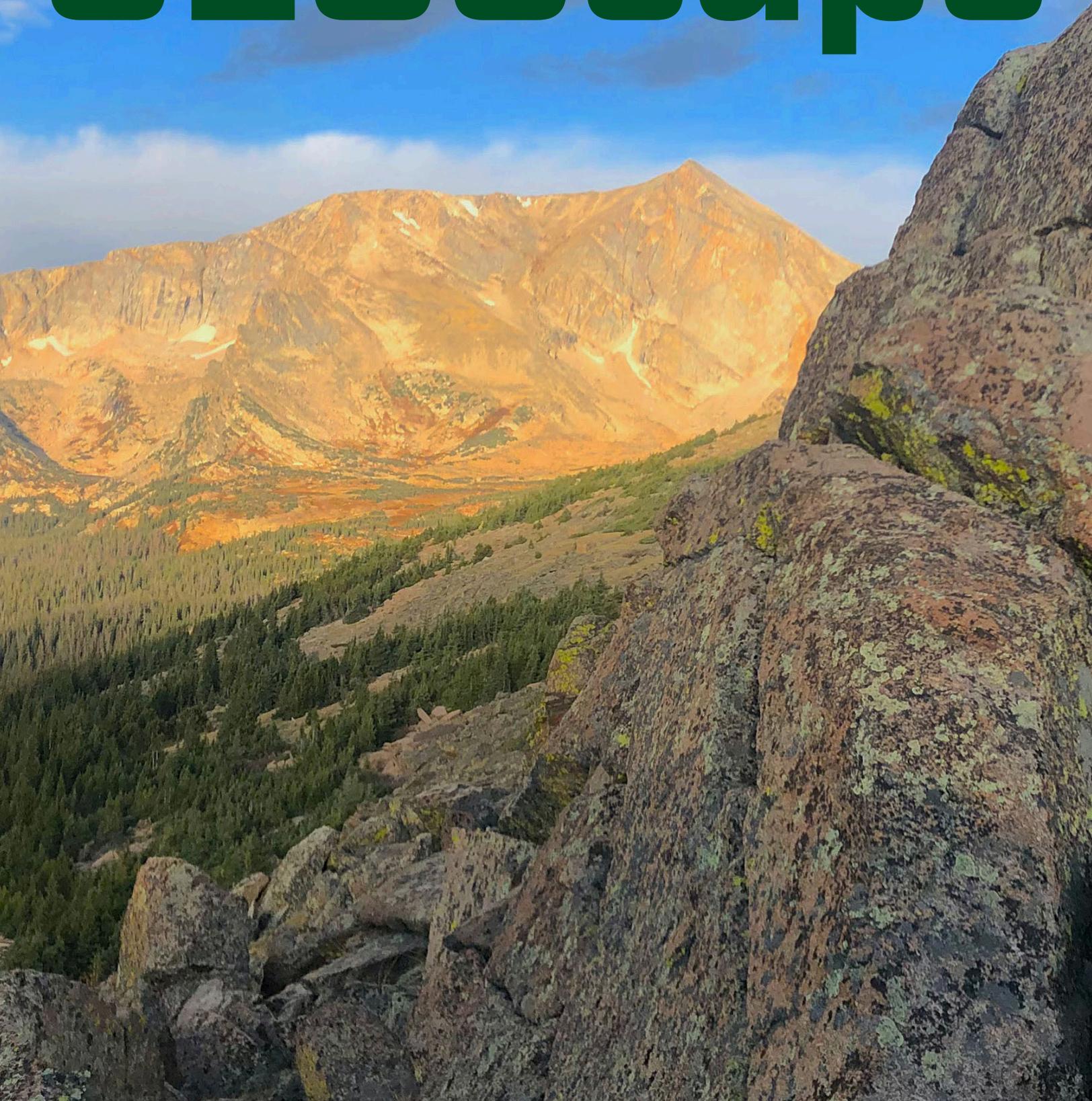




GEOSCIENCES  
COLORADO STATE UNIVERSITY

2020

# GEOscape





Ph.D. student Emily Iskin in the field. Photo by Ellen Wohl

## Message From Rick Aster, Department Head

Welcome Geosciences friends to the 2020 *GEOScape* newsletter! I'm sure it's an understatement for our readers to note that this has been an unusual year as the numerous and unprecedented developments of the COVID-19 pandemic affected so many aspects of our personal and professional lives and presented profound challenges to our community, University, and department.

Following spring break, Colorado State University pivoted to become a fully online University through to the end of spring semester. This required extraordinarily rapid, all-hands, and heroic efforts on behalf of our faculty and staff to completely revamp our teaching and essentially all other aspects of our department activities. These changes also demanded focus and dedication on behalf of our students, as they were called upon to abruptly adapt nearly every aspect of their academic and personal lives to accommodate strange and new circumstances (as well as become experts in Zoom, Teams, and other virtual teaching and communications platforms). Summer required yet more exceptional efforts as faculty worked to accommodate summer research and teaching while preparing for a partial in-person, partial online and social-distanced fall semester. One exceptional accomplishment from the summer is that we were one of the few geosciences programs to successfully conduct an in-person summer Field Camp (for our geology seniors, who needed this to complete their degrees this year). This success, again, was made possible by outstanding commitment and effort on behalf of department faculty and staff.

As fall semester began, we were certainly more experienced and confident working remotely and socially distancing our in-person labs and other courses than we had been earlier in the year. However, the challenges of largely or wholly at-home work, especially for colleagues with at-home kids and associated home-school responsibilities, was considerable. CSU made the (especially in the perspective of the national trends, as I write this) prescient decision to have our in-person fall teaching transition to and complete the semester fully online following Thanksgiving break. In a testament to the many laudable efforts by our faculty and staff to adapt our teaching, living, and other efforts across the department, college, and campus, we continued to deliver in-person classes into November, thus far avoiding campus-closing viral outbreaks that have occurred at so many other higher education institutions. Our campus and northern Colorado community was yet further impacted by multiple historically large, prolonged, and rapidly moving forest fires, which were not completely contained until November. Our Mountain Campus experienced a near miss when the enormous (209,000-acre) Cameron Peak Fire swept through, but all of the structures remarkably survived, thanks to the at times almost unbelievable efforts of our firefighting heroes. This fire ultimately burned down to the foothills and nearly to the doorstep of Fort Collins near Masonville. Yes, we are all indeed, hoping for a (much) more "normal" year in 2021!

All that said, Geosciences continued to innovate, evolve, and realize new opportunities, even during the exceptional times of 2020. Notable happenings included the promotion of Sara Rathburn to full professor, the arrival of Assistant Professor Jeremy Caves Rugenstein (who is enhancing our teaching and research depth in Introductory Geology, Isotope Geochemistry, and Paleoclimatology), and an exciting new collaboration with the Denver Museum of Nature & Science with alumnus and Curator of Dinosaurs Joe Sertich (B.S. '04) to expand our paleontology teaching and other efforts. In staff news, we were pleased to welcome a new administrative staff member, Kailarae Lilly, to the department this fall. On the bittersweet side, our extraordinary and longtime academic success coordinator and all-around department colleague, Jill Putman, will be leaving the department in January 2021 for a new opportunity with CSU's Collaborative for Student Achievement as its associate director for outreach and support programs, where she will continue to foster student success across campus. Jill has had a tremendous positive impact on our students and department since she joined us in fall 2014 and leaves big shoes to fill. Patti Uman continues to anchor our department office with her exceptional efforts as lead office administrator. In summary, I applaud and compliment colleagues across the department staff and faculty for their above-and-beyond efforts to sustain our teaching, research, and broader mission as a Geosciences department. I wish all of our readers well as we continue to live through these "interesting" times, and as we look forward to a bright future. As always, I offer a huge end-of-the-year thanks to our generous alumni, friends, and collaborators who do so much to enhance professional opportunities for our students and department activities through teaching, networking, and philanthropy.



Rick Aster, near Round Mountain

### In This Issue

- 3 Message From the Dean
- 6 Alumni News
- 9 Student Highlights
- 14 Faculty and Staff
- 30 Departmental News
- 35 Departmental Honors
- 40 Thanks to Our Supporters

### On the cover

Wild Basin is seen from the windy summit of Mount Orton, Rocky Mountain National Park. Photo by Rick Aster

*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.

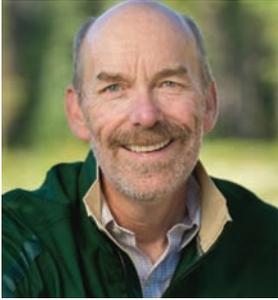


**WARNER COLLEGE  
OF NATURAL RESOURCES**  
COLORADO STATE UNIVERSITY

A handwritten signature in black ink, reading 'Rick Aster'.

Rick Aster, Ph.D.  
Geosciences Department Head

## A Note From Dean John P. Hayes



**WCNR Dean John Hayes**

2020 has been a year like no other in the history of the planet. On one level we all share a common experience in that the pandemic has impacted every one of us, but I am deeply aware that each of us has experienced those impacts in unique and distinct ways. I hope that you are healthy and that you are doing as well as possible under these very challenging circumstances.

In the face of unprecedented challenges, Colorado State University has demonstrated incredible resiliency, innovation, and commitment over the past year to continue to advance our mission to educate, research, engage, and serve. As friends, alumni, affiliates, and collaborators of the Department of Geosciences, you should feel proud of the way the department responded. Geosciences faculty, staff, and students all stepped up in the face of the immense obstacles to continue to lead our programs to new heights.

Despite the challenges we are facing, this is an exciting time at CSU. This year, under the leadership of President Joyce McConnell, the University has begun an effort to work toward creating a new, courageous vision for the future. This endeavor strives to build on our current strengths, take advantage of our foundation of programs and location, and tap into the innovative thinking of our faculty and staff to position the University to make even greater impacts in the years to come. I anticipate the outcome of this work to align exceptionally well with our programs in Geosciences.

As always, it is a real treat to read of the accomplishments of the faculty and staff in Geosciences and some of the great work of the department. Geosciences is a department that just keeps getting better and better. While it is easy to focus on the outputs and outcomes, I want to take a moment to state what is probably obvious: All of the great work being done in Geosciences is fueled by the department's incredible faculty, staff, and students.

I am also very excited about the partnership being forged between Geosciences and the Denver Museum of Nature & Science (as noted within this newsletter on page 31). The opportunity to have Dr. Joe Sertich join our team in this collaborative effort opens the door to new educational and professional opportunities for our students, as well as to advancing research partnerships between DMNS and Geosciences.

I hope you enjoy this issue of *GEOScape* and I look forward to seeing many of you in the months to come when circumstances permit.

John P. Hayes Ph.D.

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

Dean, Warner College of Natural Resources



**Department graduate students collect ground-penetrating radar data in support of the NASA SnowEx campaign near Cameron Pass. Photo by Brianna Rick**

Geosciences graduate students Johanna Eidmann, Nikki Seymore, and Eyal Marder conduct fieldwork in Calabria, Italy. Photo by Sean Gallen



Geology 201 undergraduates  
measure the dip of the Ingleside  
Formation near Lory State Park.  
Photo by Sara Rathburn





**ALUMNI NEWS &  
STUDENT HIGHLIGHTS**

# Alumni Feature: Charles Livingston

## A Lifetime of Giving Back Bachelor of Science, '59

When I graduated from the small geology program at CSU in 1959, we still had the draft and I had to go. I ended up in the Marines in a program where you go for six months (three months in boot-camp and three months of active duty at other Marine bases), followed by seven and a half years of monthly meetings in the Reserve.

After I completed my six-month stint in the Marines, I started looking for a job in geology while attending the monthly Reserve meetings. They ran all day Saturday and Sunday each time. After a few months of this, while also working for a concrete contractor in Fort Collins, I landed a geology job on a large hydro project just north of the Glenwood Springs. Sweetwater Lake is in the central portion of the project area. I was working nearly dawn to dark six days per week, and there was no way that I could make it to the Reserve meetings at the Federal Center on the west side of Denver while I was on that work schedule. I went to Denver to talk



**Charles Livingston and Ann Roerig,  
1957 Rams**

to the Marines about this. They sent me to another office, where I was told that the country needs people like me and that they were going to classify me as having a critical civilian occupation. This meant that I would not have to attend any more monthly reserve meetings, and I received an honorable discharge.

In my 45-year career as a professional geologist that followed, I had

the opportunity and the honor of working on projects that I estimate have had a beneficial effect on 300 million to 400 million people. I think that I have fulfilled my obligation!

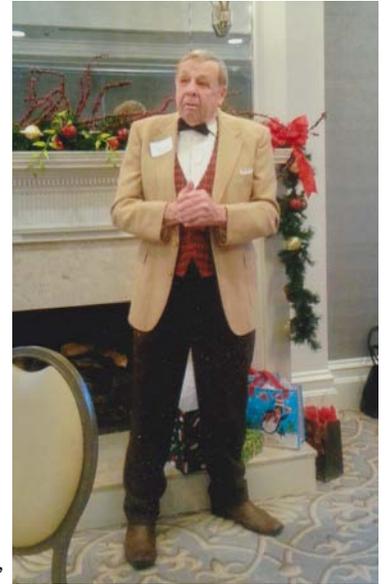
Projects that I have been involved in include nuclear power plants, major dams, an investigation in Prudhoe Bay, Alaska, oil refineries, consulting work for numerous government agencies, industrial minerals, environmental cleanup, and a geologic and soils

investigation for Disney World in Orlando, Florida, before the public even knew that there was going to be a Disney World. In addition to all the geology work, I have had the pleasure of giving many geology talks to students in grade school and high school.

Sadly, we lost my wife Ann in 1984, when she was only 46 years old. We all thought that she was healthy and fit. She and I were always moving (dancing, playing tennis, water-skiing, etc.). I eventually remarried. My new wife Carol and I did a lot of fun things for several years, and then our lives were suddenly disrupted. In October of 2013, Carol had a massive stroke. She was in the hospital for a total of 74 days, and we almost lost her. I now have a new mission, which is being the primary caregiver for Carol. I do everything that needs to be done inside the house, and I keep the yard manicured. I put in 12- to 14-hour days, seven days per week. I'm now 84 years old, but I'm in good shape, and I can do this.

I have written, what is now, a 60-page article titled "Challenges Of Being A Primary Caregiver" based on my own experiences. Based upon this article, I give talks to stroke survivor clubs at the various hospitals in the Atlanta area, and to caregiver groups at various churches. I also give talks to the head honchos at the major hospitals about things that they were not doing when my wife was there all that time, things that they could and should be doing that would make it much easier for the caregiver once the patient is back home. I'm trying to make it easier for the caregivers that come behind me.

I have been able to be of help to a lot of people besides my wife, and I am grateful for it. It is a great pleasure for me when I can make a positive difference in someone's life.

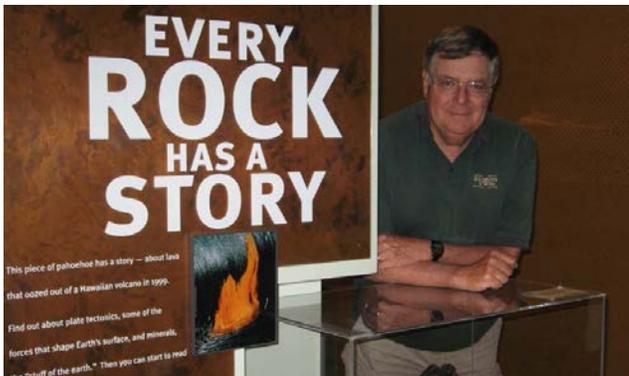


**Charles Livingston**

# Alumni Engagement

## Chris Lidstone (M.S., '81), Roger Steininger (Ph.D., '86), and Ernie Brown (B.S., '76) – 2020 Business of Geosciences Course

Geoscience education at CSU is strong on the technical aspects of our profession but has historically been lacking in discussion of the business side. Most of us have learned the business aspects of our profession through the school of hard knocks. In the fall of 2019, the Geoscience Advisory Council discussed how we might address this shortfall. With the support of the department, including Department Head Rick Aster and academic success coordinator Jill Putman, we agreed to realize an alumni-taught seminar course titled The Business of Geoscience as a one-credit class offered during spring semester 2020.



**Roger Steininger**

Lidstone covered consulting and environmental aspects and Steininger took on mineral exploration and mining. What was notably missing was someone to address the hydrocarbon career and business elements. Fortunately, another engaged department alum, Ernie Brown, joined the team to cover this segment of the business.

The course was limited to upper-level undergraduates and graduate students and addressed basic aspects of business within a geoscience framework, covering fundamental topics such as profit and loss statements, general ledgers, the intricacies of propagating and maintaining a business, types of geoscience businesses, and succession planning. The seminar progressed (with nine students) until spring break 2020, at which point the entire University converted from in person to virtual classes because of the COVID-19 outbreak.

This seminar, like all other classes, went to online delivery. The course concluded with a capstone project, where each student prepared a business plan in one of three areas: consulting, mining, or oil and gas exploration.

This final project allowed them to apply the fundamentals of business to the development of a business plan that included concept planning, startup funding, hiring team members, finding clients, budgeting, profit and loss statements, and eventual sale of the business. In the resource segments, there was a need to include locating and acquiring exploration targets, permitting, and environmental issues to develop the resource, and how to keep investors and potential investors informed while adhering to business regulations and filing.

While it is, of course, impossible to fully develop all aspects of the business of geoscience during a one-semester, one-

credit-hour class, the seminar exposed the students to key business aspects of their chosen profession. Although many may remain in geoscience as scientists within large organizations, this seminar allowed them to be conversant on many of the essential business aspects of our profession. Judging from the feedback and the project

writups, this introductory foray into teaching the Business of Geosciences was successful!



**Chris Lidstone**



**Ernie Brown**

## STUDENT HIGHLIGHTS

### Sara Newman

#### Geology Concentration, Honors Student, and 2020 Geosciences Field Camp Award Recipient

You could say my passion for geology is genetic. My dad was a geology professor at the community college level, and throughout my childhood, geology was a way to connect with him. We camped and traveled a lot, and on every hike, in every national park, my dad would discuss the surrounding geology with a passion and drive that, over time, he passed on to me. What had started as just a way to connect with my dad had, by halfway through high school, become a full-fledged passion of my own.

So, when it was time to choose a major for college, it was an easier choice for me than many of my friends. I knew I was going to be a geology major before I even applied to CSU. I remember, on a prospective student visit to the campus with my mom in March of 2017, we wanted to check out the Geosciences department. So, we went to Warner College, surprised to find the doors open on a Sunday, then went up to the mostly empty third floor. Walking by those classrooms who would soon house countless memories, and the offices of those that would soon become great teachers and mentors, I felt a sense of belonging. Now, in the final semester of my undergraduate degree, the third floor of

the Michael Smith Natural Resources building is my second home.

Outside of academics, I admit to a chronic case of wanderlust. My family has been doing multi-week road trips since I was 13, and through these massive summer vacations, I have created memories in 49 U.S. states. As of right now I'm missing only Hawaii (it's a hard state to road-trip to). The national parks, monuments, and forests are beautiful and often have interesting geology that my dad and I nerd out about while my mom and sister try to ignore us. But I also enjoy experiencing the different cultures that are just here in the United States.

I love trying the different cuisines of New Orleans, Dallas, Miami, Seattle, or Portland, or taking in the music of Nashville, Chicago, Austin, or New York City. As for future plans, I would love to work for the National Park Service! Teaching visitors about our natural world would be really rewarding, not to mention that I'd get to be outside and enjoy our beautiful natural lands for my job. Thinking about a more technical job, my favorite sector of geosciences is structural geology, so perhaps that is what I would want to pursue an M.S. in. When I think of what I want to do after my undergraduate degree, I'd prefer work for a little while to get more experience, then go into graduate school with a clearer grasp of what I'd like to focus on.



Sara Newman hikes in Rocky Mountain National Park, September 2020.



Ph.D. student Kristen Cognac

**Kristen Cognac**  
M.S., '18, and Current Ph.D. Student, Geosciences  
Graduate Student Department Representative

Growing up in a historic New England mill city, the local river that supplied our drinking water was often too polluted to swim in. After decades of environmental clean-up and regulation, the requisite warning to swimmers remains in effect – never touch the bottom! Environmental contamination is a global problem with a variety of solutions, all of which require a fundamental understanding of geologic and environmental processes. A desire to clean up the environment is what initially drove me to get a B.S. in environmental science and geology at Northeastern University in Boston, Massachusetts. After graduating, I worked for almost five years at an environmental consulting firm that remediated groundwater contamination before coming to CSU to pursue an M.S. in hydrogeology.

Western states face unique challenges related to water availability that are amplified by rising demands, long-term use, and climate variability. These challenges set the stage for my current research on issues of long-term groundwater availability within the Denver Basin Aquifer System. The DBAS is a regionally significant groundwater resource that has been heavily pumped for decades, resulting in aquifer depletion and questions about long-term use. Groundwater recharge describes many processes that replenish aquifers. Estimates of recharge rates are necessary for modeling the response of aquifers to

pumping and understanding the long-term availability of groundwater.

My adviser, Dr. Mike Ronayne, and I are working to better understand recharge processes in the DBAS. My M.S. thesis work attempted to gain a better understanding of recharge between shallow and deep aquifers in the Denver Basin by incorporating variations in aquifer materials, or geologic heterogeneity, into a groundwater model that simulated the effects of long-term pumping. My research demonstrated that aquifer heterogeneity can influence recharge rates under scenarios of regional water table decline, which are occurring in the Denver Basin. The results from my M.S. thesis sparked new ideas and questions that led me to pursue a Ph.D. in hydrogeology at CSU. My current research expands my M.S. work to evaluate the effects of heterogeneity on recharge with rigorous geostatistical methods and flow modeling. With support from a USGS Water Science Center grant, I'm also exploring other recharge mechanisms in the Denver Basin, including seepage along mountain-front streams.

Mike has been operating a network of nested piezometers on streams throughout Douglas County since 2016. I'm evaluating the extent to which large daily temperature fluctuations affect streambed fluxes and hyporheic exchange using analytical and numerical temperature and flow models. This work may lead to insights for how projected changes in climate and stream temperature might alter streambed fluxes.

## Geosciences Club

The CSU Geosciences Club (with undergrad geology major Julie Spawn serving as president) went fully virtual in the Fall 2020 semester. With biweekly Zoom meetings, club students have been able to stay engaged through virtual social activities as well as guest speakers. The club also hosted several virtual game nights during which students bonded over online games including skribbl.io (similar to Pictionary) and the newly popular space game, Among Us.

Geosciences Club hosted two guest speakers from the Geosciences faculty this fall: Sean Gallen and Jeremy Caves Rugenstein. In October, Sean gave a talk titled “Reassessing Mediterranean Tectonics and Earthquake Hazard from the

A.D. 365 Earthquake.” This focused on his research in Crete working to better understand tectonics and consequential hazard risks in the region. In November, Jeremy spoke to the club about his research piecing together ancient atmospheric conditions and environments in a presentation titled “Unraveling changes in Cenozoic climate, Ecosystems, and Tectonics.”

These meetings of game nights and guest speaker presentations have allowed students to maintain an active community and continue to grow together through their shared geosciences interests during these unusual times.

## AAPG Student Chapter

Last November, the American Association of Petroleum Geologists CSU student chapter took a field trip to Arches National Park with the University of Utah AAPG student chapter. Members learned how the unique salt tectonics of the area helped form the greatest concentration of rock arches in the world. Through erosion, rock layers turned into fins, and fins to arches. It was an exciting and memorable trip. It was also a great chance to meet and get to know members of an AAPG student chapter at another major university.



The AAPG student chapter field trip to Arches National Park, Utah. From left to right: Standing: Teresa Langenkamp, Jonathan Voyles, Manny Guerzon, Emily Farrer, Claire Atlas, Sam Lopez, Jeremiah Bernau, Hannah Hartley, Noah Vento, and Andrew Ruetten; Sitting: Ethan Andrews and Eyal Marder

Cole Sitar (M.S. program) near  
the crest of the Sangre de Cristo  
Mountains, September 2020.  
Photo by John Singleton





Ellen Wohl speaks about geosciences careers with student in Sherwood Forest. Photo by Rick Aster



# **OUR FACULTY & STAFF**

Our faculty and staff explore the wide world of geosciences.



**Rick Aster, Professor**

I continued to work this year on several NSF-funded initiatives in Antarctica and a few other research projects. Seismic studies of glacial and glacial-tidewater systems continue to produce fascinating and continuous observations of their dynamic and brittle properties that cannot be observed by other methods. Ph.D. student Hank Cole is doing groundbreaking icequake research in Antarctica and is also developing parallel machine learning methods of event detection and characterization in partnership with the USGS National Earthquake Information Center.

One aspect of his dissertation research involves studying tidally triggered ice shelf seismicity on the Ross Ice Shelf, using data that colleagues and I recorded with a 34-station

seismographic array spanning the shelf that was recently deployed to continuously record two full years of data. Other studies from this unique seismic data set include shelf-front seismicity and calving stimulated by the persistent waves of the Southern Ocean, and intra-shelf icequakes associated with features that may be analogous to erupting, potentially tidally activated “tiger stripe” rifts near the south pole of the icy Saturnian moon Enceladus (which has led to some interesting new collaborations with NASA-funded colleagues at the University of Maryland and Howard University).

I also began another, new, NSF-funded project this year to study the seismicity and internal structure of Erebus volcano (Ross Island, Antarctica) with colleagues from the University of Texas at El Paso and the University of Alaska, along with new CSU graduate student Erika Jaski. Among other goals, we are working on producing new tomographic images of the deep magmatic plumbing of this volcano from its persistent near-summit phonolitic lava lake through the crust and into the upper mantle.

I also continue to collaborate with (project leader) Derek Schutt and colleagues from Michigan State and a number of Canadian institutions in our NSF EarthScope program-funded geophysical studies of the Mackenzie Mountains region of Yukon and Northwest Territories,

where we published a number of papers this year with Canadian and other colleagues, and hosted an early-2020 CSU workshop with many collaborators attending (some weeks before the COVID-19 situation became the dominant story of the year and basically ended all in-person meetings). My Ph.D. advisee, Michael Baker, graduated this year (he was the last of the grad students who accompanied me to CSU from my former position at NM Tech in 2014) with a spectacular dissertation encompassing seismic wave propagation into and within the Ross Ice Shelf as well as its persistent seismic excitation by ocean waves. Michael has now started at Sandia National Laboratories working with new fiber-optic (DAS) strain and seismic sensing systems deployed on the Arctic ocean seafloor.

Finally, I continue to serve as chair of the Incorporated Research Institutions for Seismology Board of Directors. This year, the U.S. geophysical community made historic progress on effecting a statutory corporate merger of IRIS with its sister geodetic consortium, UNAVCO. We will be working hard across the next several years to plan and realize this merger and to lead a national effort to propose to NSF for the new EarthScope Consortium to operate NSF’s combined geophysical instrumentation, data, and educational and outreach facilities beginning in 2023.



Sky Pond



### Sean Bryan, Senior Instructor

As we have all experienced, the past year has been eventful and challenging. This past spring semester, we were faced with rapidly transitioning our courses to online delivery following spring break. In a couple of weeks, I went from teaching in person with our 500-plus students in Intro to Physical Geology to becoming an aspirational YouTube star. (I'm not quite there yet!) This has involved learning new software, writing new labs, and struggling with unpredictable Internet connections.

Through it all, I have been inspired and so thankful for our teaching and learning assistants who allow GEOL 120 and 121 to happen. Our GEOL 121 TAs this spring (Kristen Cognac, Ethan Costello, Teresa Langenkamp, Eyal Marder, Ryan McCalden, Aren Roybal, James Van Hook, and Lucas Zeller) handled the transition to online teaching with incredible poise, and I'm pleased to report that Lucas Zeller was awarded the Geosciences Outstanding GTA award for 2019-2020!

Through all of this, we are learning more about how to deliver geoscience content in more flexible, innovative, and accessible ways. Right now, our introductory labs (GEOL 121) are participating in an NSF-funded, multi-institution study examining the level of

inquiry in introductory geoscience labs. As a part of this, we've incorporated some new labs in online and in-person formats, which are designed to provide students with more authentic inquiry experiences. We think these will improve students' understanding of geoscience concepts and the scientific process.



### Jeremy Caves Rugenstein, Assistant Professor

This is my first semester at CSU, and it's already shaping up to be quite a busy year. I have two M.S. students who started with me (Ellie Driscoll and Siânin Spaur), and both are researching how the hydrological cycle varied in the past when atmospheric CO<sub>2</sub> was substantially higher. Specifically, Ellie is studying how moisture transport has varied across Europe during the Cenozoic, in response to both tectonic changes and to changes in global climate.

Siânin is working on how the North American Monsoon varied in strength during the middle Miocene Climate Optimum, a period when atmospheric CO<sub>2</sub> is thought to have nearly doubled approximately 15 million years ago. Both projects are aimed at better understanding how the water cycle, including precipitation, evaporation, and runoff, will change in a warming world.

To jump-start this work, I'm currently renovating the 306B lab to create a geochemical preparatory laboratory. I am also installing two major pieces of equipment in the NREL EcoCore facility, the start of a deeper relationship between Geosciences and NREL. These instruments include a GasBench, which, when coupled to a mass spectrometer, permits measurements of the isotopes of C and O in CO<sub>2</sub> gas, and a Picarro water isotope analyzer, which measures the stable isotopes of H and O in water (liquid or vapor).

Lastly, I've been co-teaching GEOL 192, our new student orientation and introduction to geosciences with Sara Rathburn. It's been a wonderful pleasure to meet the incoming students, and I've learned a tremendous amount about the department and CSU as we discuss what it takes to be a successful geology major to these new students. I'm looking forward to having many of them next semester when I fill in for Sara in GEOL 154 Historical Geology while she is on sabbatical in Iceland.



### Sven Egenhoff, Professor

I had started my sabbatical in Spring 2020 when the COVID-19 pandemic hit, and my ongoing work on the *Siliciclastic Mudstone* book came to a screeching halt as other tasks awaited me, including taking care of

my son, who suddenly had to juggle online school, and trying to fathom a new normal that included a halt to social interaction. Since the sabbatical wasn't really that much of a sabbatical anymore, my plans of going to Sweden for fieldwork had to be postponed, but I am still planning on doing the fieldwork in Sweden (and some core work in Germany) once the pandemic ends (and hopefully not in another seven years).

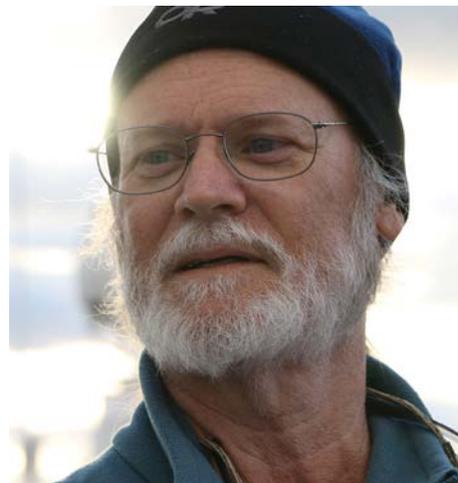
The pandemic impacted my general productivity, but I am currently working on five manuscripts focusing on several aspects of shale sedimentology, as well as on other sedimentary geology problems, such as facies distribution in mixed carbonate-siliciclastic systems and diagenesis of mud-rich sedimentary successions, such as (how surprising) the middle Bakken in North Dakota.

At the beginning of the year, I submitted a research proposal to several oil companies to establish a consortium, but these research dreams quickly became obsolete once the economic downturn began and petroleum companies largely stopped funding universities. Nevertheless, I am now preparing to submit a proposal to ACS-PRF as soon as time permits, while teaching two fall courses and writing the book, supervising four graduate students, and trying to understand coastal plain successions that are not majorly composed of siliciclastic mudstones.

I continue to chair the Field Camp committee. We succeeded, with lots of special effort, in running an in-person course with nine students this year. My instructional part, as always, involved section measuring and helping students study the stratigraphy and sedimentology, this year, again, in the Molas Pass region near Silverton. The Field Camp class camped for the first time at the Molas Lake campground at an altitude of more than 10,000 feet.

Despite the challenges of social distancing, Field Camp was a huge success with these students, all of whom needed the class to graduate. It was also one of the few in-person Field Camp courses that was held in the U.S. – most others were canceled because of the pandemic.

Finally, while my four current graduate students are all working to finish their degrees, one of my other students completed his M.S. last semester and started working for ExxonMobil in March. This is a chance that my other graduate students may not get, as the U.S. oil price is currently extremely low and even briefly went negative for the first time in history earlier this year; something that I thought was not possible!



### Dennis Harry, Professor

This has been an active year for me and for my group of graduate students. We published six manuscripts and have another in review. It's hard to narrow down the highlights from the year, but one is surely Ph.D. student Micah Mayle's presentation at the American Geophysical Union Chapman Conference in Iceland, which drew wide attention and has led to new international collaborations with colleagues at Aarhus University in Denmark.

Micah's work is supported by the National Science Foundation and focuses on understanding feedback between continental rifting, magmatism, and basin formation. M.S. student Manny Guerzon is extending the work I began during my participation in International Ocean Discovery Program Expedition, which drilled the late syn-rift and post-rift strata in the deepwater Mentelle Basin off the southwest Australian continental margin during late 2017.

Manny's work takes the next step, using the drilling results and regional seismic data to infer the tectonostratigraphic evolution of the margin during the (undrilled) early rift stages. The area is significant as it is an unexplored basin with high hydrocarbon potential, as well as a place that played a critical role in the breakup of Gondwana and the opening of the northeast Indian Ocean.

A final research accomplishment this year was obtaining funding for a National Science Foundation Workshop that I will co-host on the CSU campus in Summer 2020. This will be a planning workshop by the U.S. science community to develop a new five- to 10-year vision for NSF-funded research into continental and oceanic rift systems.

I will close with a word about teaching. I am excited that I was able to spend much of the 2020 fall semester developing a new course focused on the structure and processes within the Earth's interior. This modernized version of the traditional Solid Earth Geophysics class includes recognition of feedback between Earth's interior, oceans, and atmosphere, contributing to our department's continuing efforts to empower our students with a "Whole Earth" view of geosciences.



### Sean Gallen, Assistant Professor

Despite new challenges presented by 2020, my past year has been similar in many ways to other past years; much of my time has been spent on proposal and manuscript writing, conducting research, teaching, and advising. I was fortunate to conduct field research with my graduate students this year. I went to Chile with John Singleton and crew in January, where I worked with M.S. student Emily Perman to collect data on mysterious lines in the desert. Ph.D. student Johanna Eidmann and I went to Puerto Rico in early March to install a network of weather stations designed to better understand rainfall-triggered landslide hazards.

This summer, Ph.D. student Eyal Marder and I worked along the Arkansas River in southern Colorado to disentangle tectonic versus climatic drivers of landscape evolution. Several students I've been working with published exciting research this year. Of particular note is the publication of Marius Huber's (my former M.S. student from ETH-Zürich) thesis on the timing and emplacement mechanisms of large "exotic" boulders in the Nepalese Himalaya. Marius' work suggests large (> 5 m) boulders in central Nepal traveled far distances (tens of kilometers) during exceptionally large floods associated with protracted

periods of glacial retreat at ~5 kyr and ~10 kyr before present. These results are vital for constraining flood hazards in the Himalaya, particularly considering the ongoing retreat of glaciers in the region due to human-induced warming.

Since January, I've been an active member of the NSF-sponsored SZ4D (subduction zones in four dimensions) Research Coordination Network. The goal of the RCN is to design targeted experiments to make the next giant leaps in understanding the processes underlying subduction zone hazards from the trench to the arc. This fall, I also got involved with a large group of scientists at CSU, led by Sara Rathburn from Geosciences and Stephanie Kampf from the Department of Ecosystem Science and Sustainability, to study the impact of the Cameron Peak Fire on hydrology, landsliding, and sediment loading and transport. I look forward to an exciting and busy year.



### Jerry Magloughlin, Associate Professor.

Hello all! As I'm sure others will write, this has been a very weird and stressful year. I taught an introductory geology course online this spring, along with Advanced Petrology; through certain arrangements and planning these were, in the end, little affected by the shutdown of campus. It was surreal 'evacuating' to my house in March, and

visiting my office after six weeks or so was like walking into someone else's space. Being more or less confined at home, at first led to some catching up of long-delayed tasks around the house; the "cleaning out the storage closet" phenomenon that I suspect many experienced. Then, later in the summer and into the fall, having the largest wildfire in Colorado history dropping ash on Fort Collins and creating a cap of smoke in the sky for many weeks only heightened the strangeness of the year.

My family did manage to carry out, while staying healthy, a visit to relatives in Minnesota, and continuing on to eastern Tennessee for additional family matters. But there was no fieldwork this year at all! Much work and various preparations and revisions over the summer allowed us to start Optical Mineralogy and Mineralogy, modified to allow us to proceed but with some deletions and changes, and finishing up the last two weeks and finals week of fall semester remotely.

Remember the ancient Chinese curse: "May you live in interesting times." Here's hoping for a much less eventful 2021. I'll leave everyone with a time-appropriate tip for 2020. If your face mask is getting a little ripe, next time you wear it, try sucking on a peppermint Lifesaver – on subsequent use, your mask will be minty fresh. I hope everyone is staying healthy, and please keep in touch.



**Daniel McGrath,  
Assistant Professor**

Last winter started out with an ambitious NASA remote sensing campaign testing L-Band InSAR for snow remote sensing at Cameron Pass (and 12 sites throughout the Western U.S.). COVID-19 cut the campaign short in March, but the preliminary results are very promising, and we're gearing up for a follow-up campaign this winter with partners from NASA, Boise State, and University of New Mexico.

Randall Bonnell defended his M.S. in June and was awarded a NASA FINESST fellowship to support his Ph.D., which will be primarily focused on radar-based snow remote sensing. Bri Rick continues to make good progress on her Ph.D. research examining cryo-geohazards. She's harnessed the power of Google Earth Engine to analyze the entire Landsat archive to produce a detailed record of changing glacial lakes in Alaska.

We also managed to squeeze in some fieldwork at her Lake Agnes rock glacier field site this summer, where we collected ground-penetrating radar surveys to elucidate the interior structure of the glacier and conducted repeat Structure from Motion drone flights to quantify glacier deformation/velocity. Lucas Zeller's fieldwork in Alaska was canceled due to COVID-19, but colleagues at USGS managed

to collect some necessary in situ data sets. His research is focused on quantifying the emergence velocities of Wolverine Glacier in order to inform how to best parametrize this field for deriving seasonal mass balances from repeat geodetic products. Christoph Suhr (co-advised by Sara Rathburn) completed an ambitious USGS EDMAP-funded mapping project and collected some fascinating GPR surveys of the valley-fill at the Mountain Campus (despite both COVID-19 restrictions and the Cameron Peak Fire!)

I'm excited to be starting a new NASA-funded collaborative research project (13 PIs and >100 team members in total!) focused on understanding cryospheric and hydrologic changes in High Mountain Asia. We'll be quantifying changes in historic glacial lake extent and predicting future glacier and lake extents to produce detailed glacial lake outburst flood hazard assessments. And, lastly, I've enjoyed developing and teaching a new Environmental Geophysics class this fall that provides an introduction to both surface and near-surface geophysical observations.



**Sara Rathburn, Professor**

Spring 2020 started off with good news – all of my graduate students received student research grants from the Geological Society of America. In addition, Ph.D. student John Kemper

was selected for the Robert K. Fahnestock Award, which recognizes the best proposal submitted to GSA in sediment transport and fluvial geomorphology, and Celeste Wieting (Ph.D. student) was chosen for the J. Hoover Mackin student award given to the outstanding graduate student proposal submitted to the Quaternary Geology and Geomorphology Division of GSA. Christoph Suhr, M.S. student co-advised with Dan McGrath, in addition to his GSA award, received a Colorado Scientific Society student scholarship.

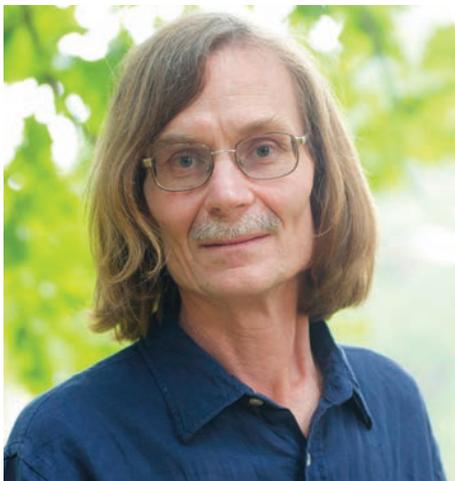
Once March arrived, the news took a distinct turn and our adaptability was tested as we moved to online teaching and advising. My GEOL 154 Historical Geology class did get to complete their laboratory petrographic analysis of lunar samples borrowed from NASA, but they missed all of their field trips to map the local geology.

My TA, Randall Bonnell, and I compiled virtual field trips that the students completed remotely, but there is no substitute for seeing outcrops in person, taking strike and dip measurements, and actually walking contacts in the field to add to a geologic map. Fortunately, most of the GEOL 154 students enrolled in GEOL 201 Field Geology of the Colorado Front Range this fall (co-taught with John Singleton), and we successfully completed all outside exercises and the four, one-day field trips (in masks!), so the students are back on track.

This fall, I am also teaching my GEOL 662 Field Geomorphology class, and co-teaching GEOL 192 Exploring Geosciences with new Assistant Professor Jeremy Rugenstein. As I write this, every week we remain flexible in how we teach based on COVID-19 cases and smoke from the local fires. This has been a distracting fall but rewarding to see the eager student learners, all working hard and supporting the COVID-19 restrictions. I

was promoted to full professor this year and selected as a Fulbright Scholar to Iceland to study channel stability through afforestation efforts on rivers within national forests. Because of COVID-19, I plan to be in Iceland from April-July 2021, with my sabbatical through the year 2021.

While on sabbatical, I will continue working with my students from afar on their research, and continue collaborating with colleagues on research at CSU's Mountain Campus through a Colorado Water Center grant to our multidisciplinary research team, as well as through a recently funded NSF proposal to assess post-fire impacts on flow and sediment dynamics in the upper Poudre River Basin.



### **John Ridley, Associate Professor**

This was an especially challenging year, particularly for field courses, which are a major part of my teaching. In particular, field teaching in our Geologic Field Methods course during the spring semester became impossible because of the pandemic (the students, thus, informally renamed the class “Photo Methods”).

The COVID-19 situation also affected our summer Field Camp in its timing, and, of course, safety protocols, and the course was restricted to a smaller

group of socially distancing geology majors who required the course for imminent graduation.

A new field area also was utilized (sight unseen for me) for the students to study and map volcanic rocks, examining the widespread hydrothermal alteration and ores within the Questa caldera of northern New Mexico (with sometimes challenging road access to reach the field area). Whenever possible through the year, I have also been continuing to work on the second edition of my book *Ore Deposit Geology* and I am still hoping to get all of the materials to the publishers by their deadline of the beginning of next year.



### **Mike Ronayne, Associate Professor**

This has been an eventful year for teaching! Like everyone else, I moved my classes online after spring break. The transition was relatively smooth for my graduate-level groundwater modeling class. Students continued their assignments using personal laptops, and they persisted to learn the material and modeling techniques with great enthusiasm. My large-enrollment intro environmental geology course was a bit more challenging, as we had students participating from multiple continents and many different time zones.

This semester, I am teaching another section of introductory geology. With both in-person and remote student groups, there has been a lot to learn – from the design of online assignments to real-time engagement of remote students during lecture. I am very grateful to the CSU and WCNR technology support groups!

In graduate student news, this summer, Matt Sturdivant defended his thesis on the hydrogeophysical characterization of unconfined aquifer drainage processes during groundwater pumping. Matt is now employed as a hydrogeologist in the Sacramento area, working on California groundwater sustainability plans among other things.

In August, M.S. student Valerie Doebley joined our group. Valerie is interested in mountain hydrogeology and plans to focus her research on groundwater residence times and storage dynamics in high-elevation watersheds. Ph.D. student Kristen Cognac (featured elsewhere in this newsletter) continues her research into the geologic controls on shallow and deep groundwater recharge.



**Bill Sanford,  
Associate Professor**

The COVID-19 pandemic changed how we did our jobs this year. Moving to fully online instruction during the spring semester came upon us quickly and required a steep learning curve to be able to provide quality instruction. In the spring, I taught Environmental Geology online for the first time, which required a slight change in the material covered. Also in spring, I offered a seminar course on Environmental Issues in Mining, where experts from the mining industry, environmental consulting firms, and state regulators gave presentations on various topics. The first few presentations were in person; after going online, there were still eight presentations given remotely, which was actually better for the speakers and the students, especially for those who would have traveled from out of town to give in-person presentations.

After necessary delays, I taught my week of Field Camp in northern New Mexico for the 14th time. I decided that this would be my last year teaching Field Camp, a course I have been involved in since 2003. I really enjoyed it and will miss the one-on-one interaction with the students in a field setting.

This fall, I am teaching Hydrogeology in person, while capturing and streaming

the lectures for those students who feel uncomfortable coming to campus. Because of the uncertainty in how long we would remain on campus, I changed the lab schedule so that all fieldwork and hands-on lab work were addressed in the first several weeks of the semester, while the remaining labs are more suitable for online offering.

Because of social distancing requirements, the TA for the course (Kristen Cognac) conducted the lab experiments herself while the students recorded the data and did the analyses. The one aspect I miss the most is the one-on-one interaction with students, especially when they come to ask questions about assignments. It isn't the same when we hold office hours online. The role of groundwater in maintaining streamflow in headwater systems has become a major focus of my current research.

Graduate student Amber Lidell is working hard to complete her M.S. thesis on using low-cost sensors to measure specific conductance in headwater streams, with the goal of using the data to estimate the contribution of groundwater to baseflow to the discharge in streams during the period following the snow-melt runoff.

The results look very promising. I am currently working with various researchers from watershed science and outside entities to develop a project in the Senator Beck Basin in the San Juan Mountains along Red Mountain Pass to look at the influence of drainage from several wetlands in the basin on maintaining streamflow following snowmelt. My incoming M.S. graduate student, Nick Chohan, will be working on this project as part of his thesis work. This year, I was a co-author on a manuscript in the *Journal of Contaminant Hydrology* on the dynamics of major and trace elements to determine the impacts of seawater

intrusion in the coastal Todos Santos aquifer in Baja California Sur.

Finally, I hired a postdoc, Mohamed Al Faitouri, who was a Ph.D. student of mine who graduated in 2013. He is working on the influence of geology on salt inputs to rivers in arid and semi-arid climates, focusing on Colorado at this time, as well as analyzing aquifer pumping data, chemistry, and isotopes collected at three large groundwater pumping centers in central Libya. Some of this work is a continuation of Mohamed's Ph.D. work. Overall, it has been a very interesting year.



**Derek Schutt,  
Associate Professor**

The early part of the year was focused on research in Northwestern Canada and on the temperature of the continental lithosphere, with four publications, and one in review (Baker et al., 2020; Estève et al., 2020a, b; Goes et al., 2020). We also started our multi-institution project to produce a set of integrated geodynamical Earth models, which has been a wonderfully fun and productive multidisciplinary collaboration. As part of this, we are looking forward to hiring postdoc Patrick Ball, who will start early in 2021.

Teaching has certainly been different, but it's been a good opportunity to

invest time in improving classes. In the summer, four colleagues and I put together a seed NSF grant to create a standards-based set of geophysical teaching modules. This was also of interest to the IRIS consortium who has expressed interest in funding our development of seismology teaching modules to be shared with the community. With that in mind, I have been working hard to create a flipped seismology class that can be taught both in person and online, and I have really enjoyed working with an amazing bunch of students who don't let anything stop them (see: <https://integrated-earth.github.io>).



### John Singleton, Assistant Professor

The year 2020 started off the same as the previous four years, with fieldwork in the Atacama Desert of northern Chile. CSU grad students Nikki Seymour, Emily Perman, and Skyler Mavor participated in this fieldwork, along with professor Sean Gallen and our Chilean collaborators. Our main focus this year was on neotectonic lineaments preserved in surficial deposits in the Coastal Cordillera. We interpret these lineaments to represent grabens above reactivated bedrock faults, possibly associated with co-seismic extension during subduction megathrust slip. Right before the

pandemic shutdown hit in March, I was able to get out to the field in southeastern California with Skyler Mavor, who is investigating Neogene dextral faults in the lower Colorado River region as part of his dissertation.

The academic highlight of 2020 for me was seeing Nikki Seymour successfully complete and defend her Ph.D. in the spring, with 96 people viewing her April defense via Zoom. Nikki is now at Stanford University on an NSF postdoctoral fellowship. Since the pandemic started, my research has shifted to more local projects.

In August, M.S. student Erinn Johnson and I did some fieldwork near Ouray, where we are looking at Ancestral Rocky Mountain structures, and in September new M.S. student Cole Sitar and I did some reconnaissance work in the Sangre de Cristo Mountains near Crestone. For his M.S. thesis, Cole will be investigating Laramide thrusts that have locally been reactivated as normal-sense shear zones (presumably during early stages of Rio Grande rifting).

This fall, I have been working with undergraduate student Sara Newman on clastic dikes exposed along Fountain-Ingleside Formation contact in and around Lory State Park. I really enjoyed the last week of Field Camp this August with nine highly motivated seniors. We camped at Molas Lake and did our usual mapping project near Lime Creek with nearly perfect weather.

This fall semester has been a challenge, but Sara Rathburn and I managed to take our 22 students in GEOL 201 (Field Geology of the Colorado Front Range) on all four scheduled field trips in the course, and I am enjoying teaching Advanced Structural Geology with a group of four students.



### Lisa Stright, Assistant Professor

While 2020 has provided many challenges, the students and my colleagues who I work with in research and teaching have been a bright light in the midst of it all. I am teaching GEOL 124 Geology of Natural Resources this fall in a hybrid format (half in person, half online) with an enrollment of 76 non-geology major students.

The class content provides a foundation in geology for a deeper understanding of the source, accumulation, search, and stewardship of our geologic natural resources (water, minerals, and energy). I also continue to teach senior/graduate-level petroleum-related courses (Reservoir Characterization and Modeling; Petroleum Geology; and Well-Logging and Petrophysics).

As noted below, at the beginning of the year, I coordinated a special seminar course for a dedicated group of students who committed their time and energy to compete in the 10-week American Association of Petroleum Geologists Imperial Barrel Award. We were honored to receive industry mentoring from Steven Crews (M.S., geology, '85) and local retired geologist from ExxonMobil, David Advocate. The team was composed of M.S. students David Cammack, Teresa Langenkamp, Ahmed Abukhtwa, and Manny Guerzon,

## FACULTY AND STAFF BRIEFS

and undergraduate student Cesar Quiroz. Although our students in this inaugural effort did not place in the top three winning group, as Steven Crews noted, they learned a lot – not just about how to evaluate an area in terms of petroleum geology, but about working on an ad hoc team, making and delivering industry-style presentations, and working quickly to hard deadlines.

This experience should be valuable to them in whatever future work they do. It will also be a good thing to have on their resumes, especially if they decide to work in the energy industry. We hope to be offering the IBA team experience on a regular basis in future years! We are currently in the second

year of phase 3 of Chile Slope Systems. The team completed fieldwork in Patagonia in the early part of 2020.

The field season was nearly complete before COVID-19 hit and was cut a bit short, but not before students were able to collect the data they needed to complete their research. This year, M.S. student Noah Vento completed his thesis titled “Hypothesis-based Machine Learning” to predict interpretive deepwater architecture from core data. Noah joined ExxonMobil shortly after completing his degree.

I currently have two M.S. students who are working on projects associated with characterization and modeling of deep-

water depositional systems. Andrew Ruetten is in his last semester of his research on characterizing reservoir-scale fluid flow patterns and testing the ability of stochastic geocellular modeling to accurately predict these flow patterns.

Finally, Teresa Langenkamp, a second-year M.S. student, is working on using seismic modeling to better understand the information content in inverted seismic data for predicting facies rock properties for modeling. Teresa and Andrew both had successful remote internships last summer, with ExxonMobil and Occidental Petroleum, respectively.

### The 2020 Department IBA team



The 2020 IBA team: David Cammack, Ahmed Abukhtw, Teresa Langenkamp, Manny Guerzon, and Cesar Quiroz



**Sally Sutton,  
Associate Professor**

With Ph.D. student Christophe Simbo and other colleagues, I continue to focus on understanding geochemical rock-water interaction, particularly related to aquifer storage and recovery. ASR, which has seen increased use in Colorado in recent years, utilizes aquifers to store surplus water that can then be recovered when needed by pumping.

The seasonality of snowmelt-derived water makes many Front Range communities excellent candidates for ASR, and it is especially promising as an alternative to constructing more large-scale surface reservoir projects. Christophe is beginning to work on geochemical modeling of rock-water interactions during ASR in a carbonate aquifer in Texas and plans to deploy a novel method for downhole measurement of redox potential in groundwater.

A question in any proposed ASR operation is whether interaction of oxidized injected water with a reduced native water could result in mobilization of metals, e.g., arsenic or uranium, from the host rock. We are beginning to address this with a combination of geochemical analyses and geochemical modeling. In addition to the continuing ASR-related work, new M.S. student

Alex Marr is following up on a project of John Ridley's M.S. student Anne Ji. Alex is looking at the relationship between changes in fluvial deposits and arsenic contaminated floodplain sediment downstream from the Homestake gold mine in South Dakota. Alex also just completed a very successful internship with the Colorado Geological Survey.



**Ellen Wohl, Professor**

It's been a challenging year in many ways, but we've all persevered. M.S. students Zach Kornse, Julia Grabowski, and Emily Iskin successfully defended their theses via Zoom not long after the world shut down for COVID-19. Zach is now working for the Fort Morgan school district and Julia is now with Headwaters Corporation in Fort Collins. Emily is continuing on for a Ph.D., examining patterns and drivers of floodplain heterogeneity in river systems across the continental U.S.

I did not accept any new graduate students, but Sarah Hinshaw and Juli Scamardo continue their Ph.D. programs, having each successfully completed a summer of fieldwork despite onerous permissions requirements for travel. Sarah wins a prize for the most rapid about-face in dissertation research ever: fieldwork originally planned for Chilean Patagonia had to be scrapped because of travel restrictions, but she is now deep in an

exciting project quantifying the carbon sequestration potential of Stage 0 river restoration projects.

Juli is working on sediment dynamics in ephemeral river floodplains, having successfully survived the anti-mask sentiments of rural southern Utah and southern Arizona this past summer. Rich Knox continues to challenge the limits of computing time and his sanity by developing remote methods for mapping artificial levees across the U.S. Anna Marshall will defend her M.S. this coming spring and has decided to continue for a Ph.D., with plans to examine how large wood facilitates channel and floodplain heterogeneity on rivers in Montana. A personal milestone was completing the 11 years of annual logjam surveys in Rocky Mountain National Park.

Now, I have a pile of data to analyze. I'm actually beginning to miss interminable international flights and looking forward to the resumption of a pre-COVID-19 lifestyle sometime in 2021. I did, painfully at times, learn how to record acceptable online lectures and seminars. I am also apparently nearing the end of my career, at least in the eyes of some: I received the Mel Marcus Distinguished Career Award from the Association of American Geographers, the David Linton Award from the British Society of Geomorphology, the Borland Hydraulics Award from CSU, and the Distinguished Alumni Award from the University of Arizona. I feel very distinguished, but I still have to shovel the driveway when it snows and obey the dictates of Naia the Cat. Ah, well. Here's hoping we all have a more enjoyable 2021!

## Geological Resources Inventory Group

The group continued to produce scientific geologic information to assist the National Park Service in the management and protection of our national parks. Information about the GRI program and its products can be found at the NPS GRI program website: <https://www.nps.gov/subjects/geology/gri.htm>, as well as at the CSU GRI website: <https://warnercnr.colostate.edu/geosciences/geologic-resources-inventory>

The GRI currently employs seven CSU research associates (four of whom are departmental alumni). The GRI also continues to employ CSU geology student interns, a commitment that is in its 20th year. The team aims to hire at least three additional research associates in the coming year. This year, the GRI completed new digital geologic-GIS maps for seven parks, including: Channel Islands National Park, Glacier Bay National Park and Preserve, and Yellowstone National Park. The GRI also continued its effort to update legacy digital geologic-GIS maps, and this effort updated approximately 70 legacy maps, including Cuyahoga Valley National Park, Glacier National Park, Olympic National Park, and Saint-Gaudens National Historic Site. The GRI also completed work migrating more than 30 geologic and surficial maps for Yellowstone National Park.

This was a substantial project that utilized more than 70 source geologic maps, published between 1956 and 2007. Understandably, there are many places where geologic interpretations across map boundaries differed. To resolve these conflicts, GRI map team members Stephanie O'Meara, Jim Chappell, and James Winter worked with graduate student Natali Kragh and her faculty adviser Madison Myers at Montana State University, as well as Jeff Hungerford, the park geologist at Yellowstone National Park.

Over the summer, Natali, Madison, and MSU students began fieldwork within the park to collect field data related to the map boundary issues. Natali will next compile these data and will use remote imagery and GIS software to best integrate and merge the map data. Next summer, she will resume fieldwork with continued collaboration with the GRI. Additionally, this year the GRI map team developed and released two new supported GIS map product formats to display GRI digital geologic-GIS maps. A total of eight GRI reports were published in 2020 with an additional 13 reports in various stages of completion as of November 2020. Every report is truly a collaborative effort, requiring communication within the GRI team and reaching out to local geologic experts and park resource managers.

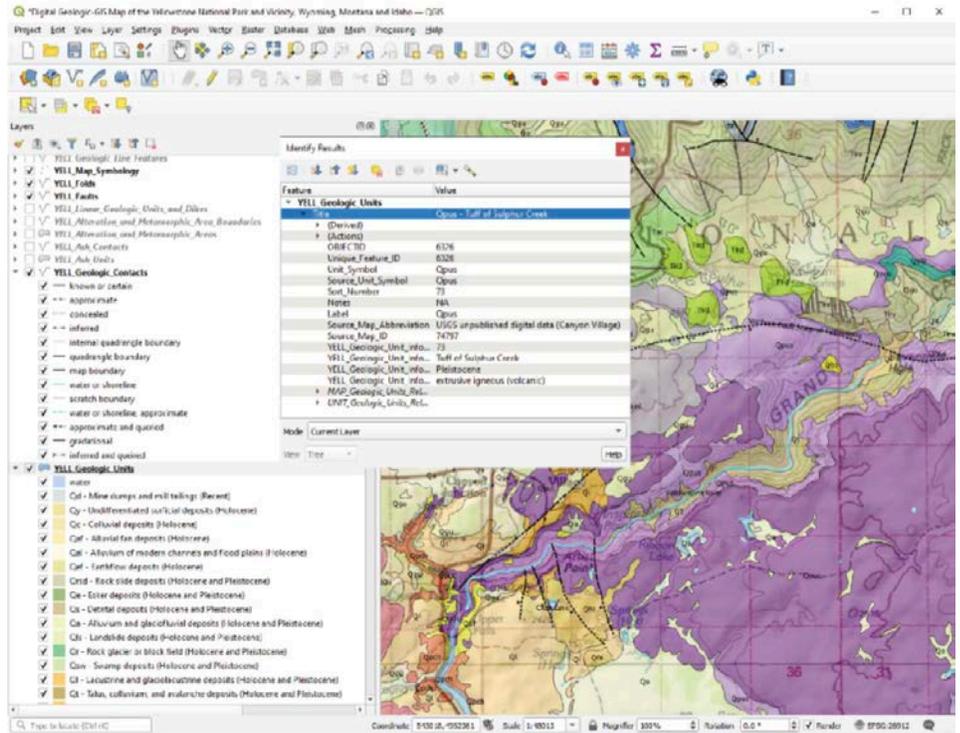


The 2020 Geological Resources Inventory Team from left to right: Tim Connors (NPS), Jason Kenworthy (NPS), Jake Suri (CSU non-student intern, has graduated), Judith Hannah (CSU), John Andreoni (NRCS), Katie KellerLynn (CSU), Rebecca Port (NPS), Michael Barthelmes (CSU), Georgia Hybels (CSU), Stephanie O'Meara (CSU), Amanda Lanik (NPS), Bruce Heise (NPS, retired), Trista Thornberry-Ehrlich (CSU), John Graham (CSU, retired), Sarah Lowe (CSU - graduated student intern), James Winter (CSU), Jim Chappell (CSU), Chelsea Bitting (NPS), and Ron Karpilo (CSU).

## The GRI Digital Geologic-GIS Map of the Yellowstone National Park and Vicinity, Wyoming, Montana, and Idaho,

shown in QGIS software with a U.S. Topo map service from ESRI. The Yellowstone River springs to the surface at the mouth of Sevenmile Hole near the Lava Creek Caldera Rim Fault before flowing southwest; incising Pleistocene-aged Canyon Rhyolite Flows (Qpuc) and Sulphur Creek Tuff (Qpus) on its way through the steep valley of the Grand Canyon of the Yellowstone before a perilous drop through Yellowstone Falls.

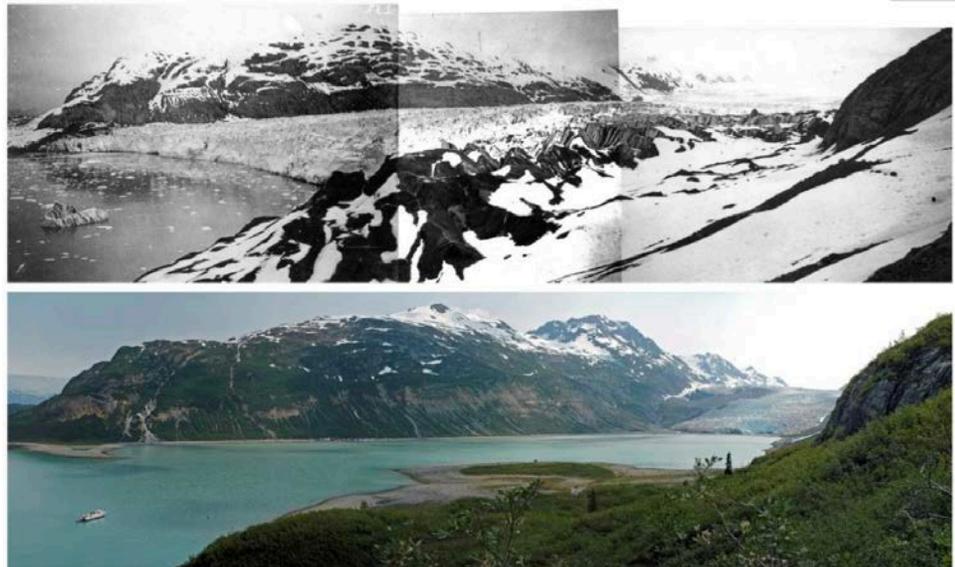
The GRI data is available from the NPS Data Store at: <https://irma.nps.gov/DataStore/Reference/Profile/1044842>



## Repeat Photography

In addition to his role on the GRI map team, Ron Karpilo has spent the past two decades conducting repeat photography projects documenting glacier and vegetation changes in Alaska National Parks. Ron has relocated and repeated hundreds of historical photos in Denali National Park and Preserve, Gates of the Arctic National Park and Preserve, Glacier Bay National Park and Preserve, and Klondike Gold Rush National Historical Park.

The resulting photo pairs reveal how the natural resources of Alaska's national parks have changed during the past century and how the ecosystems and landscapes are responding to drivers such as climate change, human visitation, and development. A selection of photo pairs from the Gates of the Arctic and Klondike Gold Rush projects are available at the following links: [www.nps.gov/gaar/learn/photosmultimedia/repeat-photography.htm](http://www.nps.gov/gaar/learn/photosmultimedia/repeat-photography.htm) and [www.nps.gov/klgo/learn/nature/repeatphotography.htm](http://www.nps.gov/klgo/learn/nature/repeatphotography.htm)



Repeat photo pair shows several kilometers of retreat of Reid Glacier in Glacier Bay National Park and Preserve, Alaska. Upper photo was taken June 12, 1899, by G.K. Gilbert, USGS; lower photo was made June 27, 2004, by Ron Karpilo.

### GRI FAREWELLS

In 2020, the GRI team said farewell to two of our CSU research associates. John Graham retired on May 8 and Georgia Hybels passed away on May 19.



**John Graham** (Ph.D., '96) joined GRI in 2001 as one of our earliest hires and one of the three core report writers. Over his 19 years with the program, John wrote reports for 47 parks from Acadia National Park (Maine) to Zion National Park (Utah).

He researched and wrote about the widely variable roles geology plays in the landscapes of our national parks from subtle (Herbert Hoover National Historic Site, Iowa) to spectacular (Yosemite National Park, California).

He also participated in dozens of scoping meetings for dozens of parks and accumulated untold frequent-flier and road-trip miles. John and his wife continue to call Fort Collins home, at least when he's not out in a canoe, preferably in the Boundary Waters. Happy trails (and rivers), John. We wish you the best!



**Georgia Hybels**, who passed away in 2020, started in 2002 as an intern with a National Park Service air quality information management system program and she joined the GRI team soon thereafter. She was an NPS term employee for eight years and joined CSU as a research associate in 2014, where she continued working for the GRI team.

Georgia was an integral part of the GRI GIS production team and also coordinated the development and production of GRI posters that display our data and accompany the reports. She mentored many CSU student interns who crafted the posters and always made sure new team members were welcomed and included. Her family is working with local parks and the Rocky Mountain Conservancy to place benches as a tribute to Georgia's love of the outdoors. We will forever miss Georgia's room-brightening smile, generous spirit, kind soul, and spectacular laugh.



Sandbeach Lake, Rocky Mountain National Park, at dawn Photo by Rick Aster

Graduate student Lucas Zeller checks geophysical equipment at the CSU Mountain Campus with flames from the still-smoldering Cameron Peak Fire visible in the background. The combined Cameron Peak and East Troublesome fires burned more than 401,000 acres in the Roosevelt and Arapaho National Forests west of Fort Collins during the Summer 2020 fire season.



Smoke from the Cameron Peak Fire blankets the sky over the CSU campus. Photo taken from the Michael Smith Natural Resources Building, Sept. 6, 2020.



# Departmental News

DMNS collaborations and Field Camp

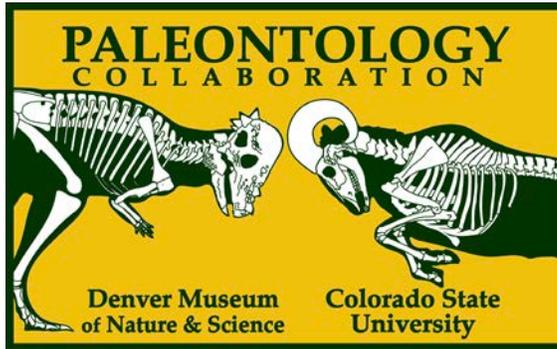
## College-Department-Denver Museum of Nature & Science Collaboration to Advance CSU Paleontology

With spectacular regional discoveries over the past several years, from a trove of ice age mastodon from Snowmass, to horned dinosaurs from Thornton and Highlands Ranch, to revealing the record of life's recovery after the K-Pg mass extinction recorded in rocks at the Corral Bluffs near Colorado Springs, scientific, educational, and public interest in Colorado's fossil record has never been greater. Indeed, links between the evolution of life on Earth and the geological record are all around us and are among the most popular topics covered in university classrooms.

In late October, the Warner College of Natural Resources, the Department of Geosciences, and the Denver Museum of Nature & Science were pleased to formalize a five-year collaborative agreement, made possible by the Warner College of Natural Resources Warner Endowment funds, to bring a variety of new paleontology opportunities to CSU undergraduates. This new collaboration responds to both a sustained student interest in the Geosciences department, and to ongoing and remarkable scientific progress in understanding our fossilized surroundings and Earth's paleoenvironment.

Led by CSU Geosciences alumnus Joe Sertich (B.S., '04), in his capacity as the associate curator of dinosaurs at DMNS,

the collaboration will kick off in spring semester 2021 with Joe teaching our upper-level paleontology course (GEOL 342), which will link concepts in sedimentology, geologic time, and depositional environments to the fossil record and is always a very popular undergraduate elective for our geology majors. Additional courses are being planned, including an introductory course that will prominently feature dinosaurs and their world for Spring 2023.



Perhaps the most exciting new developments of all will be unique, hands-on opportunities for students, including an annual summer field course that includes a one-week expedition to the dinosaur-rich badlands of northwest New Mexico and anticipated

summer internships for CSU students with the Department of Earth Sciences working with Joe and colleagues at DMNS. Closer to campus, opportunities abound for research into local dinosaurs, such as the giant Horsetooth Allosaurus, discovered in 2000 in Morrison Formation exposures along the reservoir's shore, and the Briggsdale Triceratops, discovered in the poorly known dinosaur ecosystems of the Laramie Formation east of Fort Collins. By providing students with opportunities to explore and learn from the rocks around us, there is no doubt that CSU students will be discovering and naming new dinosaurs of their own very soon!



Joe Sertich Ph.D., associate curator of dinosaurs at the Denver Museum of Nature & Science

### Joe Sertich (B.S., '04) Department Affiliate and Paleontology Instructor

Inspired by my geological training at CSU, I have spent much of my career hunting dinosaur ecosystems around the world to explore patterns of biotic response to tectonic, climatic, and environmental perturbations. My work has taken me across much of East Africa, Madagascar, and Antarctica in search of fossil ecosystems, but it is here in the Western Interior of North America where many of my most exciting and impactful discoveries have been made.

For example, since joining DMNS more

than nine years ago, I have led annual, multi-month expeditions to the remarkably continuous Upper Cretaceous rocks of southern Utah, documenting long-term ecosystem change in response to rising mountains and fluctuating seas. In the process, these digs have led to the discovery of more than a dozen new dinosaur species and numerous new turtles, lizards, crocodiles, and birds.

Similar work in New Mexico has already resulted in the discovery of new dinosaur species and numerous geological puzzles, many of which will be perfect for introducing students to paleontological and geological fieldwork and research, and for collaboration with other CSU geoscientists.

## Field Camp 2020 – Looking at Rocks During a Worldwide Pandemic

Sven Egenhoff, Lead Field Camp Professor

This summer's capstone Field Camp was taught under the most unusual circumstances in the history of the department. However: (1) it was taught, and (2) it was taught successfully! Together with very few other universities nationwide the CSU Department of Geosciences made an in-person Field Camp happen in the middle of a worldwide pandemic. Of course, that was not an easy task – we had to be extraordinarily careful throughout the course, and the path to adapt the course (and get it approved in all respects) required a lot of new planning.

First – we moved the five-week course from May-June to mid-July-August. This is later in the summer than we have ever taught Field Camp and provided just enough leeway to get all the logistics and approvals addressed and still be done before fall classes started. As an example, we needed to get CSU approval to run Field Camp as an in-person course, which took a while but was ultimately successful;

we received final approvals a good two weeks before Field Camp started. The maximum number of students we were allowed to accept was limited to 10 – and nine students (all graduating seniors in geology) would finally go on this extraordinary Field Camp experience. While most everybody in Fort Collins was confined mostly to their homes, we traveled. It was amazing!

Quite a few things were rather different this year. We could only camp, (no lodging) and everybody slept solo in their own tents, and there were no cooking groups – everybody had to prepare meals themselves. Every morning, the course TA would take the temperature of every participant and report it back to the department office in Fort Collins, just to ensure we were all OK and symptom-free. Of course, we had an even more detailed than usual emergency response plan, including being especially aware of the nearest appropriate medical facility for COVID-19-related contingencies, and we had the vehicles and the TAs ready at all times.



The CSU Field Camp 2020 students  
in the San Juan Mountains



The CSU Field Camp 2020 students in the San Juan Mountains Photo by John Singleton

However, our academic subjects and standards, and many other aspects of the course, were similar to other years. Five instructors each taught one-week modules. This year, the first two weeks were held in New Mexico near Questa. Bill Sanford taught the first week, focusing on hydrogeology. This was Bill's last time teaching Field Camp (he's been a cornerstone of our Field Camp faculty since 2003), and this

in such an unusual environment! John Ridley taught a second week covering hydrothermal alteration and economic geology focusing on the remarkable Questa caldera (a new location for us).

After the initial two weeks, Sean Gallen took over and taught geomorphology out of Cañon City, Colorado, in a spectacular landscape but also in, at times, near-100° heat. I then met up with the group and everybody relocated to a campground south of Silverton, Colorado. We first focused on the sedimentology of carbonates and siliciclastics, and then on the stratigraphy of the Paleozoic succession in the Animas Valley, with looking in detail at one particularly beautiful roadside outcrop south of Molas Pass.

The last week was again taught by John Singleton, again taking advantage of the spectacular outcrops of Paleozoic rocks near and at Molas Pass and the incredible structural features visible nearly everywhere in that area. The group returned to Fort Collins on Aug. 15, just in time to unpack and get ready for the fall semester to start – with an unforgettable Field Camp experience.



Panorama of an outcrop of the upper Hermosa Group, a succession that spans shelf, coastal, deltaic, and continental environments located along Highway 550 south of Molas Pass. This Pennsylvanian succession was deposited at the eastern margin of the Paradox Basin located in Utah and Colorado. Note the incredible blue sky that we have every year when teaching and working at this outcrop. Photo by Sven Egenhoff

Field Camp student Jake Suri studies the Carbonates of the Hermosa Formation at Molas Pass. Photo by Sven Egenhoff



### Department and College Scholarships and Awards

With sincere thanks to the generous donors who have made these scholarships and awards possible

#### Undergraduate Students

**Brendan Auer:** The Steve and Gail Kloppel Scholarship in Geosciences

**Chad Croft:** The Geology Field Camp Scholarship

**Cody Delgado:** WCRN Honors Senior Award, Neil J. Harr Award (RMAG)

**Lucas Dolliver:** The Chris Lidstone and Kate Laudon Scholarship in Geosciences

**Lab Ducote:** The Chris Lidstone and Kate Laudon Scholarship in Geosciences

**Joshua Elkington:** The Geology Field Camp Scholarship and the Katharine E. Compton Field Experience Scholarship

**Jacob King:** Philip A. Connolly Memorial Scholarship and the Charles E. Beverly Memorial Scholarship

**Cielo Martos:** The John and Dolores Goodier Scholarship

**Sara Newman:** The Ernest and Bernice Dice Scholarship, the Geology Field Camp Scholarship, the Charles E. Beverly Memorial Scholarship, and the 2020 Outstanding Field Camp Student Award

**Adam Parol:** The William D. Hatfield, Jr. Memorial Scholarship, the Roy G. and Ruth K. Coffin Memorial Scholarship, and the Michael Smith Scholars in Geosciences

**Daniel Pelphrey:** Salonee Kharkar Memorial Graduate Scholarship

**Dawn Russell:** The Michael Smith Scholars in Geosciences

**Jenna Salvat:** The Florence and Robert Boughton Scholarship and the Michael Smith Scholars in Geosciences

**Kathleen Snelling:** Undergraduate Explorationist Scholarship

**Julie Spawn:** The Chris Lidstone and Kate Laudon Scholarship in Geosciences and WCNR Student Success Scholarship

**Jacob Suri:** The Geology Field Camp Scholarship

**Matthew Swarr:** The Geology Field Camp Scholarship and the David V. Harris Memorial Geology Scholarship

**Jacob Switek:** The Treckles Scholarship in Geosciences, the Geology Field Camp Scholarship, the Myron Brown Ludlow Memorial Scholarship, and the Undergraduate Explorationist Scholarship

**Matt Tyrrell:** Clinton H. Wasser Scholarship and the Michael Smith Scholars in Geosciences

**Nicholas Wilder:** The Michael Smith Scholars in Geosciences

#### Graduate Students

**Randall Bonnell:** The NASA FINESST Grant

**Nick Chohan:** The Edward M. Warner Graduate Research Assistant

**Kristen Cognac:** Harlan Erker Memorial Scholarship from the Colorado Groundwater Association

**Hank Cole:** The Theodore Chamberlain Scholarship in Earth and Marine Resources

**Valerie Doebley:** The Robert L. Stollar Scholarship in Hydrogeology

**Elizabeth Driscoll:** The Edward M. Warner Graduate Research Assistant

**Johanna Eidmann:** The Thomas A. Jones Graduate Fellowship, Natural Resources Workflow Development Fellowship, and a Geological Society of America Graduate Research Scholarship

**Demi Giro:** The McCallum Mineralogy and Petrology Graduate Scholarship

**Sara Hindshaw:** The J.W. Powell Graduate Fellowship, the Marie Morisawa Graduate Fellowship, and Geological Society of America student research grants

**Emily Iskin:** The Schumm Graduate Scholarship

**John Kemper:** The Evelyn I. Clark Scholarship, the Robert K. Fahnestock Award, and Geological Society of America student research grant

**Teresa Langenkamp:** AAPG Foundation Grants-in-Aid Award

**Amber Lidell:** The Robert Farvolden Scholarship from the National Ground Water Association

**Anna Marshall:** The Lary Kent Burns Memorial Scholarship

## Department and College Scholarships and Awards

With sincere thanks to the generous donors who have made these scholarships and awards possible

### Students:

**Skyler Mavor:** The McCallum Mineralogy and Petrology Graduate Scholarship

**Eyal Marder:** Geological Society of America AGeS2 Grant, Geological Society of America Cares Scholarship, and Earth Surface Processes Institute 2020 Scholarship

**Juli Scamardo:** The Ware Geosciences Fellowship and Geological Society of America Student Research Grant

**Michael Sitar:** The Edward M. Warner Graduate Research Assistant

**Christoph Suhr:** The Hill Memorial Fellowship, Colorado Scientific Society Memorial Research Funds Grant, the Professional Development CSU Grad School Award, and Geological Society of America Student Research Grant

**James Van Hook:** Outstanding Teaching Assistant

**Christophe Wakamaya Simbo:** The Roger and LuAnne Steininger Fellowship, Geological Society of America Research Grant, and the National Association of Black Geoscientists Grant.

**Celeste Wieting:** The Shepherd Diversity Scholarship and the Quaternary Geology and Geomorphology J. Hoover Mackin Research Award

**Lucas Zeller:** Outstanding Teaching Assistant  
**Faculty and Staff:**

**Sean Bryan:** WCNR Harry E. Troxell Distinguished Service-to-Students Faculty Award and WCNR Recognition of Creative, Innovative, and Impactful Instruction During the COVID Pandemic

**Sean Gallen:** WCNR Outstanding Publication Award

**Jill Putman:** Graduate of the Global Academic Advising Association Emerging Leaders Program and WCNR Recognition of Exceptional Service to Students during the COVID Pandemic

**Sara Rathburn,** Fulbright-NSF Arctic Research Grant

**Derek Schutt:** WCNR Recognition of Creative, Innovative, and Impactful Instruction During the COVID Pandemic

**Patti Uman:** WCNR Recognition of Exceptional Service to Students during the COVID Pandemic

**Ellen Wohl:** CSU Borland Lecture in Hydraulics, Mel Marcus Distinguished Career Award from the Association of American Geographers, the David Linton Award from the British Society for Geomorphology, and the Distinguished Alumni Award, University of Arizona

### SPECIAL THANKS

Sincere thanks to our 2020 Geosciences Advisory Council: Roger Steininger (chair), Ed Warner, Harold Pranger, Matt Morgan, Bob Stoller, Scott Larson, Jon Robbins, Tara Tafi, Chris Lidstone, Steven Crews, and Landry Griffin.

This year, the GAC conducted its fall Geosciences student research presentations competition virtually, with the top prizes going to Richard Knox (Ph.D. program), Teresa Langenkamp (M.S. program) and Andrew Ruetten (M.S. program).

### SHARE YOUR THOUGHTS WITH US IN OUR ALUMNI SURVEY

We invite you, as a member of the worldwide CSU geosciences community, to share your interests with us in a brief (just three pages) online friends and alumni survey. Opportunities for engagement may include guest lectures; student field trips; supporting and advising our AAPG, SEG, or other student club activities; and becoming a mentor to enhance a student's preparation for a geosciences career. Kindly access the survey via the web page at <http://warnercnr.colostate.edu/geosciences>, go to the "Alumni" tab, and click "Geosciences Friends and Alumni Survey."

## Your Gift's Impact

### Sara Newman

#### Geology undergrad

"I wanted to offer my gratitude for your donations and for giving me an award for Field Camp. Your support is invaluable as it takes a large weight off my shoulders, allowing me to focus on what a great opportunity Field Camp is going to be instead of worrying about how I am going to cover the fees for it. It fills me with pride to see that others believe in me and what I can do with the education I've gotten here at Colorado State University."



### Jake Suri

#### Geology undergrad

"I cannot thank you all enough for your goodwill and kind nature! Your support significantly eases the financial burden I was facing for Field Camp this summer and allows me to concentrate more on getting myself ready academically. It can be very hard to concentrate on school when your source of income is too low to match the costs you are accumulating. I hope that my time at Field Camp exposes me to the types of work I can expect from different career paths and helps me to decide what I would like to pursue."



### Matt Swarr

#### Geology undergrad

"I would like to begin by stating how grateful I am for all of the opportunities that you have provided for myself and other students in the department. During my time at CSU, I have seen the contributions made to the department make the difference in students' lives. I am very honored and grateful to have been selected for this scholarship. It not only eases some financial burdens, but it also validates my decision to pursue a degree in geology at CSU."



### Skyler Mavor

#### Ph.D. program

"I was a recipient of the Ed Warner Graduate Research Fellowship. The fellowship allowed me to travel both domestically and internationally for structural geology research and spend more time in the field. I also had a discretionary fund that I used to purchase the field gear that I needed. Several years later, I've used this gear for close to a hundred days in the field since I started at CSU for research, field trips, and TA-ing Field Camp. The gear is still in great shape and has served me well!"



### Brianna Rick

#### Ph.D. program

"Funding from the Warner Research Assistantship allowed me to attend the Karthaus Summer School in Italy in September 2019. This is a 10-day course taught by experts on ice sheets and glaciers within the climate system. I expanded my knowledge, formed connections with international peers and experts, and had a cultural and academic exchange. This experience has been a highlight of my program. I am incredibly grateful for this support and the generosity of donors."



### Jacob Switek

#### Geology undergrad

"I want to thank the donors to the department Field Camp scholarship. Summer Field Camp gave me really important experience in field geology, but is an additional expense for geology students outside of the regular semesters, and finding money for it can be a challenge for us! After I finish my geology degree, I plan to attend a graduate degree program in seismology or geodynamics."





## The Department of Geosciences

### Faculty

Rick Aster, Professor and Department Head  
Sean Bryan, Senior Instructor  
Jeremy Caves Rugenstein, Assistant Professor  
Sven Egenhoff, Professor  
Sean Gallen, Assistant Professor  
Judy Hannah, Professor  
Dennis Harry, Professor  
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Daniel McGrath, Assistant Professor  
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Michael Ronayne, Associate Professor  
Bill Sanford, Associate Professor  
Derek Schutt, Associate Professor  
John Singleton, Assistant Professor  
Lisa Stright, Assistant Professor  
Sally Sutton, Associate Professor  
Ellen Wohl, Professor

### Joint Appointment Faculty

Wolfgang Bangerth, Professor, Dept. of Mathematics, Colorado State University, Joint Professor with Geosciences  
Tim Covino, Assistant Professor, Ecosystem Science and Sustainability, Colorado State University, Joint Assistant Professor with Geosciences  
Steven Fassnacht, Professor, Ecosystem Science and Sustainability, Colorado State University, Joint Professor with Geosciences  
Svetoslav Georgiev, AIRIE Program, Research Associate IV, Joint Affiliate with Geosciences  
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Lee MacDonald, Professor Emeritus, Ecosystem Science and Sustainability, Colorado State University, Joint Professor with Geosciences

Holly Stein, Director, AIRIE Program, Senior Research Scientist and Joint Professor with Geosciences

### Staff

Jill Putman, Academic Success Coordinator

Patti Uman, Administrative Assistant III and Graduate Coordinator

Kailarae Lilly, Administrative Assistant II

Aaron Zimmerman, Research Associate, AIRIE

Gang Yang, Senior Research Associate, AIRIE



### Staff Highlight

We are pleased to welcome Kailarae Lilly to the department as our new office administrative assistant. While working remotely will be her reality during the fall, as it is for most of us, she is greatly looking forward to coming back to campus soon and getting to know the faculty, staff, and students who make our department the engaging academic environment it is. Proudly a lifelong Ram with deep ties to CSU, Kailarae holds a B.S. in nutrition and food science, prior administrative experience within CSU, and a passion for education that drives her to serve her community. She's excited to be here, and we're excited to have her!

### Staff Farewell

The department sincerely thanks Jill Putman for her exceptional contributions over the past six years and wishes her all the best in her new role as associate director for outreach and support programs in CSU's Collaborative for Student Achievement. Jill has been an extraordinarily dynamic and valuable member of our department and has been deeply involved in all aspects of the Geosciences undergraduate experience. Good luck, Jill. We will miss you!



## Thank You to Our Department of Geosciences Affiliates

Harley Benz, USGS National Earthquake Information Center

Joel Cubley, Geology Instructor, Yukon University

Kenneth Dueker, Associate Professor, University of Wyoming

David Dust, CSU Environmental Engineering Alumnus

Neil Fishman, Senior Geologic Advisor, Hess Corporation, Houston

Jonathan Friedman, Hydrologist, USGS Fort Collins Science Center

Vineet Goswami, Assistant Professor, Physical Research Laboratory, Ahmedabad, India

Ethan Greene, Director, Colorado Avalanche Information Center

James Hagadorn, Denver Museum of Nature and Science

Øyvind Hammer, Associate Professor, Natural History Museum, University of Oslo, Norway

Dario Harazim, Technical Geologist, ETC Seal and Trap Team, Chevron Energy Technology Company

Eric Harmsen, Professor, Earthquake Information Center, University of Puerto Rico

Ed Harvey, Supervisory Hydrologist and Chief of the U.S. National Park Service Water Resources Division (Ret.)

Christopher Hiemstra, Research Physical Scientist, U.S. Army Corps of Engineers, Cold Regions Research and Engineering Laboratory

Kenneth S. Hughes, Department of Geology, University of Puerto Rico

Antun Husinec, Associate Professor, Department of Geology, St. Lawrence University

Scott Johnson, Assistant Professor of Geology, California Polytechnic State University

Chris Lidstone, Regional Manager and Principal, Wenck Associates Inc.

Scott McCoy, Assistant Professor, Dept. of Geological Sciences and Engineering, University of Nevada, Reno

Snorre Olaussen, Professor of Arctic Petroleum Geology, University Centre in Svalbard, Norway

Frank J. Pazzaglia, Professor, Department of Earth and Environmental Sciences, Lehigh University

Robert Porritt, Geophysicist, University of Texas, Institute for Geophysics

Sandra Ryan-Burkett, USFS, Rocky Mountain Research Station

Daniel Scott, University of Washington

Michael Scott, Adjunct Faculty, Watershed Sciences Department, Utah State University, Logan, Utah

Joe Sertich, Associate Curator of Dinosaurs, Department of Earth Sciences, Denver Museum of Nature & Science

Graham Sexstone, USGS Denver

Roger Steininger, CSU Geosciences Advisory Council

Robert Stollar, Regeneration Management Group; CSU Geosciences Advisory Council



Randall Bonnell prepares to measure snow properties in a pit near Cameron Pass, Colorado. Photo by Dan McGrath

Gyana Tripathy, Associate Professor, Dept. of Earth and Climate Sciences, Indian Institute of Science Education and Research, Pune, India

David Wald, USGS National Earthquake Information Center

Edward Warner, Geologist and Philanthropist; CSU Geosciences Advisory Council

### 2020 Postdoctoral Researchers

Mike Prior - Ph.D. Earth and Planetary Science, University of California, Berkeley

Mohamed Al Faitouri, Assistant Professor, Department of Earth Sciences, University of Benghazi

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Anna Marshall, still cheerful, after round-the-clock sampling at Little Beaver Creek in the Roosevelt National Forest, Colorado. Photo by Ellen Wohl

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