there, followed by the study of the mineral deposit in the sedimentary rocks.

All of our excitement poured over into the night, so we took Christine up on her offer to take the 16 of us to a rap/ written word performance by a fellow Colorado College Professor! The rain continued to pour through-out the night, and after the performance, we were all thinking the same thing- The Fan. Disregarding our original plan to return to campus we headed to see our site in action at 9:30 at night! Soaking wet with smiles on our faces, the entire class was in awe of this geological process. Water was transporting sediment everywhere and we were able to witness it. The first two weeks of the geology FYE showed us first year students what "building on the block" truly means.

COLORADO HAS NOT HAD THIS MUCH RAIN IN MORE THAN A 100 YEARS! By Ximena Buller and Ryan Kwan

'It's got to be the largest storm that I can imagine in the state's history' said Colorado Gov. John Hickenlooper. In the past five days there has been non-stop precipitation in Colorado, breaking records of over 70 years (73-year-old record of 5.5 inches for September in Boulder). Heavy rains are not unusual for Colorado, however nobody was expecting the intensity in which they came

this time and Colorado citizens were not prepared. The main threatened sites have been Boulder, Denver, and Colorado Springs, causing roads and education centers to be closed and people to be evacuated from their houses. The flooding water is heavily full of debris which makes it all much more dangerous. Buildings have collapsed and roads have been eroded, making the cities unsafe. In Colorado Springs, a record of at least 7 inches of rain was collected in 24 hours whereas in the past, the highest amount of rain the Colorado Springs area collected in the month of September was 5.91 inches in 2011. Such high amount of rain caused rivers and creeks in Colorado Springs that are normally dry or have a relatively low flow rate to flood over bridges and the creeks became roaring rivers. For instance, Monument Creek at Bijou Street which normally has an average discharge of 20 cubic feet per second reached over 3000 cubic feet per second during the recent floods! Despite such intense weather, our geology class managed to visit one of the first field study sites, that shows signs of water movement in the past, to see it 'in action'. The field site was at Cheyenne Canon, and after a brief visit at nighttime, our class managed to see the power of water, transporting sediments and gravels down the slope of the mountain and out to the road near residential areas.



The Sed/Strat class observed this years flood damage on Manitou Ave while going to visit the Great Unconformity.

Regional Studies: California

Lauren Dangles ('14)



Group photo of Reigonal Studies class at an overlook of Death Valley in California.

This year's Regional Studies in Geology block was taught in the very progressive state of California by CC geology professors Christine Siddoway and Henry Fricke. For 19 days, we traversed the eastern side of the state starting in the north near Lake Tahoe and eventually making our way south to the Death Valley Region, while examining the geologic processes that the area has undergone. After spending the last three years learning about the geology of the Rocky Mountain Region, it was refreshing to head west and to get a different perspective.

Before our trip even really began, senior Will Durrett became a local celebrity when he was interviewed on the news in the Trader Joe's parking lot on his thoughts on the government shutdown. His wise words, something along the lines of, "It's a bummer" were heard throughout the region. The shutdown did throw a little wrench in our plans in that we were not able to spend as much time as we planned in Yosemite, although we were able to drive through on Highway 120, or Death Valley, but in no way was it detrimental to our learning experience.

This kicked off our first stop in Soda Springs, CA, where we stayed in a chic ski house with internet access so that we could



Regional Studies class attempting to portray the 'sevier' folding in these rocks. May need to work on it a bit more...

update our class blogs with pictures of our gourmet meals, selfies, and of course rocks. The class blogs were a new aspect of the course this year and were used to reflect on the day's geologizing so that we stayed on top of our developing geologic history of the region. Here we studied an east-west transect across the state spending the majority of our time on the eastern flank of the Sierra Nevada Range. Since California's geologic history is so complex and confusing we focused on developing the paleotopographic story of central California from ~200 Ma to the present.

The next portion of the class was spent exploring Owen's Valley and Long Caldera area. After roughing it and camping for a couple of nights, we stayed at the Sierra Nevada Aquatic Research Laboratory (SNARL) and began our group projects. Plutonism, metamorphism and structure, regional volcanism, and glacial geology were the topics that we researched and worked on in the field with our groups, and at the end went on a "museum tour" to each group's field sites for presentations. In addition to working on our group projects, multiple trips to hot springs were taken during this portion of the class, obviously to get a better understanding of geothermal activity in the area.

Heading further south, the third week of the class was meant to be spent in Death Valley, but because of the government shutdown the professors worked extra hard to find alternative sites just outside of the park. Here we visited some Neoproterozoic rocks that show evidence of snowball Earth with dropstones in mudstone, siltstone, and diamictite. We also had two (in one day!) Celebrations of Learning on two of California's most confusing outcrops, one even being related to the Amargosa Chaos.

Finally, to round off the class we headed back north and stopped off at the Comstock Lode for a tour led by Larry Martin, the Vice President of Exploration and Mine Development, and got to poke around in the rocks looking for gold. I think I speak for all of us seniors when I say that this year's capstone experience was one for the books! No government, no rules!

Link to Regional Studies in Geology 2013 Blog:
<http://sites.coloradocollege.edu/gy445-2013/>



Regionals class visits Devils Postpile near Mammoth Mountain in eastern California to witness some amazing columnar basalt!

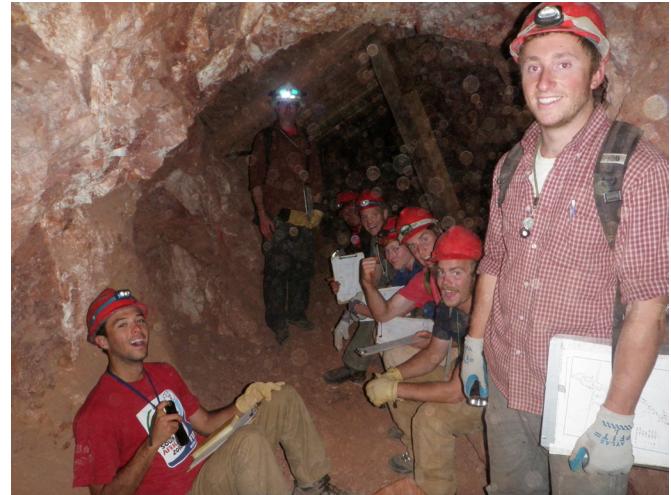
Congratulations!

Dirk Rasmussen '13 will be presenting at the 2014 GSA Joint Rock Mountain/Cordilleran Section Meeting in Bozeman, Montana.

Abstract Title: *Sedimentation Rates and Alluvial Fan at the Urban-Wildland Interface, Colorado, September 2013.*

Presentation Date: Tuesday, 20 May 2014

Wiley Skewes '08 has been awarded a Graduate Student Fellowship by the Society of Economic Geologists Foundation. Sponsored by Newmont Mining Corporation, the sum of \$10,000.00 is in support of an MSc in the field of economic geology.



This years Economic Geology class traveled to Salome, AZ to explore old, underground gold mines with Charlie Sulfrian.

Colorado College Alumni Relations will offer a 2014 educational trip to the Antarctic Peninsula, with CC Professor Christine Siddoway. Christine will take part as a geology lecturer, joining the knowledgeable and experienced guides from Travel Dynamics International, who will lecture on a rich variety of topics from Antarctic exploration to Seabirds to Marine mammals. The dates for the cruise are December 26, 2014, to January 7, 2015, embarking from Ushuaia, Argentina on the vessel Corinthian II. If you would like to celebrate New Years while at sea under the austral sun, watch for notices from CC Alumni Relations about the details of the trip, and/or contact csiddoway@coloradocollege.edu to request an electronic copy of the trip information.



CC Alums (from left to right): Kye Birchard ('13), Sarah Geisse ('13), Ryan Gall ('13), and Francisca Dannemann ('12) reunite on the slopes at Arapahoe Basin in Colorado.

THANKS to everyone who attended our 4rd annual CC AGU fall meeting gathering in San Francisco and our GSA meeting gathering in Denver in 2013. We had an amazing turn out and it was great fun--let's do it again next year!

Alumni Spotlight

Eric Daniels '09

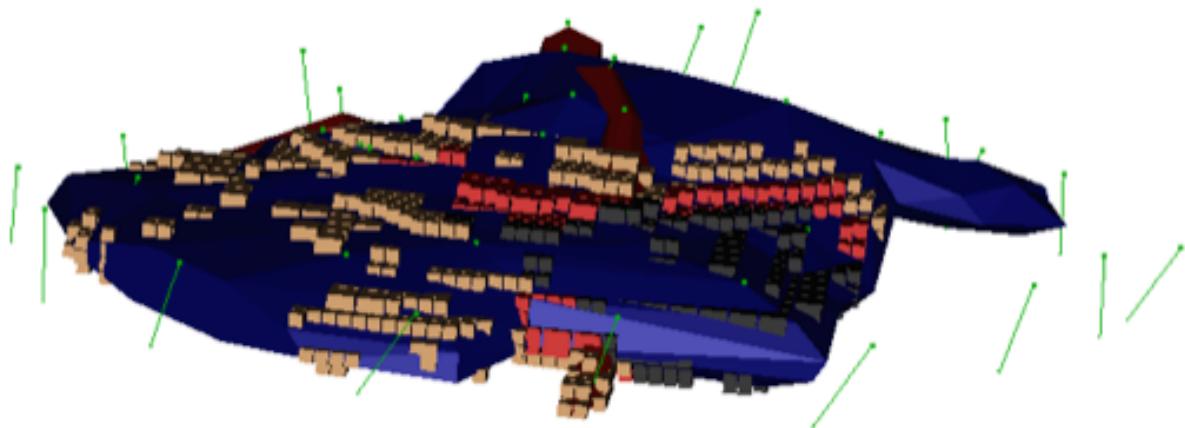


Eric Daniels is currently in graduate school at University of Alberta where he is studying Geostatistics.

live in a place I love, my colleagues were great, the geology is endlessly complex, the pay was good, I had it all. It was that good, and it continued to be for a few years. But, inevitably, work became routine and I wanted a change. However, while working at Cripple Creek I discovered a love for geologic modeling ... I'm not talking about creepy photos of Zion posing with rocks; I mean actually modeling the geology in 3D, as realistically as possible.

I thoroughly enjoyed studying geology at Colorado College. Field trips, research blocks, and even living in a van with Zion, it was all fantastic. By the end I was done. I didn't want to go to school ever again. A few short years later, here I am in graduate school. How the hell did this happen?

Within a year of finishing school I quickly found myself full time employed as a mine geologist at Cripple Creek and Victor gold mine. It was a great gig. I got to

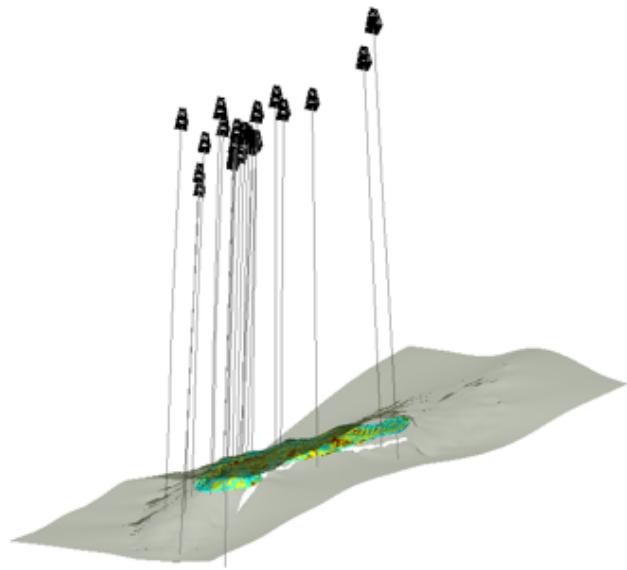


Example of a block model, generated via ordinary kriging, used for ore body estimation for a copper porphyry deposit using GEMS software. The overlaid blue and red surfaces represent two different rock types. The warmer colored blocks represent higher grade copper ore.

If you enjoyed mapping in intro geology, and the more complex task of mapping for structural geology, wait till you see what is possible in 3D. In any mapping or modeling workflow at some point you've got to connect the dots from one sampled, observed or otherwise "known" point to the next. If you work in the mining, oil, hydro or environmental realm, how that space between your "known" data points gets in-filled can make a big difference in the end result for any model of an ore body, reservoir, aquifer, or pollution plume. Geostatistics field of research sits between geology, engineering, and spatial statistics and provides a set

of mathematical tools to generate the most reliable ore body, reservoir, aquifer, or pollution plume possible.

To understand exactly how the prettiest, most accurate 3D geologic models are made, you've got to study the math behind them. It turns out there aren't many places to do this. With a bit of guidance and support from colleagues, employers and CC professors I have found myself at the University of Alberta for a MSc. as part of the Computational Centre for Geostatistics (<http://www.uofaweb.ualberta.ca/ccg/>).



Using information from the wells drilled, a simulated model for this folded and faulted oil reservoir can be generated using GOCAD software. Sequential Gaussian simulation is used here to calculate the total volume of oil that can be expected from this reservoir.

Graduate school is busy! The first semester was a bit of a wake-up call. I was playing catch up in regards to math, and after four years away from school I had to rebuild a tolerance for studying. After the initial adjustment, school has continued to be busy and challenging. Geostatistics classes have answered many of my lingering questions, engineering classes have sparked a new interest in math, the computer programming has allowed me to implement research ideas, and my background as an alum of the CC geology program provides me with the ability to apply all of this.

For anyone considering a grad school, I was asked to write a bit about the day to day and what it can be like. Keep in mind every school is different, what you choose to study and who your advisor is can have a huge impact on what school looks like for each individual. In my case, graduate school is kind of a middle ground between a job and school. Yes there are classes, but there are fewer, they are smaller, more interesting, and more challenging. There is also research, which feels a bit more like a job sometimes... but the schedule is a bit more flexible, however it will require more than the cushy 40 hour work week. Research may be a lot of hours, but it can be fascinating and enjoyable, or it can be stressful and difficult as that next presentation approaches. The people are great. The research group is comprised of brilliant engineers, geologists, metallurgists, here from all over the world, to study geostatistics. There is surely value, camaraderie, and fun to be gained from working alongside a good hardworking group. If you are considering graduate school, make sure you like what you are going to study... because you will be spending a lot time doing just that.

I am in the middle of my second semester here in Edmonton at the University of Alberta and anticipate it will fly by and I'll be back on the Front Range in no time. For anyone studying geology at CC, you might consider working in economic geology. The geology is fascinating, there is a lot of opportunity, there are great people to learn from, even a large number of CC geology alums. If you've got an interest in mining, geologic modeling, geostatistics, or if you make a wrong turn and find yourself in Edmonton, say hello.

CC Alumni Block Break Trip: Canadian Rockies

David D. Finley
Professor and Dean Emeritus



Back row, left to right: Jeff Biven, Rodger Gurrentz ('78), Jon Hill, John Alsterda ('82), Eric Leonard
Front row, left to right: Christine Biven ('91), Joan Gurrentz, Lisa Noll

My wife Judy ('58) and I went on the Alumni Office sponsored block-break trip to Banff September 23-29, 2013, led by Eric Leonard, his wife Lisa Noll, and Steve Weaver – all from the Geology Department. This trip was such a great CC experience complete with an amazing group of nineteen that included alumni ranging from '58 to '91, faculty, staff and even one trustee. We had heard about the project back in January. Never having been in the Canadian Rockies, eager for the perspective of geologists long acquainted personally and professionally with the area, finding the costs reasonable and the schedule convenient, we jumped at the opportunity quickly and we were unsurprised that the program group filled up fast.

We flew in to Calgary, spent a night there and headed west up the Bow River valley next morning in two vans, one rented there and one driven up by Steve Weaver from CC. Four nights ensued at Mt. Engadine Lodge, an excellent choice in back country south of Canmore in the Spray Valley Provincial Park, which abuts the south edge of Banff National

Park. Lots of dramatic mountains, cavorting moose outside our cabin, fine food and fine rustic accommodations. We spent our days riding north and hiking trails in the park, avoiding grizzlies, learning some basics about the geology of the area from Eric's lectures, and getting good photographic coaching from Steve. Johnston Canyon, Lake Louise, and Bow Lake were among notable stops. Evenings allowed for good camaraderie, power-point presentations and discussions at the lodge.

Our first noonday break on the ride west from Calgary included a short hike up a Moraine Trail in the Bow Valley, and a talk by Eric about the tectonic origins of the region and the glaciation that has molded this range of the Canadian Rockies. It was easier to understand glacial moraines when walking on top of one. Next day after driving into Banff Park we had a memorable hike up Johnston Canyon, partly along catwalks constructed beside and above its rapid creek among aspens to a spectacular "lower falls." On the 27th we drove with Steve to Kananaskis Lakes and hiked up the Mt. Everest Expedition Trail to a dramatic overlook of the mountains north and southwest. The 28th took us northward to the head of Bow Lake beneath a famous glacier. And later on our return we stopped, along with large numbers of other tourists at Lake Louise, a famous destination in western Canada since the mid-nineteenth century. (Well worth our stop, but the crowds made us appreciate how Eric and Steve had generally steered us into more remote regions of natural grandeur). We all collected troves of photos and memories. It was great to have Eric and Steve make numerous sudden stops to let us jump off the vans and try to preserve the reflections of those craggy peaks in the blue waters of the lakes below them. All told, an educational and very congenial experience.



Christine ('91) and Jeff Biven hiking through the snow in the Canadian Rockies.

We got back to Colorado Springs Sunday evening (except for a few who drove in and drove out), and we noted that Eric and Steve then had to ready themselves for new classes early next morning. We recounted our experiences with numerous other alumni and colleagues over the course of the busy Homecoming weekend a few days later. I know the College needs to cultivate alumni

support actively, and I am sure this project was a strong consolidation of the CC association for all of us who partook. We all hope it can be a model for similar College ventures in the future. Clearly, such projects have to be considered carefully among other priorities and opportunities. Undesirable intrusion on faculty scholarly endeavors and stealing time from student activities must be avoided. Costs have to be covered by charges. But I believe this sort of opportunity can definitely be a win-win choice for CC.

Geology Day

April 13, 2013, Tutt Science Lecture Hall

Student Posters:

Alex Robertson

"Delineation of subglacial bedrock structure in glaciated regions using DEMs derived from stereoscopic satellite imagery: An example of the Land Glacier catchment, West Antarctica"

John Collis

"Basement Rock of the Big Horn Mountains; an investigation using remote sensing and spectral analysis"

Abby Seymour

"Petrology and Geothermometry of Garnet Amphibolite Blocks, Santa Catalina Island, CA"

Hannah Karlsson

"Ar-Ar illite thermochronology for dating of fault and fold deformation in the Range monocline, Colorado Springs region."

Dave Freedman

"Geomagnetism of Clastic Dikes in the Colorado Front Range: Determination of age and origin"

Fischer Hazen

"Paleomagnetism: The Key to Discovering the Age of Tabular Sandstones in the Front Range"

David Fay

"Seismic Anisotropy and Petrographical Analysis of Surface Structures within the Big-horn foreland Arch Complex in the Cloud Peak Wilderness Area, Wyoming"

Presentations:

Dave Freedman

"Basement-hosted tabular sandstones of the Colorado Front Range: Geomagnetic insights into age and origin"

Devon Cole

"Sedimentology, Stratigraphy, and Geochemistry of Latest Devonian Strata, Utah"

Zach Snyder

"Cambrian–Ordovician Stratigraphy and Palaeogeography of the Western Margin of the North China Block"

Brennan O'Connell

"Sedimentology and Stable Isotope Geochemistry of the Chickaloon Formation, Alaska"

Sarah Geisse

"Geophysical Analysis of the Coast Range Boundary Fault in Puget Lowland"

Ryan Armstrong

"Repeating Earthquakes in the Darfield Region, New Zealand"

Ryan Gall

"Numerical modeling of the Middle Boulder Creek Paleoglacier, Front Range, Colorado: Insights into LGM paleoclimate and post-LGM rates of climate change"

Alex Robertson

"2 Dimensional numerical modeling of the Winsor basin paleoglacier & insights into Last Glacial Maximum climate changes of North New Mexico"

Kye Birchard

"Chemostratigraphy of an Early Ordovician, Basal Stairian Stage, Biomere Extinction Event"

Mike Curran

"Mantle Flow Analysis of the Chile-Argentina Subduction Zone using Frequency-Dependent Shear Wave Splitting Analysis"

Senior Awards

Annual Awards

Year: 2012-2013

Rocky Mountain Association of Geologists

Award:

Zachary Snyder

Ewing Outstanding Senior Geologist:

Devon Cole

William A. Fischer Special Recognition:

Ryan Gall

Rock Mountain Association of Geologists

McKenna Scholarship (for a junior the previous year):

Abigail Seymour

Buster Scholarships:

Devon Cole

David Fay

David Freedman

Sarah Geisse

Fischer Hazen

Zachary Snyder

Gould Scholarship Recipients: Spring 2013

Ryan Armstrong

Caleb Birchard

Devon Cole

David Fay

Sarah Geisse

Brennan O'Connell

Zachary Snyder

Andrew Gregovich

Putman Scholarship Recipients: Spring 2013

Ryan Gall

Brennan O'Connell

Creager Field Scholarship:

Victoria Crystal

William A Fischer Family Scholarship:

Victoria Crystal

Venture Grants:

John Collis '13 - "Volcanoes of the East African Rift Valley: An Investigation Detailing the Volcanology of Ethiopia and its Role in Cultural Development"

Edward Crawford '14 and William Durrett '14 - "Using Seismic Refraction to Image the Structure of the Critical Zone"

David Fay '13 - "Investigation the Effect of Human Disturbances on Local Ecosystems"

David Freedman '14 - "Practical Methods in Mineral Exploration"

Zach Keskinen '15 - "Synthesis of Nitrogen Analog of SCYX-7158"

Ellen Smith '16 - "Cambrian Explosion: A Study of the First Appearance of Clams and Geochemical Changes in the Ocean"

Student Conference Presentations 2012-13**GSA in Denver, CO, Fall 2013:**

Edward Crawford '14

"Two Distinct Estimates of Last Glacial Maximum Climate on the Pikes Peak Massif, Front Range, Central Colorado, using Numerically Modeled 2D Paleoglacier Reconstructions"

Victoria Crystal '14

"Understanding the magmatic evolution and processes associated with the formation of the lava flows found in Lavericks Bay, Banks Peninsula, New Zealand"

David Freedman '14

"Anisotropy of Magnetic Susceptibility as a Proxy for Emplacement Patterns of Basement-Hosted Sandstone Dikes, Colorado Front Range"

Seminar Series Spring Semester 2012-13

Block 5 – February 19 – Dr. Jitao Chen, Research Assistant – “Microbial build-ups & large-scale patterns of Earth History”

Block 6 – March 5 - Dr. Bob Jarrett, Research Hydrologist, USGS, “The Life of a Flood Hydrologist: Insights, narratives, and directions for the future from a career in the field.”

Block 6 – March 6 - Dr. Lee MacDonald, Sr, Research Scientist, CSU, “The Life of a Water-shed Hydrologist: Fire, sediment, and land use in a changing world.”

Block 6 – March 7 - Career Panel with Eric Daniels '09, Sarah DeWitt '00, & Harry Hamill '84

Block 7 – March 31 - Dr. Bob Butler – U of Portland “Great Cascadia Subduction Zone Earthquakes: From Ghost Forests and Turbidites to New Insights from Tohoku 2011 and EarthScope”

Block 7 – April 3 - Dr. Bob Butler - U of Portland “Engaging Novice Earth Science Learners in EarthScope Science: Lessons from Tohoku for Cascadia”

Block 7 – April 9 - Dr. Jim McCalpin – 2013 Jahn's Distinguished Lecturer, “Paleoseismology: Has it Reduced Seismic Hazards, and if not, How Do we Change Course?” and “Ski Areas and Their Slope Stability Problems; the Colorado Story”

Block 8 – May 13 - Dr. Whitey Hagadorn, Curator of Geology, Denver Museum of Nature and Science, “Death of a Megapredator”

Seminar Series Fall Semester 2013-14

Block 1 - September 9 - Dr. Darren Larsen, CU Boulder, “Abrupt and non-linear Holocene climate change in Iceland: geological context and implications for the future”

Block 2 - October 11 - Dr. Craig Manning, UCLA, “Deep Carbon Cycle Accounting: Can the budget be balanced?”

Block 2 - October 21 - Dr. Will Levandowski, CU Boulder, “Tales of the tectonic history (and future?) of the western U.S. told by lithospheric density models”

Block 3 - November 1 - Dr. Chris Yakymchuk, U of Maryland. “Hot rocks in cold places: what migmatites in West Antarctica can tell us about the crustal plumbing system”

Block 4 -December 5 - Dr. Jonathan Caine, USGS Denver, “Couplings Among Stress, Strain, Heat and Fluid Flow in the eastern Colorado Mineral Belt”

Block 4 – December 6 - Sophie Holtsnider Environmental/Civil Engineer Encana Corporation, “Oil and gas extraction, waste water management, and geologic controls within in the Piceance and DJ Basins, Colorado”



This years Regional Studies class represents CC Geo while grilling some good looking burgers in California.

**Thanks to all the alumni who have sent updates in this year! We really appreciate it.
You can always send us updates at precambrianbsmt@coloradocollege.edu**

Penny Rieke Arentsen '96

My husband Paul and I are enjoying our 40th years on the planet and our 10th season running our whitewater rafting business, Winding Waters River Expeditions in Joseph, Oregon (geologically speaking, a really cool place to live). We have a 3 year old daughter, Linden, who is already beating us down the ski slopes and ready to guide trips. And we're expecting our 2nd child this May. While expanding our family keeps me from guiding on the Snake River in Hells Canyon, the Salmon and Grande Ronde Rivers, my daughter is already a rock-hound adventurer and that makes up for so much! Life is good and I hope all my fellow graduates are doing well, too.



Penny Arentsen with her husband, Paul, and daughter, Linden, on the White Rim in Canyonlands this past fall.

Ryan Armstrong '13

I am working as a first-year Geology and Geophysics Master's student at the University of Wyoming with Dr. Steve Holbrook and Dr. Cliff Riebe. My research focuses on an Airborne Electromagnetic dataset funded by the Wyoming Center for Environmental Hydrology and Geophysics (WyCEHG). The helicopter-flown survey mapped ~40 square km of electrical resistivity anomalies in a mountain watershed, to gain important information about the connection between

surface hydrology and its connection to the subsurface. The Critical Zone, the layer of chemically and physically-weathered rock above the basement, primarily controls these water pathways. Future work will likely include field-verification of the mapped anomalies and possibly a Bayesian analysis of the errors associated with our survey.

Link to article about Ryan Argmstrong's project: <http://www.uwyo.edu/uw/news/2013/09/uw-teams-with-aarhus-university-to-map-aquifers-in-laramie-and-snowy-ranges-.html>

Michael Beckel '05

I am currently working as a political reporter for the Center for Public Integrity in Washington, D.C., a city that I have been calling home for five years now. Does that really surprise anyone who saw my attempts to balance my geology studies with being a student journalist at the Cipher? I still love getting out into nature, though, and D.C. offers great access to many fantastic places, from Shenandoah National Park in Virginia to the Dolly Sods Wilderness in West Virginia. In 2013, I was also fortunate enough to travel with a friend to South Africa, where I



Michael Beckel on Robben Island, with Table Mountain and Cape Town, South Africa, rising in the background.

saw so many incredible rocks! The long drive through the Swartberg Pass brought back so many great memories of Colorado College geology field trips. My day job involves a lot of shifting through campaign finance filings, and I have learned that everyone under the sun has lobbyists, including geologists :)

Eric Bilderback '99 celebrated his year anniversary with the National Park Service and being back in Colorado in the autumn of 2013. Eric was hired as a geomorphologist, with the primary duties of leading the geological hazards and disturbed lands restoration programs.

Eric returned to Colorado and the U.S. to join the National Park Service from the University of Canterbury in New Zealand, where he completed his PhD in geology. At the University of Canterbury, Eric studied landslides, landslide sediment budgets, and catchment-wide hillslope responses to river incision. Eric also assisted with research and public outreach after the 2010 and 2011 destructive earthquakes in Christchurch, New Zealand.

Prior to his PhD work, Eric worked for the Washington State Department of Transportation where he helped identify and

mitigate landslide hazards to public safety and infrastructure. He also assisted with the exploration for aggregate resources and the managing a database designed to proactively prioritize and mitigate unstable slopes. Before that, Eric worked for the Washington State Department of Natural Resources on watershed-scale landslide hazard zonation mapping and state-wide seismic site-class and liquefaction hazard mapping.

Eric, his wife, Alexandra ('99) and daughters, Chani and Kaia are excited to be back in the Rocky Mountains and will enjoy the recreational opportunities in Colorado.

Rose Bloom '08

I just wrapped up my MSc in Geology at Western Washington University in Bellingham, WA. My thesis is on garnet nucleation and growth kinetics. I moved back to Colorado in June, and I must say, I am so happy to be back! I love the PNW, but nothing beats the Colorado sunshine. Now, I am back drawing maps at Geologic Data Systems where I worked pre-graduate school, HA! Hey, it's nice looking at the big picture again. Hope to see you all on the hiking trails throughout this gorgeous state.



View along one of the tributaries to the Waingaromia River in the upper Waipaoa catchment, Gisborne district New Zealand. Landscape features include deep-seated landslides of different size (foreground and middle distance) and last glacial aggradation terrace remnants (right side of the image) perched above the Waingaromia River.

Photo by Eric Bilderback '99



(Top) Paul and Cara Bovet with their two daughters, Edith and Helen. (Bottom) The Bovets put the CC logo on the curb of their new house.

Paul Bovet '03

This year Paul and Cara (Geology 03' & Chemistry '02) welcomed their second daughter Edith, born 3 years to the date after their first daughter, Helen, both on April 1st. We bought a new house in Houston, Texas and promptly marked it with the CC Tiger. There is not much exposed rock here in Houston but a visit to southern India this winter allowed us the chance to view the granite and gneiss of the Western Ghats mountain range.

Nancy Calhoun '07

I'm finishing a Master's at the Centre for Natural Hazard Research at Simon Fraser University in Vancouver, Canada. The project is focused on a strange liquefaction event related to the giant Flims landslide in the Eastern Swiss Alps. There's a good crew of CC geo grads up here in Vancouver, and we like to homebrew, ski or concoct a reason to inspire Canadians to attend a 'costume' party (CC style, or at least that's the intent!) I also had a great time catching up with CC professors and alumni at the GSA confer-

ence in October- good showing and good fun. Thanks CC Geology department! Ya'll continue to be the best.

Bryn Clark '00

My husband Louis Sass and I live in Anchorage, AK. He works for USGS as a Glaciologist and I work for ConocoPhillips as a Petrophysicist. We also had a baby girl (Aven Eileen Sass) on July 30, 2013.

Ann Hooker Clarke '72 retired from NASA and has affiliated with the Silicon Valley Mediation Group (<http://www.svmediators.com>) in Los Altos, CA, as an environmental mediator and collaborative partnering facilitator.

Dr. Jack Coash '47

Retired for past 25 years. Before that Professor of Geology at Bowling Green State University, Dept Chair for 13 years. Then Science Dean for 19 years at Cal State University, Bakersfield. 2 years at NSF & a stint with AID/NSF in India. Believe it or not, two field trips during the past six months. Last fall, the family gathered at Yosemite to celebrate my 90th birthday. Field trip - 2 brief walks to see the falls and Half Dome. And about a month ago, a brief trip to the Grand Canyon - son & his wife, daughter & two grandsons, and the wife and great-granddaughter & sister-in-law and her husband (3 of whom had never been there). Got to give a running commentary - two even hiked into the canyon. Not very impressive of your publication's articles, but still trying! Have to add, how much I appreciate hearing about all the women geologists, something I tried to promote.

Maggie Cowling '12 is now a GIS Manager at Moyes and Co. in the Dallas/Fort Worth Area.

Alexander Durst '93

I am working hard in NYC assessing, remediating and developing contaminated property. Real estate development continues to bring me interesting environmental

remediation scenarios to investigate and complete.

Ryan Ewing '98

I'm an Assistant Professor at Texas A&M University in the Department of Geology and Geophysics and study sand dunes on Earth, Mars and Titan. I revisit White Sands Dune Field in New Mexico every year and think about my first trip there 18 years ago during my intro CC Geology class with Joanie Kleypas!

Edith Fouser '99

Life is grand here in Essex, Mass. We have two little boys who are growing like tulips. Loben will be three in February and Kepler will have his first birthday next week. The vegetable garden is put to bed for the winter, but the backyard sauna is getting heavy use. I'm teaching full time (yikes) at the Waring School in Beverly, Mass, where I was a student once upon a time. I got the job 6 years ago as an Earth Science teacher for a sabbatical replacement, but it was a good fit, so now I'm putting my liberal arts education to use teaching Humanities, Writing, Geometry, and 6th&7th grade Science. It's never boring! Every so often I get to talk about Antarctica (...and sandwiches.) I have to say, being a working parent of two little guys requires about the same spirit of adventure that I recall being useful during long days of field work with Paul or Christine! And the rewards are even more awesome than any view from the top of any hogback anywhere. Hope you all out there are well and I would love to see anyone passing through the Boston area.

Ross Freeman '90

After 5 years as the Environment & Sustainability Manager at Stevens Pass Ski Resort in Washington's Central Cascade Mountains, I decided to tackle new challenges in April 2013. But before I left, I was honored to win a major award in 2012 as one of Washington State's 50 greenest companies.

I'm now working back down at sea level, serving as the first-ever Sustainability Manager for the City of Mercer Island, just outside of Seattle, and right in the middle of the Seattle Fault Zone. Certainly a change of pace and scenery, but many similar goals, and a lot of community support including from the Mayor; a daily 30 mile bike commute keeps me sane! Turns out my new boss is a CC Grad.

Still doing sustainability consulting on the side, and guiding a few summer white-water trips on Oregon's Rogue River for fun. Backcountry ski and climbing trips deep into the Cascades are still a favorite pastime, along with occasional overseas adventures (just got back from a fascinating fortnight in Burma).



Ross Freeman was featured in Seattle Business Magazine holding one of the resort's popular electric vehicle chargers; they were the first mountain pass in the country to install them.

Carter Gehman '97

I'm a geophysicist for Hess Corporation working in Kuala Lumpur, Malaysia. I have lived here with my wife and two daughters for the past two and half years. Thanks to Jeff, I followed my passion for geophysics and ended up in an amazing part of the world!

Cece Matot Hartman '80

My news would be that my son Jay is a freshman at CC this year. I am excited

for him and jealous at the same time! I tried to talk him into an Intro Geology course this year, but being the son that he is, he declined. I am hoping to get him into the Geology Dept. next year. The other news is that Mike Florance and I see each other during ski season in UT. Mike is also an '80 Geology Major Graduate. His daughter Kathryn is a Senior at CC this year. His son graduated about 2 years ago from CC. Neither of his kids were Geology majors, unfortunately... Mine probably won't be either.

Dick Heermance '95

Colorado College (BA 1995) was the first stop on my counter-clockwise circumnavigation around the Colorado Plateau, with subsequent stops in Logan, Utah (Utah State) for a MS (2002), Santa Barbara, CA (UCSB) for a PhD (2007), and Tucson, AZ (USGS) for a postdoc. I've finally settled down as an assistant professor at California State University Northridge (of 1994 earthquake fame). Current research projects include the glacial history of the northern Sierra Nevada and Klamath Mountains in CA (I knew I should have taken geomorphology with Dr. Leonard) and neotectonics of the Qaidam Basin within the northeastern Tibetan Plateau. In my spare time I'm trying



Dick Heermance in Yardang field within the central Qaidam Basin. It is a tough place to find shade in July. Plio-Quaternary lacustrine strata are presently being uplifted and wind-eroded on the basin floor.

to figure out how to be a dad to our new daughter.

Robert Jacobsen '10

Wow another year! I'm still loving it in Knoxville, TN, but do miss Colorado a lot. I'm still working on my phd in planetary geology. My qualification exams are this month (January), and hopefully I'll be a candidate by the end of the semester!



View of Payette Lake from Osprey Point in Ponderosa State Park, where Beth Kochevar taught at the science school.

Beth Kochevar '11

Hi! I'm currently living in McCall, Idaho, finishing my M.S in Natural Resources at the University of Idaho. I participated in the Environmental Education graduate program at the McCall Outdoor Science School last year, and loved teaching science to kids and getting them excited about our natural world.

Anna Kutkiewicz '11

For almost a year and half after graduation, I worked as an exploration geologist in Brisbane, Australia on a FIFO schedule to the Bowen Basin in Queensland. I managed not to hit a single kangaroo with my ute, and learned the how-tos in managing drill crews. The driller is always right. Although I certainly

loved Australia (and plan to return), a year ago I took another exploration geologist position in Missouri. My work has shifted to be less rig-oriented and more analytically-based, evaluating drill spots and prospective targets and block resources using 3D modeling software, and traveling to various conferences across North America. Next up: Vancouver!

Bonita Lahey '69

I finally returned to geology! I am working as a volunteer at the Denver Museum of Nature and Science. I work as an interpreter for the Prehistoric Journey Exhibit and as a geology volunteer in the Geology Department. For the latter, I am part of a team working on two extinctionsboundaries in Colorado/Wyoming - the Ordovician and the Permian. I am working with Whitey Haggardorn, Geology Curator at the Museum. Great place to volunteer! Happy to be back where I started!



Picture of Steve Spear, Ph.D and Bonita Lahey, both '69 geology graduates, at '68/'69 reunion in 2013.

Geoffrey Mason '85

After many years, I have gotten back into long distance running. Last year I ran 14 races ranging from a mile to a marathon. Having turned fifty this year, I ran my fourth marathon after a break of 27 years. I was only 23 minutes off my last one, clocking a time of 3:25. My favorite race of the year

was a trail half marathon at the Mountain Institute on the side of Spruce Knob Mountain, the highest point in West Virginia. Camping out in the fog, visiting the Mountain Institute for the first time since I was a kid, and flying up and down the steep trails made it quite a weekend.



Geoffrey Mason racing his way through Patuxent River Park in the Patuxent River Trail 10K in Maryland.

Charles Matteson '69

Have not been doing Geological work for the last 15-20 years and making a lot more money with a Contract Heating Business. Still hiking, skiing and raising our 4 daughters (Haley - 17 Yrs, Syd - 16 yrs, Callie - 13 yrs and our youngest, Annillia (adopted from Guatemala) 9 years old). We live just down the road from CC, but were not in town for the reunion. We have done a great deal of traveling over the last 15-20 years but still remember some of our Geology field trips as our greatest trips. Sorry to have missed the reunion, but were out of town at our daughters' horse competitions. Would like to hear from some of the other "Boulder Beaters" if you have time.

Georgia Matteson '69

Sorry we missed the reunion. Our four daughters keep us on the run. We enjoy living in Colorado Springs, just down the road on the North end of Wood Avenue. I have been involved with flying for quite a long time. Had a small airline for cargo, transportation and instruction. After I sold that, went

to work with United. Just finished recurrency for all of my certificates and will be doing pilot training again sometime in the future. Charlie and I are having great fun with the girls. Would be nice if one of them ended up at CC. We do a lot of traveling and work with a foundation that concentrates on work with children at high risk in the Colorado Springs area as well as New York and California. It has been difficult at times, but also very rewarding when it works. Both Charlie and I have very fond memories of the "Boulder Beaters" and Dr. John Lewis and our beloved Dr. Bill Fisher. Bill was one of my heroes, along with Chuck Yeager. Would love to hear from our classmates and friends. Wish you all a Merry Christmas and Happy New Year. (Oh, and yes, we do have one daughter that likes "rocks").

Jen Pierce '95 is an Associate Professor in the Geosciences Department at Boise State, where her office is next door to Shawn Benner (class of 1990). She continues to research wildfires in the past and present, including climate controls of fire activity and fire-related debris flows. She will be expanding her research areas this spring to the jungles of Thailand, where she will be looking for evidence of past civilizations in leech-infested swamps. She is enjoying watching her two girls (age 3 and 1) grow up and learn to ski while wearing princess dresses. She and her husband Dave live in Boise, but spend as much time as possible at their cabin in the Tetons.

Sonya Popelka '97

Formerly Sonya Berger, I got married in April 2013. If anyone happens to pass through north-eastern Utah, feel free to swing by Dinosaur National Monument to drop your CC connection at the front desk and get a special tour from the Interpretive Operations Supervisor. As an NPS Park Ranger for the last 16 years (at Zion, Everglades, Tongass N.F., National Mall, Gila Cliff Dwellings, Acadia

and now Dinosaur), I find that my favorite parks are the ones that get mentioned in several write-in-the-rain orange notebooks that still have a place on my bookshelf. Geology field trips almost two decades ago solidified connections between a love of geology and a love of national parks in my brain and I've enjoyed exploring those connections ever since. Coming full circle, I had a very pleasant surprise last May to see Paul and Steve hiking down Dinosaur's Fossil Discovery Trail with a new crop of CC geologists. Christine, Eric and Jeff, they were supposed to share Junior Paleontologist badges with you. Let me know if you need anymore.

Jon R. Rotzien '07 and Stanford University Ph.D. '13 is now at BP in Houston, TX. Always up for a coffee with CC alums, please email at jrotzien@alumni.stanford.edu.

Raffaello Sacerdoti '03

A lot has just changed for myself so I thought I'd give you guys an update. I had a daughter named Annabelle Marie Sacerdoti on 3/28/13. Her mom is Elizabeth Sacerdoti, also a CC Alumna, formerly Elizabeth Nelson. I just changed jobs leaving EnCana Oil and Gas to start working at Enduring Resources in Denver. I am working the Wolfcamp Shale play in the Midland Basin and am trying to remember all the carbonate geology I haven't thought about since CC. The last time I worked carbonates was with Paul Myrow on the El Paso Group outcrops in West Texas.

Robert Schock '61

Since my last update, I have not managed to be completely successful at retirement (In fact you could say I am a miserable failure), keeping busy consulting on energy technologies. As a convening lead author of the Global Energy Assessment (Cambridge Univ. Press, 2012) we finished the chapter on Energy Supply Systems and held workshops around the world. I have also published two papers and had several

workshops on the importance of the rapidly growing cities of the world and their integrated energy systems to global sustainability. These efforts use the physics of complex networks to allow stable control of power distribution, transportation systems and other very large interconnected networks such as waste disposition, pollution, and governance. I still manage to race sailboats, attend Giants baseball games and Susan and I very much enjoy our three daughters and four grandsons.

Lisa Seaman '87

The big rains and flooding in Boulder in September 2013 were devastating to many, and sadly deadly for some, too. We had just returned from a week of backpacking in the Wind Rivers, where I re-read John McPhee's "Rising from the Plains," a great geology book by a great writer. When we got home the rains started. We left our small cooler out to measure rain, and when it filled up after a day of rain, my husband emptied it, thinking that 9 inches of rain in a day was not possible. But actually it was true! After the flood, I've enjoyed checking out the landscape. There are things, I don't know what to call them, but there were "water outbursts" out of hillsides, not a valley or re-entrant (as they call them in the sport of orienteering), but water seemed to burst out part-way down a hill, leaving interesting tracks. Now, I also have a much better visual understanding of how riverbeds can fill up with sediment and add to the sedimentary layers in eons to come.

Laura Dickerson Sears '99

Shawn Sears '98 and I welcomed our son Casper in April of 2013. Casper's favorite "toy" of the moment is a perfectly round river rock from one of my many Geo field trips! Shawn and I continue to run the nonprofit we started 13 years ago, Vida Verde Nature Education, providing free, 3-day environmental education camping trips for inner-city youth of the San Francisco Bay Area. www.Vvedu-

cation.org. We always welcome visitors, and are usually looking to hire great people!



Laura and Shawn Sears with their new happy, baby boy, Casper.

Karri Sicard '07

A year ago I finished my Master's at the University of Wyoming in Laramie with Art Snoke. I mapped and studied the geology of the Ruby-East Humboldt metamorphic core complex near Wells Nevada. I drove and ferried up to Fairbanks Alaska in January to work for the Alaska Division of Geological & Geophysical Surveys (DGGS). It's a great thing I enjoy skiing and winter as one downhill ski area was open till May 6th and the cross country trails were open even later. I survived



Karri Sicard doing fieldwork this past summer in Alaska with the Division of Geological & Geophysical Surveys. Behind her are the Revelation Mountains in the western Alaska Range.

leading my first project, mapping in the western Alaska Range with the Mineral Resources group. Now we're working on digitizing, processing samples and getting ready for next summer in the Talkeetna mountains.

Ted Starns '07

I'm working as a Development Geologist for ConocoPhillips Alaska in Anchorage, enjoying the work, and the cold weather and salmon fishing.



(Top) Adair Stevenson watching a Partial Displacement Pile Load test.

Adair Stevenson '02

I'm currently living in Columbia, South Carolina. I work at a firm called ECS Carolinas, Ltd. (Engineering Consulting Services) as staff project manager. We do environmental, geotechnical, and construction material testing. We are currently working on several large projects in the state one of which is the new Bridgestone Off Road Tire plant in Graniteville, SC. Basically I get to play in the dirt all day which is perfect for a geologist. When I'm not working I'm usually sleeping, exercising, or hanging out with my dogs. I work a lot! Anyway that's basically it.

Merril Stypula '09 is a Geologist for EQT in Pittsburgh, PA and is currently working on the Huron Operation project. She stopped through the Geology Department while working on reunion planning for the class of 2009!

Michael Toomey '00

In the past few months I have started a position as Senior Remote Sensing Analyst, working with a federal contractor to the USDA. Our work is housed within the Foreign Agricultural Service, using satellite remote sensing to facilitate estimates of global food production.

Lynne Westerfield '00

I am now Executive Director of the Cloud City Conservation Center in Leadville, Colorado. We are in our second year of operation up at 10,200 feet and are busy working on clean energy, energy efficiency, waste diversion and all sorts of great community projects. We have two internship positions that CC students or grads would be perfect for. Also I'm taking some time off this Summer to guide in the Grand Canyon (rafting) and hoping to work the CC alumni trip. Maybe see ya there.

Lisa Broader Whitlock '83

All is great at the busy Whitlock house. Lisa owns and operates a small Family Practice and Pediatric medical clinic in Portland Oregon. Times have changed since I looked for a college in a black and white book that was kept at our high school college counselor's desk! I have two daughters, Madeline a junior and Isabelle a freshman. We are beginning the college process with our junior and yes CC is on "the list". While not running a company and carting my two teenagers around my husband Mike and I enjoy playing tennis and golf, skiing and walking the dog!

David B. Williams '87 is working on new book weaving together natural and social history. Titled Too High and Too Steep: Reshaping Seattle's Topography, the book will look at how Seattleites have created its modern landscape by filling in tideflats, rejiggering its waterways, and washing away hills. The book will be published by the University of Washington Press.



Photo by Stephen G. Weaver

Dear Colorado College Geology Alum:

We hope you have enjoyed the 2013-14 edition of the Precambrian Basement, CC Geology's annual alumni newsletter. We would love to hear what you're up to, where you've been, and where you are now. Please fill out this form and return it to:

The Precambrian Basement
Colorado College
Geology Department
14 E. Cache La Poudre St.
Colorado Springs, CO 80903

OR: email us at precambrianbsmt@coloradocollege.edu
We love pictures!

Last Name _____ First Name _____

Maiden Name or Nickname _____ Year of Graduation _____

Current Address (street) _____

City _____ State _____ Zipcode _____

Home Phone _____ Business Phone _____

Email _____ Website _____

Current Employment or Graduate School Info:

Recent Events, Exciting Adventures, and other Comments

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