

GEOscape



THE ALUMNI AND FRIENDS NEWSLETTER OF THE
COLORADO STATE UNIVERSITY GEOSCIENCES DEPARTMENT
DECEMBER 2015

Department of
GEOSCIENCES

*Geology
Geophysics
Hydrogeology
Environmental Geology*



Colorado State University
WARNER COLLEGE OF NATURAL RESOURCES



A MESSAGE FROM THE DEPARTMENT HEAD

Dear Friends of CSU Geosciences,

What an exciting year this has been for the department! Continued record enrollments, energetic new colleagues (with new arrivals including two assistant professors, John Singleton and Lisa Stright; research scientist, Dan McGrath; and department academic success coordinator, Jill Putman), exciting happenings at the College and University levels, a slew of awards for our faculty, an engaged student body, and an economically and culturally booming Fort Collins all make for exhilarating times, to say the least. Once again, it's a pleasure to share this news with you and to relate a cross-section of remarkable student, faculty, and alumni achievements.

Developments in 2015 provide some exciting new opportunities for alumni engagement. Examples include ramping up our program of career talks with a reinvigorated Geosciences Club, a recharged Geosciences Advisory Council of alumni and friends, and a new undergraduate-to-graduate mentor program. Please do let us know if you might be in the Fort Collins area and would like to meet our students and participate in department events. Our students benefit tremendously from meeting with alumni, establishing contacts with professional mentors, and broadly learning more about careers and professional opportunities.

I'd like to also give a shout-out to our hardworking students (currently around 180 undergraduates and 65 graduates), who include high percentages of first-generation college students and returning veterans. We continue to work to enhance their curricular, work/research, and extracurricular opportunities to provide the best (broad) education possible. I'm pleased to note that, even with sectors of the resource economy presently in a slump, our students remain in demand and continue to move into exciting and satisfying professional careers.

Acting on and managing the many opportunities for serving and preparing our students better, and for advancing our research and teaching efforts, present challenges in the modern (lean) University fiscal environment. Without the prescient and generous past and recent gifts of our donors to scholarships, endowments, seminar and visiting funds, and many other areas, we'd be extremely hard-pressed to serve our students well in today's dynamic career economy, as well as to meet our high expectations as an internationally recognized geosciences department. Just one area that we will be working on during this year will be funding new undergraduate scholarships for our capstone field camp course (which is typically taken during the post-junior or post-senior summer term, when some of our neediest students have exhausted other sources of financial support).

Please do stay in touch with your news and stories, and through our varied alumni efforts. Each and every one of you is most welcome to stop by and visit in our third-floor offices in the Natural Resources building at CSU anytime!

Best,



*Rick Aster
Head
Department of Geosciences*



A MESSAGE FROM THE DEAN

Friends of CSU Geosciences,

Let me start by echoing Department Head Rick Aster's words ... it has indeed been a very exciting year for the Department of Geosciences. The department's energy and excitement are almost palpable to anyone who has the chance to walk through the halls of the Natural Resources Building to observe the interactions between geosciences faculty, staff, and students and the great learning and research taking place.

As you'll see in this issue of GEOScape, the department has made some great new hires and the department's faculty, students, and staff are working together to build on a strong departmental history to shape new understanding of Earth systems, train the next generation of geoscientists, and build strong industry and agency efforts. The department's activities span from our back door in Poudre Canyon or Rocky Mountain National Park to the Antarctic and China.

In addition to all of the great disciplinary-focused activities taking place in geosciences, the department is also core to our broad cross-disciplinary efforts within the College and University. The grand challenges confronting society are increasingly interdisciplinary in nature. Whether it be energy development or shifting climates, sustainable water use or hazard management, solutions to societal issues and needs almost invariably span across boundaries among the social, biological, and physical sciences. In natural resource programs across the country, Warner College is almost unique in the strengths that we have across this spectrum of disciplines. Over the past year, we have begun a number of activities to increase the linkages within our College programs, and Geosciences is key to those efforts.

I'll close with my personal thanks to the alums and friends of geosciences for all you have done to advance our programs and the impacts you have made in your careers and activities. In my visits with you here on campus and during my travels across the state and the country, I've had the chance to learn a bit about some of your professional accomplishments and have seen the ways that your commitment to our programs have strengthened us.

Thanks for all that you do and for representing our programs so well.



*John P. Hayes
Dean
Warner College of Natural Resources*



JEFF WARE B.S., 1988

Hey, it's true; time flies when you are having fun. When I realize that it's been 27 years since I earned my degree, I'm amazed ... that just doesn't seem possible! Unfortunately, a little less hair (some of it gray) and shorter tee shots tell me it's true. Much has occurred in that quarter-century with respect to geopolitics, technology, and so forth, but here are a few comments on things a little closer to home.

First, anyone who gets into the field of geology had better understand that most of the professional avenues related to it are going to be economically cyclical in one way or another, and while there is nothing wrong with enjoying the good times, be sure to put some money away for the bad times, as they will arrive at some point (probably when you least expect it). This is true in the soft and hard rock worlds, and I'm sure industry funding for professors and their students waxes and wanes right along with oil or gold company stock prices; certainly alumni support varies with their paychecks and confidence in continuing to receive same.

On that topic (I'm speaking to alumni now), when times are good and you are feeling philanthropic, I will encourage you to think "endowment." It doesn't take a giant check to get the ball rolling on something you can keep feeding a bit at a time, and more importantly, won't dry up and blow away when a down cycle might cause you to pause your funding of it for a few years or longer. Scholarships and fellowships are critical to the most deserving students when industry

support slows to a trickle, so you want to start and build something that will be there in the tough times!

And if you haven't been on campus in awhile, CSU just keeps getting better, as does downtown Fort Collins. We enjoyed a pleasant fall Saturday afternoon at Hughes Stadium recently (but I am looking forward to the new on-campus field in 2017) and after the game (wrong outcome), wandered around the Oval and the central part of campus. I recognized and remembered much of it, but there were plenty of new or rejuvenated buildings to admire, as well as the classic old tree-lined walks and buildings that mark the beginnings of the University. Good stuff!

And now a comment for current or recent students: Realize that as soon as you walk off the CSU campus, diploma in hand, you may experience a big shift in your motivation. You are transitioning from a learning-oriented existence to an earning-oriented one. Hopefully, you are able to land a career-path job that will allow you to acquire X number of dollars to pay for your food, clothing, housing, transportation, gadgets, and a fun vacation now and then (and put some in the bank!). At the same time, recognize you have to help your company earn a profit, too, otherwise that paycheck might dry up. At first you might not be much of a contributor to the bottom line for the XYZ Oil & Gas Company or another enterprise, but that will change with time. If you aren't too busy to miss it, somewhere along the way you might realize that you have crossed that boundary and are now a genuine asset! Hopefully, your boss realizes it, too, and more dollars come your way as a result.



"Early AM flailing" while contemplating the modern lacustrine environment of Lake Powell and its intersection with the Triassic Chinle Formation, with the cliffs of the Jurassic Wingate Sandstone capping the Chinle slopes in the background. "I might as well have been looking at the rocks, the local fish were apparently too busy making proto-glaucinite to pay much attention to my pathetic offerings." Jeff Ware, August 2015.

In any case, congrats; you have learned enough of the science/art of geology to make a significant contribution to the business of geology, and that is what makes the world go around. To speed this process along, my suggestion is that you take business classes as electives whenever possible, read the business section of the paper and trade journals, and when you do land that first internship or full-time job, find a good mentor and ask him/her both scientific and economically oriented questions.

OK, enough ramblings. I hope this finds all my fellow geology department alumni (along with present and former faculty) well and happy, and I'm rooting for all you students too! Tough times will give way to better ones, so be ready to rock when the tide turns! Good luck!

LESLI WOOD PH.D., 1992

"Fill it with dirt, turn on the water and see what happens," said Dr. Stan Schumm. Dr. Schumm was responding to my having asked him how I should set up my experimental models of sea level change at the flume facilities west of campus. Drs. Frank Ethridge and Schumm had received a large grant from the National Science Foundation to study the impact of sea level changes on fluvial systems. I was riding that NSF funding to a doctoral degree.

I graduated CSU in 1992 with my doctorate under the supervision of Dr. Ethridge. I joined Amoco Production Company where another student of Ethridge's, Maria Henry Wood, graciously mentored a newbie geologist to be creative and diligent in exploration in Trinidad, West Indies. After great success there, I moved to work in Amoco's Stratigraphic Research group where a great guy named Dr. Kurt Marfurt supervised my introduction to seismic attributes analysis. It was during this time that my interest in the study of ancient landscapes imaged by seismic data (seismic geomorphology) began to take shape. In 1997, I decided that it was "time to go do something else," and so I took myself to the University of Texas at Austin, working at

the Bureau of Economic Geology in clastic research.

Last January I came full circle, accepting a faculty position in sedimentary and petroleum geology at Colorado School of Mines. Back to the mountains!

I have come, over the years, to realize that scientific advance is not made solely through a knowledge of the "tools" of science, such as math, physics, or chemistry, but through the creative application of those tools to solve real problems. Scientific advancement requires asking the right questions and thinking creatively about the answers. Many of the endowments that support geoscience education throughout



Wood occupies the Robert Weimer Endowed Chair in Sedimentary and Petroleum Geology in the Department of Geology and Geological Engineering at Colorado School of Mines where she also directs the Sedimentary Analogs Database and Research Program, an industrial consortium engaged in study of clastic reservoir and seal systems around the world (and sometimes on Mars!).

ROGER STEININGER PH.D. 1986

the world were funded by individuals who knew how to think creatively. These people were often encouraged by their mentors to think creatively, beyond the standards of their industry, beyond the ideas of their peers. They also recognize that creativity cannot necessarily be taught, but it can be encouraged, and often that encouragement begins in departments, such as CSU's geosciences department, by someone saying "Just fill it with dirt, turn on the water, and see what happens".

As I embark upon the next 20 years of my career, I walk in the footsteps of an amazingly creative individual, Dr. Robert Weimer. I am in my current enviable position thanks to funding of an endowment by many creative individuals. I am privileged to work with a group of amazingly creative teachers and researchers at Mines, and now enjoy the camaraderie of a community of people in the Front Range region who, through creativity and hard work, have revolutionized hydrocarbon energy exploration and development. CSU provided me an opportunity to explore unique questions in earth sciences using unique experimental facilities, mentored by two creative and gifted professors. I often recall to my own students with fondness, some of the best advice I was ever given. Don't overthink it. Sometimes you've got to "just fill it with dirt, turn on the water and see what happens."

When I started my career at the Climax molybdenum mine many years ago I was teamed with a senior geologist who not only taught me the deposit's geology but, equally important proper mapping, core logging, data recording procedures, and the many other aspects of being a professional geologist.

Today, with downsized staffs and the profusion of employment with the "junior" or independent segments of our industry, mentoring is viewed as more of an extravagance than a necessity. This coincides with my observation at professional meetings; there is a huge gap between all the white-haired geologists and those who are just starting their careers. One could make the leap that the "tweeners" are doing all the work and have no time for conferences, although I don't believe that.

This gap in generations, and the need for mentoring, became painfully evident with the two young geologists who work for me at NuLegacy Gold. We have no intermediate-level geologists between them and me. They are extremely hungry for me to teach them about Carlin-type gold deposits, but I have only limited time for mentoring, given all my other responsibilities. What will happen to our profession when the "old" crew, like me, retires? Will we then define a senior geologist as one with less than 10 years' experience? And how do we impart our knowledge to the younger professionals? Basically, we need to find and train "replacement parts" for ourselves.

It is easy to define the problem, but what to do about it? Giving money to CSU and the department is the easy way out, and important, but that is not my message. What we need to do, and have a responsibility to do, is get involved. The world needs well-trained geologists to develop resources, define and prevent geo-hazards, advance the science, and address the other challenges we face.

We need to become mentors to pass our experience and knowledge along. There are some simple steps that can be taken that will produce great results. If you have young geologists in your organization, make time to develop their talents. At conferences, spend time at the student poster

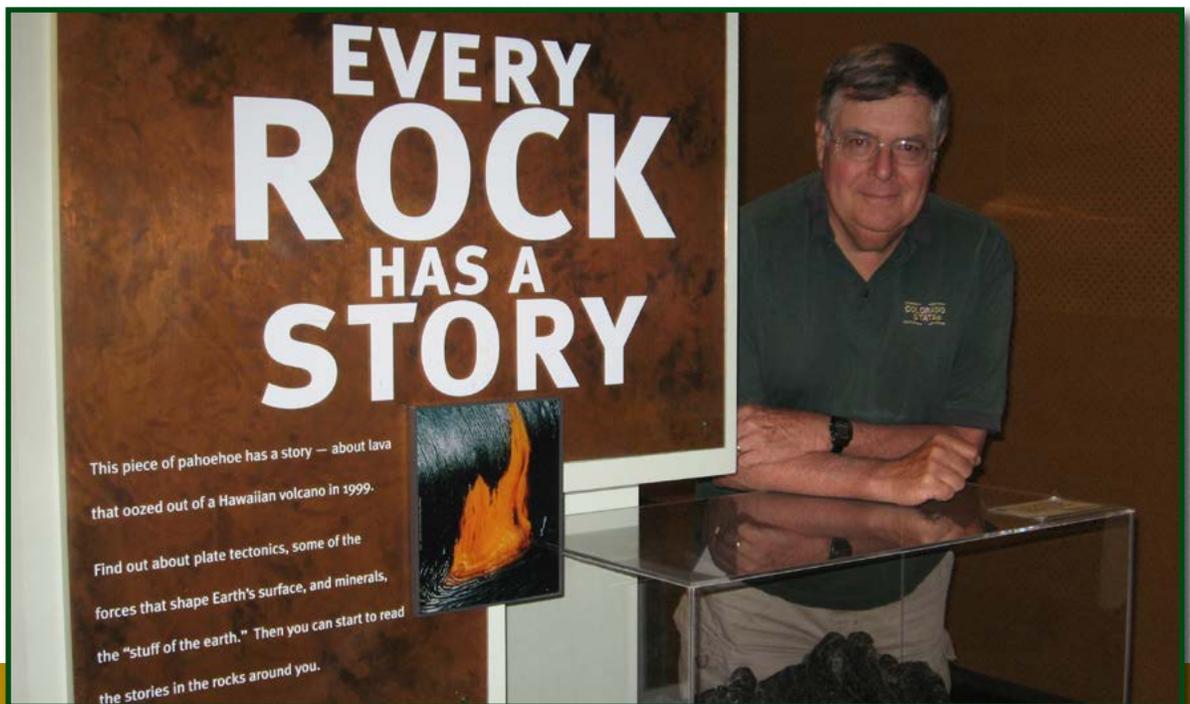
sessions and pass on whatever knowledge you can. If your travels take you to Colorado, how about visiting campus and spending some time talking to the students in the department? At meetings, go sit with the younger groups and talk to them, or better yet buy them a beer and start the conversation.

Recently, I spent time on campus hanging out with students and talking to them. I came away with the impression that there is a real hunger to have an idea of what comes after graduation, beyond the question of where to find a job. The list of questions these young geologists laid on me were long and varied, including such aspects as what additional background do I need beside geology, what does a professional geologist do, what can I expect as my career develops, etc. This is a need we can all fill if only we take the time.

The profession has been very good to me, and I want to see others have some of the same advantages of being a geologist. It seems to me that this is best done by giving time back to our younger colleagues. We need more rock stars following in our footsteps.

Enough of my soapbox; I hope I have supplied some food for thought!

Rodger Steininger is chief operating officer, NuLegacy Gold Corp., Reno, Nev. NuLegacy is a gold-exploration company, and is the recent discoverer of the Iceberg gold deposit (a Carlin-type gold deposit) in central Nevada.



TOMMY B. THOMPSON

In my time as a faculty member at the Oklahoma State University, CSU, and the University of Nevada, Reno, I have been the adviser for 89 M.S. and eight Ph.D. students, with most of this research supported by the mining industry.

During my 17-year tenure at UNR, 26 M.S. and six Ph.D. advisees completed their degrees, with all employed in the mining-exploration fields. Some publications of note are the *Society of Economic Geologists Monograph 7* (1990) where I co-edited and co-authored six of the included papers. (Carbonate-Hosted Sulfide Deposits: Central Colorado Mineral Belt) and the *Nevada Bureau of Mines & Geology Bulletin 111* (2002) (Gold Deposits of the Carlin Trend), in which I co-edited and co-authored a paper.

I continue to be heavily involved with the Society of Economic Geologists, where I was honored with the SEG Marsden Medal in 2005 for service to that professional society as their vice president, was a distinguished lecturer in 1997 (presented in Vancouver, British Columbia), served as editor for 16 years of its field trip guidebook series, served as a board of directors councilor and as the Mackay SEG Student Chapter adviser.

As student chapter adviser I have taken my students on eight international field trips during spring breaks including visits to New Zealand, Chile, Tasmania-Queensland, Australia, Mexico (twice), Turkey, and Portugal-Spain. I also served as the vice president (2012-2013) and president (2013-2014) for the Geological Society of Nevada, Reno.

I retired from UNR on Aug. 15, 2014, and continue to work actively as a consultant to the minerals industry. I was the Denver Region Exploration Geologists Society distinguished lecturer in November 2014.

Tommy Thompson enjoying some field time in Death Valley in January 2015.

Tommy B. Thompson served as a department faculty member for 23 years, retiring from CSU in May 1995 as professor emeritus. Thompson received his B.S. (1961), M.S. (1963), and Ph.D. (1966), in geology from the University of New Mexico.

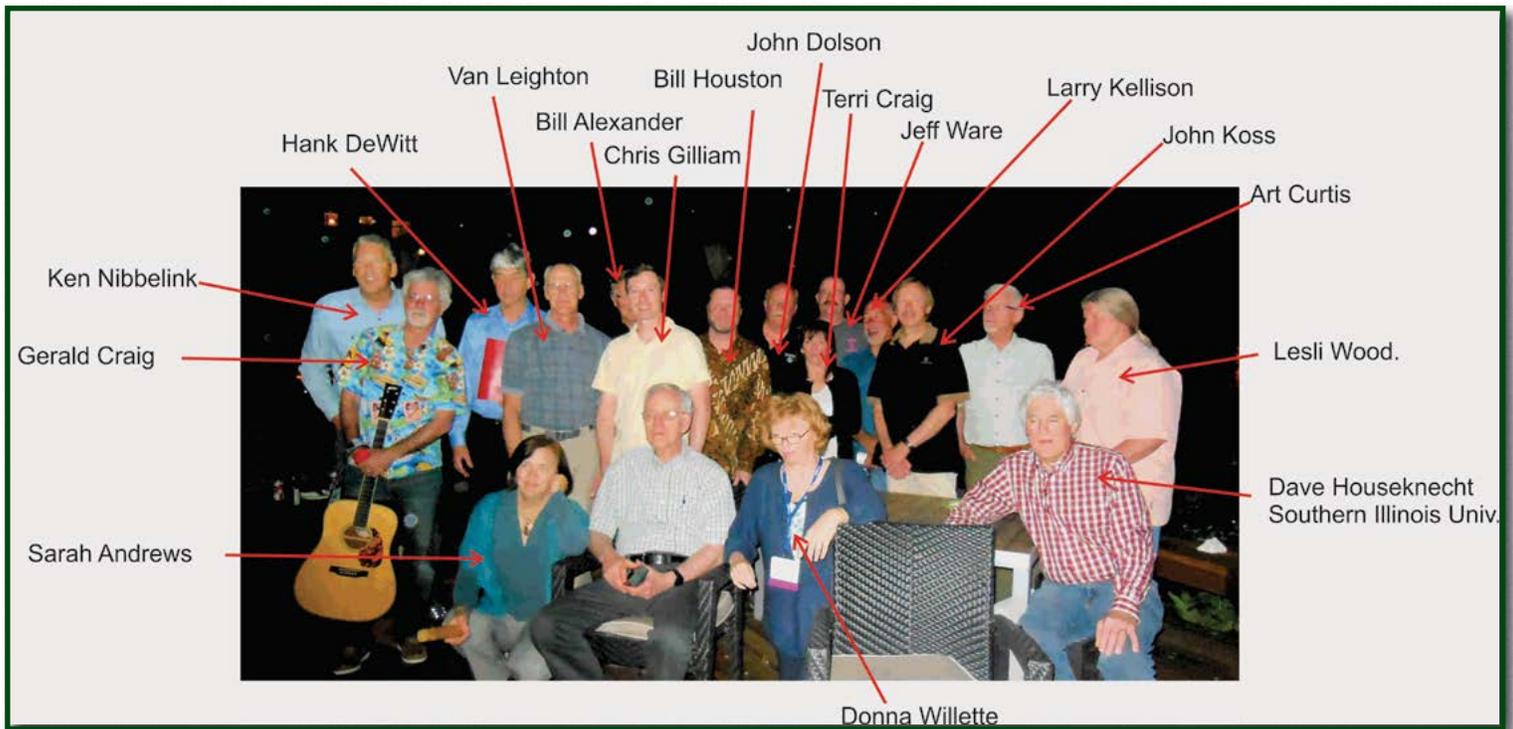
He joined the University of Nevada, Reno in 1997 as the first director of the Ralph J. Roberts Center for Research in Economic Geology and served in that capacity for 16 years. He has been an academic faculty member for more than 47 years, serving at Oklahoma State University (seven years) prior to joining CSU.

Thompson has published 110 scientific, peer-reviewed papers in international journals during his teaching-research career, as well as hundreds of consulting reports based on studies of national and international ore deposits.



FRANK ETHRIDGE

Professor Emeritus Frank Ethridge and some of his many former students gathered in June for a special get-together (dubbed “Fredpet”) at distinguished alumna Robbie Gries’ home in Denver during the American Association of Petroleum Geologists meeting. Thanks to Hank DeWitt and Lesli Wood for organizing this very enjoyable event. Ethridge continues to be a very active presence around the department and in the Colorado geological community. Below is a photo of Ethridge and some of the attendees (a small subset of his many students) at the reunion.



Frank Ethridge and some of his many students at the AAPG Fredpet reunion (with apologies to Bill Alexander!).

EXTREME WEATHER AND EXTREME GEOMORPHOLOGY IN THE FRONT RANGE

ANNETTE PATTON, M.S. PROGRAM

Usually, the scenic beauty of Rocky Mountain National Park draws tourists from across the country to gawk at the seemingly changeless landscape. I was instead lured to the Colorado Front Range in order to research recent catastrophic changes to this mountain range.

This past summer was spent completing fieldwork for my master's thesis with my adviser, Sara Rathburn. Following the extreme September 2013 rainstorm (which dropped more than 20 inches of rain in parts of the Front Range), numerous debris flows initiated throughout the region. To

better understand the controls on debris flow occurrence, I hiked to the initiation points of 11 debris flows in Rocky Mountain National Park as well as 31 control sites to compare slope characteristics. This fieldwork was both academically interesting and physically demanding; several of these sites were more than 10,000 feet in elevation, and all are steep, rocky, off-trail climbs!

At each site, I measured several variables, including soil depth, soil texture, vegetation cover, and topographic characteristics to identify the primary site-specific controls on debris flow initiation in the region. I am also conducting additional geochronologic analysis at one site that shows evidence for multiple debris flows since the late Pleistocene. This research has valuable implications for management of infrastructure and buildings in the national park, debris flow characteristics in our local mountains, and it will increase awareness of regional geologic hazards to improve public safety.

In 2015, I was honored to receive numerous awards including the American Geophysical Institute's Harriet Evelyn Wallace award (\$5,000), the American Water Resources' Herbert Memorial Scholarship (\$1,000), the Colorado Scientific Society's memorial funds (\$1,000), the Rocky Mountain Association of Geologists' CSU Scholarship (\$4,000), the Association of Environmental and Engineering Geologists' Tilford Masters' Scholarship award (\$1,000), the CSU Joby Adams Scholarship (\$1,000) and Burns Scholarship (\$1,000), and a SEED grant from the Purdue PRIME Lab (\$9,800 of sample analyses). I used the funding to support field and research efforts, including salary for a field assistant, ¹⁴C analyses, and ¹⁰Be cosmogenic radionuclide analyses.

I plan to defend my M.S. thesis in the spring of 2016 and plan to then continue my graduate education at CSU working toward a Ph.D. with Dr. Rathburn in the fall.



Annette Patton working in Rocky Mountain National Park researching debris flows mobilized by the epic September 2013 storm. She completed her B.S. in geology at Whitman College ('13).

EXCITING TIMES FOR THE GEOSCIENCES CLUB

MASON DEMIST, SENIOR & PRESIDENT OF CSU GEOSCIENCES CLUB

As a senior in the department, I have seen our student club from many different perspectives. Certainly, it was always a treat to listen to an interesting speaker with the promise of free pizza. One of my goals as the president of the club this year has been to grow the club's activities in more ways that can benefit student's ambitions (as well as their stomachs).

With the help of my fellow officers (Vice President Mandy Auer, Secretary Sean Horne, and Treasurer Truxton Blazek), we have taken the steps to become a sanctioned CSU club organization, under the new title of "Geosciences Club." As you might imagine, there is an impressive set of benefits in being officially recognized in this way at a university as large and student-engaged as CSU! Soon, we will also re-establish the role of the club as the CSU American Association of Petroleum Geologists Student Chapter, which will bring additional benefits to our members.

Our primary mission is to inform members of potential geoscience careers, while enjoying and learning about the pure beauty and astonishing complexity of the geologic world. In addition to our primary meetings in the department, we are planning on getting more club field trips established as well.

2015-2016 is shaping up to be a great step forward for the club's future, and will hopefully act as a catalyst for the future club officers who continue in our wake. The energy, support, and pride that this year's officers gave to the club is astounding, and was much needed to keep our momentum going as the year progressed. We already have the largest turnout at meetings that I've seen in my three years, including a large contingent of underclass students (which bodes well for us getting the word out about club activities). With a plethora of

well-known speakers representing a wide variety of disciplines booked, it is sure to be a fun and informative year!

Speaking as a student, although it has been tough to balance the presidency with my academic and extra-curricular life, it has had an overwhelmingly positive effect on me as a person. Taking on the leadership role was daunting at first, but after having addressed some initial issues, it's a joy to see the positive developments in the club, and the benefits for my fellow students. I'm very excited to see where the Geosciences Club goes in the future!

On behalf of all of the officers, I would like to thank the geosciences department as a whole, our supporters, and especially Rick Aster, Jill Putman, and club adviser Sven Egenhoff for helping us to make the club an even bigger success in future years!



Mason DeMist enjoying some of the local scenery.

TRACING THE HISTORIC STREAM CHANNEL AT THE SAND CREEK NATIONAL HISTORIC SITE, COLO.

BRAD SPARKS, M.S. PROGRAM

I am a second-year M.S. student, working with Dennis Harry and Ellen Wohl at the Sand Creek National Historic Site in southeastern Colorado, where I am using ground-penetrating radar and near-surface seismic refraction to map buried Holocene stream channels within the broad Sand Creek valley to identify historic stream locations.

The Sand Creek National Historic Site preserves the location of the Sand Creek Massacre, which took place along the banks of Sand Creek on Nov. 29, 1864. During an eight-hour period, approximately 675 U.S. Army volunteers, riding from Denver under the command of Col. John Chivington, attacked an encampment of 700 Cheyenne and Arapahoe, who were awaiting a peace delegation following the recent Camp Weld Conference. An estimated 200 Cheyenne and Arapahoe were killed, two-thirds of them women and children. The Sand Creek Massacre created mistrust that continues to play a key role in U.S. Native American affairs today.

My project is inspired by recognition that the current stream channel may not be the location of the 1864 channel. The exact location of the battle is recorded only in general terms, passed down from oral cavalry reports that the battle began once they crossed the stream. Recent archeological work raised the question of whether the battle site is im-

properly located, as the stream channel may have moved.

The poorly consolidated alluvium in the valley forms a distinctively low seismic velocity layer on top of the Cretaceous Pierre Formation, making seismic refraction an ideal tool for my purposes. Paleo-channels show up as incised features on top of the Pierre Formation, filled with the lower velocity alluvium. The ground-penetrating radar provides detailed information on the stratigraphic architecture, helping to resolve how channels are filled when abandoned. This work is supported by the National Park Service. I have also expanded this research to address more fundamental questions concerning how dynamic High Plains ephemeral streams are, how often streams change course within the valley, and how course changes are accommodated. I'll be completing fieldwork this fall, with an anticipated graduation in Spring 2016.



Brad Sparks in the field in eastern Colorado.

GROWING PETROLEUM GEOLOGY AT CSU

LISA STRIGHT



Lisa Stright teaching in the field at Black's Beach in Southern California.

My research interests are in petroleum geology, reservoir characterization and modeling, and reservoir engineering. I am a co-PI on two joint industry projects subscribed to by a combination of 15 petroleum industry sponsors with collaborators from University of Calgary, Virginia Tech, and the University of Utah.

The Chile Slope Systems JIP investigates channelized deep-water slope deposits in the Magallanes Basin of southern Chile, while the Rocks2Models JIP documents river to shoreline deposits in southern Utah. My principal role in each of these interdisciplinary consortia is in subsurface modeling grounded in outcrop analog studies. The primary goal is to generate more accurate models that can predict the location and distribution of hydrocarbons in the subsurface. These models can also aid in well placement to optimize recovery and to mitigate environmental and economic risk.

I hope to build intra- and interdepartmental collaborations at CSU, and with other schools across the Front Range in this area of research.

I look forward to teaching in the undergraduate core curriculum along with offering new senior- to graduate-level petroleum-related courses to our students. These upper-level courses will include: Reservoir Characterization and Modeling, Petrophysics and Well Log Interpretation, and Petroleum Geology. These courses prepare students to be competitive for jobs within the petroleum industry and provide a knowledge base to guide impactful research on petroleum-related topics. I also have a deep interest in critical discussions on renewable energy and will be proposing a new course on this topic.

When I was at the University of Utah, I advised three teams that competed in the AAPG Imperial Barrel Award competition, a competition where student-led teams perform a prospective basin evaluation, resulting in one first-place award of the international competition and two second-place awards in regional competitions. I am excited to work with Sven Egenhoff, Dennis Harry, and other faculty colleagues to build strong CSU IBA teams in the coming years. I very much look forward to connecting with CSU alumni to further grow recruiting and other collaborations between geosciences and industry partners.

Stright joined the Department of Geosciences in 2015, filling a new assistant professor position in petroleum geosciences. She has a multidisciplinary background in engineering (B.S., civil/environmental, University of Colorado, M.S., in geological engineering, Michigan Tech, and Petroleum Engineering, Stanford) and a geosciences Ph.D. from Stanford in 2011. Following the completion of her Ph.D. she joined the University of Utah as an assistant in the Department of Geology and Geophysics. She also has five years of petroleum industry experience as a reservoir modeler and engineer with (RC)2/VeritasDGC and with the Denver-based consulting company MHA Petroleum Consultants.

FURTHER EXPLORATIONS OF THE DEEP EARTH

DEREK SCHUTT



I was pleased to welcome a new graduate student, Derek Witt, to my research program. Witt, who also has a CSU geology degree in the geophysics track, started early in 2015 to help with a new \$1.1 million collaborative seismology and geodesy project from the National Science Foundation EarthScope Program to investigate the ongoing growth of the Mackenzie Mountains in northwest Canada.

This project, a collaboration that includes Rick Aster and University of Alaska colleague Jeff Freymueller, will deploy 40 seismographs and a number of high-accuracy GPS geodesy sites across the remote, beautiful, and challenging coun-

try of the Yukon and Northwest Territories in 2016. During 2015, we visited the area and deployed GPS instrumentation and four broadband seismographs near Whitehorse. I also flew into the remote Norman Wells community in Northwest Territories, where I had the pleasure of scouting some of our sites for 2016 by floatplane.

My graduate student, Ana Corbalan, was a recipient of the prestigious 2015 La Caixa Scholarship, a highly competitive Spanish fellowship to foster graduate research abroad. Of the 550 applicants in 2015, Corbalan is one of only three recipients in the Physics and Earth Sciences category. Corbalan has developed an interest in marine seismology and, upon completion of her M.S. in the department, plans to attend Dalhousie University and work with Mladen Nedimovic as part of an international marine seismology project investigating ultra-slow spreading ridges.

Graduate student Will Dybus continues his work on an NSF-funded project to combine heat flow and seismic velocity measurements to estimate the temperature of the North America plate, and the role of compositional variations in controlling temperature and tectonic evolution. Early findings suggest that the newer part of the continent, to the west, is weakened significantly by the presence of water in the plate.

I returned this past summer from a yearlong sabbatical overseas. This included a month at the Institute for Advanced Studies at the University of Bristol, England, working on seismic means for investigating ancient plate boundaries.

However, most of my sabbatical was spent at the University

Students and colleagues establishing the first Mackenzie Mountains seismic station near Crag Lake, Yukon Territory, in August.



of Aarhus, Denmark, where I worked with collaborators on new multidisciplinary methods of combining petrology and seismology to better understand the role of composition in the evolution of the North Atlantic. I also started a collaboration with Istanbul Technical University, and plans are in place to share a Ph.D. student between ITU and CSU in the near future. In November 2016 I will return to Aarhus, as part of a new multidisciplinary international mini-course in deep Earth composition and geophysics being offered to graduate students from around the world. The content developed for the course will be brought back to CSU in the future to enrich our department courses.

Schutt (Ph.D., University of Oregon) arrived at CSU in 2008. Prior to that, he was a program officer at the National Science Foundation, a research scientist at the University of Wyoming, and a postdoc at the Carnegie Institution's Department of Terrestrial Magnetism.



In Northwest Territories during siting reconnaissance for the Mackenzie Mountains experiment.



A GPS monument installed at Macmillan Pass, Northwest Territories, this summer as part of the Mackenzie Mountains EarthScope project.

PRICELESS MUDROCKS

SVEN EGENHOFF

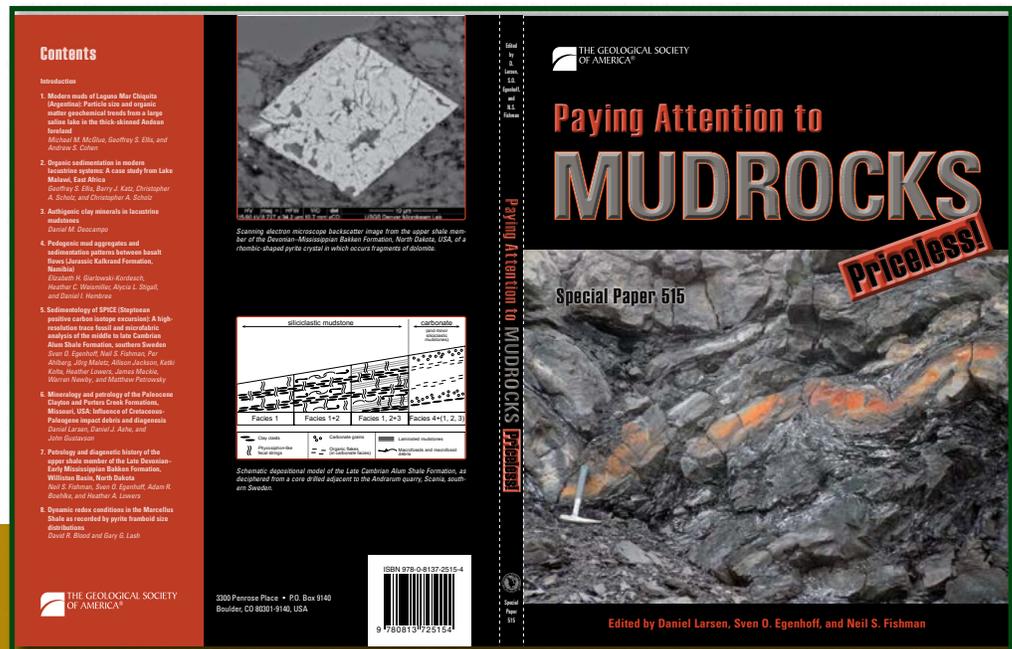


continued my long-term investigations of the Bakken and adjacent formations in the Williston basin of North Dakota and have a new graduate student, Caroline Martin, who is helping me to unravel the diagenesis of the middle Bakken Formation. We expect to present this new work at the GSA annual meeting in Baltimore, and will again at the AAPG meeting in Calgary in June 2016.

Together with two friends, Dan Larsen and Neil Fishman, I co-edited a Geological Society of America Special Paper (#515) *Paying attention to mudrocks – priceless!* that was released in October 2015. The intention of this book is to offer some insight into mudrocks (a.k.a. mudstones or shales), covering subjects from the marine and continental realms, and including unusual environments such as pedogenic mudstones deposited in between basalt flows. These formations are important everywhere – they represent approximately two-thirds of the rock record. Yet, baseline geological literature about these rocks is surprisingly scarce. This book thus adds some surface and subsurface studies to a scientifically understudied subject that is immensely important for our daily energy use; most of our production has been extracted from unconventional mudrock reservoirs such as the Bakken, the Barnett, or the Eagle Ford shales. In addition to the Bakken shales, we are focusing on the Arnestad Formation in Norway, a proximal mudrock unit in and around Oslo, to describe processes on the deep

This past year had some very positive developments for me, especially for my publication activity. Then, of course, the price of oil went and stayed low which created some difficulties maintaining my research group!

My students and I continued our work in Nevada on a project funded by Noble Energy aimed at characterizing the sedimentology of the oil-bearing Elko Formation and its gamma ray signal in outcrops. Both students, William Horner and Erin McGowan, have now defended and finished correcting their theses and have started work with petroleum companies in Houston. I also



shelf in close vicinity to a carbonate depositional realm. The adjacent Ordovician carbonates in Sweden were described in 2014 in a M.S. thesis conducted at CSU by Ali Cigri, and are the focus of four independent undergraduate studies analyzing and interpreting thin sections.

Egenhoff (Ph.D., Technische Universität, Berlin) was born in Germany, and raised in Germany, Iran, and Argentina. He studied at the universities of Clausthal and Heidelberg, Germany (where he finished his Diploma; equivalent to an M.S. degree). He joined the department in 2006 following a five-year lecturer position at Technische Universität.

UNVEILING ANTARCTICA

RICK ASTER



Rick Aster installing an Antarctic seismograph

An exhilarating year, both within the department and in my research and advising world. First, it's wonderful to have been at CSU for a sufficient length of time (two years in December) to be up to speed and engaged with the department, College, and University communities. There are abundant collaborative opportunities for geosciences across CSU, and I am very pleased to see our department moving promisingly forward in a number of exciting and critical ways. It was also a wonderful year for welcoming new department colleagues (including John Singleton, Lisa Stright, and Dan McGrath), and for seeing them rapidly ramping up their research and teaching programs in many exciting ways.

During the 2014-15 Antarctic field season, I worked in the field on two major NSF Antarctic Program projects. The first, dubbed POLENET, is a continent-spanning geophysical deployment of GPS geodetic and seismographic instrumentation. POLENET produced a number of publications in 2015 describing the structure of the Antarctic mantle and crust at much greater resolution than was possible before. Among other discoveries, this project has revealed the true topography of crustal thickness throughout the West Antarctica Rift System (West Antarctic thins to as little as 18 km in places), discovered active magmatic earthquakes below the ice sheet in Marie Byrd Land, and uncovered new kinds of ice seismicity (including icequakes that are triggered by large distant earthquakes as far away as Chile). POLENET



A seismograph site on the Ross Ice Shelf in late 2014, with Erebus Volcano in the background.

seismic data has also been inverted to produce the first mantle maps showing the more detailed velocity structure of Antarctica to depths of hundreds of kilometers. This imaging has revealed low velocity and low viscosity mantle structures that newly inform our understanding of the tectonics, volcanism, and the glacial isostatic response of the continent across the ice ages and through to the present.

The second Antarctic project, “RIS,” deployed the largest set of seismographs ever across on an ice shelf. CSU Ph.D. student Rob Anthony and I, along with colleagues from Scripps, Woods Hole, and Washington University, deployed 34 instruments across the length and width of Earth’s largest floating ice body (the Ross Ice Shelf). These instruments will remain buried in the snow for two years to record seismic and ocean signals that should drive new insight into the shelf’s dynamics, including interactions with Antarctica’s glaciers and storms. They will also record global earthquake signals coming up through the underlying ocean layer (some hundreds of meters deep) that will enable us to further tomographically study the Antarctic mantle in association with new POLENET and other data. A second Ph.D. student, Michael Baker, who is working in Antarctica recovering data as I write this, will be interpreting these

unique signals as part of his Ph.D. A third Ph.D. student, Nicole McMahon, is doing outstanding work monitoring and interpreting the remarkable recent earthquake swarms of Oklahoma in close coordination with colleagues at, and supported by, the U.S. Geological Survey National Earthquake Information Center in Golden.

I am also thrilled to be working with Derek Schutt and graduate student Derek Witt on a new NSF project crossing the Mackenzie Mountains of Canada that started this past summer. This project will utilize seismology and geodesy to understand the genesis of this unusual subarctic and far-from-plate-boundary mountain range. I am also pleased to be collaborating with Sara Rathburn on a new project funded by the CSU Water Center. The project will be analyzing river-generated seismic noise with high-frequency seismographs and infrasound, in association with hydrographic and other data, during runoff season for the Colorado River in Rocky Mountain National Park and in the South Fork of the Poudre River.

Aster (Ph.D., University of California, San Diego) joined the department in January 2014 as professor and department head. Prior to arriving at CSU, he was a department chair and professor at New Mexico Tech.



Graduate students Rob Anthony (CSU) and Cai Chan (Washington University) in Antarctica.

COORDINATING ACADEMIC SUCCESS IN GEOSCIENCES

JILL PUTMAN



I am very pleased to have joined the geosciences department as its first academic support coordinator. The ASC program at CSU is designed to provide intensive academic support to increase retention and graduation of undergraduate students. My roles in the department include meeting with every undergraduate student to provide academic advising in collaboration with the faculty mentors, conducting outreach to students experiencing academic challenges, assisting the faculty with curriculum and program structure, and generally coordinating the undergraduate student experience for the department.

In addition, Rick Aster and I, and the rest of the faculty, have been working to grow the resources and activities of the student-led Geosciences (formerly Geology) Club. We have also developed a department mentoring program

that connects graduate student mentors to undergraduate student mentees, and includes special events such as career forums. We have improved outgoing communications to students through publication of a monthly advising newsletter, enhancements to department publications, and increased use of our department Facebook page.

I am working with first-generation faculty member and college graduate Derek Schutt this fall to reach out specifically to our first-generation students. We have also created a centralized student opportunities database that connects students to research, independent study, and work positions within the department.

As I approach my one-year anniversary with the department, I am incredibly grateful for the support I have received from faculty, staff, and alumni as we have developed so many new initiatives for undergraduate student success. I look forward to continued engagement with all of you as we continue to advance the interests of the department and our students.

Prior to joining geosciences, Putman worked as a career/retention specialist in the Academic Advancement Center at CSU, and has previous work experience in residence life, undergraduate admissions, and student conduct. Jill earned a Bachelor of Arts in psychology and political science from Miami University, and a Master of Education in college student affairs administration from the University of Georgia.

RESEARCH AT THE POLES

DAN McGRATH



As a glaciologist, I study a broad range of cryospheric topics throughout the frozen reaches of our planet, including Antarctica, Greenland, Alaska, and Patagonia. With more than 15 expeditions and more than a year in the field, I have a clear affinity for time in cold, snowy places!

I utilize a range of in situ observations (automatic weather and GPS stations, ground-penetrating radar), coupled with remote-sensing techniques to study diverse topics including snow distribution on Alaskan glaciers, glacial lake outburst floods in Patagonia, and large-scale structural features of ice shelves in Antarctica. This work seeks to develop process-scale understanding of modern systems, with an eye toward how these processes will evolve in the future. I'm excited to develop research collaborations with new colleagues, both within the geosciences department and more broadly at CSU.

In addition to these research activities, I'm involved with the Extreme Ice Survey project, which was recently highlighted in the award-winning documentary *Chasing Ice*. EIS currently has more than 40 time-lapse cameras installed across the planet, from Alaska to Austria to Antarctica. Photos are taken every day-lit hour of every day, month after month, creating visual archives of these changing landscapes. For example, the EIS team's work in Antarctica and South Georgia Island over the past 18 months can be seen in a short video at (<https://vimeo.com/125634374>).

In fall 2016, I'm teaching Geology of our Environment and co-teaching a new seminar in Antarctic Geosciences with Rick Aster. In addition, I'm helping to oversee a new cross-listed glaciology course, which will hopefully become a standard offering in the future. In the future, I hope to develop other cryospheric courses for the department and provide new cryospheric field and research experiences for both undergraduate and graduate students.

McGrath (Ph.D. University Colorado Boulder) joined the Department of Geosciences as a research scientist and instructor in August 2015.

Dan McGrath on the Larsen C Ice Shelf, Antarctic Peninsula



AIRIE UPDATE

HOLLY STEIN



A main scientific highlight this past year was an expedition to Nordauslandet in northeast Svalbard, home of polar bears and walruses (Svalbard reindeer and a seldom-seen mole round out the land mammal species). Funded by the CEED Centre of Excellence at the University of Oslo, Norway, Judith Hannah and I were invited to join a team of scientists working with paleomagnetism to put timelines into a sequence of carbonates and pyrite-rich black shales deposited during a remarkable Neoproterozoic Era, just before the Cambrian explosion of life. Recovering from a broken foot and leg, I was able to bring AIRIE's Rich Markey (and his long, strong legs) to join the expedition. This work will help decide whether this important tectonic plate traversed a phenomenal 55° of latitude in just 5 million years, or if we are looking at true polar wander (a change in the Earth's rotational axis) to an extent not previously documented in Earth history. Serendipitously, while in this remote region of

Svalbard, the group stumbled upon a region of alteration in the rocks that may be associated with gold mineralization!

In addition to funding its four core researchers, two new AIRIE Program postdocs arrived in 2015. Dr. Nicole Hurtig, with her background in experimental chemistry, is setting up experiments to quantify exchange of metals (especially our favorites Re and Os) between solid organic matter, formation waters, and oils. Dr. Vineet Goswami, with his background in chemistry of modern marine environments, is looking at Re-Os in coals, and will take on an additional project to look at Re-Os in organic-rich cherts associated with the dinosaur extinction. The chert project was conceived by Hannah and me, while on a biking holiday in Denmark this summer – just can't keep our mitts off the rocks!

Dr. Svet Georgiev continues his pioneering work in Re-Os systematics in oils, and provides guidance for graduate student, Jenna Dimarzio, working on locating Re and Os within oil components. Dr. Gang Yang is working with an organic chemist at Curtin University (Australia) and me to understand the Permo-Triassic mass extinction along a paleo-shoreline related to new oil discoveries in the Perth Basin. Markey has been working on Barents Sea source rocks in the high Arctic, and provides guidance for graduate student, Marisa Boraas-Connors, working on shales with ammonites that ruled Late Jurassic boreal seas. Aaron Zimmerman, the steady hand that keeps the lab humming, a more than full-time job, also works with me on the evolution of the Oslo rift through molybdenite geochronology.

Stein has been a senior research scientist and professor in the department since founding AIRIE in 1996. A short, colorful, and nontechnical interview and media piece about the AIRIE Program can be found [here](#). She received the Warner College Outstanding Research Impact Award in 2015.



2015 Fieldwork in Svalbard.

NEW FRONTIERS IN RE-OS RESEARCH

JUDY HANNAH



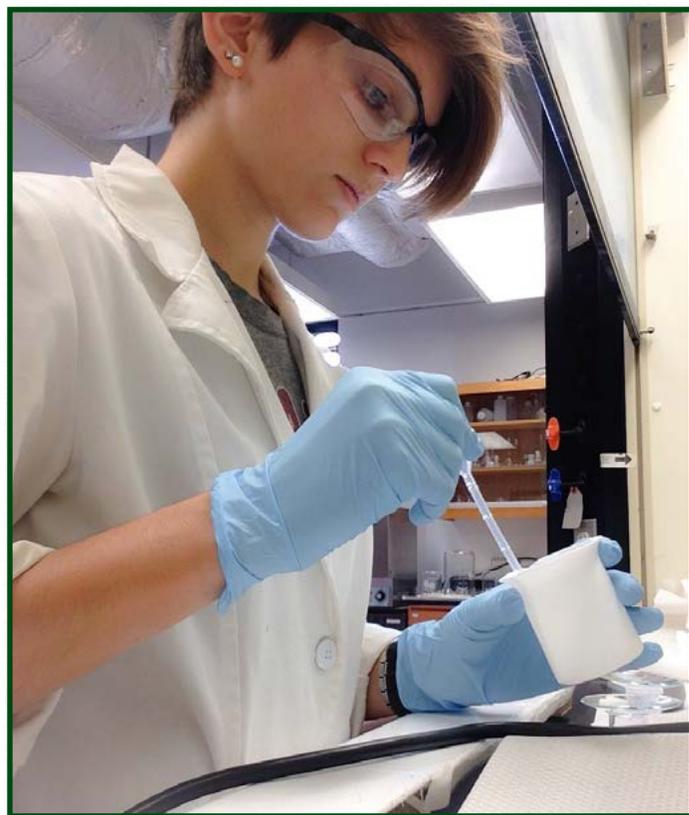
She has learned which fractions host the bulk of the Re and Os budget, and will next use analytical tools in CSU's chemistry department to determine the molecular structure of those fractions. Her work is part of a new research effort in the AIRIE Program to build knowledge of fundamental chemical processes in organic matter through experimental geochemistry. These fundamentals will underpin our interpretations of Re-Os data in natural hydrocarbon systems.

Marisa Boraas-Connors also joined the AIRIE Program in Fall 2014, with a double major in geology and chemistry from Colorado Mesa University. During her first year, she

This year I, in close collaboration with Holly Stein and AIRIE, have been working with two outstanding master's students who are breaking new ground in lab.

Jenna Dimarzio arrived from Arcadia College in Fall 2014 with a B.S. in chemistry and enthusiasm for geochemical applications. She spent her first year at CSU working as a research assistant compiling a database of molybdenite chemistry and learning the ropes in the rhenium-osmium (Re-Os) isotope lab.

Last summer, she began working with AIRIE research associate, Svet Georgiev, to break down asphaltenes in a heavy oil and determine the Re and Os concentrations in each fraction. Why do that? The Re-Os geochemistry community has been analyzing hydrocarbons with the intent to aid exploration, but no one knows where the Re and Os reside within the organic molecules. Lack of such basic understanding thwarts logical interpretation and application of the data. Dimarzio's work is the first step toward answers.



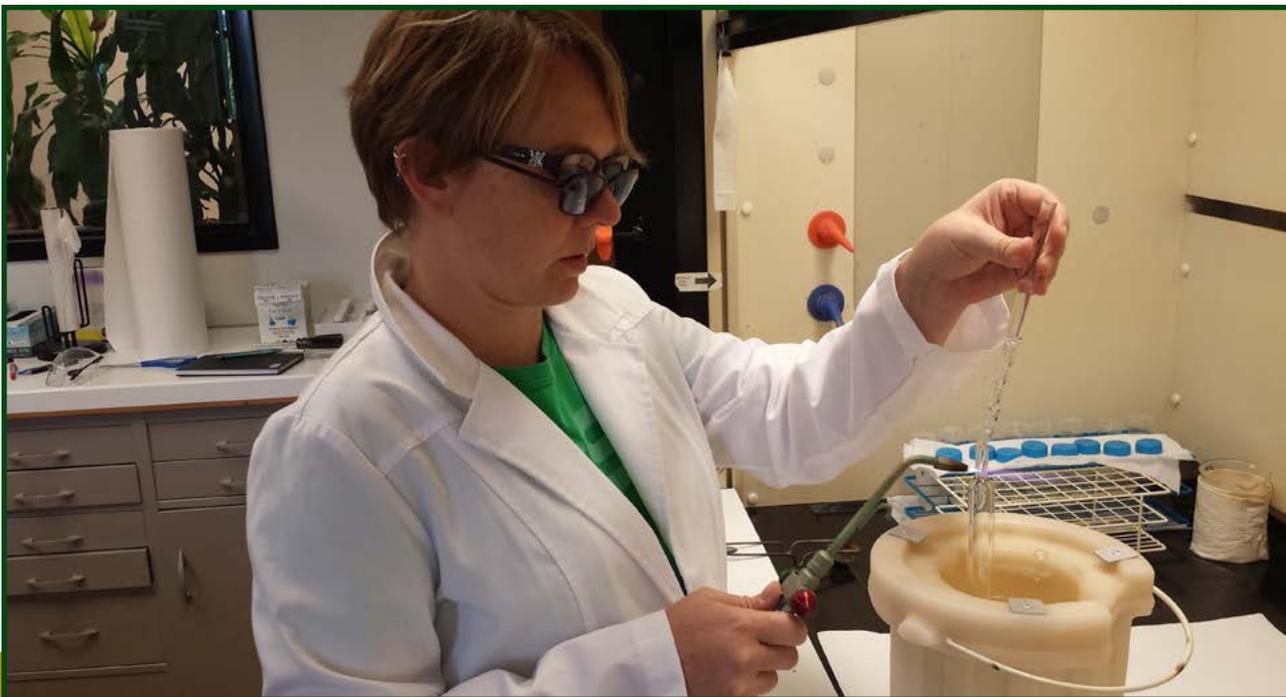
Jenna Dimarzio adds peroxide to redissolve a rhenium sample.

served as a teaching assistant in mineralogy and petrology, earning the 2015 Warner College of Natural Resources Teaching Assistant Award. Over the summer, she worked with research associate Rich Markey to undertake Re-Os geochronology of drill core through a section of black shales from Svalbard in the Norwegian Arctic. The shales are presumed source rocks for much of the oil and gas in the Barents Sea, an area of rapid exploration and development. Correlation of these critical shale beds across the complex crustal structure of the Barents region requires knowing their age precisely.

Boraas-Connors' preliminary data are accurate, but not precise. So, her challenge going forward is to determine why. The source rocks may contain hydrocarbons that have not yet been expelled into pathways toward hydrocarbon reservoirs. These residual hydrocarbons may mask depositional ages. Boraas-Connors will be exploring methods to chemically remove residual hydrocarbons and "see through" to primary depositional chemistry. If successful, this will be a breakthrough in Re-Os dating of source rock deposition.

Both Dimarzio and Boraas-Connors will be presenting their research at the June 2016 American Association of Petroleum Geologists Annual Convention and Exhibition in Calgary.

Hannah (Ph.D., University of California, Davis) joined the department in 1996.



Marisa Boraas-Connors sealing a glass vessel to dissolve her shale sample in acids at high temperature.



MIKE RONAYNE

Teaching highlights from the last year included two new graduate course offerings: Geophysical Inverse Theory (co-taught with Rick Aster using his textbook) and a graduate-level geostatistics seminar.

I also continue to teach my groundwater modeling course that, reflecting the broad interest in water across CSU, draws a diverse group of students from geosciences, civil engineering, watershed science, and ecology.

During the current academic year I am enjoying a sabbatical. During my sabbatical, I will be working on two projects involving subsurface water storage in Colorado, including a modeling investigation of aquifer storage and recovery in the Denver Basin sandstone aquifers and an evaluation of managed groundwater recharge to increase seasonal low flows on the South Platte River. I collaborate with a number of CSU and external colleagues to study a broad range of water resources problems.

Ronayne (Ph.D., Stanford) joined the faculty in 2008.



SARA RATHBURN

This has been a busy and exhilarating year! Highlights include graduating two M.S. students, Cory Williams (now at USGS in Grand Junction) and Scott Shahverdian (now at Utah State University's Ecogeomorphology and Topographic Analysis Laboratory), and traveling to Alaska and Italy for field research.

Continuing graduate students include Ph.D. student Derek Schook who is using cottonwood dendrochronology to reconstruct river flow and floodplain dynamics within the Yellowstone basin; Maisie Richards assessing river response to gravel extraction on the Toklat River in Denali National Park and Preserve; Annette Patton evaluating the controls on debris flow occurrence in Rocky Mountain National Park resulting from the September 2013 storms; and new M.S. student Matt Sparacino researching the effects of channel restoration on wetland hydrology in Rocky Mountain National Park.

Over the summer, Schook and Sparacino joined two Italian colleagues and me for fieldwork addressing drainage basin sensitivity to climate change in the Italian Alps. On the teaching front, I continue to teach the Introductory Geology class for our majors with Dennis Harry, and had a record high of 56 students in Historical Geology in spring 2015. I also co-taught a graduate seminar with Ellen Wohl on watershed connectivity using the North St. Vrain basin as a case study, and I am developing a new graduate-level course in field geomorphology for launch in fall of 2016.

Rathburn (Ph.D., University of Colorado) joined the faculty in 2001 as a special appointment assistant professor, and has been a regular faculty member since 2007.

Sara Rathburn and graduate student Matt Sparacino in the upper Colorado River during spring runoff.





JOHN SINGLETON

I joined the CSU geosciences faculty this summer and immediately dove into teaching part of the CSU summer field camp near Silverton (in the Lime Creek/Molas Pass area). I am thrilled to be here with my family in Fort Collins. This fall I taught Advanced Structural Geology, which gave me the opportunity to explore the fantastic geology of the Front Range and integrate it into my teaching, taking students on five field trips throughout the region.

I continue to be actively involved in research and fieldwork projects in Arizona and California. This research ranges from the timing and tectonic significance of high-temperature shear zones, the relationship between synextensional sedimentation and detachment fault slip, and the kinematics of brittle faults along the eastern margin of the Eastern California Shear Zone. This winter, I am excited to be starting a new project with a Ph.D. student on the Atacama Fault System in northern Chile.

Singleton completed postdoctoral work and earned his Ph.D. at the University of Texas at Austin. He joined the faculty in Fall 2015 following three years as an assistant professor at George Mason University.



A low angle normal fault exposed in Arizona.



DENNIS HARRY

The 2014-2015 academic year was a transitional year for me as I ramped down a number of service commitments, including my duties as science editor of the Geological Society of America journal *Geology*. The time I gained was spent in collaboration with visiting colleague Audrey Huerta from Central Washington University developing a next-generation computer program for modeling continental rifting and the formation of rift basins. Deeply fearful of becoming a theoretician, and to keep my models rooted in data, I also began a new project using seismic reflection data (some up to 24-fold!) to map extensional basins in the Ross Sea of Antarctica. I currently have three graduate students working with me on the Ross Sea (Sumant Jha, Ph.D.; Chris Wenman, M.S.; and Gavin Rauch, M.S.). Still wearing two hats, I continue to co-advise students working on near-surface problems. Ph.D. student Matt Sturdivant, co-advised with Bill Sanford and Mike Ronayne, is developing a method to use high-precision gravity measurements in combination with well drawdown data to obtain improved estimates of aquifer properties. M.S. student Brad Sparks, co-advised with Ellen Wohl, is using seismic refraction and ground-penetrating radar data to determine the stability and historical location of the stream channel at Sand Creek National Historic Site.

Harry (Ph.D., University of Texas at Dallas) has occupied the Edward M. Warner Geophysics Endowed Chair since 2003.



BILL SANFORD

A highlight this past year was spending a week in China, in October 2015, working on developing collaboration with Chinese universities, where I presented a talk on estimating groundwater contributions to stream flow in headwater catchments at the Headwaters Symposium at Tsinghua University in Beijing. I also presented on groundwater and urbanization at the ECNU-CSU Joint Workshop on Urban Water Issues at East China Normal University in Shanghai. The trip was successful in that collaborations have been established and dialogue will continue at CSU's Hydrology Days in March 2016 and beyond. In addition, I enjoyed organizing a session at the Geological Society of America Fall 2015 meeting on "Nanomaterials and Contaminants in Hydrogeology," which reflects some of my ongoing work in this area.

Sanford (Ph.D., Cornell University) joined the department in 1996.

Photo: Bill Sanford lecturing in Shanghai at East China Normal University in October 2015 on Groundwater Hydrology in Urban Areas. His Chinese hosts were excited to hear Sanford mention his grandfather, who taught at a Shanghai university more than 100 years ago.



SALLY SUTTON

With colleague Tom Sale (CSU Department of Civil and Environmental Engineering) I taught Modern Gas and Oil this year, a course designed for students with wide interests from across campus.

The course explores a broad range of technical, social, and political issues, encouraging students to think critically about energy issues and preparing them for careers either directly or indirectly related to energy.

I presented work on the iconic Fountain Formation at the Geoshale conference in Warsaw in the fall and returned to Poland in May to teach a course on shales at Gdansk Technical University. I continue to work on sandstones and shales; former M.S. student, Ian Hogan, and I published an article on the Fountain. The work is continuing with four new M.S. students, all working on paleo-fluid flow or diagenesis.

Sutton (Ph.D., University of Cincinnati) joined the department in 1992.

Photo: Sally Sutton speaking in Warsaw, Poland.



JOHN RIDLEY

My capstone undergraduate course Field Methods, was adversely marked by the perpetually damp late Colorado spring of 2015. (The students will certainly remember their experience!) Field camp in Silverton this past year took place just before the city, the Animas River, and the legacy of past mining reached the national and international press due to the 2015 spill. I was called in the office for a number of telephone interviews with journalists to help them write articles about the incident. Otherwise, I spent the summer writing up past research work on gold ore fluids in interior Alaska and, together with colleagues from Switzerland, a paper on the melting of complex solutions with application to fluid inclusion studies.

Ridley and students in the field this past (rainy) May near Fort Collins.

Ridley (Ph.D., University of Edinburgh) has occupied the Malcolm McCallum Economic Geology Endowed Chair since 2004.

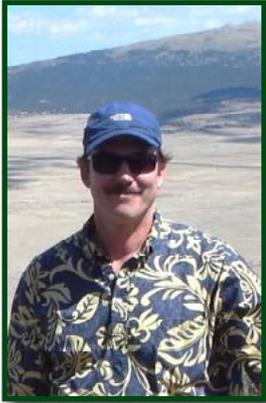


SEAN BRYAN

This past year, I continued to teach Introduction to Physical Geology and coordinate the Introductory Geology Labs. We continue to have great interest and high enrollments (more than 600 students per semester) in our 100-level geosciences classes. Exciting geoscience-related topics in the news, such as the Animas River spill and induced earthquakes in Greeley, made the course interesting and highly relevant for the broad University community. We had another great group of undergraduate and graduate student teaching assistants this past year. Our teaching assistants bring an incredible knowledge and enthusiasm for geology that allows us to teach 23 sections(!) of the Introductory Geology labs to more than 450 students. As I write this, we are gearing up to take 440 students to Lory State Park over the next two weekends to map the geology and investigate the geologic history of our backyard. On the research front, I continue to work on the reconstruction of past climate using the geochemistry of corals and marine sediments. This past summer, I visited

the Woods Hole Oceanographic Institution sampling sediment cores from the Gulf of California, with the goal of reconstructing Colorado River flow during the late Holocene.

Bryan (Ph.D., University of Colorado Boulder) is a full-time instructor in geosciences teaching introductory geology and laboratory courses.



JERRY MAGLOUGHLIN

This past academic year was busy as usual with Mineralogy and Mineral Optics in the fall, Advanced Petrology in the spring, and a large field camp group this past summer. This fall, Mineralogy fell back to a more manageable (but still historically large) 62 students at the beginning of the semester (still three labs).

But far and away, my major activity has been work on the department's first online class, a new Physical Geology course with an emphasis on the geology of parks and monuments. I've taken so many trips in preparing our new online introductory class on the geology of national parks and monuments that it's getting hard to keep track. This past year, I have visited Olympic National Park, Death Valley National Park (twice), Yellowstone, Grand Teton National Park, Arches National Park, Oregon Dunes, the Grand Canyon, the Mojave National Preserve, White Sands, Big

Bend National Park (gorgeous flowers), Craters of the Moon National Monument, many state parks, and a whole lot more parks between Missouri and New Jersey, New York, Ontario, Minnesota, etc.

Throughout, I have shot ultra-high definition video (and still photos) of geologic features and processes, along with (where legal) drone-based video (also UHD) to get aerial shots of the geology. As this work continues, I should have one or two new new photographic drones in my arsenal to augment our current department one before too long. If you have suggestions of parks or geologic features or anything else I can film in your neck of the woods, please let me know - I would enjoy working it into the course, which launches in 2016. We're also anticipating our largest field camp in many decades in the summer of 2016. As always, I enjoy hearing from everyone - please send an e-mail or stop by if you're in Fort Collins.

Magloughlin (Ph.D., University of Minnesota) joined the department in 1996.



Left: Ripples in gypsum sand at White Sands National Monument, New Mexico.

Right: Giant mollusk from Cretaceous Period, Big Bend National Park, Texas.



ELLEN WOHL

Highlights for the past year include continued fieldwork in the Colorado Front Range and Western Slope and interior Alaska with grad students Krista Garrett, DeAnna Laurel, Katherine Lininger, Bridget Livers, and Nick Sutfin. I enjoyed visiting the Colombian paramo (a sort of “tropical alpine” ecosystem that occurs between the upper limit of continuous forest and the upper limit of plant life) while teaching a short course on mountain rivers in Bogota. Our research group has also hosted multiple visitors during the past few months: Ph.D. students Margherita Righini and William Amponsah from the University of Padova (Italy) and Fernando Ugalde from Pontificia Universidad Católica (Chile), and visiting faculty members Jose Ortega from Universidad Autónoma de Madrid (Spain) and Lina Polvi Sjoberg from Umea University (Sweden). My graduate students have had a typically busy travel year, working in the Western U.S., northern Canada, and a number of other places!

Wohl (Ph.D., University of Arizona) joined the faculty in 1989. She received the Colorado State University Scholarship Impact Award, one of CSU's highest honors, from President Tony Frank in 2015.



Krista Garrett on Colorado's Uncompahgre Plateau.



Katherine Lininger planning the day's fieldwork on a smoky morning along the Yukon River, courtesy of record-breaking summer fires across Alaska this past year.



DeAnna Laurel installing a pressure transducer along Glacier Creek in Rocky Mountain National Park.

2015 FACULTY HONORS

John Ridley: Warner College Outstanding Publication Award.

Sally Sutton: Warner College Outstanding Service Award.

Holly Stein: Geochemistry Fellow, Geochemical Society and the European Association of Geochemistry, for outstanding work in the field of geochemistry, particularly her innovative uses of Re-Os isotope geochemistry; Warner College Outstanding Research Impact Award.

Ellen Wohl: Colorado State University Scholarship Impact Award; Warner College Outstanding Mentorship Award.

2015 STUDENT HONORS

UNDERGRADUATE STUDENTS

Fisher Ankney: Connolly Scholarship; Explorationist Scholarship

Philip Dalbo: Beverly Scholarship

Mason DeMist: Beverly Scholarship

Madeline Egger: Goodier Scholarship

Lonnie Hufford: Edmondson Scholarship; Harris Scholarship

Erinn Johnson: Outstanding Service by a Graduating Senior

Brian Longstreth: Anderson Scholarship; Lidstone Scholarship

Julia Makiejus: Honor Senior

Jay Merrill: Hurd Scholarship

Halena Moreno: Shepherd Scholarship; Kharkar Scholarship

Jeremy Patterson: Pulliam Scholarship; Explorationist Scholarship; Student of the Year Award; RMAG Pick Award

Aaron Pattison: WCNR Scholarship

Breanna Van: Coffin Scholarship

Abbey Vogler: Association of Women Geoscientists

Michael Wyatt: Dice Scholarship; Kloppel Scholarship

GRADUATE STUDENTS

Michael Baker: Adams Scholarship

Karie Boone: WCNR Scholarship

Marisa Boraas-Connors: McCallum Scholarship; Warner College Outstanding TA Award

Cat Cannan: Stollar Scholarship

DeAnna Laurel: Hill Scholarship

Bridget Livers: Schumm Scholarship

Jenna Dimarzio: Steininger Scholarship

Annette Patton: Adams Scholarship; Burns Scholarship

Mariah Richards: Anderson Scholarship; Clark Scholarship

Max Schultz: McCallum Scholarship

Codie Wilson: Anderson Scholarship

Natalie Anderson: Association of Women Geoscientists

Audrey Crockett: Association of Women Geoscientists

Krista Garrett: American Water Resources Association Scholarship

Chris Gates: Society of Economic Geologists Fellowship

Charlie King: Farvolden Award, National Ground Water Association; GSA Research Grant; Hydrogeology Division Award, GSA

Katherine Lininger: Geological Society of America Research Grant; PEO Scholarship; Morisawa Scholarship

Annette Patton: Harriett Evelyn Wallace Scholarship of American Geosciences Institute;

American Water Resources Association Scholarship; Colorado Scientific Society Scholarship; RMAG CSU Scholarship; AEG Tilford Scholarship

Dominic Pyanoe: Colorado Scientific Society Research Award

Derek Schook: Geological Society of America Research Grant; Colorado Scientific Society Research Grant; AGU Outstanding Student Paper Award; Ware Scholarship

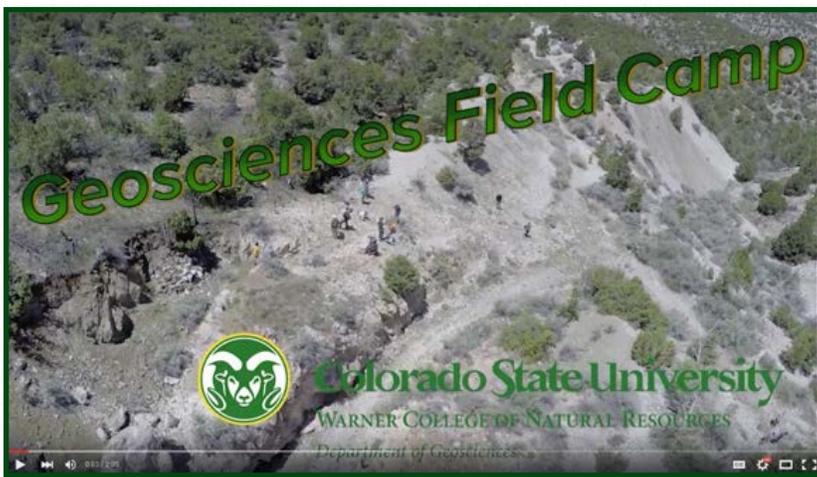
Dan Scott: AGU Outstanding Student Paper Award

Brad Sparks: GSA Research Grant; Geophysics Division Student Research Award

READ OUR DEPARTMENT HISTORY

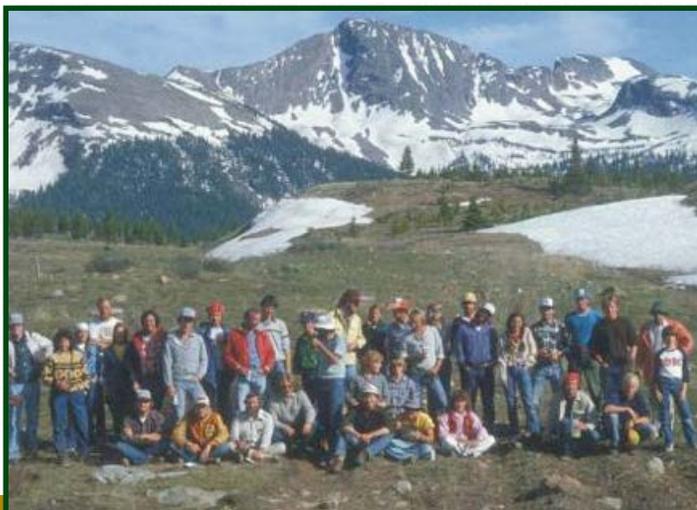
Professor emeritus, and former department head of earth resources (1989-1990), Frank Ethridge last year updated a compendium of the Colorado A&M and CSU geology story from 1922 through the present. We continue to update this annually, to seek new and more detailed information on the department's long and impactful history. Kindly contact Department Head Rick Aster (rick.aster@colostate.edu) should you have historical recollections and/or photographs that you'd like to share with us. You can view the most recent version of the department history [online](#).

2015 FIELD CAMP

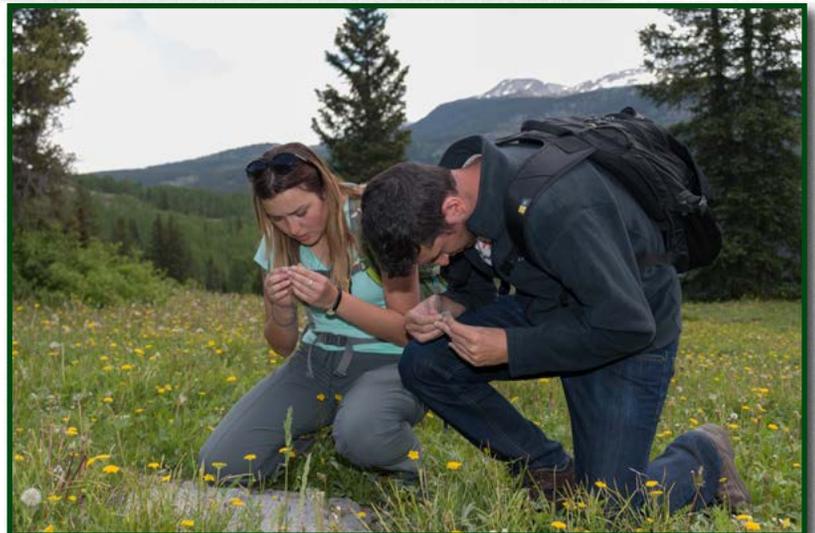
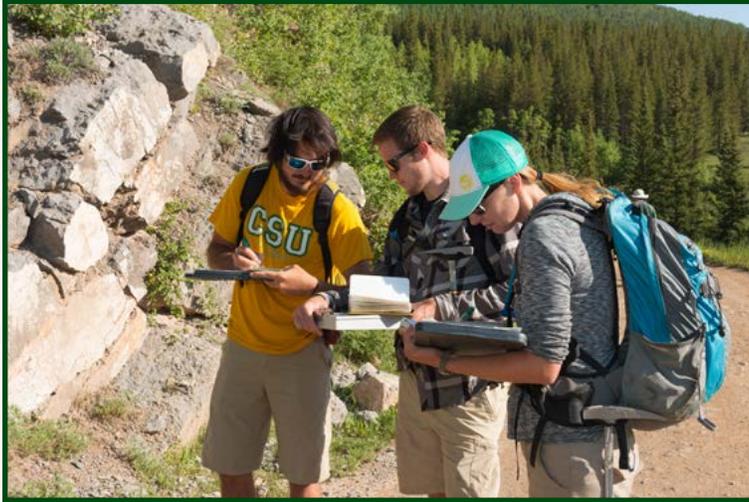


2015 was another great year for field camp, with 38 students participating, and we created a field camp promotional video! View it [here](#).

Below, on the left, you'll see the field camp group from 1982 near Little Molas Lake above Silverton, Colo. and the 2015 group in northern New Mexico on the right.



2015 FIELD CAMP PHOTOS



SPECIAL THANKS TO OUR MAJOR SUPPORTERS

Our community of supporters around the world contribute in diverse ways to the department each year; below are a few special highlights. Our continued thanks!

Many thanks to Steve and Gail Kloppel for establishing the Steve and Gail Kloppel Scholarship in Geosciences. Steve and Gail hope this scholarship will allow CSU to continue providing world-class leaders to the field of geosciences.

Thank you to Scott Larson for his continued support to increase the Salonee Kharkar Memorial Scholarship. Scott continues to remember his friend and classmate, and his gift is representative of his passion and commitment to support students in the department.

A special thanks to Sulan and Chintamani Kharkar, and Shamola Kharkar for their gifts to endow the Salonee Kharkar Memorial Scholarship.

Thank you to Chris Lidstone and Kate Laudon who endowed the Lidstone Scholarship in Geosciences this past year. The first scholarship was awarded to a geosciences student in 2015. Chris and Kate have continued to add to this scholarship endowment over the last year.

A special thanks to Chuck Mabarak for endowing the McCallum Mineralogy and Petrology Graduate Scholarship. Chuck continues to add to this endowment each year. This fund now awards two scholarships to graduate students who have an interest in a career related to gems and/or minerals or mineral deposits.

Thank you to Jeff Ware who continues to provide funding to the Ware Geosciences Fellowship, the Schumm Graduate Fellowship, the Lary Kent Burns Memorial Scholarship, and who recently provided the initial gift to establish the Geosciences Speaker Series.

Thank you to Bob Stollar who continues to add to the endowment for the Robert Stollar Scholarship in Hydrogeology.

Thank you to Roger and LuAnne Steininger who are continuing each year to increase the Roger and LuAnne Steininger Fellowship.

Thank you to John and Dolores Goodier for their continuing support to the John and Dolores Goodier Geosciences Scholarship.

Thank you to Ethel Schumm for her support to the Schumm Graduate Fellowship in memory of her husband and former professor emeritus, Dr. Stanley Schumm.

Thank you to Maria and Mike Steppe, Kim Roberts, and Thomas Jones who continue to support the geosciences department fund.

Thank you to Frank and Sylvia Ethridge for their support to the Ethridge Sedimentology Endowment.

Thank you to Doug Gratwick for his many years of support that funds two Undergraduate Explorationist Scholarships.

Thank you to Joby Adams for his continued support for annual scholarships to graduate students.

A special thank-you to Ed Warner and Jackie Erickson for broad and continued support to the geosciences department and the Warner College.

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