

Basement

THE COLORADO COLLEGE GEOLOGY DEPARTMENT



2010

Volume XII of the new series

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Cover Photo:

Mt. Aconcagua, Argentina

From Regional Studies trip to Argentina

Photo by Tom Neilson

The Precambrian Basement

2010

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So I was going about my business last summer when Christine came into my office and said, "You are Chair of the department now!" "Like hell I am!" I said. She proceeded to tackle me and we wrestled, kicking and punching and pulling hair, until I was forced to say "Uncle", or more accurately "I'll do it". Sounds crazy I know, but that is how we pass on administrative duties around here. In an act of desperation I tried to auction the department on Ebay, but once Mandy found out she made me take the listing down.

The summer seems so very long ago now, and I am still getting up to speed on all the ins and outs of being Chair. One thing I have learned is that Christine was amazing in this position, and I would like to begin this newest installment of the "Precambrian Basement" by thanking her very, very much for the work that she did. The list of Christines' accomplishments is staggering, and I will only hit some of the highlights: she oversaw both the hiring and third-year review of Megan Anderson, she dug into budgetary details in order to guide the department through the recent economic downturn, she worked to develop our first department-level assessment plan, and she oversaw the first major overhaul of the department curriculum in ~15 years. On top of these extraordinary activities, there were the more 'ordinary' duties of reviewing salaries, hiring visitors, and planning homecoming events. No matter what the problem or the responsibility, Christine met it head on, and we all owe her a great deal of thanks (or at least a beer the next time you see her) for the fantastic job she did in managing this motley crew of a department over the last four years.

In addition to this passing of the administrative torch, the year 2010 saw the department and its alumni continuing to thrive. Mandy has fully adopted all of us, including the furry members (not just Eric and Jeff but dogs Buddy, Pearl and Bessie), and her office remains a hive of activity particularly during class breaks. In addition to keeping all of us up to date in software and hardware, Steve has seen his photographs spread across campus, with twenty of his images decorating the cover of the campus phone directory.

Faculty members continue to be successful in writing grants and getting funding from such agencies as the National Science Foundation (congratulations to Christine and Eric!), as well as publishing their work in a variety of journals (see the publication list towards the back of the PCB). They also continue to maintain a presence in the Keck Geology Consortium, with Megan and Christine co-leading a project last summer in the Bighorn mountains of Wyoming. In addition to tenure-track faculty, this year sees us with two new visiting members: (1) Chris Krugh, who is teaching structural geology among other courses while Christine enjoys a sabbatical, and (2) Esti Ukar, who is teaching metamorphic petrology among other courses while Jeff continues to enjoy his time in the Dean's office. And last but not least, there is a changing of the guard in our summer introductory geology course, with Emily Pope ('04) handing over teaching duties to Claire Lukens ('04).

Students continue to take advantage of research opportunities outside of the classroom, with 11 of 24 seniors this year working on some type of independent project. Not only are our students undertaking great research, they are also communicating their results exceptionally well, as is evidenced by Tia Wood ('10) receiving the prestigious 'Outstanding Student Paper Award' for her poster at the 2009 AGU meeting.

To conclude this brief summary of 2010, let me say that everyone in the department had a great time at Homecoming Weekend this fall. Although reconnecting with our alums is always fun, it was particularly enjoyable to join in the celebration of the lives and accomplishments of Bill Fischer and Eiler Henrickson. Theirs are big shoes to fill, but I'd like to think that we are making them proud!

I hope you all have a great year, and that you stay in touch!

Henry Fricke
Geology Department Chair



MEGAN ANDERSON
(Geophysics)

This year has been a time to work with current and past research students at CC. Fieldwork on my two NSF grants (Bighorns, WY and Sierras de Cordoba, Argentina) came to a close, and my students and alums came to help me and my colleagues pull seismometers out of the ground. Current students Kira Olsen, Aaron Bandler, and Wes Paulson traveled with me down to Argentina to remove instruments that had been recording data for two years in the South American subduction zone & Sierras Pampeanas. Pulling out instruments in Wyoming unfortunately happened during October, when my current students were taking classes, so I invited several alums back to help with that fieldwork. Fortunately, Leah Bedoian ('10) was able to take a leave from her farming job to wield some shovels and t-post pullers, and Alex Kerney ('10) was in between fall work gigs and could join the seismic workforce as well. Alex is now off sailing around Patagonia on a research vessel, and Leah has come back for a brief stint in the department to paraprof a couple classes.

This last summer Chris Siddoway and I also led a Keck project with Eric Erslev (U. Wyoming, Laramie) associated with the Bighorns, WY NSF project. Nine students were involved with the project, including CC student Drew Thayer. We all helped deploy ~1600 Texan instruments across the Bighorns Mountains as a part of the Bighorn Arch Seismic Experiment (BASE), then watched the explosives engineers go to work sending active source seismic waves into the ground using really big fertilizer bombs (wild!). The Keck students then embarked on individual research projects, 6 students focusing on structural studies characterizing local and regional fractures with Chris & Eric, and 3 students working with me analyzing

USArray and BASE stations for anisotropy of the crust and mantle below the Bighorns. Mindy Solomon ('08) took a break from her graduate work at Colorado State to come up and assist the undergraduates with the shear wave splitting technique. We all had a blast! Our time in Wyoming has been immortalized in a You-tube video, that is worth checking out: <http://www.youtube.com/watch?v=IceLOIVUQE0>. Our Keck students are now busy submitting their short contributions for the Keck Symposium, coming up in April.

This fall I took a semester-long sabbatical, that is now standard for the year after third-year review for tenure-track professors, so my office is cleaner than usual, but I also am teaching fewer classes this year. I did teach a winter-start FYE for the first time (block 5), and enjoyed the enthusiasm that only first-block freshmen can have. We had to battle the snow during our big field trip in early February, even though we headed south to New Mexico. The students took it in stride, but also really appreciated the trip to the hot springs!

AGU annual meeting time was fantastic this year. My current research student Kira Olsen made a presentation of her work targeting focal mechanisms in the



Megan at the foot of Aconcagua.

Wadati-Benioff zone under Argentina to better understand deformation of the subducting slab. Mindy Solomon gave a presentation on her work with shear wave splitting at CSU. We also had an informal alumni/current student gathering one night to hoist a beer together. It was great to catch up with Zion Klos ('09), Betsy Friedlander ('07), Caitlyn Florentine ('07), and Jenny Haywood ('06) among others. Let's do it again next year!

This coming summer I have a reprieve from fieldwork so that I can write a few papers based on the data from my NSF grants. I will be breaking up this work by taking a trip to Copenhagen to visit my sister and to Minnesota to visit my parents and participate in "The Ride Across Minnesota" (TRAM), which is a 300-mile bike ride that is a benefit for MS.



HENRY FRICKE
(Geochemistry)

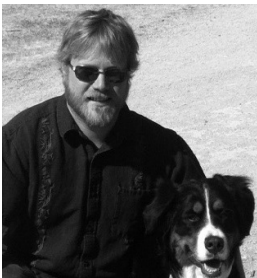
Hola! As you might be aware by now, the biggest change to my world in 2010 was the beginning of my first term as Chair of the department. It involves a lot of meetings, deadlines that I try not to miss, and more meetings. I also sign a lot of things that Mandy puts in front of me (hopefully my retirement funds are still in place). One of the big upsides, however, is getting to meet all the new majors; they need me to sign their declaration forms and this gives me a chance to welcome them to the best department on campus. In general, I just hope I can make it through the next few years of Chairing without messing anything up too much!

Other than trying to learn the administrative ropes, 2010 was a pretty good year. I got a chance to teach Historical Geology while Paul was gone in the spring, and I took the class to the San Juan basin in New Mexico. We studied 120+ ft long fossil trees, visited

museums, and literally walked in the tracks of Jurassic dinosaurs. What could be more fun than that?! This fall I co-taught one block of the newish sophomore-level course, GY210, with Eric and learned that when things break, they fall down in a predictable manner (being the father of a seven and a nine year old I sort of knew this already). I learned other stuff as well, and I think such cross-pollination with other department faculty will be ongoing strength of this course. Lastly, I had a great time getting to work with another group of first-year students as part of the FYE program.

On the research front, various projects are at various stages of completion. Although you've heard this before, several papers relating to Jurassic sauropod biology (they grew fast but episodically!) and behavior (some migrated seasonally to the mountains!) are about to be submitted. Like next week. Really. Work on late Cretaceous ecosystems morphed onto a recent climate paper in which we argue that a strong monsoon was an important feature of the foreland basin landscape. Moving forward with this project, a climate modeler and I are going to estimate the height and extent of the Sevier highlands at this time using a data-modeling approach. As much fun as the Mesozoic can be, I have really been having a good time getting back into the Paleogene. The hothouse climate of the early Eocene as recorded in Laramide basin sediments in Wyoming continues to fascinate me, and I am moving forward with colleagues to investigate differences in environment both over time and over space. One project that really has my attention right now involves a possible link between hyperthermal climate change (e.g. the Paleocene-Eocene Thermal Maximum) and 'megafan' sediment deposition in Laramide basins. It is especially fun because it has given me a chance to collaborate with one of our alums (Katie Snell)!

Last but not least, life at home is going great. The family took a vacation to the beach in Mexico this fall, and right now we are all enjoying one of the best snow seasons in a long time. Somewhere in there the kids go to school. They also found the time to get Buddy-the-dog a cat to 'play' with, or to ignore as the case may be. As usual I hope all is well out there in alumni land, that you'll update us with your notable events, and that you stop by and visit us if you can!



CHRIS KRUGH
(Tectonics/Structure)

Greetings,

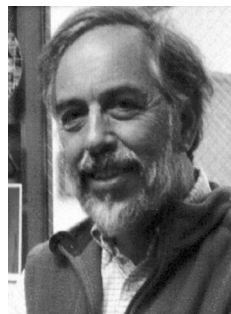
My year as Visiting Assistant Professor at CC has been a fantastic experience. While I've found it

challenging to keep up with teaching on the block system, I truly enjoy getting to know and work so closely with my students. During Block 1 I taught a course ominously titled Catastrophic Geology that thankfully didn't live up to its moniker. For Block 2 I got to teach the second half of a 2-block Introductory Geology FYE (First Year Experience) course. The highlight of this course was a weeklong trip down to New Mexico where we explored volcanism associated with the Valles Caldera and Rio Grande Rift. Somehow, all of the alleged wrong turns on this trip still produced fantastic opportunities for us to "geologize". My third class, Tectonic Geomorphology, covered a diverse range of topics through paper discussions and ended with a student-led research project on the Sangre de Cristo Mountains. This course definitely helped to get the research gears in my head turning again and has given me some ideas for future projects. This last block (Block 6), I taught Field Analysis of Geologic Structures where we escaped wintery Colorado to conduct field projects in warmer locales near Socorro, NM and in the Catalina/Rincon

Mountains outside of Tucson, AZ. For my final two blocks at CC this year, I'm going to be teaching two jam-packed classes of Physical Geology. The success of these classes and field trips are largely due to the hard work and assistance of our wonderful para-profs Tia, Tyler, and Leah.

When I'm not preparing for lecture, away on a field trip, or grading, I've been working on getting a couple of manuscripts from my PhD and Post-doctoral research projects finished up and published. I try to spend any free time I have exploring the outdoors of Colorado with my dog Madie. She's had a great time in Colorado Springs, particularly chasing squirrels in Monument Park, and enjoys CC during her random visits to my classes. Madie always looks forward to passing by Mandy's office for a sneaky treat or two.

ERIC LEONARD



(Geomorphology/Glacial Geology)

Yikes! This is my 30th year at CC. Pretty hard to believe. It was a good year – which took me to the field in Argentina and Chile as well as throughout the US Rockies.

We even became empty-nesters this year, so more travel will be in order in the future.

In February and March, Megan Anderson and I fled the cold with the 2010 senior class for a regional geology course in Argentina – which is described in detail elsewhere in this issue of the Precambrian Basement. It was a great course and I had a great time seeing some absolutely spectacular geology and geomorphology, using my terrible Spanish, staying one day ahead of the class, eating beef and drinking (occasionally?) Malbec, and, to my eternal dismay, sleeping through the 5th largest

earthquake of the last century (we were in northwest Argentina about 650 km away from the epicenter in Chile). Also in the spring semester I taught a Global Climate Change class as part of the First-Year Experience program and Glacial Geology. The latter class featured a return to the San Juan Mountains, site of a long-ago glacial geology Keck project that a few of you may remember. This fall I team-taught Physical Geology with Esti Ukar, our visiting petrologist, and our new two-block 200-level major course (advanced intro to everything?) with Henry and Paul in successive blocks.

Following the Argentina class I spent some time in (still somewhat seismically traumatized) north-central Chile – once again working on Quaternary marine sequences in an attempt to refine our understanding of both coastal uplift history and Quaternary climate along the coast. I'm still waiting on a suite of new U-series and Sr-isotope ages from the coral and mollusc samples we collected. I also tried sampling marine platforms for cosmogenic radionuclide (CRN) surface-exposure dating but that was a bust – too much salt weathering. Anyway, it was a good field campaign and I think we'll have some interesting results in a few months. During the summer I continued working on glacial history and paleoclimate in the Rockies, this year working in the Snowy Range of Wyoming as well as the New Mexico Sangre de Cristo. In June we learned that we (collaborator Ben Laabs of SUNY-Geneseo and I) received NSF funding for a three-year field-mapping, dating, and glacier-modeling project looking at regional paleoclimate and climate change during both the last glacial maximum and the subsequent deglaciation along a transect from Glacier National Park to central New Mexico. The results should also give us some insight into the ability of climate models to predict changes in storm tracks and precipitation regimes. So it looks like I'll be working in the Rocky Mountains for the next few summers. I've also been work-

ing on glacial and flood chronologies in the Sawatch Range/upper Arkansas River valley area – a project that resulted in a GSA field trip I co-led for the Denver meeting this past fall and a paper that will be coming out in *Geology* in February 2011.

Empty-nesters? Well Julia has been away for 2 1/2 years now. She is a junior at Sarah Lawrence College, but is spending this year in Edinburgh – the fall semester as an intern in the Scottish Parliament and the spring semester taking classes at the University of Edinburgh. Edinburgh and Scotland generally are, of course, famous for geology, but she wants nothing of that, being much more interested in politics. She is having a great time, despite being pounded by the winter weather. Susan has gone off to high school in Connecticut and is faring well there, despite her father's initial reservations. Every break, though, she is back in Colorado, preferring Rocky Mountain snow to the boiler-plate ice they try to ski on in New England. So now Lisa and I need to start plotting some foreign adventures. Lisa is still working as a community outreach nurse for Penrose Hospital – working long hours trying to get people the health care they need, sometimes against very long odds.



PAUL MYROW
(Sedimentology/Stratigraphy)

Greetings! My year began with a cross-country trip from L.A. to Cambridge, MA, where I spent the spring as the Crosby Lecturer at the Department of Earth, Atmosphere, and Planetary Sciences at MIT. I taught a semester course in Sedimentation for the department and lived a short distance from campus. It was great to interact with the scholars at MIT and Harvard, and live in the Boston region. I gave talks at both universities, and one at Smith College, and had

many very stimulating conversations. I also spent the spring taking jazz guitar lessons, which consisted almost entirely of discussions about music theory. This was incredibly stimulating to do after a lifetime of playing guitar without that background.

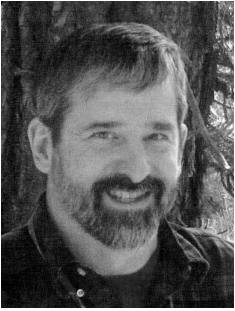
One of the many highlights of the spring was building an oscillatory-flow flume at MIT, in part by scavenging an old flume, and then building the rest of the components. It was much harder and more time consuming than I thought. In fact, it was not until mid-summer that we had the flume fully operational. We are happily making wave ripples and torturing them by changing flow conditions to see how the ripples adjust their spacing. We presented our initial results at AGU in San Francisco this fall and have an NSF proposal pending to expand the project. I found it very satisfying to do this kind of experimental work, particularly on an apparatus that we built with our own hands. In the Springs I gave a talk and led a two-day discussion for Books on the Beach, an alumni event in San Francisco. I met up with a number of geology alumni and had a great time. I wound up in San Francisco again for a workshop on the Himalaya in June, and then went into the field for two weeks in Wyoming and Montana in July. My student Julian Springer came along and later he has spent 4-5 weeks working on samples that we collected during the trip in a lab at Harvard. Alumnus J.C. Creveling also tagged along on the trip, which was aimed at examining the nature of trilobite extinction events in the Late Cambrian. In August I traveled to Australia to look at Neoproterozoic glaciogenic deposits with two graduate students from Princeton University. These post-glacial (Snowball Earth) deposits are possibly the most fascinating sedimentological facies I have ever worked on. These include remarkable bedforms that climbed nearly vertically for tens of meters(!), and that probably accumulated during glacial retreat. I did labo-

ratory work and gave a talk at Australian National University after the fieldwork.

In early October, I led a field trip to my old stomping grounds in southeast Newfoundland for the Geological Society of Canada. It was great fun to be back on "the rock". Almost directly afterwards, I went on one of the most memorable geological trips of my life...to the lower-elevation jungles of Bhutan. I can regale you with hair-raising stories of leeches and poisonous snakes if you are interested in knowing more! I felt like I was living through my own Heart of Darkness expedition.

This year I published a paper in GSA Bulletin on stratigraphy and detrital zircon geochronology from across the Himalaya. The point of the paper was that sediment dispersal across the Gondwanan continent took place over remarkable distances on the unvegetated landscape of the supercontinent during the Cambrian. My colleagues and I published one paper about Bhutan geology and have another one in press. I am also trying to shepherd two additional papers through to publication, both of which I am excited about, but feel at times as though albatrosses are around my neck. One is a big-picture paper about the affect that Himalayan uplift and erosion in the Cenozoic may have had on the isotopic composition of the oceans. This one is co-authored with CC alumnus Lou Derry from Cornell University. The other paper concerns Devonian carbon isotopes and global events, and is co-written with alumni Justin Strauss, JC Creveling, and Karri Sicard, as well as other Devonian experts.

On a personal front, I have been writing songs and thinking about doing more recording. I also spent time in Argentina this year, which was very interesting, and represented a visit to the last of the seven continents for my lifetime travels. [I am not sure why the last continent that I visited was the closest!]. I look forward to this coming year and hope to hear from you!



JEFF NOBLETT
(Petrology/Environmental Geology)

Greetings,
So yes, my granddaughter was present at my wedding. Arden Grace was born January 5th, 2010 and I

have been working hard to spoil her as much as possible ever since. Then on May 30th, Jenny Dorrington and I finally got married (after dating for eleven years) on a beautiful sunny, Colorado blue day at 9,000 feet on a hill above Estes Park. Myrow and some of his buddies provided awesome music for the reception and a number of old geologists were observed dancing (or something) that day.

We went right back to work (Jenny directs the Math Learning Center at UCCS and teaches an array of math from calculus to graduate courses in topology) but were able to sneak away for a brief "first honeymoon" in July to the Olympic Peninsula- a place neither of us had seen before and which lived up to all we had heard- from logging communities to tourist traps; glaciers to beaches- sunny on the beaches and rainy in the rain forests. A brief glimpse of basaltic material and deep-water sediments flying down from Hurricane Ridge in a dense fog was about the only geology moment I had this year (wasn't observing the sand at the beaches.)

I was able to work with a couple of students on independent projects. One student developed a nice study combining ethnogeology and volcanism on Bali- finding a tour guide from CC who was able to explain many of the religious practices and tie these to the practical understanding of volcanoes that the locals have of eruptions. Another is studying continental rifts in East Africa as she sets off to climb Kilimanjaro.

The college is doing reasonably well. Endowments are starting to recover, but we lost a lot of funding that supported financial aid, at the same time students are struggling

harder to make ends meet; department budgets have been level for a number of years which means we can't do as much as we used to; but we are still hiring faculty, developing strong programs, and responding to high numbers of students seeking to enroll at the college- so we must still be doing something right!

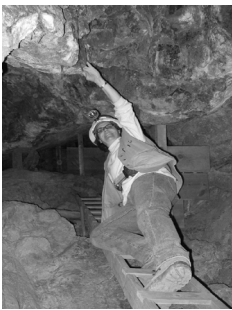
Best wishes to you all,
Jeff



CHRISTINE SIDDOWAY
(Structural Geology)

I'm on sabbatical, and Henry has accepted the role of Esteemed Geology Eminence, or Department Chair ... so this year is THE time for long stints of field work and research out in the world beyond CC! I spent July-August in the Bighorn Mountains of Wyoming for field work that's funded by the NSF EarthScope program, determining the lithospheric structure of the Laramide Bighorns arch with Megan Anderson and a big team of other collaborators (see bighorns.org). We ran a Keck project within the context of the big seismology-structural geology project, and the students' research is still underway. I then followed the sun to West Antarctica in November-December, for more summer field work—investigating the very fundamental process of formation of mature continental crust from primitive marine mud, leading to growth of Gondwanaland! To be sure, the study rocks are loaded with my favorite mineral, cordierite, and that should tell you that high temperature metamorphism played a role. A second field season is coming up next year, with an opening for a CC geo major to take part (IF someone excelled in Esti Ukar's Metamorphic Petrology course last block!). All three of my research students are working abroad this year: two on geo-hazards assessment in New Zealand, and the other on 'virtual geology' of Antarctica using

high resolution satellite imagery for tectonic mapping. This makes for a far flung group and lots of electronic communication, because in the first half of 2011, my husband Mike and I are situated at University of Calgary. We like the cold climates ourselves, but even more, Canada suits our two enthusiastic Labradorians who can't get enough of the snow. Critical news to share with some is that we lost our dear geology dog Winona to old age last year (thanks to all of you who have cared for Win over the years!)... but now we have hands full with two young Labs, Pearl and Bessie. A real advantage to having our Chocolate labs in snow country is that it is easier to spot them at night, and in daytime, too! Next year when we are back at CC, there will be no dull moments, since I'll be offering two new courses: "Rocks and Ruins," a look at records of catastrophic geological events' effects on human cultures, and a senior research seminar that uses contemporary modeling tools (Ellipsis, Thermocalc, Theriak-Domino) to learn more about continental deformation.



MANDY SULFRIAN
(Administrative Assistant)

Hi! Summer was nice and full of travel to visit family and friends. My granddaughter, Kaylee (1 ½), is growing like a weed and is more and more fun. Charlie and I took her to

the mountains and had a fun time looking for "pretty rocks". So far she is just interested in all rocks – a good geologist in the making...

Well, another year is in action and it's been pretty exciting. We had a Geology reunion at Homecoming October 8-10 and it was great seeing all attending alums. It was a celebration of the tenure of Professors Eiler Henrickson and Bill Fischer.

At the end of October there was the GSA Conference in Denver and one of our classes went to it, not to mention most of the

faculty. There was a Geology reception at Rock Bottom Brewery in downtown Denver. About 30 alums, ranging from 1972-2010, came to the reception and reconnected. A good time was had by all!

We have some great Geology students from all walks of life and full of energy! We have a large graduating class this year of 23 students. If you're in Colorado Springs, stop by sometime and meet some of them; they are impressive! Also, please make sure that you send in your email address to precambrianbsmt@coloradocollege.edu or the update form enclosed so you're sure to hear of any events we're having.



ESTI UKARI
(Metamorphic Petrology)

WOW, what a year! I finished my PhD at the University of Texas at Austin in May and moved to the Springs in August to be a Visiting Prof. for a year in the Block Plan. Things were truly hectic in the department at the beginning, but thanks to everybody's help and the student's enthusiasm my life became a lot more pleasant quickly. I was told CC is a very special place before coming here, and man, were they right! This has been an intense year in every aspect, but I have enjoyed every step of it.

Besides teaching several intro classes and my (in)famous Metamorphic Petrology class, one of the highlights of my teaching year is that I got to teach Regional Studies with Paul. What a fantastic trip! I thought we had plenty of fun in Death Valley, but then came San Salvador Island! Can we go back, I mean, right now? What a cool experience, and all the students seemed to have enjoyed it and learnt a lot (on the side).

My non-teaching blocks were not so "off". I spent my third block in Turkey. I gave a talk at the International GSA meeting, and went on a field trip to see my beloved

blueschists and the famous Color Mélange in Ankara and dedicated some time to writing papers. A couple of years ago I met some folks from the American Museum of Natural History (AMNH) in New York City while we were examining the high-P rocks and mélanges in Cuba (yeah, you got it, I love those things!). We talked about a potential collaboration back then, and I finally found the time to immerse myself in the labs at the AMNH and Columbia University during 6th block and get the project going. We obtained really exciting preliminary results on subducted carbonaceous material from these formations... but I'm not going to bore you with the details. I hope to go back soon to continue with this fantastic project. I also went back to Austin a couple of times to spend quality time with my PhD supervisor. We have so much more to do in the Franciscan! So overall these were two very productive months.

And along came Spring Break and South By South West in Austin. The friends, the music, the Tex-Mex... I guess they all played a part in the inspiration and... WE GOT MARRIED at the Courthouse, my fiancé and I. WOW! Yeah, that's what everybody said on Facebook too. I'm still very excited about round #2 in the Basque Country this summer, though. That's going to be one hell of a cultural exchange experience.

And now what? Well, I have really enjoyed my experience here at CC, but one of the things I have realized this year is that I miss research a lot. My plan is to do a postdoc next, and get some of the itching for more time in the lab out of my system. However, at CC I have also realized how much I love teaching and interacting with students. I hope that wherever my/our research/academic future may take me and my husband (that sounds weird), we end up at such a special place as CC. I honestly can say that I will never forget my year at CC. After all, it's the year I stopped being a "señorita" and became a "señora"!



STEVE WEAVER
(Geology Technical Director)

It has been another great year at CC as Geo. Technical Director. I have now been at CC for a full 15 years and still love it! Activities in the department have been busy as usual, supporting classes and helping Seniors with their research and I even managed to get in the field with some classes including the new GY210/11 and this years regional trip to Death Valley.

In addition to geo activities I continue to pursue my passion for landscape and nature photography. I was extremely fortunate to have spent 3 weeks in Alaska this past summer including a 12 day trip rafting the Canning River from the Brooks Range to the Beaufort Sea in the Arctic National Wildlife Refuge. This was an incredible experience and the amazing light allowed me to capture some fabulous images. You can see some in the Wild Alaska Gallery on my website: <http://www.stephen-weaver.com>. After the ANWR trip I spent a few rainy days in Denali NP, but was lucky to have a 12 hour window of clear weather to photograph Mt. McKinley from Wonder Lake 31 years after I stood on its summit! My work is getting more national recognition and exposure having been juried into several national exhibits, including my Bison and Crestone Peaks image (2010 State of the Rockies) being shown in the San Diego Museum of Natural History. This upcoming summer I will have a one-person show at the Hays Art Council in Hays, Kansas. I have ventured into the world of social media with a blog: <http://steveweaver.wordpress.com/> and Facebook Page, so check it out if you want to keep up with my photography adventures.

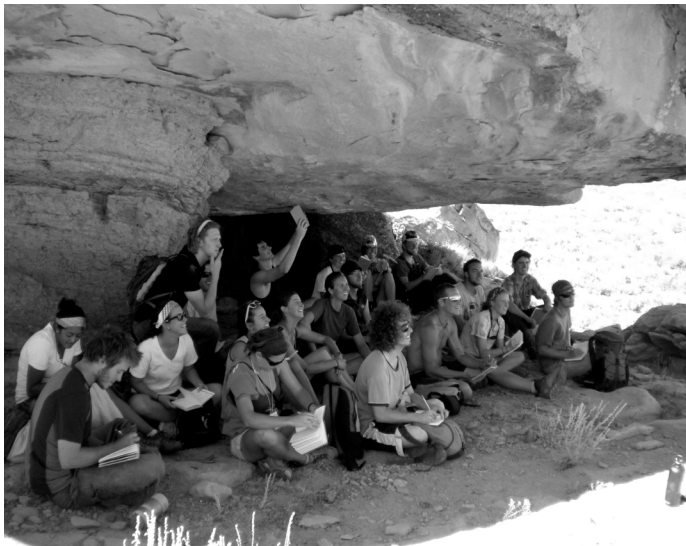
Publications Within the Department

Christine Siddoway

Siddoway, C.S., 2010, Microplate motion, *Nature Geoscience* (April 11), v. 3 (4), 225 – 226. doi:10.1038/ngeo835.

McFadden R., C. S. Siddoway, C. Teysier, and C. M. Fanning, 2010, Cretaceous intracontinental extension in the Fosdick Mountains migmatite-granite complex, West Antarctica, *Tectonics*, doi:10.1029/2009TC002492.

McFadden R., C. Teysier, C. S. Siddoway, D. Whitney, and C. M. Fanning, 2010, Oblique dilation, melt transfer, and gneiss dome emplacement, *Geology*, v. 38, p. 375–378, doi:10.1130/G30493.1



Paul Myrow's Sed. Strat. lecture. Photo by Tyler Doane.

Jones III, James V., Siddoway, Christine S. and Connelly, James N., 2010, Tectonic implications of a Proterozoic mid-crustal section, Wet Mountains, Colorado, U.S.A., *Lithosphere*, v. 2, p. 119-135, doi:10.1130/L78.1.

Korhonen, F.J., S. Saito, M. Brown, C.S. Siddoway, and Day, J., 2010, Multiple generations of granite in the Fosdick Mountains, Marie Byrd Land, West Antarctica: Implications for polyphase intracrustal differentiation in a continental margin setting, *Journal of Petrology*, 51 (3) 627-670, doi:10.1093/petrology/egp093.

Korhonen, F.J., S. Saito, M. Brown, and C.S. Siddoway, 2010, Modeling multiple melt loss events in the evolution of an active continental margin, *Lithos*, doi:10.1016/j.lithos.2009.09.004.

Eric Leonard

Young, N.E., Briner, J.P., Leonard, E.M., Licciardi, J.M., Lee, K., 2011, Assessing climatic and non-climatic forcing of Pinedale glaciation and deglaciation in the western United States, *Geology*, v. 39, No. 2, p. 171-174.

McCalpin, J.P., Briner, J., Young, N., Leonard, E., Ruleman, C., 2010, Quaternary geology and geochronology of the uppermost Arkansas valley: glaciers, ice dams, landslides, floods: *Crestone Science Center Field Guide* 6, 50p.

Paul Myrow

Hughes, N.C., Myrow, P.M., McKenzie, N.R., Harper, D.A.T., Bhargava, O.N., Tangri, S.K., Ghalley, K.S., and Fanning, C.M., 2010, Cambrian rocks and faunas of the Wachi La, Black Mountains, Bhutan: *Cambridge Journals*, p. 1-29, IP address: 205.170.15.198.

Myrow, P.M., Hughes, N.C., Goodge, J.W., Fanning, C.M., Williams, I.S., Peng, S., Bhargava, O.N., Parcha, S.K., Pogue, K.R., 2010, Extraordinary transport and mixing of sediment across Himalayan central Gondwana during the Cambrian-Ordovician: *Geological Society of America Bulletin*, v. 122, p. 1660-1670.

Megan Anderson

Dragovich, J. D., Littke, H. A., Anderson, M. L., Wessel, G. R., Kroger, C. J., Saltonstall, J. H., MacDonald, J. H. Jr., Mahan, S. A., DuFrane, S. A., 2010, Geologic map of the Carnation 7.5-minute quadrangle, King County, Washington, Washington Division of Geology and Earth Resources Open File Report.

Dragovich, J. D., Anderson, M. L., MacDonald, J. H. Jr., Mahan, S. A., DuFrane, S. A., Littke, H. A., Wessel, G. R., Saltonstall, J. H., Kroger, C. J., Recep, C., 2010, Supplement to the geologic map of the Carnation 7.5-minute quadrangle, King County, Washington—Geochronologic, geochemical, point-count, geophysical, earthquake, fault, and neotectonic data, Washington Division of Geology and Earth Resources Open File Report.

Spinler, J. C., Bennett, R. A., Anderson, M. L., McGill, S. F., Hreinsdottir, S., Mcallister, A., 2010, Present-day strain accumulation and slip rates associated with southern San Andreas and eastern California shear zone faults, *Journal of Geophysical Research*, v. 115, B11407, doi:10.1029/2010JB007424.

Anderson, M. L., Myers, S. C., 2010, Assessment of regional-distance location calibration using a multiple event location algorithm: *Bulletin of the Seismological Society of America*, v. 100, no. 2, p. 868-875.

Henry Fricke

Fricke, H.C., Foreman, B.Z., and Sewall, J. (2010). Integrated climate model-oxygen isotope evidence for a North American monsoon during the Late Cretaceous. *Earth Planetary Science Letters*, 289, 11-21.

Rogers, R.R., Fricke, H.C., Addona, V., Canavan, R.R., Dwyer, C.N., Harwood, C.L., Koenig, A.E., Murray, R., Thole, J.T., Williams, J. (2010). Using laser ablation-inductively coupled plasma-mass spectrometry (LA-ICP-MS) to explore geochemical taphonomy of vertebrate fossils in the upper Cretaceous Two Medicine and Judith River formations of Montana. *Palaios*. in press.



Henry's field lecture for FYE in Castle Rock. Picture by Madeline Scherer.

Active NSF Grants

It has been a big year in the department for NSF grants. There are 6 active grants within the Geology Department.

Christine Siddoway

Collaborative research: Polyphase Orogenesis and Crustal Differentiation in West Antarctica

Research at Undergraduate Institutions: Development of an On-line GIS Repository of Geological Data from the Ford Ranges, Marie Byrd Land, & Application to Cenozoic Paleogeography

Collaborative Research: Formation of Basement-involved Foreland Arches: An Integrated EarthScope Experiment

Megan Anderson

Collaborative Research: Structure of the Nazca slab and Sierras Pampeanas

Paul Myrow

Collaborative Research: RUI: Stratigraphic test of the tectonic assembly of equatorial peri-Gondwanaland: a Himalayan perspective

Eric Leonard

RUI: Collaborative Research: Glaciation and Climate Change in the Rocky Mountains During the Last Glacial Maximum and the Subsequent Deglaciation

Student Research

Seismology Research in the Bighorn Mountains

Drew Thayer '11

This summer I had a great opportunity for a full-on introduction to seismology research while helping Professor Megan Anderson with her ongoing project in the Bighorn Mountains of Wyoming. First, I joined Megan for a week on a mission to service all the broadband seismic stations in the region, during which we drove something like 2,000 miles, negotiated many a sketchy 4WD road, and had to get creative several times to dry out and clean equipment which had succumbed to flooding during the fast snowmelt that spring.

In July I joined eight other undergraduate students who were awarded research fellowships from the Keck Consortium and Professor Christine Siddoway led us on a fascinating road trip through the geological features of central Wyoming. We then dug in for the next month



Megan and Drew servicing a seismic station in WY.

at the Iowa State field camp facility in Shell, WY (population 50) and joined the Bighorns Arch Seismic Experiment (BASE), a massive project funded by the NSF which seeks to develop an accurate model of the surface, crustal, and upper-mantle structures of the Bighorn Mountains using structural geology and a variety of seismological techniques. The month in Shell was fantastic; I learned how to use new software, got to participate in cutting-edge research, play a lot of horseshoes and volleyball, and learned to square dance (began to learn would be more accurate) at a real-deal county fair and livestock auction. At one point the Shell camp swarmed with more than fifty people as we embarked on a project to deploy 2,000 seismometers across the entire region in two days. At other times the camp population dwindled to a small core of researchers, and I enjoyed the most exciting river-rafting of my life, running the rapids of Shell Creek with my collaborators in a 6-ft wide inner tube for tractor tires that we bought at the farm depot. Every research team is finding exciting results with the high-resolution data we collected in the Bighorns, and I'm very excited about my thesis work, analyzing shear-wave splitting in seismic data from the broadband station network, which is helping the BASE team make new discoveries about crust and mantle structure in the region.

- Drew Thayer ('11)

Chemostratigraphy of the Denver Basin

My research involves chemostratigraphic interpretations of rocks in the Denver Basin in order to identify the Paleocene-Eocene Thermal Maximum (PETM) in the rock record. Through my lab and field research in and around Denver and Colorado Springs, I ultimately aim to trace the PETM in depositional basins in Colorado, Wyoming, New Mexico, and North Dakota. If we can understand the depositional effects of the PETM in the Rocky Mountain region, we may be able to better comprehend potential geologic responses to today's global climate change.

The PETM is a well-known climate change event that occurred at the Paleocene-Eocene boundary at about 55.05 mya. Last summer, I sampled rock cores from the Denver Basin in order to analyze carbon isotope concentrations around the Paleocene-Eocene transition. I have identified a negative carbon isotope excursion in the Eocene rocks in the Denver Basin- a known marker of the PETM. The PETM coincides with a formation change at the Paleocene-Eocene boundary, which was originally interpreted as synorogenic deposition from renewed uplift of the Laramide Orogeny. I hope to show that this formation change is not tectonically driven. Rather, the formational transition is due to climatic factors such as increased precipitation or extreme seasonality. I aim to correlate PETM data and formation changes in many Laramide basins throughout the Rocky Mountain region, calling for a regional climate change event at the Paleocene-Eocene boundary.

-Beth Kochevar ('11)

Regionals Heads South

For four years our class fine-tuned its geological skills by studying the Western United States like many classes before us. We examined the phenomenal geological history preserved in the nearby rock record, minute details hidden within sedimentary structures, detangled the complex climate change and glacial history, mapped the beautifully exposed structures in the Wet Mountain range, as well as applied our geophysical knowledge to study water tables and below surface structures of the area. Last February we were presented with the challenge of reapplying all of our skills acquired during our time in this department in a foreign yet strangely familiar setting. Our class of 17 Colorado College Students, Professor Eric Leonard, and Professor Megan Anderson convened with students and professors from Purdue



Amy Ryan as scale beside columnar basalt outside of Rodeo, Argentina. Photo by Megan Anderson.



Our campsite host preparing a portion of the asado (Argentinian BBQ) for the evening meal. Photo by Eric Leonard.

University, a Columbian PhD student and two Argentinian graduate students to begin our investigations and adventure throughout northwestern Argentina. This area is the setting of flat slab subduction that is believed to be an analogue to the tectonic setting of North America in the early Cenozoic. We set out on our great adventure in a caravan of three Chevy Corsas driving between two Toyota trucks in case the smaller, far less suited vehicles encountered any obstacles along our 1,000km+, three week long road trip.

Our investigation began in the eastern Sierras Pampeanas in the province of Córdoba. Here we examined surface and seismic data in order to construct detailed cross sections of the region's various faults and décollements while sampling Argentina's seemingly endless varieties of meat and wine in the evenings. At the end of our first week we continued westward through the Pocho Volcanic field where Megan showed us how to service a seismic station, and into the

province of La Rioja. We paused in Talampaya for a day of geology tourism to check out the impressive Jurassic sandstone gorges decorated with petroglyphs. Continuing on our westward journey we were treated to stunning blind thrust faults, piggyback basins, and columnar basalts along the suture zones of Ordovician and Devonian terranes. The scenery and geology continued to become more complex and mind boggling as we cruised up and down portions of the precordillera attempting to comprehend the geological history of the area. On February 26th we camped outside of Rodeo in a canyon directly below a crumbling cement dam. Most of us were awoken at three in the morning by the 8.8 magnitude earthquake in Chile. Thankfully we were hundreds of miles away from the epicenter and the dam held strong.

In Boreal we settled into cabins with kitchens, beds and a pool, which were beyond deluxe in comparison to some of our prior campsites. From here we continued to try and make sense of the surrounding terranes and tracked down vars that were used by Wagner as evidence for continental drift.

We left our plush accommodations, consoled by the prospect of a day of hiking around the highest mountain in the Americas. Aconcagua's landscape, colorful stratigraphy, glaciers, and impressive mineral samples made this an unforgettable day. We then hopped back into our trucks and deteriorating Corsas for their last leg of the trip to Mendoza, the greatest wine producing area of Latin America! Here we checked out fault scarps in and around the city and wrapped up our class with one final asado. From here we dispersed to our various spring break locations to further study the rock climbing, wine, and culture of the marvelous country of Argentina!

- Tia Wood



Tyler Doane (in the foreground) and Julia Nave (further back) in Cordoba Argentina on regionals. Photo by Tom Neilson.

Alumni Spotlight

Warren Dickinson '71

From New Zealand: A Small Bit of Time

I graduated from CC 40 years ago in the northern spring. Since then my life has been mostly the result of random events and luck with a bit of work and planning on the side. The great law of aging is how quickly time passes, and for this reason humans have little chance of understanding geologic time, a fallacy that has led to numerous arguments lacking in age control. In fact, debate on climate change is largely a victim of this problem, and it is so easily misunderstood by skeptics and journalists. The recent Christchurch earthquakes also brings home the concept of Geologic time. Most all NZ landscapes are geologically 'young' – last 5 Myr stuff, and to imagine the countless earthquakes that have produced this landscape is truly a mind boggling concept.

In my 'story', set in human time, graduation day stands out in my memory because, I had no idea of what I was going to do after the party that evening. I remember knowing that the world was my oyster, but I had no clue how to pick it. This led to the post-graduate school of life on the ski slopes of Aspen with three other CC grads. After two years, I was facing either complete mental decay in a Colorado ski town or back to school for a life-long journey in Geology. Even though I have yet to find God, you could probably say that Geology saved my life!



Warren Dickinson and student performing field work in Antarctica

Alumni Spotlight

Warren Dickinson '71

I was a guinea pig of the CC block-plan, which started in the fall of 1970. No one knew what would result from it. For students it looked like a cram session, and for teachers it was a massive amount of work in re-organizing familiar notes to a new style of teaching. Despite its success at CC, the fact that few other colleges have adopted this system testifies to the difficult nature of the conversion. For me, geology would clearly work in this experimental system, as there could be field trips galore! So it was luck in timing that I signed on for two blocks of Intro Geology with John H. Lewis. John never used notes and his style of questioning, guidance through basic principles, is the essence of teaching in the block plan. If he didn't know the answer, he

would present the problem and let his students work it out! It is a style I have tried to emulate with little success to first-year students in NZ, who unfortunately are not used to this style and just want 'answers' for their exams. Although I was a Biology major, I never looked back after those two blocks. The very idea that Geology takes you to interesting places in the world and allows you to understand the ground you walk on was enough for me. Grad school at University of Colorado was full-on. I had to make up numerous undergrad courses in Geology and taking two classes consumed as much time as four classes at CC. It was not the difficulty, but my level of dedication. After some great summers in NW Colorado, Iran, and South Florida, I graduated and went to work for a small independent oil company in Denver, making what seemed to be a fortune of 20k per yr plus royalties on prospects I worked.



Warren with a student (left) after descending from Mt Taranaki.



Warren Dickinson flying high over the southern Alps.

Later my wife and I had the urge to see the world from a perspective outside of the Denver 'burbs'. In 1989 we moved, sight unseen, to NZ where I had a post-doc at Victoria University in Wellington. Post-doc didn't work out as planned, but I started lecturing and along with research in sedimentology and geochemistry have lived a dream ever since.

New Zealand is a beautiful 'green' country. Most of the natives are friendly and don't shoot at you. Native plants don't have thorns and only one native spider carries a poisonous bite. Not as much can be said for the imports brought by the British colonists. By US standards, politics in NZ are a non-event, and election campaigns last for scarcely 6 weeks. Recently, I found a former student of mine looking a bit forlorn on her 30th birthday. I told her that life gets better with each such decadal event. However, after six of these, I'm tippy-towing to the next. Give me a call if you are in the area, my wife and I plan to remain put for a while longer.

Alumni Spotlight

Jon Rotzien, CC Geology '07

Greetings CC Geologists!

The setting - one of the world's most renowned turbidite locales: Pukearuhe Beach, coastal Taranaki, North Island, New Zealand. Despite having been studied for decades, questions still remain regarding the depositional environment and provenance of these Upper Miocene turbidites that tower above the beaches on cliffs reaching 250 m in height.

The Stanford SPODDS research group just returned from another field season in Taranaki, North Island, New Zealand. This was my third and final field season studying the Upper Miocene Upper Mt Messenger Formation that outcrops on Pukearuhe Beach, just north of the city of New Plymouth. My advisors, Don Lowe & Steve Graham, and I study this formation to learn more about the evolution of flows that deposited the sediment ~10 Ma in a mid-bathyal, relative base of slope setting on the cusp of the proto-shelf. This fine-scale study of the processes of sedimentation fits into a larger scale research objective of elucidating the purported systematic progradation of the shelf into the Taranaki Sea during the Miocene.

In order to get at the depositional environment, we constructed photopanel spanning the 5 km long outcrop and marked in hierarchical scour, drape and onlap surfaces that bound measured stratigraphic sections. Filling these pans was a stroll along the magnetite-rich, midnight-black sand beach compared to the epic road trips needed in order to address the provenance questions. Much of the Upper Mt Messenger Fm is composed of very fine grained greenschist-grade and quartz-mica lithics. Where was this sediment coming from, and why is it all very fine grained?

Over the course of the field season during bad tide cycles and inclement weather, we departed our campsite at Urenui and traveled over 3,000 km by car, boat and foot to collect stream samples draining schistose source terranes, traversing both islands from Hawke's Bay all the way to Northwest Nelson and Cape Palliser (where we passed Pinnacles Park, visited briefly with the CC'07 senior crew on our regional trip in Jan.-Feb. 2007 with Chris and Eric). The regional collection included an adrenalin-packed 30 hour 700 km sampling road trip on the South Island before taking the tumultuous return Interislanded to Wellington, en-route back to Pukearuhe Beach for more sed/strat.

Next year we'll be leading a SPODDS affiliates trip to the Taranaki outcrops, so let the data reduction and analysis begin! Best wishes to CC & thank you for an excellent education.

Sincerely, Jon Rotzien, CC Geology '07

Geology Day Presentations

April 3rd 2010, Kresge Lecture Hall, Tutt Science Center

Robert Jacobsen

Paleoglacier reconstruction and estimates of Late Pleistocene climate in the southern Sangre de Cristo Mountains, New Mexico

David Goverman

Using ArcGIS to Investigate the Role of Melt in Deformation

Fiona Smith

Tectonic Analysis and Detrital Zircon Geochronology of the Obstruction Formation, San Juan Islands, WA

Anna Phelps

Sedimentology, Magnetic Susceptibility, and Chemostratigraphy of the Chaffee Group, Cement Creek, Colorado

Jennifer Crittenden

An Investigation of Selected Taxa from a New "Lower" Cambrian Trilobite Fauna in the Upper Harkless Formation of the Weepah Hills, Nevada

Julia Nave

Using stable and clumped isotope geochemistry to reconstruct paleoclimate and paleohydrology of the Kootznahoo Formation, SE Alaska

Tim Gibson

Sedimentology, Depositional History, and Detrital Zircon Geochronology of the Lower Devonian Tsakhir Formation, Shine Jinst Region, Mongolia

Ashley Contreras

Detrital Zircon Geochronology of southern Front Range Dikes



Senior class last Asado. Photo by Eric Leonard

Thomas Neilson

Geophysical study of the Lau Basin: OBS deployment and earthquake influences on bathymetry

Leah Bedoian

Gravity and magnetic analysis of subsurface deposits in the San Luis Valley, CO

Tia Wood

Anisotropy and Mantle Flow in the Eastern Sierras Pampeanas from Shear Wave Splitting

Tyler Doane

Integrated Structural and Gravity Analysis: The role of lineaments in Laramide deformation and implications for a lithospheric scale response

Amy Ryan

Lava Flow Morphology and Rheology at Volcan de Colima, Mexico

Buster Research Scholarships

Aaron Bandler
Emily Cleveland
Benjamin Mackall
Kira Olsen
Wesley Paulson
Maisie Richards
Julian Springer

Gould Research Scholarships

Adam Freierman
Nicholas Weldon
Drew Thayer
Anna Kutkiewicz

Putman Research Scholarships

Ashley Contreras
Anne Hanson
Jessica Tréanton
Wesley Paulson
Dirk Rasmussen

William A. Fischer Scholarship

David Conwell

Hannigan Field Scholarship

Adam Freierman
Jessica Tréanton

Creager Field Scholarship

Hannah Karlson
Thomas Neilson

Ritt Kellogg Grants

Beth Kochevar
Wesley Paulson
Martha Brummitt
Alex Gould
Kyle Dern
Tim Gibson

Venture Grant Recipient

Martha Brummitt
Emily Cleveland
Tyler Doane
Thomas Neilson
Hayden Miller

Senior Awards

Presented at Honors Convocation 2010

Rocky Mountain Association of Geologists**Award:**

Leah Bedoian

Association for Women Geoscientists Award:

Amy Ryan

Estwing Outstanding Senior Geologist:

David Goverman

William A. Fischer Special Recognition**Award:**

Tyler Doane

Scholarships Awarded in 2010**Rocky Mountain Association of Geologists****Phillip J. McKenna Scholarship**

Kira Olsen
Aaron Bandler

Seminar Series 2010

Dr. Lindsay Schoenbohm, University of Toronto, Mississauga, January 28th, 2010
Erosion, Exhumation, and High Topography in the Chinese Pamir of Life at the Foot of the 'Ice Mountain Father'

Dr. Lindsay Schoenbohm, University of Toronto, Mississauga, January 28th, 2010
Towards a Quaternary spatial and temporal deformation history at the Central Andean Thrust front

Dr. Estabalitz Ukar, University of Texas, Austin, April 5th, 2010
Franciscan Geology (California): Not your typical schist

Dr. Estibalitz Ukar, University of Texas, Austin, April 6th, 2010
Rocks don't suffer deformation, they enjoy it! The effects of high pressures on rocks

Dr. Charles Verdel, University of Michigan, April 12th, 2010
Cenozoic tectonics of Iran

Dr. Charles Verdel, University of Michigan, April 13th, 2010
Modes of extensional tectonism

Dr. William Krugh, University of Wyoming, April 22nd, 2010
Thermochronologic constraints on fault array evolution and footwall denudation

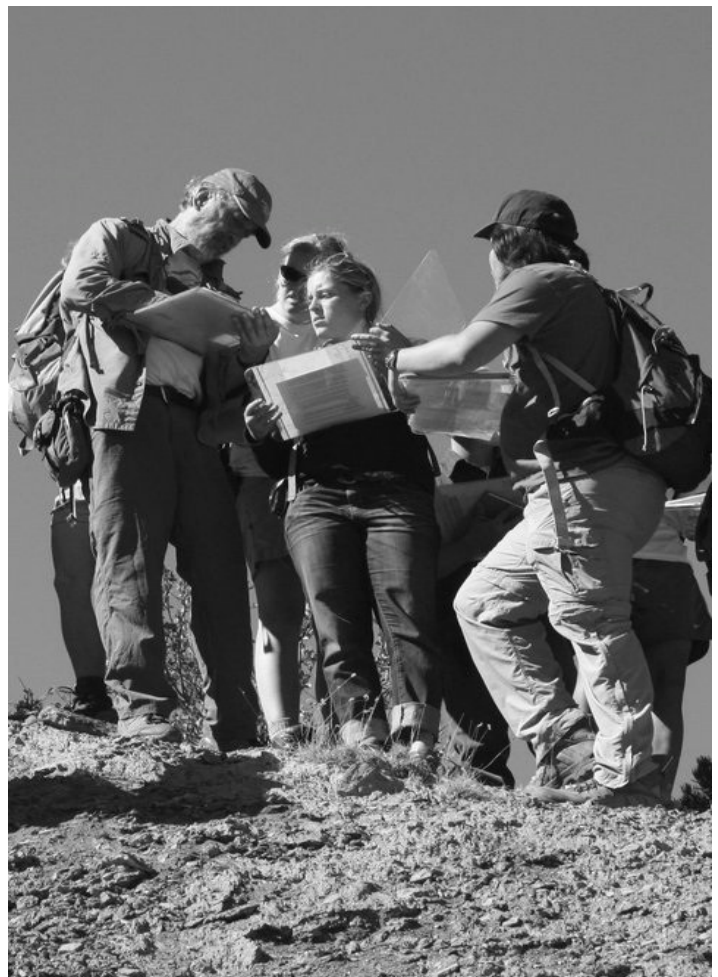
Dr. William Krugh, University of Wyoming, April, 23rd, 2010
An investigation of the Cascadia subduction zone

David Goverman '10 and Tyler Doane '10, April 26th, 2010
Wine, Cheese, and Rocks: Geology of the Pyrenees

Nicholas Weldon '10, April 26th, 2010
Climactic impacts of volcanic eruptions; using sulfate isotopomers to trace Cenozoic ozone depletion

Thomas Neilson '10, May 10th, 2010
Geophysical Study of the Lau Basin, Tonga/ Fiji, using High-Resolution Bathymetric Images

Robert Jacobsen '10, May 10th, 2010
Methane river and ice channel/valleys: What you didn't learn about in geomorphology or Fluvial network analysis on Saturn's moon Titan: Climactic and tectonic interpretations



Eric with GY 210 in the field.

Homecoming 2010 Geology Department

Our beloved Geology Department had a large presence at this year's Homecoming weekend. The weekend was full of opportunities for catching up, meeting, and merging of both new and familiar faces. It started with a symposium where we heard from Woody Fischer ('00) on "climate change and mass extinctions: Insights from study of the end-Ordovician ice age", Laura Crossey ('77) "The trail of time: Communicating geoscience to the public", and Lee Vierling ('92) "The great exhale: Reflections on a breathing planet." A poster session where several students and faculty presented current research immediately followed the three talks. Of course, appropriate beverages were available for consumption and there was plenty of reconnecting of old friends and classmates.

The weather was perfect on Saturday morning for our field trip for alumni, friends, and family. Led by Christine Siddoway and Eric Leonard, we visited all of your favorite stops; in Manitou Springs, we revisited the ol' Great Unconformity (remember the 600 Ma gap in time between the Pikes Peak Granite and the Sawatch Sandstone?). Standing atop the Triassic Lykins formation in Garden of the Gods, we discussed the general tectonic setting of the Rocky Mountains. Finally, we ended the trip with a geo-hike around Red Rocks Open Space.

Saturday evening we all convened once again in Gaylord Hall to commemorate Dr. Bill Fischer. A slide show of photos from the last 40 years or so in the geology department brought back many memories as we fraternized, while Front Range Barbecue provided food. Dennis Fischer ('73) provided the feature attraction of the evening; a presentation on his father Bill Fischer's fascinating life

from childhood through his career at Colorado College. Such a great man to have been such a large influence on this department! He will always be remembered fondly amongst us here in the basement!

Overall the weekend was a hit! Thanks to all those that came, it was great to see you. For those of you that could not make it, you were missed, but not forgotten (your picture probably came up in the slideshow). We hope to see you all again soon.

-Tyler Doane



Talapampaya National Park, Argentina. Photo by Tom Neilson.

A Successful Running of GY 210 For the 2nd Time Around

For the second time in its short life, GY 210, Fundamental Geologic Methods was taught this year during blocks 2 and 3. For those of you unfamiliar with this new class, it is part of the redesigned major, in which GY 210 replaces Minerology and Petrology classes, and the students then have a choice between several of the "core" classes and several of the electives. GY 210 is intended to be a broader introduction to several geologic fields for students at the sophomore level. This year block 2 was split between geochemistry (led by Henry) and structure (led by Eric). The class went on two field trips to apply their skills and knowledge. First, they toured the Pikes Peak region to collect data for the Pikes Peak Batholith project, their geochemistry project. Second, they visited the scenic Huerfano Basin to observe the structure there. Block 3 began with an introduction to geomorphology, in which the students conducted an analysis of the rapidly migrating Fountain Creek. This included blind pebble counts, tracing the thalweg, measuring the channel widths and depths,

and determining bankful heights. Then, Paul Myrow took the students on a six day field trip to charming El Paso, TX and southern NM to compare the stratigraphy in the Caballo Mountains of New Mexico, the Franklin Mountains of Texas, and the Waco Mountains east of El Paso.

The final week of the block changed focus to an introduction of geophysics and in particular gravity modeling. Students gained experience with ArcGIS as they used the program in conjunction with some tricky Excel work to determine the geometry and depth of the Mohorovicic Discontinuity beneath the Bighorn Mountains. Congratulations to the students on a job well done and to the department for a successful running of this new class!

-Tyler Doane '10

High Number of CC Graduates Received NSF Fellowships

We are proud to have 3, that's right 3, CC geology grads that are current recipients of NSF research fellowships! Considering the size of our department, this is impressive! Marie Hoerner ('09) is enrolled in a PhD program at University of Chicago investigating diagenesis of bioapatite and conducting a stable isotope study to quantify the climate of Central and northern South America. Zion Klos ('09) is attending University of Idaho and is part of an interdisciplinary project within the watershed department. Jon Rotzien ('07) is at Stanford University studying the sedimentation of the Mt. Messenger Formation in New Zealand. Congratulations to all of you!



Students atop the Caballo Mountains, New Mexico, during block 3. Photo courtesy of John Collis '13

Conference Presentations and Posters

AGU Fall Meeting in San Francisco, CA December 13-18, 2010.

Olsen, K., Anderson, M. L., Linkimer, L., Gilbert, H. J., Beck, S. L., Zandt, G., Alvarado, P. M., 2010, Dynamics of flat slab subduction: Focal mechanisms, ridge buoyancy, and slab tear in central Argentina: Fall Meeting, AGU, San Francisco, CA, December 13-17, Abstract T11A-2047.

Anderson, M. L., Linkimer, L., Olsen, K., Beck, S. L., Alvarado, P. M., Gilbert, H. J., 2010, Flat-slab dynamics: Deformation in the central Andean subducting slab: Fall Meeting, AGU, San Francisco, CA, December 13-17, Abstract DI42A-06.

Leonard, E.M., Laabs, B.J.C., Refsnider, K.A., Plummer, M.A., ***Jacobsen, R.E., *Wollenberg, J.A.**, Plummer, M.A., 2010, Last Glacial Maximum Climate in the Central Rocky Mountains, USA: Eos Trans. AGU, 91 Fall Meet. Suppl., Abstract PP1.

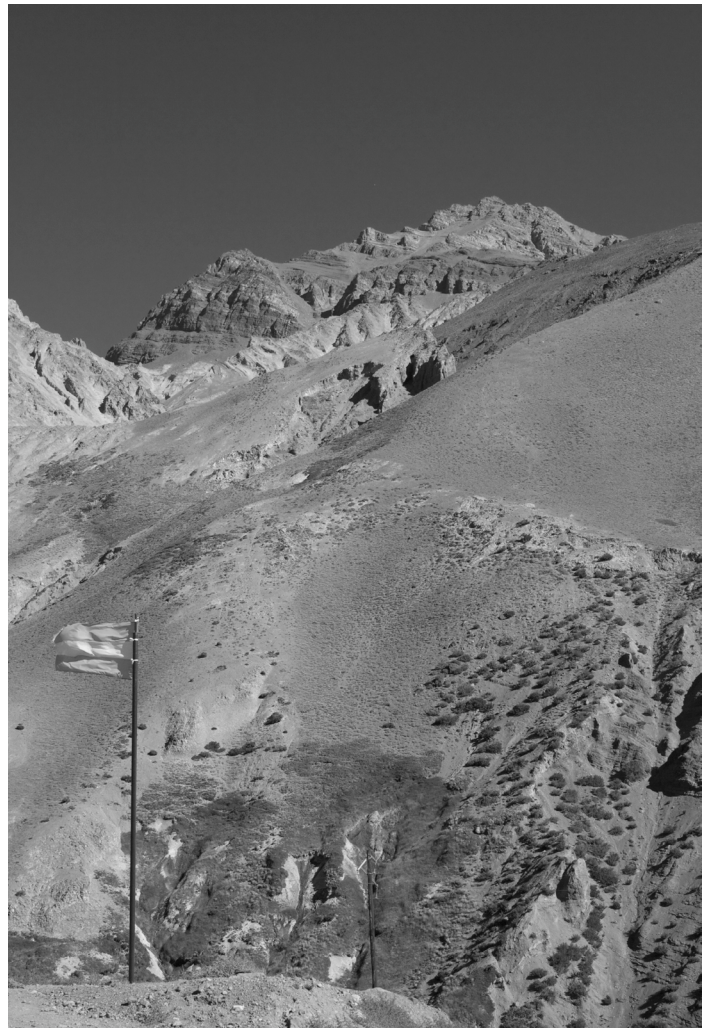
GSA Fall Meeting in Denver, CO Oct. 31- November 3, 2010.

Jacobsen, R.E., Leonard, E.M., Plummer, M.A., 2010: Last Glacial Maximum Climate in the southernmost Rocky Mountains, USA: Geological Society of America Abstracts with Programs 42.

Fricke, H., 2010, Paleoelevation of the North American Cordillera from the late Cretaceous to late Eocene: An integrated climate model-oxygen isotope approach, GSA Fall Meeting, Denver, CO, Oct. 31- Nov. 3

Congratulations to Tia Wood '10

Our very own Tia Wood, '10, received a prestigious award for her presentation at the Fall AGU meeting 2009. She was awarded an "Outstanding Student Paper Award" for her presentation "Anisotropy and mantle flow in the eastern Sierras Pampeanas from shear wave splitting." What makes this even more impressive is that Tia was competing against graduate students for this award as well. Congratulations Tia!



The Argentinian flag flying high at the base of Aconcagua. Photo by Thomas Neilson.

Alumni, thank you once again for keeping us posted on your exciting and unique lives! We are always eager to know where you may end up next. You can always send us updates at precambrianbsmt@coloradocollege.edu.

Ron Jackson '67

Ron is a Senior Associate of Behre Dolbear. Ron specializes in mineral exploration, mining and environment.

John Dolson '71

John is currently running for President of the American Association of Petroleum Geologists (AAPG), with 38,000 members in 116 countries, after being a member of AAPG for 27 years.

Marcia McNutt '73

Marcia had an exciting first 6 months as director of the US Geological Survey. Perhaps an understatement! Her tenure began with the 7.0 Haiti earthquake, resulting in 230,000 casualties from this event, mostly attributed to poor urban planning and lack of building codes in this very poor nation. The USGS still had its scientists in the field in Haiti 6 weeks later when the entire globe shook to the 8.8 magnitude Chilean earthquake, which made the USGS top 5 list of all-time largest earthquakes ever recorded. However, the experience in these two events demonstrated that once you accounted for the differences in earthquake size and location to populated regions, a citizen of Chile was 400 times more likely to survive an earthquake than a citizen of Haiti, thanks to better building codes and earthquake preparedness in Chile. USGS still had teams in Chile when air traffic was shut down over the

busiest corridor on the planet by the eruption of a little known, and barely pronounceable, volcano in Iceland. The skies were just opening up again, and the USGS was hard at work with jet engine manufacturers on better safety standards for flying in zones affected by volcanic ash, when a deep water well in the Gulf of Mexico took a kick, and its blow out preventer failed. The worst oil spill disaster in US history was underway. Marcia was dispatched by the Secretary of the Interior to BP Headquarters in Houston for the next 3 months to coordinate a federal team of scientists and engineers to work with BP on well intervention to contain the oil and kill the well. Her team of geologists and geophysicists had to invent new techniques to measure quantities that had never been determined before, such as the flow rate of a wild well a mile deep on the ocean floor and the integrity of a shut-in well with suspect pressure readings. They had to come up with monitoring protocols that were sure to detect hydrofractures to the seafloor from hydrocarbons escaping from the well bore after the well was shut in, no easy task in the darkness of the deep sea. In the end, we were proud that we managed to shut off the flow of oil to the ocean a full two months before the relief well penetrated the Macondo well, and were able to keep the well safely contained with no loss of well integrity and no further pollution to the ocean. So what is next? Marcia would love to take a nice, long vacation.



Eric Leonard describing the rock with modern dance moves.

Greg Twombly '75

Greg's daughter Becky is attending CC, as yet undecided on her major. His son Chris is majoring in Engineering Physics at CU Boulder. His youngest son Matt is still in high school and is currently Colorado Indoor and Outdoor Archery Champion. He recently attended an archery training and coaching camp at the Olympic Center in Colorado Springs. Greg's company Resource Development Technology LLC ("RDT"), an oil and gas producer with wells in Colorado, New Mexico, Wyoming, Utah, and Oklahoma, just sold their assets in New Zealand (a coal bed methane project on the North Island). They are working on exploration stage projects in Eastern Europe and China. In the past few years Greg has published papers on coal bed methane in the Waikato Basin in New Zealand, coal bed methane in Heilongjiang Province in China, and shale gas in New Zealand. RDT has supported graduate research in real time methanogenesis in coal seams, and CO₂ sequestration in coal seams in Australia. Mary (CC 1976), Matt and Greg took a vacation trip to England, Scotland, and Ireland.

They used William Smith's 1820 map to track the geology from London to Edinburgh, and walked the outcrops of Hutton and Murchison in the Edinburgh area that formed the early foundations of geology.

Robert Wilson '94,
Robert is now an assistant professor of historical geography at Syracuse University. He has recently published a book that has caught the public's attention. The book is called SEEKING REFUGE: Birds and Landscapes of the Pacific Flyway. A book review is available at
<http://www.americanscientist.org/bookshelf/pub/of-birds-and-bureaucracy>.

Emily (Munson) Richardson '95
Emily got married September 2009 to Mike Richardson. They had a baby, William Taft Richardson, on July 29th, 2010. They are adjusting to life with a baby and trying to catch some sleep here and there. William's father is a Husky, so Emily will have to work on getting him interested in CC!!



William Taft Richardson, son of Emily and Mike Richardson

Lindsey (Quackenbush) Flagstad '97
Lindsey is working as a plant ecologist for the Alaska Natural Heritage Program. She just had another little boy; Aksel Alden Flagstad born July 10, 2010. Her first son, Vebjorn Leland Flagstad is now 3. Her husband, Trond continues to work as the coach for the University of Alaska Anchorage ski team and we are still building a house in the foothills above Anchorage.

John Howell '98
John, his wife Tracey and son Finnegan moved to Portland, OR. They are doing well and would love to here from any classmates in the area!

Christian Baxter '98
Christian is living in Vancouver, B.C. with his wife Alex and their dog Hannah. They moved up there a few years ago when he went back to school and they can't imagine leaving anytime soon. Christian works at Teck Resources Ltd. as Manager, Strategic Analysis.

Julienne Ruth Emry '99
After graduating from CC Julienne went to KU for a Masters, worked for ExxonMobil for three years and then returned for her PhD at KU focusing on geobiology and diagenesis.

Meadow Koslen Ridd '00
Meadow is living on the south island of NZ with her husband Duncan and two kids, Oliver who is six and Madeleine who is three. She is working at an English language school and as a substitute teacher in the elementary schools in the region, but spends most of her time taxiing the kids around to different activities, making sure that Daisy, the crazy dog gets a walk every day, and managing a busy home

Michael Toomey '00
In 2004, Michael got his MS in Earth Systems Science from South Dakota School of Mines and Technology. Lee Vierling, another Geology alumnus, was his Thesis advisor. After that, I went to the Peace Corps and served for 27 months in Morocco. After getting back, I started a PhD program in Geography (always mistaken, but I assume the pre-Cambrian basement readers would recognize the difference) at University of California Santa Barbara and I am doing research in remote sensing of terrestrial ecology and land use. I am starting a NASA fellowship this fall and should hopefully finish before too long. Oh, and I just got married!

Drew '01
Drew (his wife actually) had a baby at the end of February - their first!

Paul Bovet '03
Since leaving CC in 2003, Paul Bovet ('03) and Cara (Johnston) Bovet ('02) spent one year in Boston working in Sam Bowring's geochronology lab (where they had the pleasure of getting to know Blaire Schoene), after which we each decided to go back to school, Cara to UT Austin for a masters in Conservation and Information Science and Paul to Utah State and Indiana University for a master of science. Paul and Cara were married in 2007 after graduating and moved to

Houston where Paul currently works at Chevron as an operations geologist in the Gulf of Mexico. Paul finally published his thesis in the American Journal of Science, vol. 309, April 2009, which covers his work in western China. Most importantly, Cara and Paul welcomed their daughter, Helen, earlier this year and are enjoying watching her rapidly grow up!



Paul and Cara Bovet with their daughter Helen.

Patrick Picard '04

Patrick is pursuing his Masters degree in urban and regional planning at UCD and thoroughly enjoying it! On top of that he started an internship working with the bicycle planner in Denver which he is equally excited about.

Emily Baldwin '05

During the past five years I've shifted from looking at rocks through a microscope to a more macroscopic and less academic appreciation of them. By that I mean, I no longer study rocks but do get my daily fill of them looking out at the Flatirons of Boulder. I'm living someplace I love with someone I love (and am marrying next summer—Robby Waldeck, '08) doing non-geologic work I love. Couldn't ask for more. I got lucky on Craigslist again and wound up as Program Director for a couple of small, growing, women-owned and operated businesses educating professionals and the public on the essential role of families in addiction recovery and how to involve them in the recovery process most effectively. An unexpected shift, I know, but one I'm thoroughly enjoying. I Hope those who have helped shape me through the years are as richly blessed as I am.

Michael Beckel '05

Since graduating five years ago Michael has worked in California, Minnesota, Colorado, Montana and now is in Washington D.C. He is currently working as the money-in-politics reporter at the Center for Responsive Politics. It's a nonpartisan, nonprofit that tracks money in politics -- campaign contributions, lobbying expenses, etc., etc. They just got done with a big report on the political influence of the Oil and Gas Industry and are in the process of rolling out a news series on the 2010 election. You can check out all the work they do on OpenSecrets.org (and our blog is OpenSecrets.org/News/). Recently, Michael has written about lobbyists now working in the White House, outside groups spending big money on political ads this year and a slew of other topics, including the political contributions of meteorologists as well as putting together a little humorous piece exploring the question: if running for president somehow causes global cooling -- as part of the "Fueling Washington" series on the influence of the oil and gas industry.

Caitlyn Florentine '07

After a year at Vail Mountain School in Colorado, Caitlyn Florentine has been enjoying residence in Bozeman, Montana, while earning her MS in Earth Sciences at Montana State University. She has happily befriended and is still carousing around with many CC alums in Bozeman (including Helen Lynn, '07; Emily Reinsel, '09; Cassy Cooper, '06; Max Stevens, '06) and has been reveling in the CC-similar outdoors-oriented and intellectually curious character of this Montana community. Her MS research focuses on the Lone



Paul Myrow getting a drink while doing field work in Alaska. Photo courtesy of Eric Leonard.

Peak rock glacier, located on the property of Big Sky Resort. As of the time of this update Caitlyn is writing her thesis - which includes three manuscripts she hopes to submit to professional journals by December, 2010 - and plans to defend this fall. The manuscripts pertain to the role of catchment geology in rock glacier distribution in southwest Montana, the internal structure and deformation mechanics of rock glaciers based on geophysical surveys, and the geochemical and physical nature of rock glacier ice as a microbial habitat. Her research is supported by the Big Sky Institute, an interdisciplinary foundation that specializes in science outreach and education. Science outreach and education have been important components of her graduate experience; Caitlyn has delivered numerous community talks and has facilitated many events relating to her work on the Big Sky rock glacier. She will be teaching snowboarding at Big Sky Resort this winter, and will shortly be applying for professional geologist positions. She is particularly interested in the fields of seismic hazard mitigation, natural resource management, and environmental remediation. She is furthermore interested in relocating to the San Francisco, Portland or Seattle areas, so if anyone out there has suggestions of companies or institutions in these locations she would love your insight! Caitlyn thinks often and fondly of her classmates, instructors, and all the fascinating field trips during her time in the basement of Palmer Hall. She hopes to maintain the community of scientific curiosity and genuine collaboration that were landmarks of her CC geology experience in whatever direction her career takes her and is as excited as ever about rocks!



Marie Hoerner In the San Salvador Islands.

Matt Rosales '08

After working in Mali for several years Matt is now working at Teck Resources in Vancouver, BC, finding gold, and enjoying N. America once again after his time in Africa.

Larrissa Phillips '08

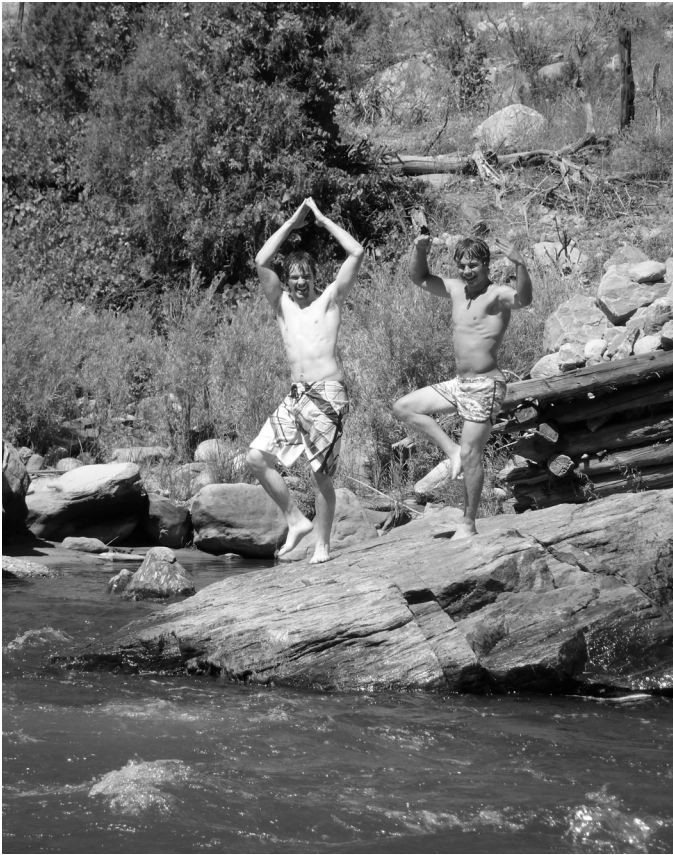
Larrissa is now a climbing instructor in Golden

Marie Hoerner '09

Marie is currently in her second year as a Ph.D. student in the Geophysical Sciences Department at the University of Chicago. She is currently writing her thesis proposal and finishing up her coursework in paleontology and geochemistry. She went on a class trip to San Salvador Island in the Bahamas last year to study modern and fossil carbonates, and spent a couple weeks over the summer as a field assistant collecting trilobites in Nevada and Utah. The rest of the summer and this year, she has been focused on developing a thesis topic, getting the brand new stable isotope lab up and running, and learning to use two mass spectrometers. She will defend her proposal and take her exams for candidacy this spring, with any luck.



Zion and volunteers in Denali National Park.



FYE students taking a swimming/yoga break from field studies. Photo by Madeline Scherer.

Jeff Wirken '09

Jeff was spotted along the coast of Maine, sailing around Camden in the summer time and heading down to the Bahamas for the winter while pondering where next to take his formal education.

Zion Klos '09

Zion spent the summer leading a group of volunteer high school students on a backcountry trail-building expedition in Denali National Park. It was a very rewarding experience for him, helping foster a sense of confidence and conservation ethic within young people new to the backcountry. Now he has started as a student in an interdisciplinary team-based PhD program at the University of Idaho. He is looking at the effects of climate change on the social-ecological systems of the West. In particular, he is researching how changing climate will influence the distribution of water within mountain hill slopes and its implications for future water availability.

Eric Daniels '09

In the spring of 2010, Eric Daniels took a job in Salome, AZ, working for Charlie Sulfrin '73 in an underground mine, assessing the amount of gold ore. He worked with Tom Ashley '11, and was very glad that he wasn't the lowest on the ladder. He is now working at Cripple Creek Mine and living closer to campus so we get to see him around time to time!

Leah Bedoian '10 and Emily Reinsel '09

Emily Reinsel and Leah Bedoian, accompanied by friends from Bozeman, spent the month of January 2011 climbing and traveling in Morocco.

Amy Ryan '10

After finishing school in June 2010, Amy moved back to her hometown of Orinda, California and put her geology degree to good use walking dogs. In October, she moved to Plainfield, Massachusetts (population 589) to participate in a 10 month Student Conservation Association (SCA)/AmeriCorps residential corps program focused on teaching environmental education in local elementary schools in the winter, and working on conservation projects across the Commonwealth of Massachusetts in the spring. She enjoys spending her free time hanging out with her 15 fellow corps members, trying to stay warm, baking, and thinking about ice rheology. She plans one day to enroll in a Masters program for volcanology.

Robert Jacobson '10

After graduation, Robert spent 6 months with his family. his time with them was extremely refreshing. he is very excited to begin a PhD program in planetary geomorphology at the University of Tennessee Knoxville. Go Vols!



Leah and Emily traveling through Morocco



Photo by Steve Weaver

Dear Colorado College Geology Alum:

We hope you have enjoyed the 2010 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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