



GEOSCIENCES  
COLORADO STATE UNIVERSITY

# GEOscape

Department of Geosciences Alumni and Friends Annual Newsletter

Fall 2017



Ph.D. student Michael Baker and Rick visiting seismographs this summer in Canadian mud and mosquitoes.



## A Note from the Department Head

RICK ASTER

What an exceptional year for the Geosciences Department and Warner College of Natural Resources! As I write this, the college is in the process of constructing a spectacular new addition to the existing Natural Resources Building along University Avenue, with the entire NR building to be rechristened as the Michael Smith Natural Resources Building next year. New spaces will include teaching labs, with extensive nearby specimen space; IT-friendly classrooms; student success offices; and a wide range of formal and informal meeting spaces. As we use some of these new spaces for Geosciences, we will be able to renovate and repurpose several key rooms within our current department space, which will include revamped graduate student, faculty, and visitor offices.



While this historical physical expansion is ongoing, we are significantly expanding teaching and research depth and breadth through the addition of two geoscience assistant professors. Sean Gallen (profiled in this newsletter), will be transitioning from his current position as a senior scientist and lecturer in the Earth Surface Dynamics Research Group, ETH-Zurich to join us as a near-surface processes geoscientist in January 2018. Sean's research and teaching interests span Earth's critical zone, which encompasses multidisciplinary processes and structures ranging from the surface through to the deepest weathered zones. Dan McGrath (previously profiled as a research scientist in the 2015 *GEOScape* for his "Research at the Poles") will be transitioning to a tenure-track faculty position in August 2018. Dan has broad interests that include remote sensing; environmental and other near-surface geophysics, glaciology, and geology; and surface hydrology. We're enthused to welcome these exceptional early-career faculty to the department! Our longer-established faculty had many notable recent accomplishments and accolades this year, including a promotion to full professor for Sven Egenhoff and a promotion to University Distinguished Professor (the highest academic recognition awarded to a faculty member at CSU) for Ellen Wohl. Among many student achievements, I especially commend our vibrant Geosciences Clubs, including the exciting and professionally motivating activities of our Society of Exploration Geologists and American Association of Petroleum Geology chapters, who are building strong engagement with our far-flung friends and alumni to build stronger professional experiences, preparation, and networking opportunities for our undergraduates and graduate students.

I'd also like to once again commend our Geosciences Advisory Council, under the chairmanship of Roger Steininger, for their continued guidance and assistance. The GAC's contributions have notably included the co-coordination of a successful new scholarship program that is already providing substantial support for our undergraduate students in attending our capstone summer Field Camp. My sincere thanks to our exceptional office staff, Sharon Gale, Patti Uman, and Jill Putman, for once again doing a stellar job this year on Field Camp coordination and so much more.

Look for increased GAC involvement in our general alumni outreach in the coming year as well. I would be remiss if I did not once again thank our great friend and alumnus, Ed Warner, for his specific and exceptional support this year in scholarship and broader advancement of the department and college. Finally, sincere thanks to Michael Smith for establishing the four-year undergraduate Smith Scholarship program in our department. This exciting program for in-state geology majors is just beginning this year (with the awarding of the first Smith Scholarship to Aren Roybal of Longmont, Colo.) – expect a major highlight on Smith Scholars to appear in our 2018 newsletter.

A handwritten signature in black ink that reads "Rick Aster". The signature is fluid and cursive, with a long horizontal stroke at the end.

Rick Aster, Geosciences Department Head

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## On the cover

Students in John Singleton's and Sara Rathburn's GEOL 201 course as photographed by Daniel Celvi, a communications intern for Warner College of Natural Resources.

*GEOScape* is the annual newsletter produced for alumni and friends of the Department of Geosciences at Colorado State University. We appreciate your continued support and welcome your thoughts.



**WARNER COLLEGE  
OF NATURAL RESOURCES**  
COLORADO STATE UNIVERSITY

Folded sediments in the Mackenzie Mountains, Northwest Territories (photo by R. Karstens).



## A Note from the Dean

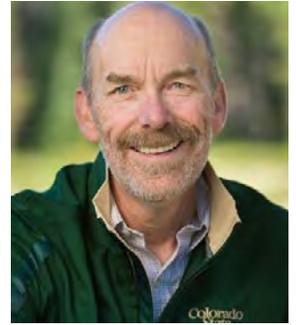
JOHN P. HAYES

As I'm sure you'll see from the accomplishments and activities described in this newsletter, it has been an exciting and productive year for Warner College's Department of Geosciences. The department has truly embraced a spirit of continual improvement, and each year's accomplishments somehow seem to outstrip those of previous years. As those of you who have had the opportunity to visit the hallways of Geosciences know, the department's offices, laboratories, and classrooms are abuzz with positive energy and the excitement of learning and discovery – an atmosphere that is continually rekindled and fueled through the intermingling of the department's core programs and faculty with exciting new faculty hires and recruitment of eager young students.

This summer, I had the opportunity to immerse myself for a few days in a foundational element of the geology degree program – Field Camp. Joining Drs. Rick Aster and Sven Egenhoff and the class in Silverton, I had the chance to engage the students in the field as they were applying the knowledge that they gained in Fort Collins to address real-world geological questions in the field and learning the techniques that most of them will build careers around. I left my time with the class with reaffirmed recognition of the quality and enthusiasm of our students and the strength our degree programs. Especially notable was the

chance to hear the impacts that scholarships and financial support for Field Camp and their degree programs has had on our students, some of whom would not be able to attend CSU without this backing. A special thanks to each of you who have helped make higher education a reality for our students through financial support of scholarships.

I hope you enjoy this issue of *GEOScape*. The next time you are in Fort Collins, be sure to come by campus to see the progress on the Michael Smith Natural Resources Building and stop in to say “hello.”



A handwritten signature in blue ink, appearing to read 'John P. Hayes'.

John Hayes

Dean, Warner College of Natural Resources



The Michael Smith Natural Resources Building is set to open in Fall 2018.



Lac Bleu in the Arolla Valley of Switzerland, a site of some of the earliest research on mountain glaciers and streams (photo by Ellen Wohl).



## **ALUMNI NEWS**

Our alumni are contributing to geosciences work and research all over the world.



# TRANSFORMATIVE JOURNEY

Life's puzzle a lesson in resilience  
for this geologist-turned-writer

**Jim Davidson,**  
M.S., Geology, 1988

When I arrived at CSU in 1986, I was seeking science and adventure. I have been fortunate to have plenty of both in my life. From 1986-1988, I studied environmental geology under the late professor, Don Doehring. His excellent guidance and support included securing a research assistant position for me, which really helped me get through grad school. I studied hydrogeology and groundwater contamination, which set me up for a wonderful career as a hydrogeologist just as soil and groundwater contamination issues were exploding.

Right after CSU, I worked as a hydrogeologist for Shell Oil, assessing and remediating subsurface hydrocarbon contamination problems. It was an intense and fast-paced job that had me working on hundreds of impacted properties across the country. While I loved the work, I did not love Houston. So, when I got married to Gloria in 1989, I moved back to Fort Collins, and have lived there ever since.

What I had learned at Shell allowed me to open my own environmental consulting practice, Alpine Environmental Inc. For the next 12 years, I worked on gasoline spills, pipeline breaks, and all kinds of subsurface contamination issues. With environmental cleanup work continuing to expand, I also taught scientific short courses across the U.S. and overseas on groundwater assessment and remediation. The multidisciplinary approaches and analytical skills that I learned at CSU got put into action when I served as a scientific expert witness on dozens of subsurface contamination legal disputes.

Along the way, I found myself deeply embroiled in the science and social aspects of a widely used gasoline additive called methyl tertiary butyl ether. As the complex topic played out in headlines and legal battles, I worked with many sharp people conducting applied research on MTBE usage, transport, and removal from drinking water. From 2002 through 2006, I continued working on these topics as senior managing scientist with the consulting firm Exponent, in Boulder.

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My geology degrees prepared me for a science career, which sharpened me for my work as a resilience speaker and writer.

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After 20 years of science and consulting, I still liked the work and felt comfortable doing it, but I was feeling pulled in another direction. Back in 1992, I had climbed Mount Rainier (14,410 feet) near Seattle with a fellow CSU alumnus, Mike Price. We summited in good order, but on the way down a hidden snow bridge collapsed beneath our feet, and dropped us into an 80-foot-deep glacial crevasse. Down inside the Emmons Glacier, I gave Mike CPR, but my good friend soon died of his injuries. I found myself alone, devastated, and injured down in the crevasse. After many setbacks, I eventually solo-climbed an overhanging ice wall out of the crevasse and barely survived. This



Jim Davidson ([www.speakingofadventure.com](http://www.speakingofadventure.com)), at 23,700 feet on the south side of Mount Everest. Jim is a resilience expert, author, adventure speaker, and expedition leader, who makes his home in Fort Collins. His epic tale of survival on Mount Rainier was featured on the Discovery Channel TV show *I Shouldn't Be Alive*. With Kevin Vaughan, he co-authored a memoir, *The Ledge – An Inspirational Story of Friendship and Survival* (2011), which was a Best Book of the Year on Amazon and a *New York Times* bestseller.

traumatic experience weighed heavily on me. As the years passed, I felt a growing urgency to share who Mike was and what happened down inside the crevasse. And so, I retooled myself into a writer and professional speaker. I left my science career behind in 2007 to vigorously pursue my new mission. Now, I speak and write to share lessons about personal resilience, resilient teamwork, and how to be a resilient leader. I miss geology, but my new career feels even more important.

Since having adventures and sharing the lessons learned is now my job, I have been on climbing expeditions to Argentina, Bolivia, Ecuador, Nepal, Tibet, and more. All these remote trips have shown me some great geology with the most powerful display being when I was caught up in a 7.8-magnitude earthquake in Nepal. I was making my first attempt to climb Mount Everest (29,032 feet) and was camped

on the Khumbu Glacier at 19,900 feet when the quake made the glacier lift and buckle beneath our feet. Avalanches roared toward us, but everyone survived at Camp 1. Sadly, there were many lives lost and many buildings destroyed all across Nepal and in neighboring countries. After doing fundraising work in 2016 to help Nepal rebuild from its biggest earthquake in 81 years, I eventually decided to return to Everest. This expedition went much smoother and I was thrilled to summit the mountain on May 22, 2017. My geology degrees prepared me for a science career, which sharpened me for my work as a resilience speaker and writer. Though I could never have predicted it, this transformative journey makes sense in hindsight. After all, life is a series of puzzles to solve, challenges to overcome, and opportunities to seize.

— By Jim Davidson

GEOL 201 students studying a sedimentary section near Fort Collins.





## **STUDENT HIGHLIGHTS**

Our students experience a comprehensive learning environment of knowledge-gathering, research, outreach, and career-mentoring.

## STUDENT HIGHLIGHTS

### Andrew McCarthy, M.S. Graduate Student

I was lucky enough to land in the Front Range after stints on both coasts. I grew up in Southern California and went off to Maine for my bachelor's degree (Colby College, 2010). Upon graduation, I returned to Los Angeles, where I worked as a petroleum geologist for five years before coming to CSU to pursue my master's degree. I was awarded the Edward M. Warner Research Assistantship in Fall 2016 to work with Dr. Lisa Stright as a part of the Rocks2Models consortium, a joint effort with the University of Utah, working to improve the predictive power of petroleum reservoir models with fine-scale outcrop characterization.

My major objectives in returning to school were to strengthen my field experiences and skills while learning how to better link outcrop studies with subsurface analyses. Working with Dr. Stright on Rocks2Models was a fantastic opportunity in that regard. The growing petroleum program and proximity to Rocky Mountain outcrops made CSU an obvious choice, and I am having a phenomenal experience here. It has been an absolute joy to work with and learn from such an academically diverse and engaged group of faculty and students. Geosciences is inherently multidisciplinary, and I draw on the expertise of friends and colleagues in different sub-fields every day.

Last fall and early this summer, I ventured to the Kaiparowits Plateau of southern Utah to measure stratigraphic sections in the John Henry Member of the Straight Cliffs Formation to characterize estuarine and tidal channel-and-bar complexes and collect data for subsurface models. I spent the remainder of my summer on campus, experimenting with facies data from fluvial point bar outcrops in the Horseshoe Canyon Formation near Drumheller, Alberta, Canada. We tested various geostatistical algorithms for their capacity to replicate outcrop qualitative character and leverage bedform statistics, and plan to present preliminary findings at both the GSA Annual Meeting in Seattle and AAPG's Annual Convention and Expo in Salt Lake City (May 2018).

In addition to my research and course work, I have served as the AAPG Student Chapter's president since January 2017. The CSU chapter, re-activated in early 2016, after a long hiatus, and has since worked to build up a membership base, bring in speakers, and foster professional development for geosciences students interested in



petroleum careers. In the spring, the chapter hosted a technical talk on Anadarko-basin unconventional resources through the Rocky Mountain Association of Geologists, and, for the fall semester, is working to bring in technical speakers focused on unconventional resources and petroleum land issues here in the Front Range, as well as organize local field trips.

I intend to graduate in Spring, 2018 and return to work in oil and gas armed not only with a strong base of knowledge but also with so many invaluable connections and friendships forged here at CSU. The people are what make this place truly special.



Sara Pharazyn, third-year undergraduate student in geology and president of the Geosciences Club. The club continues to expand student geoscience experiences and expertise, and extends an open invitation to alumni to share their experiences and skills with CSU students at future club meetings and on field trips.

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### Sara Pharazyn, Geology Major

I am third-year undergraduate geology major. I am originally from Ohio and moved to Colorado so I could attend Colorado State to be a geology major. When I think back to when I was a kid, I can't remember a time I didn't want to study geology or paleontology. In high school, I was the only person to participate in the district science fair, but this is where most of my thoughts and ideas about geology

## STUDENT HIGHLIGHTS

started to flourish. Today, I still have a passion for paleontology, but I have discovered more amazing directions in geology that have provided me with a world of possibilities.

For the last three years, I have worked as a work-study assistant in the front office of the Geosciences Department, helping to organize geological maps, chemicals, and supplies, as well as running errands, filing paperwork, and posting events to the bulletin boards and website. I have helped set up many events and speakers in the department, giving me the chance to meet and speak with a number of leading academics and industry visitors.

This year, I was elected president of the Geosciences Club in the department. The club has three associated student chapters, including the Society of Economic Geologists, the American Association for Petroleum Geologists, and a recent partnership with the American Institute for Professional Geologists. A central goal of the Geosciences Club is to provide additional opportunities for students to learn and experience geosciences, outside an academic setting, through speakers in different geoscience professions, field trips to different parts of Colorado and the Western United States, and trips to geologic conferences and events.

This semester, the club has focused on professional development for the students, featuring speakers such as the Warner College academic coordinator, Leanna Biddle, in a resume-building and networking workshop before the All-Campus Career Fair, and the graduate coordinator, Sharon Gale, in an applying to graduate school 101 workshop. Our future speakers this semester include Mike Viney, CSU alumnus and preparer of the petrified wood collection in the Geosciences Department, and college namesake Ed Warner. This October, Geology Club led a rockhounding trip, and, in November, we joined the paleontology class on a trip to the Denver Museum of Nature and Science to meet the head curator of the mineral collection and the head dinosaur preparator.

The club also focuses on community and outreach to the greater Northern Colorado area. This has included presenting at the Shepardson Elementary School's Family STEM night, as well as helping a third-grade class at the Werner Elementary School with their geology lessons. The club participated in the Colorado State Fall Clean Up Day, which included helping individuals in the community with outdoor chores before the winter sets in. The club also participates in a fundraising event through CSU, called RamRide, which provides a safe drive home from parties or events for CSU students and the Fort Collins community.

During the spring of 2018, the club focus will be on exposing students to different jobs and other opportunities available after graduation. We are looking into having the curator of the Colorado School of Mines Museum come to talk about

the collections before we take a trip to tour the museum, and we are exploring expanding outreach to other parts of Colorado in partnership with the Pinhead Institute in Telluride. The Society of Economic Geologists is also planning another ambitious spring break trip for geology students in 2018 (this time to Arizona and New Mexico).



Kayla Stott in Northern California. Kayla is a geology major with an environmental geology concentration (and is currently taking Jerry Magloughlin's mineralogy class!).

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### Kayla Stott, Geology Major

As an aspiring geologist, I trace my interest in geology and mineralogy back at least three generations, to my great-grandfather, Charles E. Stott (1896-1978). He was a mining engineer with a particular interest in geology and mineralogy. Beginning in the late 1920s, he explored and evaluated ore deposits throughout the southwest U.S. and Mexico, often on horseback with his pocket transit and pistol on his hip. His fieldwork also took him to South America, Africa, and Europe. The highlight of his career occurred from 1953 to 1965, when he was the general manager of the famous Tsumeb Mine in southwest Africa (now Namibia). My great-grandfather described Tsumeb to a newspaper reporter as "the damndest mine in the world," and for good reason. Not only did it produce large amounts of copper, lead, zinc, silver, germanium, and cadmium, Tsumeb also contained an amazing variety of minerals in three oxidation levels. At least 292 different mineral species were >

### Stott | Continued from previous page

found, and Tsumeb is the type locality for an astonishing 72 minerals. One of these, a hydroxide of iron and germanium,  $\text{FeGe}(\text{OH})_6$ , was discovered in 1957 by a miner named Friedrich Gramatzki. Hugo Strunz (of Strunz mineral classification fame), P.G. Söhnge, and Bruno Geier (Tsumeb's chief mineralogist) named the new mineral "stottite" in honor of my great-grandfather. Thought to be world's first-discovered naturally occurring germanate (germanium-oxygen mineral), stottite is extremely rare and, to this day, has only been found at Tsumeb. The mineral is so rare that at this year's annual Denver Gem & Mineral Show, attended by our Mineralogy class, one specimen of stottite only a few millimeters across had an asking price of \$17,500!

In addition to the great variety of minerals found or first identified at Tsumeb, the mine also produced especially fine and large crystals of such minerals as azurite, malachite, cuprite, smithsonite, diopside, and wulfenite. One of these specimens, a group of giant azurite crystals measuring nearly 10 inches across, was used by a miner to pay his bar tab at the Eckleben hotel, the local non-management watering hole. It sat on display at the bar until my great-grandfather convinced the proprietor it would be in his best interest to return the azurite, which my great-grandfather then sent to company headquarters in New York. Known as the "Newmont Azurite" (Newmont Mining had a large stake in Tsumeb) and called "The World's Finest Mineral Specimen" (Conklin, L.H., 2016, *Mineralogical Record*, 47: 333-335), it is now the centerpiece of the American Museum of Natural History's Harry Frank Guggenheim Hall of Minerals. This year, my family donated a photograph of the Newmont Azurite to the AMNH, taken by Bruno Geier in 1962, because the back of the photo says that the specimen was found at the 28 level in Tsumeb's second oxidation level, and not the first oxidation level as had previously been presumed. These are some of the reasons I dig minerals!

### Phil Dalhof, Society of Economic Geologists Student Chapter

Ambitious is probably the best way to describe our chapter's activities. Both during our inaugural year, as well as our plans for the future, our chapter has strived to develop a program that is as inspiring as our members are motivated.

To join the SEG student chapter, one should be serious about the pursuit of knowledge in the field of ore deposit geology. However, we felt this would limit not only chapter participation, but also the scope of information being discussed. Thus, we determined that the pursuit of knowledge should also extend to the fields of structural geolo-



Club members at Barrick's Cortez Hills, Nevada, mine.

gy, geochemistry, petrology, mineralogy, sedimentology/stratigraphy, geophysics, hydrogeology/hydrology, and geomorphology as they pertain to the genesis, discovery, and extraction of "economic" minerals and elements. Both graduate and undergraduate students are encouraged to participate. Furthermore, we do not require chapter dues to become a member, only that they are serious about our chapter, and that they consider joining the global Society of Economic Geologists (our parent organization).

So, what has made our program so impressive? It is our members and their dedication to chapter activities, ranging from volunteering opportunities to academic presentations to field trips. Our chapter's primary form of volunteering is organizing and supervising the Rocks and Minerals section of the Science Olympiad competition. This competition is for middle school and high school students, and aims to expose them to and spark an interest in our wonderful world of geology. In 2017, the club participated at both the Northern Colorado regional and state levels. For 2018, we have already confirmed that we will participate again at the Regional level, and looking forward to the possibility of helping out at both the state and national levels.

To challenge our members academically, we require that they prepare presentations for our biweekly meetings and for our field trips. During our bi-weekly meetings, members volunteer to present a 20-30-minute presentation on topics relating to economic geology that hold specific interest to the presenter (e.g., "Ore Deposit Geochronology," "Overviews of Mining Methods and Terminology"). To participate on our extended field trips, our members have to research, prepare, and present papers (on topics relating to the places we visit. These papers are also compiled into comprehensive road journals for each of the participants.

## STUDENT HIGHLIGHTS



Club Chapter President Phil Dalhof (left; in profile) and club adviser John Ridley with SEG Chapter students at Mono Lake during the 2017 spring break field trip.

Above all, it is our field trips that really excite our members. To date, we have conducted three large trips. During the Spring Break 2017, 13 of our members went on a roughly 2,000-mile trip through Utah, California, and Nevada. On this trip, we were able to visit and explore the stratigraphy of the Colorado Plateau at Zion National Park, borate mines in Death Valley, epithermal gold systems in Mono County, porphyry copper and skarn systems in Yerington, and Carlin-type deposits near Elko (with Rachel Toler, B.S., '16). In August, we were fortunate enough to participate in a single-day trip led by Howard Coopersmith (B.S., '75) to visit the Northern Colorado kimberlites. Most recently, seven of our members traveled to Montana for four days, visiting the Culvert Hill Skarn, Stillwater Igneous Complex, Montana Resources Continental Pit, and Montana Tech's mineral museum.

Going forward, our chapter has two more field trips planned: one to a pegmatite system south of Colorado Springs, and the other to Arizona and New Mexico during Spring Break 2018. Currently, the spring trip is scheduled to include a uranium breccia pipe at the bottom of the Grand Canyon, porphyry copper deposits at Bagdad, Morenci, Ray, and Superior, Ariz., and REE deposits in New Mexico. As with

previous trips, we will try to connect with CSU alumni who now work in industry. On this trip, we plan to meet up with Alexandra Racosky (M.S., '17) at Rio Tinto's Resolution Mine in Superior, Ariz. All trips are open to friends and alumni (highly encouraged) and students.

Funding for our trips has come from our industry mentor Roger Steininger (Ph.D., '86), and the Society of Economic Geologists Stewart R. Wallace Fund, both to whom we are extremely grateful, and from the students themselves.

### Get social with us!

Stay connected, share, and get news.

**Public group to join: Colorado State University Geosciences Club**  
**Warner College page:**  
**@WarnerCollegeofNaturalResources**



@csuwarnercollege



@WarnerCollege

Sven Egenhoff and students at Field Camp near Silverton.





## **OUR FACULTY and RESEARCH STAFF**

Our faculty and research staff explore the wide world of geosciences.

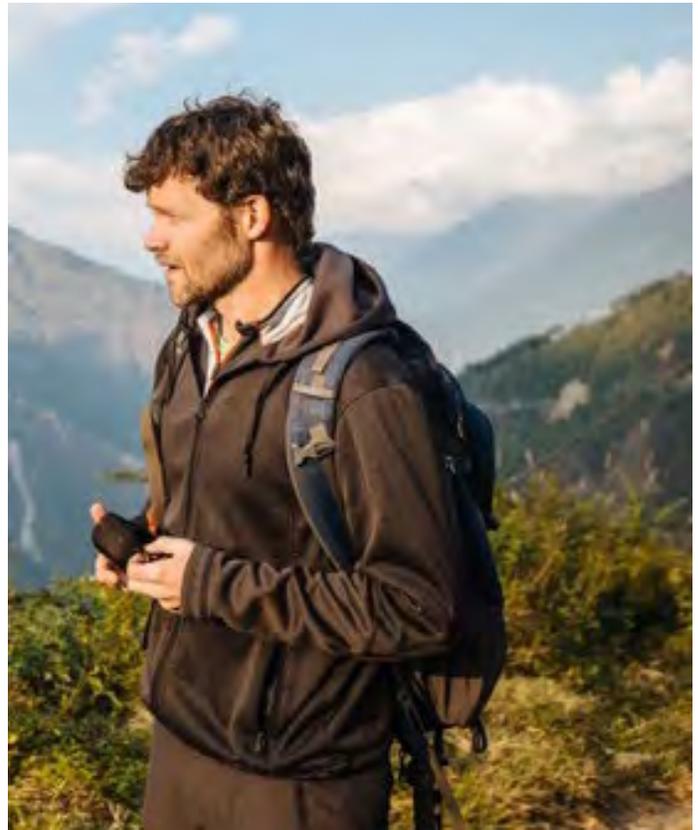
## WELCOME

### Sean Gallen, Assistant Professor

I am a geologist who studies the various physical and chemical processes that shape the Earth's surface. I enjoy studying this topic because it is inherently interdisciplinary, lying at the intersection of process-based geomorphology, critical zone science, active tectonics, geodynamics, structural geology, and geologic hazards. My research aims to better understand the feedbacks between the tectonic, climatic, chemical, and biological processes that shape topography, how topographic change affects mass and nutrient fluxes, weathering rates, and the evolution of aquatic species, and how geomorphic archives can be used to inform our understanding of tectonic, geodynamic, and climatic processes. To address my research questions, I use some combination of detailed field studies, geographic information systems, analytical techniques, geochronology, laboratory and data analysis, and numerical models. My wide range of research interests lends itself well to collaborative research, and I am looking forward to new interactions with faculty and students throughout CSU and at other universities across the Front Range.

I am presently working with domestic and international collaborators on a variety of projects from using geomorphology to understand the dynamics of subduction zones to understanding the role of large earthquakes on sediment transport and geochemical processes in places such as Greece, Nepal, and the U.S. I plan to continue work on these and other research topics. One project that I have been working on over the past few years that I look forward to expanding, is the development of topography in post-orogenic mountain belts and its impacts on erosion, sediment dispersal, intraplate seismicity, and aquatic species evolution. My research indicates that spatial and temporal variations in rock types exposed at the surface through erosion plays an important, but generally underappreciated role in the dynamics of ancient mountain landscapes. Using the southeastern U.S. as a natural laboratory, I have been able to relate rock type-triggered changes in river network geometry and erosion rate to anomalous intraplate seismic zones and major evolutionary events encoded in the DNA of fish and salamanders. Beyond the obvious implications for earthquake hazards and aquatic species evolution, this research has potentially important implications for improving understanding of sediment flux and dispersal patterns in resource-rich basins in the Gulf of Mexico and Atlantic Ocean.

In addition to starting my research program, I am excited to begin teaching at CSU. In the fall of 2018, I will initially be teaching the introductory geology majors course and a 300-level class on critical zone science. Critical zone science is the study of the interactions between the solid Earth, hydrosphere, atmosphere, and biosphere that, among other things, leads to the development of soils that support much of life of terrestrial Earth. I like to think of critical zone science as the study of the Earth's weathering reactor. I am particularly excited about developing and implementing this course, as it provides the ideal opportunity to demonstrate an integrated Earth-systems approach to the geosciences. On arriving in January 2018, I will be offering Tectonic Geomorphology for senior to graduate-level students, and, in the



Sean Gallen in Nepal. Sean will be joining the department as an assistant professor in January 2018.

summer, will teach a new one-week Field Camp module to bring new Earth surface process and mapping content to the course. I also plan to regularly offer a seminar-style courses related to solid Earth-biosphere-atmosphere interactions, and am working with other faculty members to explore a course that would be targeted at enhancing students' computational and problem-solving skills with specific applications to Earth science.

While at ETH-Zurich, I have advised two Ph.D. students and three M.S. students. I envision growing my program to support a research group of similar size, working on a host of different projects. I am enthusiastic about enticing motivated undergraduate students into various aspects of my research agenda. In my experience, one way to get young scientists involved in research is through new technology. Many aspects of my research use unmanned aerial vehicles, or drones, to monitor and detect changes in the Earth surface in great detail. I am optimistic that I can use this technology to encourage undergraduates to dive into research earlier in their careers. I am also excited to get involved with researchers through the CSU-wide drone users community. I think that the overlap of methodological interests that has brought together this diverse group of scientists will lead to new and exciting collaborations throughout the University. I look forward to joining and working with the faculty in the department, college, and University, and anticipate many fruitful collaborations.



**Rick Aster,**  
Department Head

I continued to advise two Ph.D. students, Michael Baker and Nicole McMahon, and to work on a variety of research and teaching projects. Nicole, in addition to co-authoring several papers on the remarkable recent history of induced seismicity in Oklahoma, published a first-author paper on the aftershock evolution of the 2011 Prague, Okla., (M 5.7) earthquake using advanced earthquake and detection subspace methods that we have been developing and implementing with colleagues at the U.S. Geological Survey's National Earthquake Information Center in Golden. Another Ph.D. student, Rob Anthony, graduated this year and is now employed by the U.S. Geological Survey at its Albuquerque Seismological Laboratory.

I organized a weeklong NSF-funded international Glacial Seismology course for students from 16 nations this June, with help from Dan McGrath and other colleagues from the U.S. and Europe (Fort Collins and CSU are an excellent place to hold a workshop in June!) that included a spectacular day trip to Rocky Mountain National Park, led by Dan, to examine glacial landforms and discuss the dynamics of some of the small glaciers in the park. Course collaborator Paul Winberry (Central Washington University) and I also wrote a comprehensive review paper on glacial seismology which was published this year in *Reports on Progress in Physics*.

With Derek Schutt and Jeff Freymueller (University of Alaska), I engaged in fieldwork in Yukon and Northwest Territories

this summer, along with department graduate students, Michael Baker and Derek Witt, and our colleague at Yukon College, Joel Cubley. It was another beautiful field year in northern Canada, with spectacular float plane travel and good weather (compared to the relentless rain of last year). We also learned more than we wanted to about grizzly bear interactions with remote seismographic equipment (which is generally not a good thing). Despite the wildlife and technical challenges of this project, we recovered an excellent and substantially complete first year of seismographic data spanning the Mackenzie Mountains (the instruments will remain in the field for one more full year), and also graduated our first student related to this project (Derek Witt, M.S., '17). Derek promptly got hired for a job in Fort Collins working for Bob Stollar (M.S., '69) and Ed Warner's (B.S., '68) exciting water management company, SWIIM System (which was recently lauded by *Forbes* as a top 25 innovative ag startup).

I also have two ongoing projects in West Antarctica advancing understanding of the geophysics of the Ross Ice Shelf (with Michael Baker) and the large-scale geophysical structure of the Antarctic plate and icecap. My Antarctic collaborators and I expect to have some significant papers arise from these projects in coming months (including a paper just accepted by *Geology* on lithospheric delamination beneath the Transantarctic Mountains).

Finally, I continue to work with my co-authors, Brian Borchers (New Mexico Institute of Mining and Technology) and Cliff Thurber (University of Wisconsin) on the third edition of my textbook, *Parameter Estimation and Inverse Problems*, with plans to complete this project by the end of 2017. The book revision was aided by my teaching a graduate-level Solid Earth Inverse Methods class this spring to students from the department and college.

**Sean Bryan, Instructor**

Highlights from the past year include teaching our general education Introduction to Geology course (GEOL 120) and coordinating the Intro to Geology Labs (GEOL 121). Interest in our introductory courses continues to be very strong; during the 2016-17 school year, 1,097 students took GEOL 120 and 889 students took the GEOL 121 lab. We continue to look for ways to improve our introductory-level instruction and expand the reach of geosciences into the broader University community. As a part of these goals, we are bringing some of our geology major students into the GEOL 120 classroom as learning assistants. The LAs help to answer questions and promote active learning during class sessions. Serving as an LA also provides our geology students with an additional opportunity to gain teaching experience as undergraduates.



I also had the pleasure to co-lead the WCNR-Alliance Summer STEM Institute for the second time this past summer. During the program, we brought 21 students from CSU Alliance Partnership high schools (<https://accesscenter.colostate.edu/alliance-partnership/>) to campus to spend a week gaining a collegiate experience and learning about Earth sciences and sustainability. Highlights of the program involved trips out to the Pawnee Buttes and the CSU Environmental Learning Center, and two days at the CSU Mountain Campus, where we saw moose, thought about the formation of the Rocky Mountains, and measured ecosystem recovery after fire.

This fall, I am excited to be adding an undergrad/grad-level seminar to the mix, focused on the geologic carbon cycle and the lessons that Earth's past can teach us about our current perturbation to the carbon cycle.

**Andy Darling,**  
Research Scientist

The last year has seen major advancements in two ongoing projects on the landscape evolution of the Colorado Plateau. One project, in Desolation Canyon, Utah, included a research rafting trip with M.S. student Marissa Fichera and New Mexico colleagues this summer to collect samples for detrital sanidine dating (looking for terrace ages and provenance data) and detrital cosmogenic samples to measure erosion rates. We also have begun a collaboration with industry geologists who have significant unpublished sedimentological data on the rocks being eroded in the canyon, which we are looking to use as proxies for rock strength to further understand relationships between topography, erosion rates, and rock strength in the canyon, as we piece together the incision history of the Green River. The second project that I am wrapping up will produce two papers to flesh out the relationship between rock strength and erosion patterns in the Grand Canyon, as I continue to add detailed cosmogenic erosion rate datasets and theoretical development to our understanding of this iconic landscape. I am looking forward to another great year at CSU!



Floating between sample collection spots along Desolation Canyon in eastern Utah.



**Sven Egenhoff, Professor**

I have recently been reappointed section editor for *Marine and Petroleum Geology* for the third year in a row, now with a term of two years, 2017-2019. The position is based on excellence in shale research, and comes with a small honorarium that I plan to spend on research in Scandinavia for me and my graduate students. The section editor position consists of editing and assigning reviewers to up to 100 documents per year (!). I also recently accepted the associate editor position for the *Journal of Sedimentary Research*, one of the most highly ranked journals in sedimentary geology. The nomination for JSR is based on an invitation by the main editor and consists of editing and keeping track of manuscripts sent to the journal, assigning reviews, and evaluating their timeliness and scientific rigor. More information about these journals can be found at: [www.journals.elsevier.com/marine-and-petroleum-geology](http://www.journals.elsevier.com/marine-and-petroleum-geology) and [jsedres.geoscienceworld.org/](http://jsedres.geoscienceworld.org/).

**Judy Hannah, Professor**

The past year was one of many smiles and exciting new work. I continue to teach the core course in Igneous and Metamorphic Petrology, thereby getting to know the latest cohort of undergraduate students. Thesis committees, teaching assistants, the new Social Seminars that Andy Darling is organizing, and innumerable social conversations let me interact with the graduate students. Research continues to be centered on Re-Os and related geochemistry with the AIRIE Program, as outlined in Holly

Stein's piece. Graduating two superb M.S. students, Marisa Connors and Jenna DiMarzio, was the best gift of the year.

Yes, Holly and I still spend half the year at University of Oslo, where we are increasingly steeped in organic geochemistry and petroleum geology. Despite the recent downturn in the industry, there is still plenty of activity in the North and Barents seas, and we are now engaging in petroleum projects across the world, as we have done for two decades in economic geology. With research associate Svet Georgiev at the head, we are leading the world in radiometric dating of oils and detailing the temporal evolution of whole petroleum systems. Postdoctoral associate, Nicole Hurtig, is undertaking groundbreaking experiments to determine the fractionation of Re and Os among hydrocarbon components and water. Gang Yang and Vineet Goswami are working on several other projects while CSU alumnus Aaron Zimmerman keeps the lab humming. Holly tells the rest of the story.



The National Park Service Geologic Resource Inventory group (profiled elsewhere in this newsletter), funded through a cooperative agreement with CSU, continues to win kudos for their innovative GIS data model, valuable reports on geologic features (and hazards) in individual parks, and overall high productivity. Stephanie O'Meara, Jim Chappell, and James Winter (all CSU alumni) reside in the department at CSU, working with a rotating team of student interns. Five others work from remote or home offices, including CSU alumni Trista Thornberry near Missoula, Mont., and John Graham in Fort Collins. Over the past 18 years, the growing team has completed a GIS with geologic data and report for

almost every park unit and is now working on updating and improving legacy data. All products are publicly available online at the NPS Data Store at <https://irma.nps.gov/DataStore/> (Select Natural Resource Inventories.)



**Dennis Harry, Professor and Edward M. Warner Chair in Geophysics**

Dennis is on sabbatical this year. This fall, he is participating in an International Ocean Discovery Program cruise (No. 369), which has the theme of Australia Cretaceous Climate and Tectonics. Among other things, this cruise will be exploring the early Cretaceous Naturaliste Plateau. The plateau extends from Western Australia into the Indian Ocean, and connects in an impactful way with the history of West Antarctic rifting, relationships between extension and magmatism, and with the breakup of Gondawana as Australia separated from India and, later, Antarctica. Dennis will also be collaborating this academic year with colleagues at CU Boulder on western tectonics, extension, and geodynamics, and its relationships to syn-rift magmatism and the uplift of the High Plains.

A Fort Collins rainbow seen from Horsetooth Reservoir Park (photo by Rick Aster).







**Jerry Magloughlin,**  
Associate Professor

This past school year started with Mineralogy and Optical Mineralogy as usual; both were a little bit smaller after the previous several years of very large classes. John Singleton and I led a department “Geology of the Rocky Mountains” trip to the Black Hills, which was fun as always. I did a little fieldwork in October in the Cascades, which is a fantastic time to be there as the maples are in brilliant colors. Derek Schutt and I co-taught a fun department seminar class on various aspects of ultramafic rocks.

I was on sabbatical during spring semester, so no teaching, which is always strange, but plenty of travel, fieldwork, and research. I went along with John Singleton and students to Chile, which was wonderful, despite my encyclopedic knowledge of between 20 and 30 Spanish words. I had long wanted to see the Atacama Desert, and the photography was wonderful. We spent a fair bit of time in the San Pedro de Atacama area, where I had a wonderful visit, and toured the highest geyser basin the world. It took only three tries, as I was chased out by thunderstorms and even hail, and narrowly missed some flash flooding. We toured the Cerro Paranal Observatory, a place I had heard about for decades, and it was amazing to see those giant telescopes in the thin dry air of the desert.

In April, I returned to New Zealand, as a bit of a getaway, for fieldwork, and for a photographic visit to the Kaikoura area, a place I knew well before the recent earthquakes. I heard some fascinating stories from the locals, and did a helicopter video/photo flight

around the area, with no door and only a harness to keep me in place. Very fun on the tight turns, and amazing to see all the seabed uplifted and so cleanly exposed. In May, I attended the GSA Cordilleran section meeting in Honolulu, where the conveners seem to always have trouble getting attendees to, well, actually attend the meeting. I gave two talks on mineralogic and petrologic/tectonic topics. I flew back and forth to the Big Island a couple of times, shooting Halemaumau Crater, which is currently the largest lava lake in the world and lights up the sky at night, as I witnessed at 4 a.m. from the Jaggar Museum (Check out my YouTube channel; my Hawaii lava flows video has roughly 170,000 views!). Back home, I taught some courses this summer, and traveled to Franklin, N.J., which

mineral fans know as the fluorescent mineral capital of the world, where I was given great access to both the mine and minerals.

Since May, we’ve been watching the new Smith Building slowly taking shape on our front doorstep; the view out of the Mineralogy/Petrology lab will, before too long, be a view into a hallway of the new building. There has been a lot of work going into the role of this new building and how it will change things, and we’re hoping to have an extensive geo-presence there. In other news, graduate student Adrian Kahn not only got a job in Texas, but successfully defended his thesis work – two things that always go well together. As always, keep in touch or stop by for a visit if you’re in the vicinity.



Conducting a summer LIDAR scan of Andrews Glacier in Rocky Mountain National Park with UNAVCO colleagues.

**Dan McGrath, Research Scientist, Instructor,**  
and Assistant Professor (Fall 2018)

It’s been a great year filled with exciting fieldwork, new collaborations, and conferences/workshops!

In January, I presented at a workshop on ice shelf stability in Wales, which was timely, given the increased scrutiny of a large fracture crossing the Larsen C Ice Shelf in Antarctica at that time. In the months leading up to the eventual calving of iceberg A-68 from Larsen C, I joined NPR’s *On Point* (<http://www.wbur.org/onpoint/2017/01/10/antarctic-ice-shelf-global-physics>) and CBC’s *Quirks and Quarks* science show (<http://www.cbc.ca/listen/shows/quirks-and-quarks/segment/12973781>) to discuss the causes and implications.



During the spring, I conducted fieldwork at various sites, including Grand Mesa, Colo., as part of the NASA SnowEx mission to develop satellite-based approaches to measure snow water equivalent, and two different glacier mass balance projects in Alaska and Colorado.

Another highlight this year was participating in the Glacial Seismology Training School organized at CSU by Rick Aster in June, which brought together 10 instructors and more than 40 students from 16 countries, to discuss this rapidly developing field. Lastly, I presented new results from my study of glaciers in Rocky Mountain National Park at the International Glaciological Society Meeting in Boulder this August.



Sara Rathburn, associate professor, with Matt Sparacino, (M.S., '17), conducting an ER survey along the upper Colorado River in Rocky Mountain National Park (photo by D. Dust).

**Sara Rathburn,**  
Associate Professor

Highlights of the 2016-2017 academic year include the launch of my course, Field Geomorphology, with 11 graduate students enrolled, and welcoming Johanna Eidmann as a new M.S. student in the fall. Johanna's research quantifies and characterizes the ongoing flux of 2013 Front Range flood sediment into an important water supply reservoir. I also welcomed back Annette Patton, a former M.S. student who stayed on to work with me for her Ph.D. Annette is mapping and assessing landslides in Denali National Park and Preserve to understand mass movement hazards under a changing climate. I gave an invited talk at GSA and helped three graduate students prepare for talks or posters. I also worked closely with postdoc Georgina Bennett (shared with USFS colleague Sandra Ryan) on several field projects and manuscript preparation before she landed a faculty position at the University of East Anglia, U.K., and with visiting Ph.D. student, Francesco Mditieri, University of Salerno, Italy.

In spring, my co-authors and I celebrated the publication of a *Geology* article on the fate of 2013 flood-eroded sediment, wood, and organic carbon. My Ph.D. student, Derek Schook, graduated and began a postdoc with the National Park Service, and Matthew Sparacino completed his M.S. thesis and took a job as a geomorphologist in Calif. I taught Historical Geology and

always look forward to bringing NASA's lunar samples to class and hosting various guest speakers, including CSU alumnus Joe Sertich (curator of dinosaurs, Denver Museum of Nature and Science). Over the summer, fieldwork took me with graduate students to the Colorado River, where horses helped carry electrical resistivity equipment, on a boating excursion on Ralph Price Reservoir to collect bathymetry and sediment cores, and fly a drone (with pilot David Dust, Research Assistant) along North St. Vrain Creek, and basically schlepping gear into remote places of geomorphologic intrigue. A good year, indeed!

**John Ridley,**  
Associate Professor and  
Malcolm McCallum Chair in  
Economic Geology

This is the first active year of the newly formed Society of Economic Geologists Student chapter in our department. The activities and development of the Chapter are described in detail elsewhere in this issue of *GEOScape*. As faculty adviser, I participated in and contributed to field trips of the chapter, including the inaugural week-long trip over spring break to Nevada, California, and surrounds, visiting and discussing both ore deposits and some classic geological sites. The majority of my summer was spent with M.S. students – starting two new students on projects in Montana, and guiding others through their writing and defenses, and hence onto careers as geologists.



**Mike Ronayne,**  
Associate Professor

Along with students and colleagues from Natural Resources, Agricultural and Resource Economics, and Civil and Environmental Engineering, I recently completed a study of the energy required for groundwater pumping throughout the Denver Basin regional aquifer system. Groundwater depletion over several decades has resulted in increased pumping lifts and rising energy costs to produce groundwater from these aquifers. This work has been submitted for publication and will hopefully be in press soon. In January, I published an article in *Journal of Hydrology* that documents a new modeling analysis to evaluate the potential for streamflow augmentation by managed aquifer recharge. My group also continues to study natural groundwater recharge processes in the Denver Basin. M.S. student Kristen Cognac is investigating recharge from alluvial channels in Douglas County, Colo., to better understand current rates of groundwater replenishment (photos available).

In the spring, I taught a section of The Blue Planet: Geology of Our Environment. This course has seen increasing enrollment, with 198 students in the spring offering this year! I also continue to teach graduate-level courses in Groundwater Modeling and Geostatistics.



**Top:** M.S. student Derek Witt (left) and Yukon College colleague Joel Cubley retrieving data from an autonomous seismograph at Macmillan Pass, near the Yukon/Northwest Territories border, during 2017 Mackenzie Mountains project fieldwork. **Left:** Ph.D. student Michael Baker surveying a bear-visited seismic station at Dodo Lake, Northwest Territories (the station still returned excellent data).



Collaborating student Edda Saiza from Universidad Mundial in La Paz sampling water at Todos Santos, Baja California Sur, Mexico.

**Bill Sanford,**  
Associate Professor

2017 has been a productive year for research. For one project in Todos Santos, Baja California Sur, Mexico (near the CSU campus), we are studying the hydrogeology of the local aquifer, for which I made two trips to Mexico to collect water samples for chemical and stable isotope analysis. Our main goal is to create a numerical model of the aquifer to be able to predict the effects of increased water extraction and the potential effects of sea level rise on a local estuary. Currently, graduate student Marissa Fichera is analyzing these data.



A second project involves quantifying the groundwater contributions to baseflow in several headwater streams in the Medicine Bow-Routt National Forest with the U.S. Forest Service. We have collected water samples for chemical and isotope analysis this summer and fall. By quantifying baseflow, the effects of increase water diversions on in-stream flows can be predicted. Amber Lidell, an incoming graduate student, will be analyzing the data.

A third project is a continuation of looking at the transport of carbon nanoparticles through porous media under varying chemical conditions. The results of the experiments will be used to help understand flow and transport of hazardous nanoparticles in natural systems. The experiments and interpretations are being done by graduate student Tyler Gilkerson.

Finally, I have been working with colleagues at Cornell University to prepare a proposal to the Department of Energy to create a well field facility at the CSU Foothills Campus for the development and testing of a comprehensive suite of tracers, including heat and nanoparticles, to characterize flow and transport in fractured rock. Our goal will be to determine the volume of fractured rock encountered and develop a better method of quantifying flow through fractures in a field setting. An oil company research group is very interested in collaborating with us on this.

**Derek Schutt,**  
Associate Professor

I had a busy field season this summer, working with Rick Aster and graduate students, Derek Witt and Michael Baker, in the Mackenzie Mountains of the Yukon and Northwest Territories. This is the third year of a five-year NSF-funded project to investigate why a mountain range can be actively uplifting so far inland from the plate boundary (and perhaps give us insights into the formation of the Colorado Rocky Mountains). M.S. student Derek Witt did a spectacular job coordinating the fieldwork and is graduating this fall.



M.S. students Aditya Khare, Kivanc Subunis, and David Heath are also studying the Northern Canadian Cordillera and we are presenting early results at the American Geophysical Union meeting in December. Additionally, my work with colleagues at Utah State University and Scripps Institute of Oceanography on the temperature of the base of the Western U.S. crust has just been accepted to *Geology*. We are now working on several related follow-up projects that assess the role of temperature and composition in lithospheric strength.

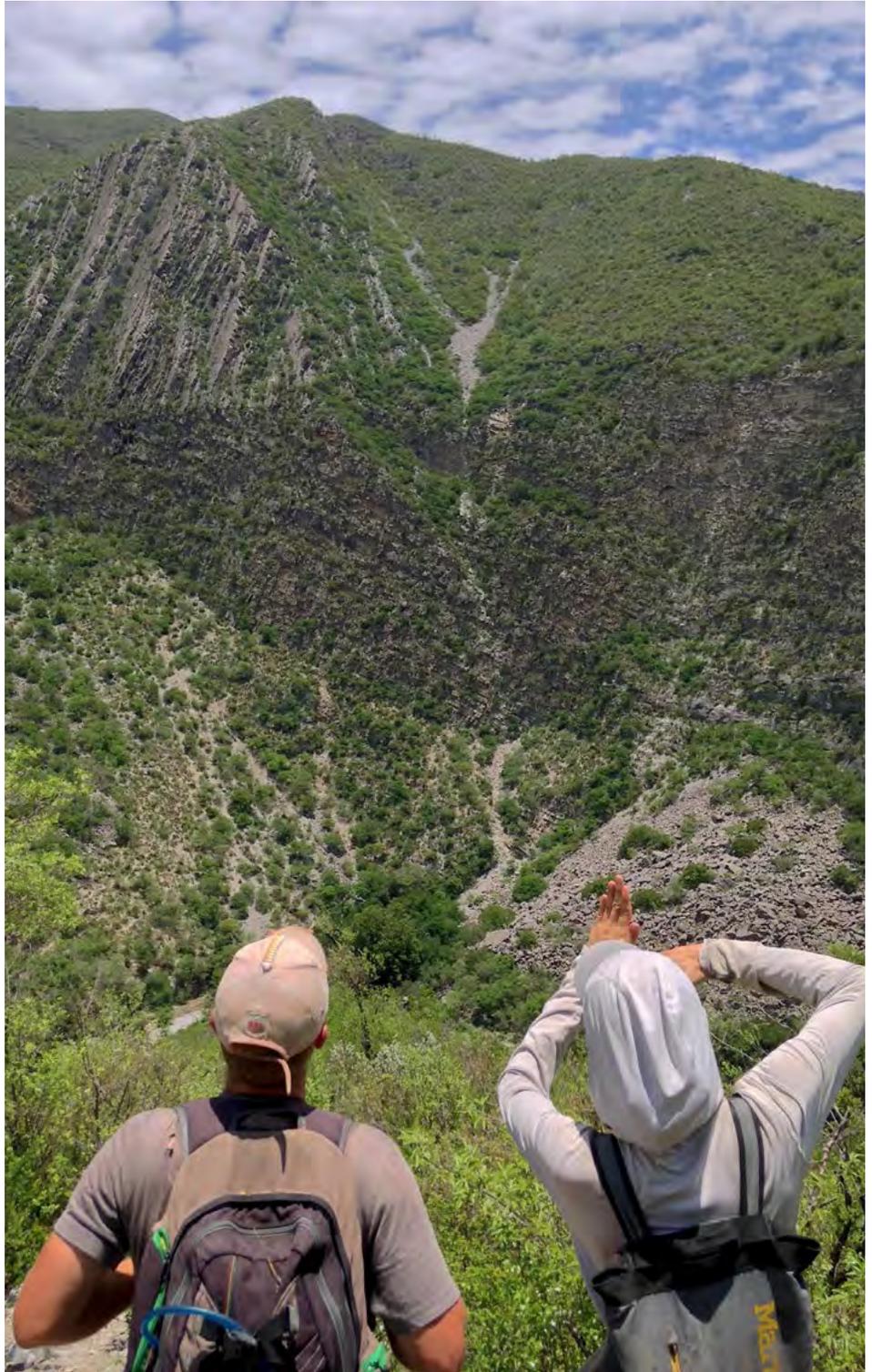
Teaching has also been going well. I am piloting some active “flipped” learning into my geophysics and seismology classes, as I carefully test how to bring the research on physics and math education into my teaching. I have also had the pleasure of working with student researchers David Herman and Yashwant Soni. David presented a poster on shear wave splitting in British Columbia at a CSU undergraduate research symposium and is now in graduate school at the University of South Carolina. Yashwant and I continue to work with European collaborators on Monte Carlo modeling of European lithospheric geotherms using surface wave velocities as constraints. I am pleased to be co-author with CSU Ph.D. student Sumant Jha and fellow geophysicist Dennis Harry on a series of research and teaching tools to model plate flexural response. I also spent two weeks in Aarhus, Denmark, where I was invited to help teach an intensive multi-disciplinary Ph.D. course. As part of this course, my Aarhus University colleagues and I have developed new interactive teaching materials that I have taken back to classes at CSU.



**John Singleton,**  
Assistant Professor

2017 has been a great year for fieldwork in my research group. In January, three grad students and I teamed up with Chilean geologists to map parts of the Atacama fault system in northern Chile. In the spring, my research group wrapped up fieldwork in the northern Plomosa Mountains metamorphic core complex in western Arizona (see [http://repository.azgs.gov/uri\\_gin/azgs/dlio/1728](http://repository.azgs.gov/uri_gin/azgs/dlio/1728)) and completed data collection on a young strike-slip fault system in the region. Over the summer, we started a new project in the Sierra Madre Oriental near Galeana, Mexico. We are investigating the role of a thick evaporite zone in the development of the orogenic belt. These evaporites are some of the most spectacularly deformed rocks I have ever seen! So far, fieldwork on this project has involved two new M.S. students, a CSU undergraduate and a CSU postdoc. Lastly, in August I organized a one-week field research seminar in the Black Hills (Wyoming and South Dakota) for a group of eight students (six graduates and two undergraduates). We are investigating the Laramide deformation and exhumation history of the uplift, and students are currently analyzing the structural data they collected in the field and preparing samples for low-temperature thermochronology analysis.

In addition to teaching my regular classes (Structural Geology, Field Camp, Advanced Structural Geology), I co-taught a new undergraduate course with Sara Rathburn this fall, Field Geology of the Colorado Front Range, that centered on field trips to our fantastic local geology – it was fun!



**Top:** Mapping in the Sierra Madre Oriental. **Right:** Graduate student Skyler Mavor examining an outcrop of folded Jurassic evaporate sequence with an axial plane cleavage defined by elongate sulfate nodules.





**Holly Stein, Professor,  
Research Scientist, and AIRIE  
founder**

A call from the Office of the Vice President for Research to directors of research units at the University level was answered by Holly Stein with a successful proposal to replace four badly decayed fume hoods used by the AIRIE Program. In the last year, the AIRIE Program published 12 journal papers, with five more in press or in review. AIRIE continues to cover all program salaries and operational expenses with external funding acquired by Holly. Given AIRIE's expanding directions of research in recent years, we continue to forge collaborations with the chemistry department, including access to analytical equipment to meet AIRIE's new research initiatives.

Two stellar graduate students through the gate! Jenna DiMarzio came in with a B.S. in chemistry and was put through the paces to gain a background in geology. Jenna was provided a research assistantship through AIRIE Program funds. Her M.S. work was the basis for the AAPG 2016 Jules Braunstein Memorial Award – presented in a glamor-studded ceremony in Houston in April 2017. Her work has just been published in the top journal in geochemistry, *Geochimica et Cosmochimica Acta* – with her manuscript accepted with essentially no revision, a rare event as noted by the editor. The M.S. thesis work of Marisa Boraas-Connors (B.S., double major, chemistry-geology), who received the best teaching assistant award in the WCNR, was fully supported

by AIRIE Program funds. Based on new drill cores from the Arctic in Svalbard, Marisa reconstructed the paleoenvironment and petroleum migration history in the Upper Jurassic. Her committee included the well-known Dr. Øyvind Hammer from the Natural History Museum in Oslo, Norway. Marisa's manuscript is in revision for submission to *Palaeogeography, Palaeoclimatology, Palaeoecology*.

AIRIE's core research associates Svet Georgiev, Gang Yang, and Aaron Zimmerman are doing a great job, as the AIRIE Program continues to push the envelope, widening their spectrum of research, and moving sharply toward biogeochemistry, starting with Arctic seaweed collected this

summer! A record level of cross-disciplinary work is at hand. Svet published two landmark papers in top journals, *Geochimica et Cosmochimica Acta* and *Earth and Planetary Science Letters*. Postdoc Vineet Goswami has submitted two papers, one on Re-Os dating of terrestrial coals and one on dating black cherts straddling the K-Pg boundary (dinosaur extinction) at the famous Stevns Klint locality in Denmark. Post-doc Nicole Hurtig, an experimental chemist, submitted her paper on the interaction of doped aqueous fluids with oils to examine Re-Os isotopic exchange – a first step toward understanding reactions between oils and formation waters in the natural environment.

**Lisa Stright, Assistant Professor**

I continue to do research with primary research consortium, Chile Slope Systems, which is now in its sixth year of continuous funding. The consortium is jointly funded by ConocoPhillips, Shell, BHP Billiton, CNOOC Nexen, Repsol, Statoil, Hess, and Chevron. The focus of our research is to improve predictive models of deep-water slope systems through the integration of detailed, outcrop-based stratigraphic studies with advancements in geostatistical and reservoir modeling approaches. I work in an interdisciplinary team with Dr. Brian Romans of Virginia Tech and Dr. Stephen Hubbard of University of Calgary. We are currently collecting new outcrop information from the Tres Pasos Formation of southern Chile, which forms the foundation of an ever-growing database that the group is using to: (1) refine conceptual models of slope channel stratigraphic architecture at regional to reservoir scales; (2) develop statistical relationships of facies and stacking patterns; and (3) examine reservoir connectivity, flow performance, reservoir model upscaling and seismic-reflectivity responses with the high-resolution 3-D architectural models derived from the outcrop database.



Students working with me on this research are specifically focusing on the reservoir analog aspects of the work. I am also continuing with related research in my Rocks2Models research group focused on the Kairparowits Plateau in southern Utah in collaboration with Dr. Cari Johnson at the University of Utah.

During the last year, I've continued to work in collaboration with other faculty members in the department to grow the Petroleum program. This includes substantially expanding the curriculum to include more applied courses in Petroleum Geology, Reservoir Characterization and Modeling, and Well Logging and Petrophysics. We are also working to bring more industry guest lectures and short courses to the department, as well as to renew and enhance our many relationships with industry recruiters and alumni.



**Sally Sutton,**  
Associate Professor

My students and I continue to work on diagenesis and weathering in sandstones and mudrocks. In the last couple of years, much of this work has focused on evaluating local sedimentary units as potential targets for aquifer storage and recovery. ASR, which involves injecting water into an aquifer for later recovery, may be a means of increasing water storage capacity along the northern Front Range without building additional reservoirs. M.S. student Adam Adam has just completed his thesis, in which he compiled, analyzed, and mapped data from water well records for the Ingleside and all younger strata in Larimer County. His work gives us a clearer picture of which units have favorable hydrogeological properties and how the properties vary within the county. From his work, it appears that the Ingleside Formation, various members of the Dakota Group, and some members of the Pierre Shale show promise. Daniel Collazo has compiled and analyzed data on the Fountain Formation for the entire Front Range and is in the process of writing his thesis. His findings support our hypothesis that the Fountain is compartmentalized and show that it appears to have good potential for ASR in some areas. Amanda Doherty has begun looking at geochemistry of both whole rock and native water, along with petrography, in the Fountain Formation, Ingleside Formation, and Dakota Group. Her goal is to use geochemical modeling to predict rock-water and water-water interaction if these units were used for ASR. Ahmad Issa is completing his thesis on diagenesis

sis in the Ingleside Formation, which will provide useful background for interpreting Amanda's results.

I continue to teach Sedimentary Geochemistry and Petrology, as well as Modern Gas and Oil. Also, this past spring I developed a new course in Sandstone Petrology. My research on the Kupferschiefer continues and, along with Polish colleague Zbigniew Sawłowicz, I have just published on Kupferschiefer geochemistry in a monograph, *Łupek miedzionośny III*.

**Ellen Wohl, University**  
Distinguished Professor

My highlights for the past year include continued work on large wood dynamics and organic carbon storage along river corridors in the Western U.S. During my 2016-2017 sabbatical, I had the chance to do some international travel (Australia, Austria, Ecuador, Germany, Rwanda, Switzerland), and I wrote a book that came out in September 2017: *Sustaining River Ecosystems and Water Resources*. MS stu-

dent Andrew Pfeiffer finished in May 2017 and now works for Wright Water Engineers in Glenwood Springs, Colo. Ph.D. students, DeAnna Laurel, Katherine Lininger, and Dan Scott, will be finishing this academic year, and we welcomed new M.S. students Ethan Ader, Sarah Hinshaw, and Juli Scamardo to the fluvial geomorphology group



Geosciences Ph.D. student Dan Scott on fieldwork in the Alpine Lakes Wilderness of Washington.

The Geologic Resources Inventory is a National Park Service program that produces high-quality digital geologic-GIS maps and detailed geologic reports of NPS resources. The GRI, administered by the NPS Geologic Resources Division with funding from the NPS Inventory and Monitoring Program, hosted within the Geosciences Department, is a cooperative program between the NPS and CSU. Since its inception in 1999, the program has employed a number of research associates, many of whom are CSU alumni, and has funded more than 25 undergraduate and graduate GRI student interns to provide geologic information to support resource management and science-based decision making throughout the National Park System.

As an update to our 2016 *GEOScape* article, the GRI continues to produce both digital geologic-GIS maps and geologic reports, as well as refine how digital geologic-GIS map data is produced and used by NPS and the public.

In 2017, the GRI completed digital geologic-GIS maps for: Appalachian National Scenic Trail (numerous Eastern states), Cape Krusenstern National Monument (Alaska), Channel Islands National Park (Calif.); Chickamauga and Chattanooga National Military Park (Tenn., Ky.); Florissant Fossil Beds National Monument (Colo.); Gates of the Arctic National Park and Preserve (Alaska); Jean Lafitte National Historical Park (La.); Kobuk Valley National Park, Minidoka National Historic Site (Ark.); Noatak National Preserve (Alaska); Pictured Rocks National Lakeshore (Mich.); and Voyageurs National Park (Minn.). To produce these maps, we partnered with the U.S. Geological Survey, Louisiana Geological Survey, Minnesota Geological Survey, University of Tennessee, and Western Michigan State University, as well as many other Eastern state geological surveys. In 2017, the GRI also published detailed geologic reports for: Big Thicket National Preserve (Texas); Bluestone Na-

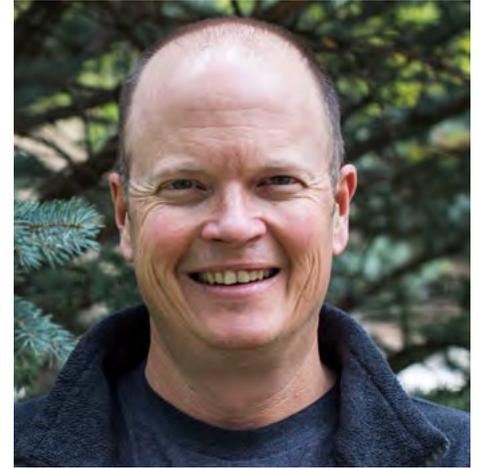
## Geological Resources Inventory



**Stephanie O'Meara,**  
Senior Research Associate

tional Scenic River, (W. Va.); Boston Harbor Islands National Recreation Area (Mass.); Cabrillo National Monument (Calif.); Cape Lookout National Seashore (N.C.); Gauley River National Recreational Area (W. Va.); Herbert Hoover National Historic Site (Iowa); Kenai Fjords National Park (Alaska); Minute Man National Historical Park (Mass.); New River Gorge National River (W. Va.); Petroglyph National Monument (N.M.); Pipestone National Monument (Minn.); Salinas Pueblo Missions National Monument (N.M.); and Shiloh National Military Park (Tenn. and Miss.).

Lastly, in addition to producing GIS datasets, this last year the GRI mapping team developed a process and standard for symbolizing NPS geologic-GIS map data. By standardizing and automating the symbolization process, we are able to produce



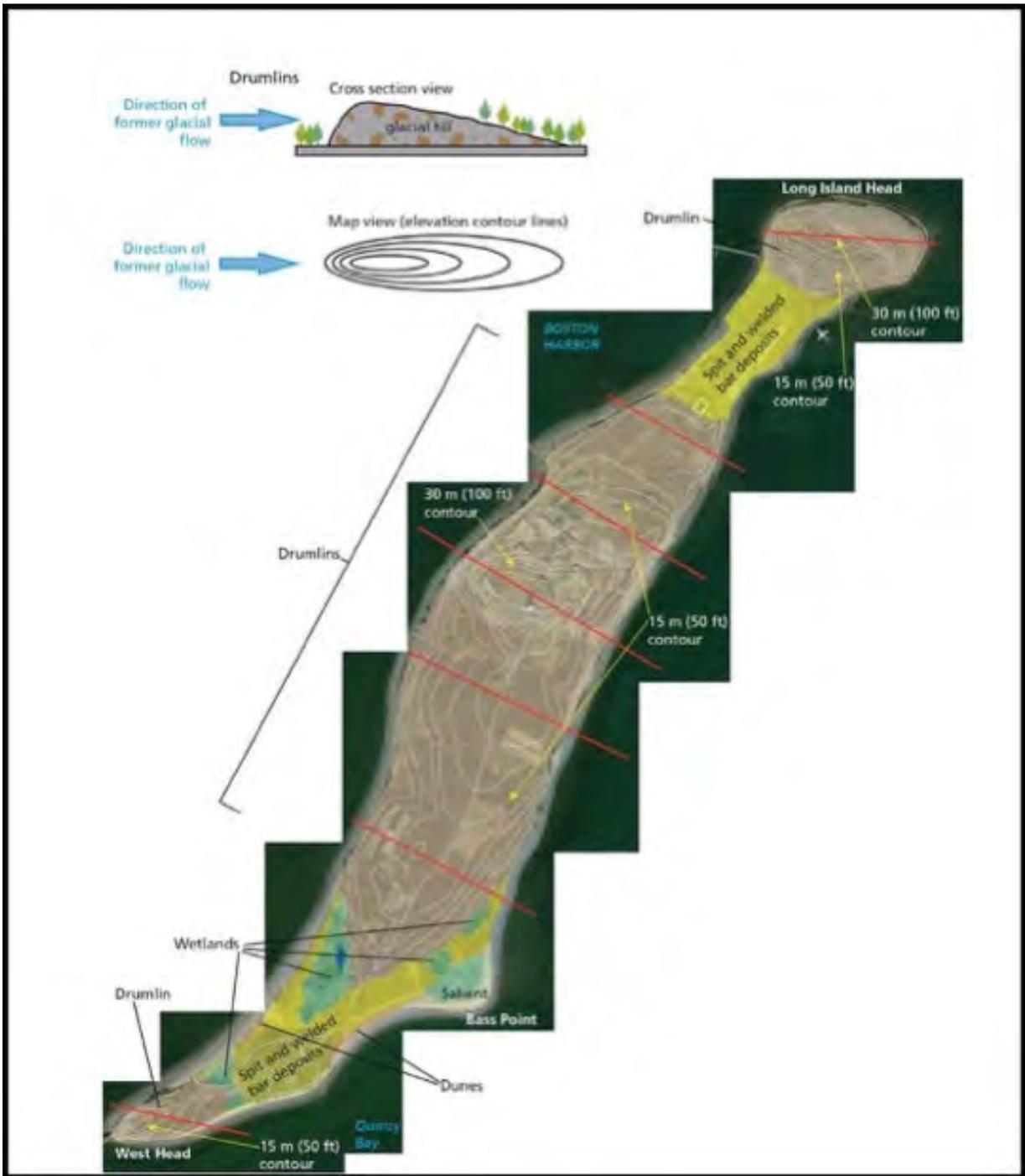
**Jim Chappell,**  
Research Associate

more consistent-looking datasets at a fraction of the time it takes to symbolize data manually. CSU research associates, James Chappell, Stephanie O'Meara, James Winter, and Ron Karpilo produced a poster "Standardizing and Automating Digital Geologic-GIS Map Symbolization," which was presented at the U.S. Geological Survey Digital Mapping Techniques Workshop in Minneapolis last spring and was presented in October at this year's Geological Society of America annual meeting in Seattle.

Additional information on GRI is available at <http://warnercnr.colostate.edu/geo-research/departamental-research/geologic-resources-inventory>, or at the NPS GRI webpage, <http://www.nature.nps.gov/geology/inventory/>.

## DEPARTMENT PUBLICATIONS

Using Google Scholar, we have set up a web interface that automatically tracks Geosciences Department publications. For a comprehensive and timely look at what the department-affiliated authors have been publishing, or for links to specific papers of any date, please go to: [warnercnr.colostate.edu/geosciences/geo-publications](http://warnercnr.colostate.edu/geosciences/geo-publications), and click on the Google icon.



GRI schematic of drumlin formation on Long Island, Boston Harbor Islands National Recreation Area. Graphic by Trista L. Thornberry-Ehrlich (CSU) using USGS topographic coverage and the ESRI World Imagery base map.

## Department and College Scholarships and Awards

With thanks to all of our donors who have made these scholarships and awards possible.

### Undergraduate Students

**Nicholas Andujo:** Salonee Kharkar Memorial Scholarship

**Josephina Blue:** W.O. Edmondson Memorial Scholarship and the Thomas A. and Anne L. Shepherd Diversity Scholarship

**Tavon Boaman:** Undergraduate Explorationist Scholarship and the Oscar and Isabel Anderson Undergraduate Scholarship

**Amanda Eddleman:** David V. Harris Scholarship and the Thomas A. and Anne L. Shepherd Diversity Scholarship

**Tyler Garvey:** Oscar and Isabel Anderson Undergraduate Scholarship

**Will Gnesda:** Bruno and Ouida Fritschi Scholarship

**Micah Hernandez:** Thomas A. and Anne L. Shepherd Diversity Scholarship

**Rachael Hirsch:** John and Dolores Goodier Scholarship in the College of Natural Resources

**George Kerr:** Charles E. Beverly Memorial Scholarship

**Sarah Lowe:** Roy G. and Ruth K. Coffin Memorial Scholarship

**Dalton Meyer:** Thomas C. Evans Scholarship and the Chris Lidstone and Kate Laudon Scholarship

**Cesar Quiroz:** Ernest and Bernice Dice Scholarship and the Undergraduate Explorationist Scholarship

**Kevin Ramm:** Charles E. Beverly Memorial Scholarship

**Aren Roybal:** Michael Smith Scholars in Geosciences

**Frederique (Freddy) Tremblay:** Chris Lidstone and Kate Laudon Scholarship in Geosciences

**Michael Vogler:** Ernest and Bernice Dice Scholarship and the Chris Lidstone and Kate Laudon Scholarship

**Shannon Weld:** Katharine Compton Field Experience Scholarship

### Geology Field Camp Scholarships

Laurel Anderson

Grant Bannick

Calli Dodd

Christopher Dunkelman

Tyler Garvey

Aaron Higgins

Peter Hurtgen

Aaron Jackson

Sydney Kristensen

Paul Meisenheimer

Trevor Miller

Aymber Stein

Alexander Torres

Mike Vogler

Ray Wacha

Shannon Weld

### Graduate Students

**Kristen Cognac:** Roger and LuAnne Steininger Fellowship

**Philip Dalhof:** McCallum Mineralogy and Petrology Graduate Scholarship

**Amanda Doherty:** Joby Adams Geosciences Graduate Scholarship

**Johanna Eidmann:** Hill Memorial Fellowship and the Schumm Graduate Scholarship

**Tyler Gilkerson:** Robert L. Stollar Scholarship in Hydrogeology and the Ware Geosciences Fellowship

**Adi Khare:** Joby Adams Geosciences Graduate Scholarship

**Katherine Lininger:** Oscar and Isabel Anderson Graduate Fellowship and the Lary Kent Burns Memorial Scholarship

**Skyler Mavor:** Edward M. Warner Graduate Research Assistant fund

**Nicole McMahon:** Evelyn I. Clark Scholarship

**Annette Patton:** Oscar and Isabel Anderson Graduate Fellowship and the Marie Morisawa Graduate Fellowship

**Anna Pfohl:** Warner College of Natural Resources Student Success Scholarship

**Julianne Scamardo:** Edward M. Warner Graduate Research Assistant fund

**Nikki Seymour:** McCallum Mineralogy and Petrology Graduate Scholarship

## Department and College Scholarships and Awards

With thanks to all of our donors who have made these scholarships and awards possible.

### Department Awards

**Rick Aster:** Distinguished Alumni Award, Department of Geoscience, University of Wisconsin-Madison

**Rick Aster** (co-authors Kent Condie and Jeroen van Hunen): 2016 Best Paper Award, Geoscience Frontiers, A great thermal divergence in the mantle beginning 2.5 Ga: Geochemical constraints from greenstone basalts and komatiites

**Jenna Dimarzio (M.S., '17):** Jules Braunstein Memorial Award at AAPG for best poster – (co-authors Holly Stein, Judy Hannah, and Svet Georgiev). Effect of Precipitation of Asphaltenes on Re-Os Isotopic Ratios

**Adam Nielson,** 2016 AGU Outstanding Student Paper Award, Near Surface Geophysics, Using synthetic forward seismic models of channelized deep-water slope deposits to inform stratigraphic interpretation, Tres Pasos Formation, Magallanes Basin, Chile

**Sara Rathburn:** Warner College Outstanding Mentor Award

**John Singleton:** Warner College of Natural Resources Outstanding Publication Award, Singleton, J., The transition from large-magnitude extension to distributed dextral faulting in the Buckskin-Rawhide metamorphic core complex, west-central Arizona, Tectonics

**Lisa Stright:** Dean's Award for Excellence to an Early-Career Faculty Member

**Ellen Wohl:** Colorado State University Distinguished Professor

**Ellen Wohl:** R.A. Bagnold Medal, Geomorphology Division of the European Geosciences Union

**Ed Warner** (B.S., '68) and Jackie Erickson: CSU William E. Morgan Alumni Achievement Award

### Share Your Thoughts with us in our Alumni Survey

We invite you, as a member of the world-wide CSU Geosciences community, to share your interests with us in a brief (just three pages) online friends and alumni survey. Opportunities for engagement include: visiting the department to present a guest lecture in a course; assisting with a student field trip; supporting and advising our AAPG, SEG, or other student club activities and mentoring; and becoming a mentor to enhance student preparation for geosciences careers. The survey asks these and other questions to help us better align alumni and department interests. Your participation will contribute substantially to advancing our department and college activities to enrich the academic and professional preparation of undergraduate and graduate students. You can access the survey [here](#).

**Thank you!**

### Friends and Alumni Engagement

This year, we wish to express special thanks to **Michael Smith, Jeff Ware, Chuck Mabarek, Ed Warner**, and our Geosciences Advisory Council Members **Roger Steininger, Karen Berry, Scott Larson, Harold Pranger, Jon Robbins, Bob Stollar, Tara Tafi**, and **Chris Lidstone** for exceptional contributions to our department.



## 2017-18 Development Focus Areas MOUNTAIN CAMPUS

### Geology Field Camp Scholarship fund

This year, the Field Camp Scholarship fund, thanks to more than 90 individual donations from friends and alumni; an endowed fund from the Compton family to establish the Katharine Compton Field Camp Scholarships; and a major matching fund from a special donor, provided substantial scholarship support to 16 (more than a third) of our five-week summer Field Camp students. Please consider a 2017-18 donation to this fund to help sustain critical support for future geology major undergraduate students as they enter the wider world as professional geoscientists.

### Experiential Learning and Field Studies fund

A major strength of our department and college is our strong field programs. Please contribute to this fund to specifically support our classes and student clubs in field education and research.

### Geosciences Speaker Series Endowment fund

With your help, we have established a strong yearlong department seminar series (ably coordinated this year by Mike Ronayne). Speakers and other visitors expand our students' professional networking, educational breadth, and research. Perhaps you would like to visit the department to speak, or would like to support a special speaker from industry or in partnership with a professional society such as AAPG, SEG, or GSA? Thank you for your contributions to our Speakers and Visitors fund that keep these activities vibrant across the department.

16

number of future geoscience professionals and CSU graduates the Field Camp Scholarship program assisted in 2017

90+

number of individual donations from friends and alumni to the Field Camp Scholarship fund in 2017





## Your Gift's Impact

### Aaron Jackson, Senior Geophysics Concentration

“Starting back at school in my late 20s was a difficult decision. From general financial hardship to emotional and spiritual difficulties, this school experience has been a long and hard road. That is why this scholarship has meant so much to me.

To know that I am being supported by my community gives me a sense of confidence and assuredness that I made the right decisions to come back here to CSU.”



### Shannon Weld, Senior Geology Concentration

“I would like to personally thank you for your generous donation toward Colorado State University's Department of Geosciences Field Camp Scholarship. Because I am not able to work full time this summer, your generosity has tremendously helped cover field supplies and tuition. Field Camp will be some of the most educational, exhausting, and exciting weeks of my time at CSU, and it is thanks to you that I can attend.”



“Your generous assistance significantly reduced the financial burden associated with attending Field Camp for myself and for my family. This exceptional opportunity blended my previous undergraduate course work with the continued expertise in field-oriented skills furnished by our outstanding professors.”

**AyMBER Stein, Geology Alumna, 2017**

## Special Thanks to Our Supporters

Your gifts provide critical support to our students and programs and elevate the department's teaching, research, and outreach.

Joby L. and Olena Adams

Erik J. and Karen Aspelin

Harold A. and Jacquelin Backer

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and Margarita Padilla

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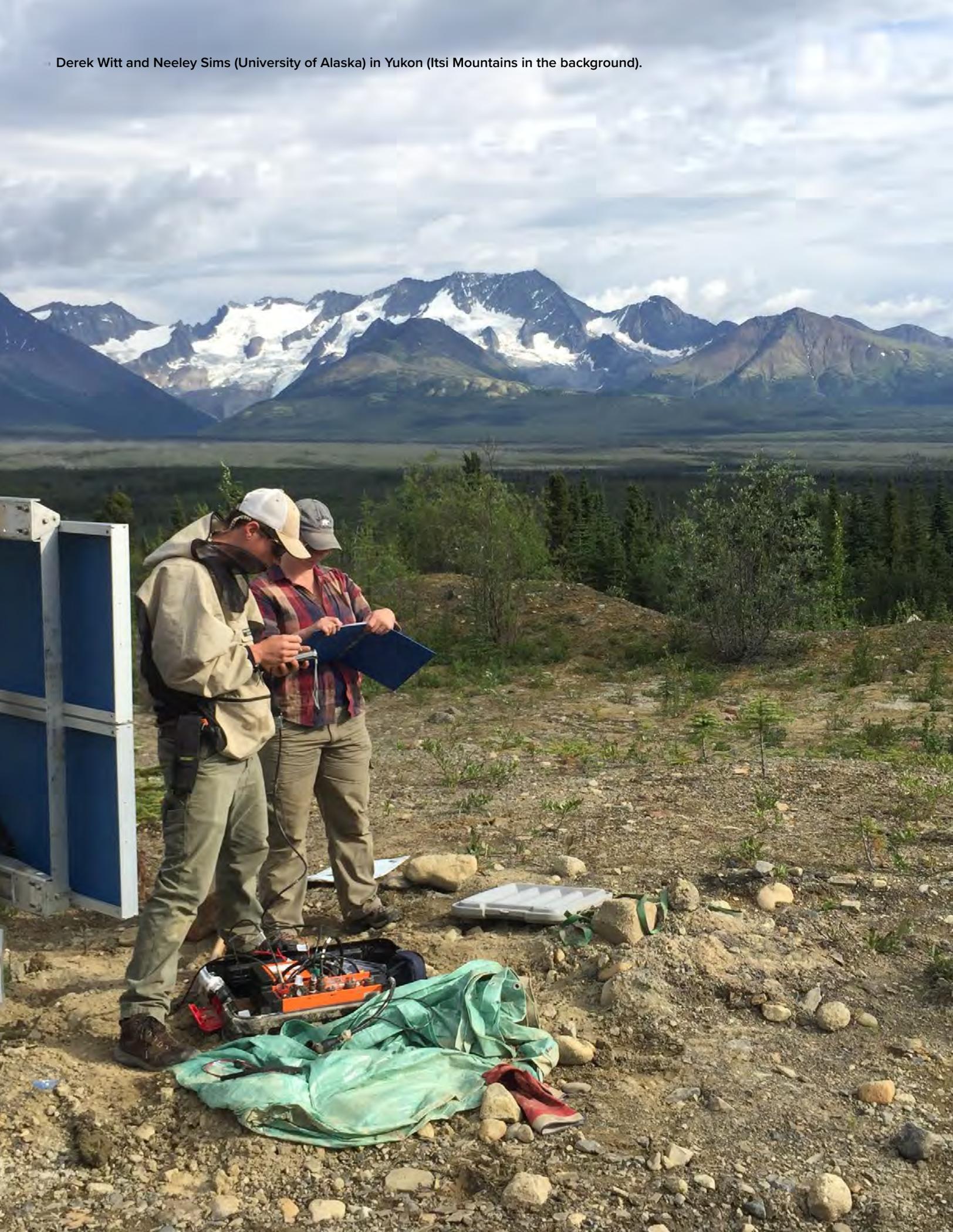
University Press of Kansas

**A special thank-you to Ed Warner and Jackie Erickson for broad and continued support to the Geosciences Department and the Warner College.**

Fallaye Diallo and John Singleton in the field.



→ Derek Witt and Neeley Sims (University of Alaska) in Yukon (Itsi Mountains in the background).



## Thank you for supporting the Geosciences Department.

To add your support to Colorado State University geosciences, kindly mail this form, or contribute online at <https://advancing.colostate.edu/GEOSCIENCES>.

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**\$ \_\_\_\_\_ Geosciences fund (14253).** Supports seminar series, curricular and department improvements, and much more.

**\$ \_\_\_\_\_ Experiential Learning and Field Studies fund (59903).** Specifically supports field trip efforts and instruction across the curriculum.

**\$ \_\_\_\_\_ Geology Field Camp Scholarship fund (72363).** Supports students attending summer Field Camp.

**\$ \_\_\_\_\_ Geosciences Speaker Series Endowment (70785).** Supports speaker series for students in the Geosciences Department.

**Thank you.** Please mail this form with your gift/pledge to: Colorado State University Foundation, P.O. Box 1870, Fort Collins, CO 80522-1870

Want to further explore giving opportunities in the Department of Geosciences and at Warner College of Natural Resources? Contact **Scott Webb**, [scott.webb@colostate.edu](mailto:scott.webb@colostate.edu) | (970) 491-3594

**Geosciences faculty, staff, students, and friends are active in the CSU community and beyond. See what we've been up to.**  
Share your news and updates with us!



**Above:** Michael Smith meets with geosciences student and Smith Scholars in Geosciences scholarship recipient Aren Roybal. **Bottom left:** Geosciences graduate student Tyler Gilkerson was able to thank Bob (M.S., '69) and Janne Stollar for their support during the annual Warner College Scholarship Dinner. Gilkerson is the recipient of the Robert L. Stollar Scholarship in Hydrogeology. **Bottom, right:** Rick Aster engages during the first Kindling Conversations: Warner Distinguished Lecture Series event with lecturer Robin Kimmerer.



## DEPARTMENT HAPPENINGS



**Top:** Graduate student Annette Patton studying permafrost and landslides in Denali National Park. (photo by Sara Rathburn).

**Left:** Rick Aster, Derek Schutt, Mike Ronayne, John Singleton, Bill Sanford, and Sally Sutton enjoying downtown Fort Collins following our August 2017 Faculty Retreat.



### DEPARTMENT HISTORY

As in previous years, we will continue to update the department history, building on the original document initiated by David Harris, Jack Campbell, Bob Johnson, Frank Ethridge, and Don Doehring.

Please check out the latest edition by clicking the link on our department homepage (<http://warnercnr.colostate.edu/geosciences-home> or at <https://warnercnr.colostate.edu/wp-content/uploads/sites/2/2017/10/GEO-CSU-HISTORY-Current.pdf>.) Help us document the amazing history of our department; we very much welcome your additions or corrections!



Colorado State University

The **Geosciences Department** is housed within the Warner College of Natural Resources.

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