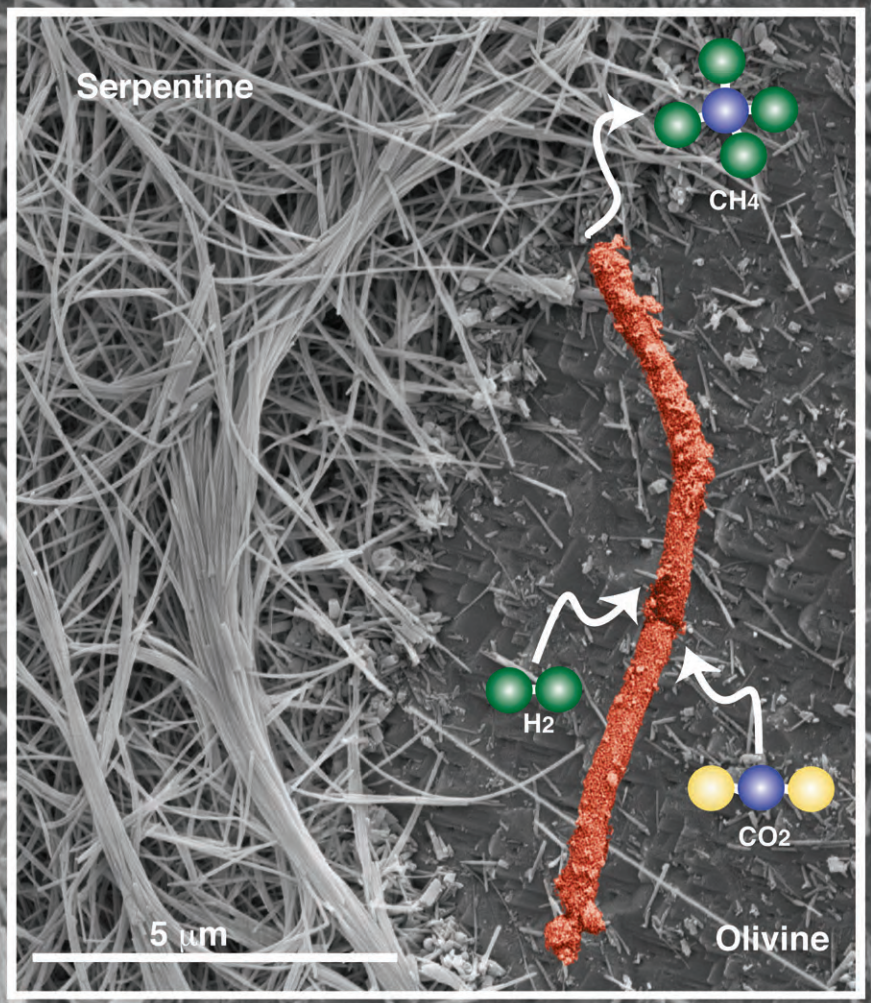
GEOLOGICAL SCIENCES
UNIVERSITY OF COLORADO BOULDER

Geology News



Editors
Mary J. Kraus
Dan W. Mitchell

2010 - 2011

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Letter from the Chair

Lang Farmer

Greetings from the Department of Geological Sciences! I am pleased to report that we had a very smooth and productive 2010-11 academic year. I won't describe here all of our good deeds but will try to present you with at least a flavor of the year's activities.

First off, both our graduate and undergraduate programs remain strong. During the past year, we grew our undergraduate program up another notch to about 235 majors, the highest number in at least ten years. Most of these undergraduate majors are following our traditional geological science track, but this year was the inaugural year for the new environmental geosciences major track. Students in this track were treated to a new lower division course in "Planet Earth", a combined lecture and field course led by Professor Bob Anderson, and a new "Earth Materials" lecture and lab course in which students were introduced to mineralogy and to igneous, metamorphic, sedimentary and ore petrology.

We also welcomed about 22 new graduate students last year, about half Doctoral and half Masters students. These students are now well on their ways to earning degrees in such disciplines as petroleum geology, planetary geology, geomorphology, tectonics, geophysics, geochemistry, and geohydrology.

This past year was the department's final one as part of CU's Science Education Initiative (SEI). This program was highly successful not only in helping us to revamp our lower and upper division courses but also in keeping faculty and graduate teaching assistants clearly focused on what our students are learning (or not learning!) in these courses. Much of the success of this program stems from the dedication of Dr. David Budd, who served as the department's SEI director over its entire 5-year run.

We have already seen evidence of lasting benefits from the SEI program and other campus teaching initiatives. For example, we now have a fall orientation for incoming graduate student teaching assistants, a department-sponsored "tutor" room for our undergraduates, and an increasingly common use of "learning assistants", or LAs, in many of our undergraduate classes. Learning assistants are undergraduates who join faculty and teaching assistants in class laboratories as an additional resource for students as they try to master the course materials. The University of Colorado, Boulder has been a pioneer in developing the LA program and Geological Sciences has been a major contributor to the program's success.

There were no big changes to the faculty this year. As expected, Dr. Kevin Mahan (Metamorphic Petrology and Structural Geology) joined the faculty last fall and proceeded to skillfully maneuver his way through his first year of faculty responsibilities. Overall, our faculty continue to be remarkably active in research activities both domestically and around the world. What is particularly heartening is the fact that we have such an excellent group of Assistant Professors, including Kevin Mahan, but also Dr. Brian Hynek, Rebecca Flowers (National Science Foundation CAREER award winner in 2010) and Alexis Templeton (Early Career Award Recipient in 2011 from the U.S. Department of Energy). If the long-term health of any organization can be measured in part by the quality of its up and coming "junior" members, then the department is in remarkably good shape.

The Geological Sciences Advisory Board again met twice this year under the excellent leadership of Dean Miller. Check out Dean's alumni column elsewhere in the newsletter for an overview of their activities. Of particular note, however, were the "Career Nights" that the Advisory Board organized for both graduate and undergraduate students, and a Houston area alumni reception last October that was hosted by Advisory Board member Penny Patterson. Several Advisory Board members also participated in the Bradley New Graduate Student Field Trip last August and Gus Gustason even taught (again) a graduate course in the department merely out of the kindness of his heart. The department is much the better for all of these volunteer activities and I know I speak for the entire department in expressing our sincere gratitude.

Of course, the chair's letter must have a mandatory pitch for alumni donations, for which we have conveniently included the usual envelope in the newsletter. Donations from alumni and friends do, in fact, make a huge difference to our program. A primary example is our undergraduate mentorship program, which matches undergraduates with graduate student and/or faculty mentors who then provide our undergraduates with an opportunity to try their hand at legitimate research projects. These mentorships are funded solely through alumni donations. In addition, four graduate students received academic years fellowships provided through the Bruce Curtis, Zena Hunter-Andrews and Jeff Dean Fellowship Funds. Without your support the undergraduate mentorships and many of our graduate fellowships would simply not exist. So I thank all of you for the past donations and hope that you will consider a gift to the department again in the upcoming year.

We want to thank our Advisory board members for donating their time and energy to the department

Notes from the Advisory Board

by Dean Miller

Greetings once again from the Geology Department Alumni Advisory Board. It was a busy year for the Board. I'm pleased to report the Department is doing remarkably well despite the serious budgetary issues facing higher education.

The Advisory Board had a busy year. Last August, several members of the Advisory Board attended the annual Bill Bradley Field Trip, where incoming graduate students were introduced to the local geology by Department faculty and Advisory Board members. The two-day event included a stay at the Mountain Research Station on Saturday night. The trip was a great opportunity for new graduate students to get to know each other and learn something about the local geology. Alumni always are welcome to come along on the Bradley field trip, which takes place every August. If you are interested in participating in this year's trip, please contact Lang Farmer.

Last year, Greg Davis and Alan Seeling joined the Advisory Board and hit the ground running. This Spring, both of them participated in the career nights held by several members of the Advisory Board. We held one career night for undergraduates and another for graduate students. Both were well received and the feedback was positive. The students were very receptive to the Board members' insights on career and networking strategies and job-hunting skills. Dawn Kaback was the driving force behind the career nights and did an excellent job once again.

Many of you may have noticed that we did not hold the CU at the Brown alumni event this year. This was only a temporary hiatus. Keep an eye out for an announcement for next year's event, which will be held at a new location – most likely the Denver Country Club.

Please check out the Department's new and improved website (http://www.cugeology.org), which has information about the research being conducted by Department faculty and students. The website also has a convenient Alumni Resources link where you can donate to the Department and update your contact information. While the Department's endowed accounts held by the CU Foundation have recovered somewhat from the depths of the recession, state budget cuts have had a significant impact on the Department. Please be aware that even the smallest donation has a real impact that directly benefits the students.

Last Fall, the Board met with several undergraduate students, and this Spring we met with graduate students during our Board meetings to gain some insights into the students' perspectives about the Department. As with our student meetings last year, the feedback we received was overwhelmingly positive. Both undergraduate and graduate students reported that they are very satisfied with the educational experience the Department is providing.

Helping Students Plan Their Careers

by Dawn Kaback

The CU Advisory Board members have been helping the undergraduate and graduate students plan their careers each year and this year was no exception! After speaking with the students during our fall and spring advisory board meetings, we plan career night events, which are typically held in the spring at the request of the students. This spring we held two separate events, one for the graduate students and one for the undergraduate students. Michelle Hopkins, graduate student, helped us organize the graduate student event, which was held February 17th. We had seven advisory board members (Dean Miller, Alan Seeling, Ben Lowry, Gus Gustafson, Eric Leonard, and Rich Goldfarb, and myself), all alumni from different walks of life, come to talk to the students, tell them about their careers, provide key tips for job searching, and answer any questions. The event, accompanied by fine food and drink, was well attended and received.

As a result of this success, we followed it up with a second event April 20th for the undergraduates with the help of Lon Abbott to do much of the planning. This event was similarly structured and also was a great success! We had six alumni (Dean Miller, Alan Seeling, Greg Davis, Gus Gustafson, Karen Kelly, and myself) come to talk to the students. One of the student's provided the following comment to Lon the next day: "Tonight's event was great--I didn't realize what a terrific set of resources we have in the board. Thanks so much for organizing it and I hope we can get involved with them more in the future."

The career night volunteers also volunteer to help individual students on strategies for networking and helping with resume writing and job hunting. We are always looking for alumni who are interested in participating in these career night events and in volunteering their time to help individual students with specific interests. So please contact me if you are interested, dawn.kaback@amec.com, 303-742-5338.

Geological Sciences Advisory Board Members

Ted Ball
Los Alamos National Laboratory

Greg Davis
Brown Caldwell

Stephanie Gaswirth
U.S. Geological Survey

Richard Goldfarb
U.S. Geological Survey

Edmund (Gus) Gustason
El Paso Exploration and Production

Dawn S. Kaback
Geomatrix Consultants

Eric Leonard
Colorado College

Ben Lowry
Colorado School Of Mines

Dean Miller - Chair
Davis Graham & Stubbs, LLP

Penny Patterson
ExxonMobil Exploration Company

Alan Seeling

Joe Zamudio
ITT Visual Information Solutions

Faculty Activities

Becky Flowers' group is engaged in tectonics projects in South Africa, Canada, Colorado, Montana, and Costa Rica. New PhD student Jessica Stanley was awarded a 2011 NSF Graduate Fellowship to carry out her dissertation research in South Africa aimed at understanding the unroofing and uplift history of the southern African Plateau. Jess heads to southern Africa this summer for fieldwork. MSc student Rachel Landman defended her thesis in Fall 2010 and presented her work at the Fall 2010 GSA meeting. Rachel was awarded a GSA student research grant and an Exxon Mobil Geoscience Fellowship to help support her fieldwork in the Gore Range of central Colorado during summer 2010. Rachel plans to stay for her PhD, continuing her work focused on deciphering the cooling and unroofing history of portions of the southern Rockies. PhD student Alexis Ault continues her thesis research on the northwestern Canadian shield and southwestern Montana, and gave presentations on both topics at GSA and AGU in Fall 2010. Last summer Alexis began a side project with Prof. Giff Miller to decipher the erosional history of Baffin Island, and spent several weeks on Baffin Island as part of that new project (see photo). Alexis mentored undergraduate Keith Bowhan through the Geological Sciences mentoring program to assist her in this research effort. Undergraduate Ryan Nell completed a pilot project in Costa Rica to decipher the erosional history of the Talamanca Range, and presented his results at the Fall 2010 GSA meeting.

On sabbatical in California during 2010-2011, **Shemin Ge** splits her time between Stanford and USGS – Menlo Park. She is grateful for a Blaustine visiting professor fellowship from Stanford and resides in the Department of Environmental Earth System Sciences in the School of Earth Sciences. At USGS, she is with the Water Resources Division.

PhD student Alexis Ault sits atop a rock outcrop in Baffin Island. Working with PhD student Kurt Refsnider and Prof. Giff Miller, Alexis spent a field season collecting bedrock thermochronology samples via helicopter to investigate the low temperature thermal evolution of ancient rocks preserved on the island.

The sabbatical affords her the time to explore a new area of research that examines how climate change may affect recharge to groundwater and groundwater discharge to surface waters in headwater regions. The focus is on groundwater flow in shallow aquifers driven by surface air temperature variations at seasonal to decadal scales. As air temperatures fluctuate in a yearly cycle, for example, from -10 to 10 °C, soil permeability could change from its minimum to maximum values as pore water freezes and thaws. Consequently, infiltration to groundwater in the highlands and groundwater discharge to mountain streams follow a similar cyclic pattern. Long-term warm superimposed on seasonal variations could similarly enhance permeability and increase groundwater discharge to streams. If no sufficient precipitation to replenish the increased groundwater discharge, there could be an overall lowering of the water table in the highlands.

Another area of research she continues to pursue is to examine the effects of pore pressure dynamics on earthquakes. Shemin gave several seminars in the US and abroad on her work that suggested rapid water filling to large reservoirs could change the stress state below 5 km and induce seismicity within months and years. Interacting with seismologists and geophysics at Stanford and USGS on fluid pressure induced seismicity has been a stimulating experience.

In the meantime, graduate students in the hydrogeology lab have become more independent and resourceful than ever. Lyndsay Ball took charge of teaching Introduction to Hydrogeology while writing her dissertation on South Park hydrogeology. Miori Yoshino graduated in May 2011 as planned, finishing a MS thesis on the impact of in-situ uranium leaching on groundwater. Jessica King is becoming an expert on Niwot Ridge groundwater dynamics. Matthew Weingarten excelled during his first year and jump started his thesis research on Devils Hole hydrogeology. Visiting from Korea, Professor In-Wook Yeo provided indispensable advice and assistance to graduate students in the lab in many ways.

On a personal note, when not in her offices, Shemin enjoyed checking out faults, hiking around reservoirs, walking in redwoods, sampling seafood, and watching sunset at beaches. In, her first year without kids at home, Shemin is able to find time for things she did not have time for before; she even picked up crochet when she needs to be more creative and artistic. While she thoroughly enjoyed the sabbatical, she is looking forward to coming back to Boulder (not really).

Mary Kraus and her students continue to work on the affects of the Paleocene-Eocene Thermal Maximum (PETM) on the continental stratigraphic record. The PETM was a transient episode of global warming ~55 million years ago. The goal of this research is to reconstruct hydrological changes at the PETM event by using multiple geologic proxies to characterize changes in precipitation, seasonality, relative humidity and precipitation moisture source. Sophie Newbury completed her MS thesis on this project in December and has gone to work for Williams Energy in Denver. This summer, I am working with a large group of colleagues on the Bighorn Basin Coring Project (BBCP), funded by NSF. We will core paleosols that formed during the PETM and during a younger hyperthermal event (ELMO) to help understand the impacts of extreme climate change on the sedimentary record. Two students – Rachael Acks (BA '09) and Tom Miskelly will be involved in this research for their graduate degrees. You can follow us on Facebook by searching for the BBCP.

PETM research group in the Bighorn Basin. Mary Kraus is front row second from left. Sophie Newbury in red jacket on far right.

Peter Molnar

In the spring of 2010, Prof. Peter Molnar did something he had not done for 25 years; he taught a course for undergraduates. More precisely, he helped Lon Abbott teach the last Critical Thinking course taught by the Department designed to fulfill the University requirement, for just as the class started, the University eliminated this requirement. Fortunately, eleven intellectually curious students stayed with us and made discussions fun.

We considered the origin of the Rocky Mountains, focusing first on when the high terrain, which we eagerly clamber over on weekends and holidays, rose to its high, mean, present-day elevation. We then turned to processes that might be responsible for making the region high. As both topics remain controversial, students were free to disagree with Lon and me about both what the facts imply and how best to determine when and how the region rose. What a treat it was to have bright students earn good grades by telling Lon and me that what we thought was misguided! Although neither Lon nor I changed our views, we could not deny them the logic of their points of view.

Field trip to Florrisant fossil beds for the Molnar/Abbott course in Critical Thinking.

One emerging outcome is that Lon and I will try to restructure this into a writing course that will fulfill the University's writing course requirement. We may also explore different topics for future discussion, like how different tectonic and erosive processes have created the spectrum of mountain ranges and high plateau found on earth today.

Matt Pranter and his research group (Reservoir Characterization and Modeling Laboratory – RCML; http://spot.colorado.edu/~pranter/Reservoir3.html) recently completed another phase of research through the Williams Fork Consortium. The research focuses on stratigraphic controls on fluvial (and shallow-marine) architecture, and reservoir heterogeneity and connectivity. The research has been sponsored by 18 companies, the American Chemical Society–Petroleum Research Fund, and through a grant from the Research Partnership to Secure Energy for America (RPSEA; Department of Energy). Last September 24-26, 2010, the consortium ran its fall sponsor field trip and research meeting (46 attendees) in the Piceance Basin and focused on the Upper Cretaceous strata exposed within the Douglas Creek Arch and along southwestern basin margin.

Most recently, on May 13, 2011, Matt and the RCML conducted their spring research meeting in Boulder for the corporate sponsors (40+ attendees). In addition to the six graduate students and several researchers that made presentations, nine undergraduate students have also been actively involved in the research and participated at the research meeting. A new, 2-year phase of research begins through the consortium this June, and several new graduate students will begin their programs in the RCML this summer

continued...

Graduate student, Kim Hlava, describes the Upper Cretaceous fluvial and shallow-marine deposits at Philadelphia Creek (Douglas Creek Arch) at the Williams Fork Consortium Fall Sponsor Field Trip and Research Meeting (September, 2010).

Professor **Charles Stern** on the "Christmas cone", a small parasitic cone on the flank of the Lonquimay volcano, southern Chile, that formed on Christmas eve 1988 (see inset photo). Chuck had a sabbatical year in 2010-11 and spent most of it in the field in Chile, Argentina, Peru, Brazil and Nicaragua working on research problems related to volcanology, magma genesis and ore deposits in the Andes.

and fall. In September, the RCML will again hold its fall sponsor field trip and research meeting in northwestern Colorado where the focus will be on the reservoir-scale architecture and connectivity of relatively moderate to high net-to-gross ratio fluvial deposits.

Five of Matt's graduate students will complete their degree programs this spring and summer (Adel Aboktef, Ph.D. and Ericka Harper, Kim Hlava, Jeremy Ring, and Ali Sloan – all M.S. degrees). Masters students, Gabriela Keeton and Chris Rybowiak, will begin the second year of their graduate programs this fall. Like previous graduate students, Gabriela and Chris are conducting summer internships with ExxonMobil Upstream Research Company (Houston, Texas) and SM Energy (Billings, Montana), respectively.

In fall 2010, Matt taught Introduction to Geology, and in spring 2011 he taught his junior-level Petroleum Geology course and Petroleum Reservoir Characterization and Modeling at the graduate level. Matt continues to be active in AAPG and serves as an Associate Editor for the AAPG Bulletin. At the recent 2011 AAPG/SEPM Convention in Houston, Matt and his graduate students, Adel Aboktef, Ericka Harper, Kim Hlava, Ali Sloan, and past graduate student, Rachel Shaak, were authors on four posters that they presented at the conference.

Field trip to Florrisant fossil beds for the Molnar/Abbott course in Critical Thinking.

Prof. Eric Small reports that his PhD student, Evan Pugh, is studying how tree death from the Mountain Pine Beetle (MPB) impacts snow accumulation and melt in Colorado's headwater. In the snowmelt-dominated regions of the Western US, mountain snowpack is the largest input term in the mass balance equation that must to be solved to calculate streamflow. So, Pugh's research is important to understand how beetle kills are impacting Colorado's water resources. Since 1996, over 4 million acres of lodgepole pine in Colorado have been killed by the mountain pine beetle. The thinned canopies found in dead tree stands intercept less snow and transmit more sunlight than canopies in living forests, altering

Tevis Blom measures forest canopy structure using hemispherical photography.

snow accumulation and melt processes. Additionally, falling pine needles alter the reflectivity of the snow surface albedo.

The process of MPB-induced tree death creates two distinct classes of dead trees. During the first two years following death, a lodgepole pine's needles will change color to red and start falling off. This stage of tree death is termed the "red phase". Generally by the end of the third year after infestation, most of a dead lodgepole pine crown has been denuded of needles. Trees that have been completely denuded of needles are in what is termed the "grey phase".

To investigate the impacts of tree death on snow accumulation and melt, Pugh and advisor Eric Small made more than 3,000 measurements of snowpack depth, density and temperature. These data were collected over three winter seasons at sixteen living and dead tree stands. Results indicate that snow accumulation is similar between red phase and living stands, and 15% greater in grey phase stands. Snowmelt rates were highest in the red phase stands with snow disappearance occurring one week earlier than observed in living stands. Grey phase stands will likely also experience more rapid melt due to increased sunlight penetration. Observed increases in snow accumulation caused by advanced tree death should yield more water from annual snowmelt.

Prof. James Syvitski was appointed as the new Chair of the International Geosphere-Biosphere Programme (IGBP). IGBP, which began in 1987, is an international research program sponsored by the International Council for Science. GBP's vision is to provide essential scientific leadership and knowledge of the Earth system to help guide society onto a sustainable pathway during rapid global change. As Chair of the Programme, James will lead the Scientific Committee, IGBP's main decision-making body. James is also a Fellow of AGU.

Peter Birkeland - Emeritus

"Pete Fest" at GSA

At the November, 2010 Annual Meeting of the Geological Society of America in Denver, a symposium in honor of Professor Emeritus Peter W. Birkeland was held in recognition of his career as one of the world's most influential soil geomorphologists. The session was organized by CU students of Pete and others influenced by his work (Vance Holliday, PhD, '82; Scott Burns, PhD, '80; Raymond "Bud" Burke, PhD, '79; Marith Reheis, MS '74, PhD '84; Margaret Berry, MS '84, PhD '90; Janet Slate, PhD '92; Leslie McFadden at the University of New Mexico, and Martha "Missy" Eppes at the University of North Carolina at Charlotte).

Vance Holliday wrote: The response to our call for papers for the session - Soil Geomorphology: Deciphering Landscapes, Surficial Processes, and Quaternary History through Pedology-Based Geomorphic Study In Honor of Pete Birkeland - was exceptional. We had 23 papers filling a full day session plus 14 posters in another session. The papers exemplified the breadth of Pete's influence but also acted as a tribute to Pete's integrity and teaching, mentorship of his graduate students, his role model for working hard and playing hard, and his friendship. After the session we held an "intimate" and informal dinner/beerfest for Pete and his 70 closest friends, former students, and family members.

Among the many who presented or co-authored papers and posters were the following CU alumni: Scott Burns, Dennis Dahms, Warren Dickinson, Steve Forman, Vance Holliday, Ralph Klinger, Dan Levish, Dan Muhs, Don Rodbell, and Emily Taylor.

Peter Birkeland at Mammoth Lakes, CA in May of 1975.

David A. Budd has been elected as president of the Society of Sedimentary Geology and will serve in this capacity during 2011-12.

Paul Weimer has been elected as president of the 35,000-member American Association of Petroleum Geologists and will serve in this capacity during 2011-12.

FRONT OFFICE NEWS

by Marcia Kelly

The Geological Sciences department had another big year with major personnel changes.

In July of 2010, the Department hired **Tiernen McConaughy** as our Graduate Program Assistant. Tiernen graduated from the University of Colorado with her Bachelor's Degree from the Communications Department in May of 2009. During her years as an undergraduate student Tiernen worked as a student hourly employee in the Graduate School. We are fortunate that with Tiernen's background she hit the job running and has enthusiastically plunged headfirst into learning all other aspects of the new position. Please join us in welcoming Tiernen to the Department!

Joanne Brunetti continues in her position as the Accounting Tech with humor and efficiency – both strong job requirements! The University has gone through major changes (again!) in the process for procurement and traveling which has added significantly to Joanne's workload. Joanne works hard to ensure the tracking of finances, travel and procurement. She is very much the center of Department and faculty financial activity.

Barbara Amaral continues to enjoy her position as the front office receptionist and does a fine job of greeting students and visitors and handling phone calls with the utmost kindness and a smile on her face. She has many other responsibilities that she works on with an upbeat attitude.

Marcia Kelly is in her third year in the department as the Office Manager and supervisor. She feels fortunate and privileged to work in a department with such dedicated faculty, students and other staff. Marcia really enjoys working as the Chair's assistant with Lang Farmer.

Tiernen McConaughy, Barbara Amaral, Marcia Kelly & Joanne Brunetti

The staff works hard to facilitate the daily accomplishments of keeping the department running smoothly. We look forward to assisting students, alumni, faculty, and emeritus while helping to accomplish the mission of the department in educating the next generation of leading Earth and planetary scientists.

Please stop by and see us sometime! The Departmental office can be contacted at:

Phone: **303.492.8141**
Fax: **303.492.2606**
Email: **geolinfo@colorado.edu**

On The Cover.....

Professor Alexis Templeton

Alexis Templeton was one of three University of Colorado Boulder professors awarded a five-year, $750,000 grant as part of the U.S. Department of Energy's Early Career Research Program created in 2010 to bolster the nation's scientific workforce with top young researchers. Alexis was among 65 winners nationwide selected by the DOE in 2011. To be eligible for the DOE Early Career Research awards, researchers must have received their doctorates in the past 10 years and be untenured, tenure-track assistant or associate professors at U.S. academic institutions or full-time employees at DOE laboratories.

In Prof. Templeton's current projects, three PhD students (Betsy Swanner, Emily Knowles and Lisa Mayhew) and two undergraduates (Ryan Nell and Graham Lau) have been exploring how the weathering and oxidation of iron from rocks and minerals can release sufficient energy to support the growth of microbial organisms several kilometers beneath the Earth's surface. For example, Betsy Swanner and Ryan Nell recently isolated and characterized a novel bacterium that thrives within the Henderson Molybdenum Mine in Colorado by converting Fe dissolved within orebody fluids into abundant Fe-oxide mineral mats. In separate work, Emily Knowles has been identifying "chemical biosignatures" of ancient Fe-oxidizing microorganisms that may be preserved in ancient to modern subseafloor basalts that have experienced significant water-rock reaction. Lisa Mayhew and Graham Lau have been testing the hypothesis that during the low-temperature "serpentinization" of ultramafic rocks, the partial oxidation of iron within minerals such as olivine can release sufficient hydrogen gas to sustain microorganisms adapted to "eating" this hydrogen and thereby inhabiting massive regions of the Earth's crust. All of these projects utilize x-ray spectroscopy to examine the Fe (bio)geochemistry in these systems and explore chemical interactions between microorganisms and the minerals they destroy and/or produce.

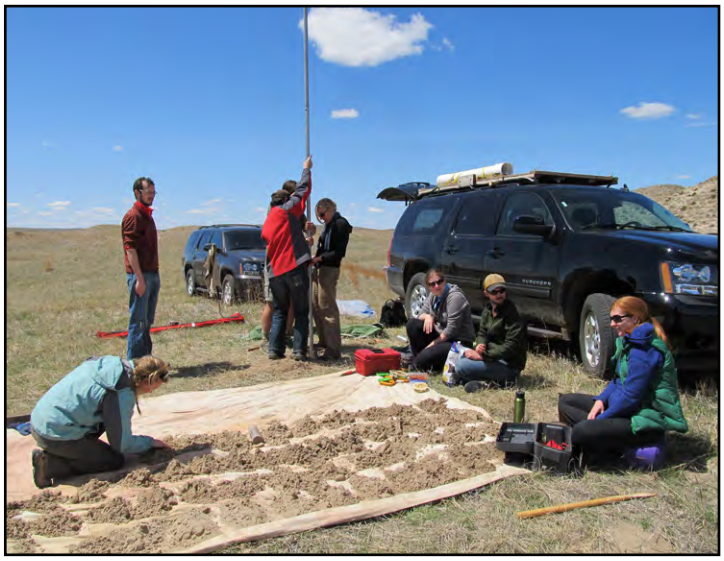
In the next several years, the DOE Early Career Award will enable Prof. Templeton to significantly expand her experimental studies of the reactions between water and ultramafic rocks in the presence of microorganisms, while explicitly tracking the fate of carbon-dioxide. In basic science and applied realms, there exists enormous interest in understanding the mechanisms of "mineral carbonation reactions", where minerals such as olivine, pyroxene or serpentine will favorably react with dissolved CO_2 and thereby store carbon in a suite of new stable secondary minerals. However, little previous work has addressed the fact that in natural systems, the types of organisms that Templeton studies (such as the heat-tolerant, hydrogen-consuming bacteria that can grow during serpentinization reactions) may change the reaction pathways involved in the alteration of ultramafic rocks, and this microbial activity could unexpectedly convert CO_2 into other greenhouse gases like methane, rather than the carbonate minerals predicted for purely geological systems (see Front Figure for a schematic image of two cells of Methanothermobacterium thermoflexus consuming H_2 and CO_2 and producing CH_4 during the conversion of olivine to serpentine). Therefore, Templeton's research group will be working hard to establish new experimental approaches that can help predict which geochemical processes control the flow of CO_2 into biological vs. mineral products.

Lisa Mayhew (left) and Betsy Swanner (right), two senior PhD candidates, conducting measurements of Fe-oxidation state and mineralogy in Geobiological systems using high-intensity, high-energy x-rays at the Stanford Synchrotron Radiation Laboratory in California.

Funding Updates

Braddock In The Field

With financial support from the In The Field Endowment, **Profs. Giff Miller** and **Tom Marchitto** took 7 students from their GEOL 5420 Quaternary Geochronology class deep into the Nebraska Sand Hills for a 4-day excursion in May. The Sand Hills are the largest sand sea in the Western Hemisphere. Although long considered a Pleistocene relict, recent studies have shown that aeolian processes have been pervasive in reshaping the Sand Hills episodically throughout the Holocene, and there are ample opportunities to evaluate dating strategies and climate implications preserved in sections and sediment cores. After a day looking at buried soils in the aeolian stratigraphy exposed in wave-eroded bluffs, and debating how best to date the episodic aeolian deposition, the crew settled in to their main task of trying to recover a continuous sediment core from The Puckett, a small, dune-dammed lake that we expected to have long and complex depositional history. Despite a stiff breeze, the team managed to securely anchor the coring platform, case the hole, and recover ~3.5 m of lacustrine mud, more than any other group had been able to obtain in past years. The final morning was spent augering through the dune dam that supports Round Lake. We intercepted the water table a little over 8 m below the dune surface, after penetrating a thick paleosol. As usual, we benefited from the generosity of the Huffman family on Carver Ranch, who allow us to camp at their homestead and to fix meals in their “office”. Everyone agreed, the Sand Hills are Nebraska’s best-kept secret.



GEOL5420 students laying out collected samples.

GEOL5420 students coring lake sediment from ThePuckett.

GEOL5420 students clearing a section at Cottonwood Lake.

2010 Bill Bradley New Student Field Trip

WHY I DONATE

TO THE BRADDOCK IN-THE-FIELD FUND

David and Ann Budd

As a faculty member in the department since 1987 (David) and a Geology alumnus (Ann; BA '78) who happens to be a daughter of an emeritus professor (Ted Walker), we have seen firsthand the impact of departmental donations through the years. We have supported the Braddock In-the-Field fund, contributed fellowship support and thesis expenses for students, and travel and miscellaneous expenses for faculty. We want to help the faculty and students achieve great things each year and know that even a small donation can have a positive impact.

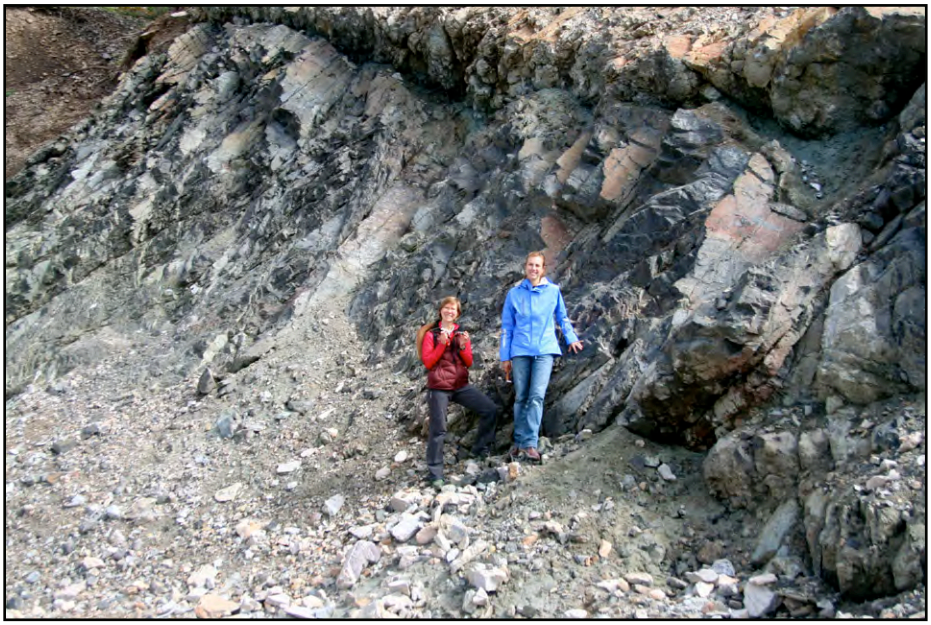
Bruce Curtis Fellowship

Thanks solely to the generosity of our many alumni and friends, the Department is making excellent progress in building the endowments that we use to support graduate student fellowships. Our endowed accounts provide fellowships for incoming graduate students and so are essential in attracting the very best earth science students into our graduate program. But we have a way to go. At present, we are able to offer only about four students departmental fellowships each year, out of a typical new graduate student class of twenty. These fellowships are highly desirable, and being offered one can make all the difference in whether or not a highly recruited student ends up studying at CU. With this in mind, the department has made the Bruce Curtis Fellowship Fund the centerpiece of its fundraising activities. This fund was founded in honor of Emeritus Professor Bruce Curtis, who had a profound influence on budding petroleum geologists during his tenure on the department's faculty. In only a few years, the Curtis Fund has been endowed to over $850,000 and provides sufficient revenue for one+ graduate fellowships per year. However, growing the fund another $350,000, to a total endowment of $1.2M, would allow a second full fellowship to be offered annually under the Curtis Fund aegis, a huge boon for the department and for our graduate students. We hope that you will consider helping us reach that goal.

WHY I DONATE
TO THE BRUCE CURTIS FELLOWSHIP

I contribute to the Curtis Fellowship because today's graduate students in petroleum geology are tomorrow's oil and gas finders. They get the excellent preparation they need at CU.

Matt Silverman (MS '83)



Betsy Swanner and Abby Langston on a Braddock in the Field Field Trip last summer (in the Never Summer Mtns.)

Field Trips

The inaugural fieldtrip of the new class Panet Earth (GEOL2001) to the NREL solar research lab atop South Table Mountain in Golden, CO. Learning about solar spectrum, flux, diffuse, global, direct, etc... photo by R. S. Anderson

Right - Graduate student Katy Barnhart points out features in the distance in this spectacular view looking south from the top of North Caineville Plateau, along the Fremont River in eastern Utah. This was a highlight of the fieldtrip capping the Geomorphology and Advanced Geomorphology classes in Spring 2011. Badlands etched in the Bluegate shale in the foreground dominate the landscape between North and South Caineville Plateaus. photo by R. S. Anderson

Bob Anderson and Lon Abbott at the Mountain Research Station during the2010 Bradley Field Trip. Brian Hynek in the background.

Undergrad Program

The number of undergraduate majors in geological science continues to soar. Three years ago the department was home to 95 undergraduate majors. Today, 235 undergraduate students are pursuing a degree in one of the department's three major tracks. The articles that follow highlight key undergraduate programs: the Science Education Initiative, the Mentor Program, and the Learning Assistant Program.

The Science Education Initiative Ends its Five-Year Run

The Science Education Initiative (SEI) was begun on the Boulder campus in the spring of 2006 with $5M in funding from the Chancellor's and President's offices. The goal of the program was to fundamentally change the way science is taught at the University to majors and non-majors alike. The Department of Geological Sciences enthusiastically endorsed the initiative – particularly the junior faculty – and David Budd spearheaded a successful proposal that allowed Geological Sciences to be one of the seven departments to participate.

For the last five years, SEI funding has allowed individual faculty members to partner with a post-doctoral Science Teaching Fellows (STF) to implement and assess changes in lectures, labs, homework, and other class activities. The goal was to employ approaches and materials known to be effective in the teaching and learning of science. Reform of individual courses typically involved defining student learning outcomes (what the students should be able to do as a result of taking a course), evaluating what is taught and how it's taught, developing and implementing approaches to facilitate student learning, and assessing actual learning outcomes.

Changing long-held and deeply entrenched ideas (about anything, including teaching and learning) is never an easy task, and the SEI proved to be no exception. The amount of faculty time needed to design, implement, evaluate, and revise changes was vastly underestimated when the project started, as was the willingness of all faculty to consider reform. Nonetheless, after five years of effort, the tally shows that 19 of the Department's 29 faculty participated in some type of course reform. Five introductory courses and eight upper division courses received some level of transformation.

GEOL4130 (Introduction to Geophysics) students performing a refraction experiment outside Benson Earth Sciences Building.

David Budd, the director of the SEI effort in the Department, judges the reform in large enrollment courses (**Introduction to Geology and Introduction to Earth History**) to be moderately successful. Nearly half of the faculty teach one of these courses, with each instructor preparing independent lectures and exams, and each instructor potentially expressing different pedagogical needs and goals. Unit- and lecture-level learning goals were defined by ~2/3rds of the instructors. All sections (~12 per year) now utilize clickers (anonymous student polling systems) or some other method to encourage student thinking, peer learning, and student-teacher interactions during class. There has also been a dramatic increase in the amount of homework assigned in these classes, with homework now more closely aligned with lecture and learning goals. Various pre-instruction "warm-up" activities and in-class group exercises were also developed for 1010, and an initial set of knowledge development activities created for 1020. Observations made by the STFs indicate that effectiveness of clickers, homework, and other activities varies widely dependent on instructor's willingness to challenge themselves and deviate from traditional lecture formats. Not all implementations can be judged equally successful. Concept inventories, which measure students' comprehension of basic geologic concepts at the beginning and end of the semester, allow learning gains to be estimated in all sections of the introductory courses, and the results show that implementation of a well-designed mixture of SEI approaches does improve (in some cases double) the amount of learning by students in the introductory courses. Some of the best gains occur in classes where the faculty member lectures less so that students have time to construct their own knowledge.

Some of the greatest SEI successes in Geological Sciences occurred in the transformation of upper-division, major-track labs in **Mineralogy** (Joe Smyth), **Paleobiology** (Jaelyn Eberle, Karen Chin, Dena Smith), **Sedimentology/Stratigraphy** (Mary Kraus) and **Structural Geology** (Kevin Mahan, Karl Mueller). In all cases, the faculty instructors and/or their teaching assistants made multi-semester commitments to improving their courses and students' learning. The reforms in the lab components of the major-track courses involved strengthening the conceptual connections between lecture and labs, and redesigning lab activities so that they utilized more inquiry-based learning strategies. Learning difficulties that students experience were identified and the labs now attack those problems head-on. As described in last year's newsletter, "warm up" activities that help to focus student thinking and interest at the beginning of each lab were also introduced. Other courses, and their instructors, that also benefited from the SEI "treatment" include **Environmental Geology** (Alexis Templeton), **Introduction to Oceanography** (Tom Marchitto), **Critical Thinking** (Becky Flowers), and **Fluid Earth** (Greg Tucker).

What of the future? Although the funding is used up and the STFs departed in June 2011, the SEI has had a permanent impact

on the Department. SEI concepts are now an integral part of the teaching mission of the department as they are routinely considered in departmental curriculum discussions, and participation in course transformation is acknowledged in annual merit evaluations and tenure deliberations. Long-term sustainability lies in the large amount of new teaching materials that have been archived in an online repository and the emergence of a cadre of ~12 faculty members with a strong commitment to SEI concepts. We now have ongoing programs to train new teaching assistants, increase the use of undergraduate learning assistants in courses, and support a tutoring room for any student in a geology course. A group of the **Introduction to Earth History** instructors (Craig Jones, David Budd, Mary Kraus, Jaelyn Eberle, Steve Mojzsis, and Lon Abbot) have also pledge to continue their collaborative efforts and make further improvements and assessments of that class.

The University's current "Creating Futures Campaign" also places a priority on funding for innovative science, technology, engineering, and math (STEM) education programs like the SEI, CU Teach and the Learning Assistant programs. One possible model for a future SEI-like program in departments involves endowed instructor positions, with each instructor devoting half of their time working with faculty to continue teaching reform, and half of their time testing new material and approaches in their own classes.

Department expands the use of undergraduate "Learning Assistants"

The Department of Geological Sciences first joined the CU-Boulder Learning Assistant (LA) program in Spring 2009 – and our participation has grown significantly in the 2010-2011 academic year! The goals of the CU-Boulder LA program center around improving science, technology, engineering and math (STEM) education at the K-12 level and in our University classrooms by recruiting select STEM majors to act as "peer learning assistants" in classroom activities (http://laprogram.colorado.edu). LAs trained through the CU-Boulder program are financially supported through a grant from the National Science Foundation, and our Department also provides matching funds for the 6-10 LAs we recruit each year.

In Geological Sciences, the LA model was first tested in several sections of "Introduction to Geology Lab 1". Each spring, Senior Instructor Lon Abbott pairs three to four undergraduate GEOL majors with a graduate teaching assistant: the LAs then help the TAs guide students through the lab and field activities associated with this course. Each of the LAs, such as **Amanda Yoshino, Rosalyn Adler, Christina Johnson** and **Robert Lee** in Spring 2011, have been able to explore their interests in science education and hone their expertise in basic geological concepts, while making a very positive impact on the learning experience for the students enrolled in the introductory labs.

In the past two years, several geology Faculty have become engaged in the LA program and have tested various ways to involve GEOL majors in "implementing best teaching practices" in our classrooms and associated laboratory activities. For example, Prof. Alexis Templeton now regularly recruits two to three Learning Assistants (such as **Rachael Hoover, Laura Schafenacker, Katherine Anarde, Trevor Mills** and **Andrew Parker**) to help run numerous interactive in-class discussions and small-group activities in "Environmental Geology", a 60-student non-majors introductory course. This past Fall Prof. David Budd conducted an innovative teaching experiment in "Historical Geology", where he mentored three LAs (**Steven Hilfiker, Katherine Anarde** and **Emily Logano**) and replaced 1 lecture per week with LA-led small-group recitations to create a structured environment for more independent learning. LAs were also introduced into the "Introduction to Mineralogy" and "Sedimentology and Stratigraphy" labs associated with courses taught by Prof. Joe Smith and Prof. Mary Kraus, respectively. The LAs (**Trevor Mills** in Mineralogy, and **Tim O'Toole** and **Chava Bobb** in Sed/Strat) worked closely with their faculty mentors and the graduate teaching assistants to help students improve their conceptual learning in the laboratory exercises.

So far, the implementation of LAs has been highly successful from multiple standpoints. First, the GEOL majors selected as LAs find these ~10 hour per week jobs to be excellent work experience, a chance to explore their interest in teaching, and a remarkable learning process that tends to significantly enhance the LA's own grasp of key concepts in the geological sciences. For the Faculty, incorporating LAs into laboratory activities or classroom exercises has made it possible to refocus courses on key learning goals, encourage collaborative learning, and foster new learning gains through increased interaction with well-prepared assistants. The LA program has also created wonderful opportunities for our faculty to directly mentor some of our most dedicated majors and to help them identify their future interests in science and/or education. Given all of these positive developments, both our Faculty and our undergraduate majors have expressed broad interest in expanding the LA program in the next Academic year! Starting in Fall 2011, it is anticipated that LAs will be regularly incorporated into classes such as Environmental Geology, Mineralogy, Sed/Strat and the Introductory Geology labs, and we also hope to initiate LAs in the laboratory sections of courses such as Paleobiology (taught by Prof. Karen Chin) and Structure (taught by Prof. Kevin Mahan).

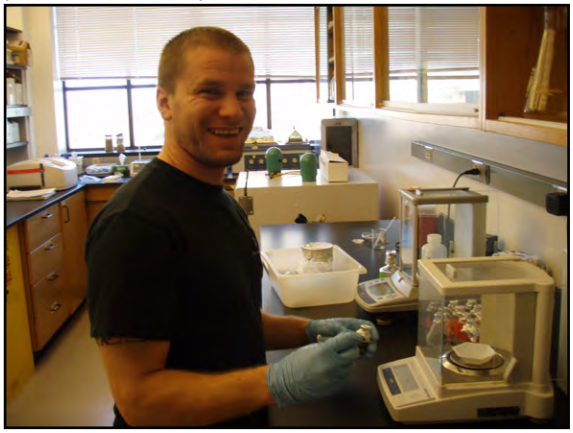
Spring 2011 graduate Andrew Parker facilitating small-group activities on groundwater quality as an LA for Environmental Geology.

2010-2011 Undergraduate Mentoring Program

Andrew Parker worked with Prof. Kevin Mahan to test hypotheses related to the timing of deformation in the Cheyenne Belt of southern Wyoming. The Cheyenne Belt is one of the most fundamental collisional tectonic boundaries in North America, representing the earliest stage of a period of prolific southward younging Proterozoic accretion of juvenile island arc terranes of the southwestern United States to the Archean Wyoming Craton. Andrew traveled to the University of Massachusett's high spatial resolution Ultrachron microprobe facility and obtained in situ geochronological data from Cheyenne Belt samples. Andrew determined that the age of the older deformation fabric is 1800 Ma and likely associated with a western extension of the Trans-Hudson orogen, which is a well-known tectonic feature to the northeast in the Dakotas and Canada but that has never been shown to have extended this far west. These data provide important new insight into the evolution of the Wyoming craton prior to Cheyenne Belt collision as well as the Proterozoic tectonic evolution of North America in general. Andrew's goal is to publish this study in a major research journal.

Keith Bowhan worked with PhD student Alexis Ault on reconstructing the low temperature thermal history of crystalline rocks of the Canadian shield exposed on Baffin Island, in the eastern Canadian Arctic Archipelago. The goal of the research is to understand the timing and magnitude of more recent regional surface changes such as burial beneath Phanerozoic sedimentary sequences and/or denudation, possibly in response to geodynamic processes operative at plate margins. Keith processed and prepared samples for target mineral selection and data acquisition; he also focused on obtaining apatite thermochronometry data from a subset of samples with the goal of understanding the timing and extent of rift flank uplift in response to the rifting of Baffin Island from Greenland in the Cretaceous.

Graham Lau conducting research in the Templeton Lab as part of his mentorship.



Graham Lau worked with PhD student Lisa Mayhew in Dr. Alexis Templeton's Geomicrobiology Laboratory investigating hydrogen gas generation from water-rock reactions (see accompanying photo). Graham was integral to the experimental set-up and data collection, learning a suite of analytical techniques along the way. In Dr. Tom McCollom's lab in the Laboratory for Atmospheric and Space Physics, he perfected the use of a gas chromatograph for measuring hydrogen, methane, and carbon dioxide. He also had the opportunity to travel to the Stanford Synchrotron Radiation Lightsource to collect X-ray diffraction data and he has been dedicated to learning how to analyze and interpret this data. In 2011, Graham will apply his knowledge and extensive laboratory experience to his own independent research as an incoming PhD student in Dr. Alexis Templeton's lab.

Shannon Whitmore (BA 2011) has been working with assistant professor Brian Hynek preparing and analyzing samples from the Cerro Negro volcano, Nicaragua. Hynek was awarded a $460,000 grant from NASA to study this extremely acidic and active volcano as an analog for conditions on early Mars and its potential habitability. Shannon has prepared field samples for XRD and thin-section petrography and has also completed the analyses. Her work is helping to unravel the controls of pH, T, and oxidation state on chemical weathering products consistent with those that have been identified on Mars.

Patrick Boulas describing sandstones in the field in the Piceance Basin, CO.

Patrick Boulas, under the guidance of Prof. Matt Pranter's graduate student Kim Hlava, undertook a field-based analysis of inclined heterolithic strata in the Douglas Creek Arch, in the northwestern corner of the Piceance Basin, Colorado. A sedimentological analysis using two vertical measured sections, 11 thin sections, gamma-ray readings, and photomosaics, was conducted in the field to explore the succession of stratigraphy and its potential impact on "reservoir" compartmentalization at multiple scales.

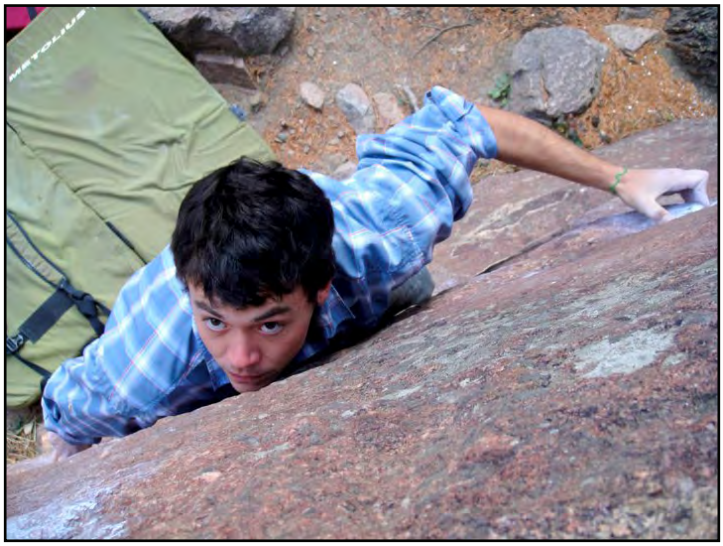
Connor Newman's mentorship project focused on studying fluvial deposits in outcrop within the lower Williams Fork Formation in West Creek, Douglas Creek Arch, Colorado. This project was under the mentorship of Erika Harper, a graduate student of Prof. Matt Pranter. Connor completed a measured section, collected gamma-ray and paleocurrent data, and measured the apparent width and thicknesses of the three fluvial sandstone deposits that

Connor Newman examining fluvial sandstones in the lower Williams Fork Formation, Douglas Creek Arch, CO.

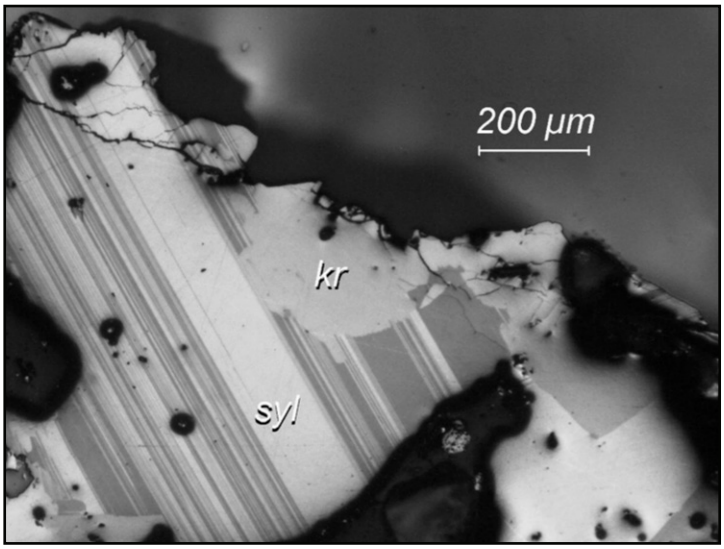
comprised the outcrop. Based on his research, he interpreted the sandstone deposits as one point bar and two crevasse splays associated with a meandering river system.

Todd Bol received an Undergraduate Research Opportunities Program (UROP) research grant to study the provenance of Colorado's Pennsylvanian-aged Fountain Formation. Todd, working with Lon Abbott, identified 100 clasts greater than 4 cm from cobble conglomerate beds low in the Fountain column at nine separate locations across the Front Range. Todd's objective was to quantify the abundance of quartzite clasts as a function of distance from present-day outcrops of Precambrian quartzite. He found that Fountain Formation pebbles and cobbles are dominantly composed of quartzite at outcrops within a few kilometers of current quartzite outcrops. However, the proportion of quartzite relative to vein quartz and granite fragments drops dramatically at distances greater than a few kilometers from modern quartzite outcrops. His conclusion is that outcrops of Precambrian quartzite along the Front Range were no more extensive during deposition of the Fountain Formation, 300 million years ago, than they are today.

Todd Bol examining quartz cobble conglomerates in the Fountain Formation at Eldorado Springs.



Using a sample donated to the University of Colorado Museum sometime around 1900 by then University Regent H. D. Thompson, **Matthew Dye** completed an Honors thesis on the crystal structure and genesis of krennerite (Au_3AgTe_8) one of the gold telluride minerals. The sample was from the Little Clara Mine, one of the early workings at Cripple Creek. Matt worked on the project with Joe Smyth, Bill Atkinson, and Bruce Geller (Colorado School of Mines). The work showed that krennerite is an ordered orthorhombic derivative of the monoclinic calaverite ($AuTe_2$) structure and depends on the ordering of Au and Ag atoms at a three to one ratio. Matthew graduated Magna Cum Laude May, 2011 and the work has been submitted for publication in the Canadian Mineralogist.



Krennerite (kr) grain enclosed by optically continuous sylvanite (syl). Note the partial fragmentation of the krennerite grain prior to sylvanite mineralization. Crossed polars, 50x magnification.

The Department of Geological Sciences undergraduate mentor program is funded solely from gifts like yours!

News and Awards

Undergraduate Awards for Spring 2011

AWARD	RECIPIENTS
Assoc. of Women Geologists Outstanding Major	Emily Longano
Bruce Curtis Outstanding Junior	Joshua Scott
Johnston Memorial Scholarship	Chava Bobb
RMAG Outstanding Senior Award	Katherine Anarde
T. Keith Marks Scholarship	Trevor Doner Christina Johnson Robert Lee Stephen Marioka

Graduate Awards for Spring 2011

AWARD	RECIPIENTS
Longley, Wahlstrom, Warner Award	Ulyana Horodysky
Spetzler Award for Research	Dave Brown
W. O. Thompson Award	Evan Pugh
Waldrop Memorial Scholarship	Kali Abel

We wish to congratulate all of our graduates and award winners.

Shell Exploration & Production Graduate Research Awards

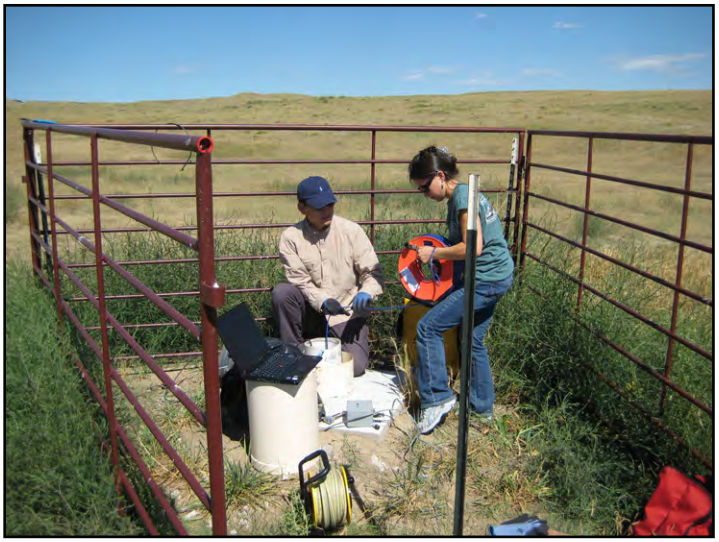
Shell provided funding that is helping 4 graduate students complete research projects for their degrees.

Rachael Acks
Evan Anderson
Stephanie Higgins
Christina Sheldon

Shell "Ambassador"

Chris Rybowiak

In Wook Yeo and Miori Yoshino were conducting tests to measure the permeability of Laramie-Fox Hills aquifer in northeastern Colorado. In Wook is visiting professor from Chonnam National University, South Korea, and Miori received her MS in May 2011 working with Prof. Shemin Ge.



MS student Jessica King skied up to Niwot Ridge to collect groundwater level data for her MS thesis research that quantifies recharge to groundwater at high elevations. Jessica is a MS student of Prof. Shemin Ge.

2010 Fall Graduates

2011 Spring Graduates

Degrees Awarded (Fall 2010 - Spring 2011)

B.A. Geology Majors

Rosalyn Adler
Brandon Amos
Katherine A. Anarde
Justin Ashar
Darren Atkins
Benjamin R. Bloss
Cletus C. Blum
Chava Bobb
Patrick D. Boulas
Zachary Catto
Caitlin Alyssa Collette
Nathan Paul Cumella
Charles Vincent Dalton
Trevor J. Doner
Matthew DeWayne Dye
Matthew Fithian
Nathan Andrew Gabelman
Daniel Griffitts
Christian Henkel
Rachael Hoover
David Robert Howell
Scott E. Johnston
Maxwell James La Fon
Maureen Anne Le Voir
Ethan Campbell Melville
Jacob Miller
Nick Montelli
Mackenzie Morris
Ryan Matthew Nell
Andrew O. Parker
Maxwell Pommer
Danielle Russell
Nathan Sahlin
Maxwell Scott
Kari Justine Schultz
Benjamin Thompson
Hannah Wasserman
Shannon Marie Whitmore

M.S. Candidates Graduating with Degrees

	Advisor	Thesis Title
Trinity Allen	Bruce Jakosky	Masters Examination
Sait Baytok	Matt Pranter	Seismic investigation and attribute analysis of faults and fractures within a tight-gas sandstone reservoir: Williams Fork Formation, Mamm Creek Field, Piceance Basin, Colorado
Suyoung Choi	Paul Weimer	Sequence stratigraphy of the Lower to Upper Cretaceous sedimentary deposits in the Exmouth Plateau and Exmouth Sub-basin, Northwest Australia
David Culp	Shemin Ge	Masters Examination
Andrew Fuhrmann	Paul Weimer	The origin of the lower Pliocene deepwater Andromeda Mound Complex, Levant Basin, eastern Mediterranean, offshore Israel
Steven Glaser	Stephen Mojzsis	Trace metal contents of ancient sedimentary sulfides
Mark Hannon	James Syvitski	Exploring predictive relationships of fluvial morphology: Using Shuttle Radar Topography Mission Data
Ericka Harper	Matt Pranter	Stratigraphic variability of sandstone-body types and dimensions in the main coal-bearing (Kmvc) to lowermost upper (Kmvu) Mesaverde Group, West Creek and Mail Box Draw, Douglas Creek Arch, Colorado, with comparison to Coal Canyon, Colorado
Kathyrn Hayo	Scott Lehman	Holocene Climate Variability in the Norwegian Sea
Ben Herber	Paul Weimer	3D seismic interpretation of a meteorite impact, Red Wing Creek Field, Williston Basin, western North Dakota
Alicia Hewlett	Matt Pranter	Fluvial architecture and static connectivity of the Williams Fork Formation central Mamm Creek Field, Piceance Basin, Colorado
Kimberly Hlava	Matt Pranter	The stratigraphic architecture and depositional evolution of the Upper Kmvl (Iles Formation) and Lower Kmvc (lower Williams Fork Formation) Intervals, Philadelphia Creek Quadrangle, Douglas Creek Arch, Colorado
Rachel Landman	Becky Flowers	Tertiary cooling history of a northern Rio Grande rift flank uplift, central Colorado
Sophie Newbury	Mary Kraus	The sedimentary response to climate change during the Paleocene-Eocene Thermal Maximum, Southeastern Bighorn Basin, Wyoming, USA

Joseph Nicolette	Paul Weimer	Subsurface stratigraphy of the Lower Williams Fork Formation in the Piceance Basin, NW Colorado
Jeremy Ring	Matt Pranter	Petrophysical evaluation of lithology and water saturation with an emphasis on feldspars, clays, and their effects on well-log data, Middle and Upper Williams Fork Formation, Grand Valley Field, Piceance Basin, Colorado
Nathan Rogers	Paul Weimer	Sequence stratigraphy of the Upper Cretaceous Mancos Group and related units, Piceance Basin, Northwestern Colorado
Rachel Shaak	Matt Pranter	Stratigraphic architecture of shallow-marine to coastal-plain parasequences: Lower Williams Fork Formation, southeastern Piceance Basin, Colorado
Ali Sloan	Matt Pranter	Stratigraphic architecture and connectivity of fluvial deposits of the Lower Williams Fork Formation: Combining outcrop analogs and multiple-point geostatistical modeling, GrandValley Field, Piceance Basin, Colorado
Lindsey Tierney	Bruce Jakosky	Assessing habitability of aqueous environments on Mars
Dawn Tschanz	Paul Weimer	Regional stratigraphy of the Paleocene Wasatch Formation, Piceance Basin, northwestern Colorado
John Van Regenmortar	Jaelyn Eberle	Masters Examination
Dustin Ward	Kevin Mahan	The relative influence of quartz and mica on crustal seismic anisotropy
Miori Yoshino	Shemin Ge	Groundwater flow of a proposed uranium mine site and surrounding areas, Weld County, Colorado

Ph.D. Candidates Graduating with Degrees

Adel Aboktef	Matt Pranter	Sequence-stratigraphic controls on sandstone diagenesis: an example from the Williams Fork Formation, Piceance Basin, Colorado
Mary Ellen Benson	Dena Smith	Freshwater diatom paleontology and paleolimnology of the Late Eocene Florissant Formation, Teller County, Colorado
Sean Bryan	Tom Marchitto	Investigation of the oceanic redistribution of carbon during the last deglaciation
Mary Beth Cheversia	Lang Farmer	Trace element and Sr isotopic geochemistry of accessory mineral phases and the origin of epizonal silicic intrusive igneous rocks ii) electrochemistry of Pb-doped molten silicate glasses and the development of new ion sources for thermal ionization mass spectrometry
Alexander Dutchak	Jaelyn Eberle	Mammalian faunal change during the Early Eocene Climatic Optimum (Wasatchian and Bridgerian) at Raven Ridge in Northeastern Uinta Basin, Colorado and Utah
Christopher Harig	Peter Molnar	The effects of lithospheric thickness variations on the dynamics of the Earth's upper mantle
Saeed Saadat	Chuck Stern	Petrogenesis of neogene basaltic volcanism associated with the Lut block, eastern Iran: implication for tectonic and metallogenic evolution
Elizabeth Swanner	Alexis Templeton	Bacterial, nutrient and element cycling in a deep, granitic environment

Alumni News

Frank G. Cooley (BA '47, MS '51) writes that he spent 62 years in the Green Formation and almost that long in Peak Oil. He received the Hon T. Peter Craven Distinguished Member Award from the 9th Judicial District of Glenwood Springs CO in January 2010.

After working for the Colorado Department of Natural Resources for 26 years, **Mark Davis** (Geol' 69) retired. He began his career in the mineral industry as a tungsten miner in Boulder Canyon while still attending CU. Shortly after graduation, he then went to work for Cotter Corporation first as mine geologist and eventually as Chief Geologist and finally, as Manager of Exploration. He began his state career at the Colorado Geological Survey as Chief of the Minerals Section under John Rold (BA Geol' 48, MS' 50) where his most notable accomplishment was the publishing of the "Gold Occurrences of Colorado", Resource Series 28, now undergoing its second printing. After 5 years with CGS, he then transferred to the Colorado State Land Board as Minerals Director where he remained until April 1, 2011. Mark and his wife Joan of 38 years, intend to spend time with grandchildren in Westminster CO and Charlottesville, VA along with the occasional round of golf and his chief hobby of flying his 1948 Stinson Voyager.

Nick Pietsch writes:
I have been building rock and mineral wall hangings. This hobby has allowed me to stay connected to my love for geology. Typically I find the specimens on Ebay or shops and then build frames to hang them on the wall. I also still do a little jewelry with unique gems and minerals. Some are pictured @ www.nickpietsch.com.

My paying job is in medical device sales selling hernia mesh for a Johnson & Johnson company called Ethicon. Hope all is well and thanks for the Geology News. (Class of 2000 and former Geology Club President.)

Jesse Richter (BA '04) writes:
I wanted to take a few moments to reflect on how my experience as a geology major at CU has impacted my post-graduation life. Before I graduated, I really didn't know how I would use my degree. The world of teaching appealed to me, so I established myself as a high school science teacher for the next handful of years. During this process I pursued higher education including an MBA from Colorado Technical University and an M.Ed. from Montana State University. I continued teaching science and also a little bit of mathematics, business, and even EFL (English as a Foreign Language) classes internationally. I have worked, lived, taught, traveled and studied in various locations including Montana, Alaska, California, Czech Republic, China, Singapore, Canada, Peru, and Colombia. Currently, I'm starting two small companies, both of which will operate on international levels. The first is an educational consulting firm whereby I will help universities and school systems around the world with curriculum development and custom program design. The second company is more of a hobby which involves making custom leather bags.

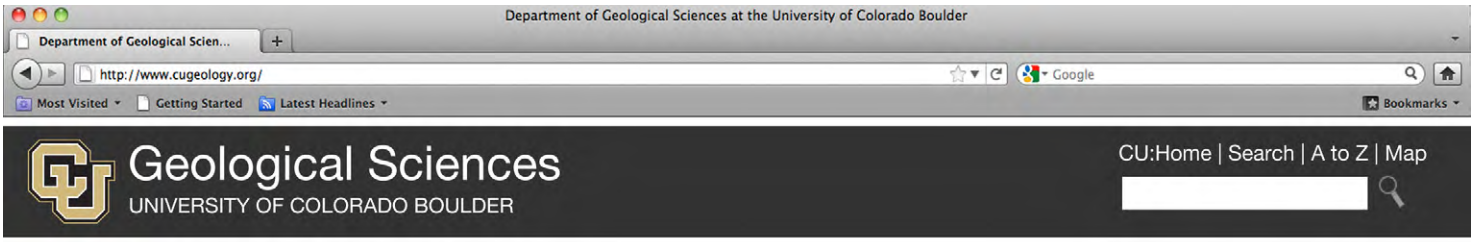
Obituaries

CLAIRE ELLEN BATES DAVIDSON
Died on October 21, 2010 in Mitchellville, MD. Born in 1924 in Quincy, Illinois, she was raised in New York City and Boston. She was a 1946 graduate of Mount Holyoke College and received a master's degree in geology from the University of Colorado. She spent her professional career as a geologist with the United States Geological Survey from 1948 until her retirement in 1989. She served with the Alaskan Branch, Washington, DC; Geochemical Exploration Branch, Denver; Eastern Environmental Geology Branch, Washington, DC; Office of International Geology, Washington, DC, Office of Resource Analysis, Washington, DC and Geological Names Committee, Washington, DC. She was a Fellow of the Geological Society of America and a member of the American Geophysical Union, American Association for the Advancement of Science, Geological Society of Washington, and Colorado Scientific Society. She was the recipient of the 1991 Award for Distinguished Service in Hydrogeology from the Geological Society of America. She was predeceased by her husband of 47 years, David Francis Davidson, who died in 2000. Survivors include her daughters, Nancy Davidson of Pittsburgh, Pennsylvania, and Leslie Davidson of Alexandria, VA, and her son, David Davidson of Bellingham, WA as well as four grandchildren, Caroline and Kevin Kensler of Pittsburgh and David and Keith Davidson of Bellingham. A graveside burial service was held in South Weymouth, MA. Published in The Washington Post on November 29, 2010

Ted (Dwight E) Ward died June 26, 2010. Ted Ward was born on December 4, 1916 in Longmont CO. He graduated from Longmont HS in 1934 and from CU Boulder in 1938 with a major in Geology and seismographic technology. Ted worked for Carter Oil Co from 1938 to 1954, with four years as a radio technician in the Navy during World War II. From 1949 to 1954, Ted worked for Carter Oil in Sumatra, Indonesia. Then, ready for more education as geologic exploration became more advanced, he returned to CU Boulder and earned his PhD in sedimentary exploration in 1959. During his graduate education, Ted married Shrmarie Ward. In 1959, Ted joined the US Geological Survey and worked for the Mineral Departments of Thailand from 1960 – 1964 and Colombia, SA from 1965 – 1969. In 1970, he was assigned to the USGS office in Golden CO until his retirement in 1982.

Living in Boulder after his retirement, Ted worked with secondary science students with their projects as a member of the CU Alumni Association. He was also active in the St. Vrain Historical Society and actively involved in environmental issues and animal protection nationally and internationally. He was buried in the Burlington Cemetery.

Submit your alumni news @ www.cugeology.org click on "Alumni Resources" "Alumni Database" "Submit News..."



The Department of Geological Sciences and our alumni are planning several special receptions and events in the coming year! Please check our website regularly for details on these upcoming events.

http://www.cugeology.org

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