

Basement

THE COLORADO COLLEGE GEOLOGY DEPARTMENT



COVID-19 Edition



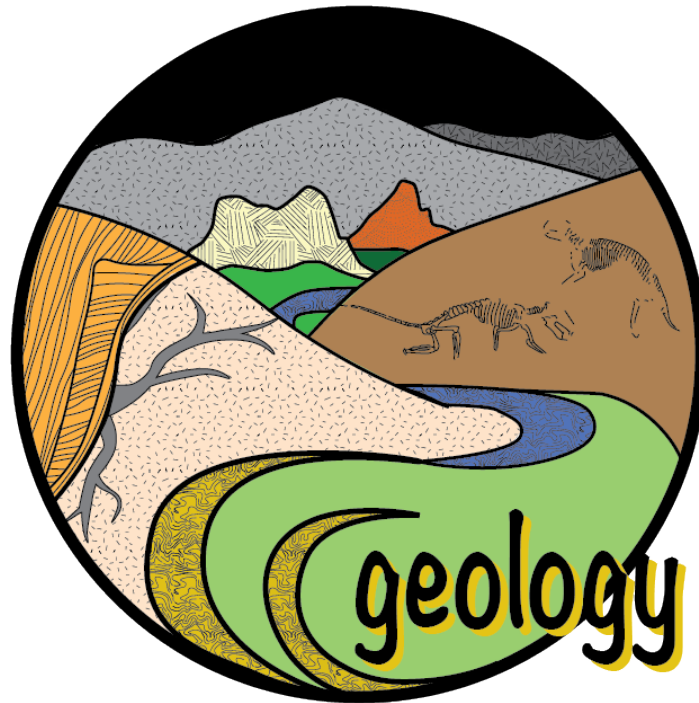
2020-2021

Volume XXII

www.ColoradoCollege.edu/academics/dept/geology

**Cover Photo:
Peaks in the Desert National
Wildlife Refuge in Nevada**

Taken by Stephen G. Weaver



Our brand new CC Geo Dept LOGO! Created by our very own Professor Sarah Schanz.

The Precambrian Basement

2020-2021

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Dear Geology Alums and Friends of CC Geology,

What times we live in. In the Year 2020, one global phenomenon has compounded upon another, each of great consequence for humanity and our manner of existence on Earth. The political turmoil surrounding the 2020 election, which escalated at the US Capitol Building in the early days of January. The accelerating pace of climate warming and increasing human impacts due to energy and resource needs. The global pandemic and abrupt shift from CC's Geology's immersive, high-contact, hands-on learning mode to online formats. And, equally impactful for the way that Geology education carries on in the future, the BlackLivesMatter movement and concerns about anti-AAPI* citizens. This spurs us to recognize scientific and academic practices that discourage or disadvantage persons of color, black, biracial, indigenous, and LGBTQ+ scholars, and women scientists . . . making the earth sciences among the least diverse professions. "A lack of diversity and inclusion is the single largest cultural problem facing the geosciences today," writes Kuheli Dutt, the diversity officer of Lamont-Doherty Observatory at Columbia University, "...privilege tends to be invisible to the person who has it" [[Dutt, 2019 Nature Geoscience](#)].

To offer an insular review of the year's departmental highlights, in my letter, as though everything in the larger world is normal – is simply not possible. Even after a full year of pandemic we at Colorado College have only a dim sense of when academic functions on the CC campus might get 'back to normal.' I will allow the contents of this Precambrian Basement newsletter to illuminate this year's undertakings and achievements. The articles and news notes provide us with much to celebrate. Kudos to the students, staff, and faculty for their resolve, creativity, and resiliency, that are sustaining the learning enterprise, this year!

We faculty will draw upon those traits of resiliency and resolve, as we undertake the hard work of self-reflection and planning to address systemic racism in academia and in the earth-sciences professions. We have devoted months of effort to learn, recognize and understand what harm is inflicted when we as educators and learners fail to be actively aware of established systems of privilege, exclusion, and racism. We recognize that our acclaimed Geology program is carried out upon the ancestral lands of the Ute and other indigenous peoples, who were forced to cede territory and relocate away from Tava and their Front Range homelands. We acknowledge that the geological sciences demographic must drastically change, if its membership is ever to resemble the demographic of the U.S.A., as a whole. The current five faculty will join together this spring for collective evaluation and development of our geology curriculum, to ensure that our educational program succeeds in preparing current and future Geology majors for all that lies ahead in the 21st Century. The three established faculty (Myrow, Siddoway, and Fricke) revel in the challenges and breakthroughs of this joint work that is undertaken along with the the two early-career faculty members who joined the Department: Geomorphologist/Assistant Professor Sarah Schanz and Petrologist/Assistant Professor Michelle Gevedon. You'll find updates from these faculty, all staff, and many alums, inside the Newsletter!

We wish you health and harmony during the year to come, and sincere condolences for those who are suffering the worst consequences of COVID-19. Please know that CC Geology is one of your lifelong homes, and we want to stay connected with you, through email, mail, and social media.

Sincerely,

Christine Siddoway
Department Chair



The *Sierra al Magre* (Spanish name for the range) and Tava / Pikes Peak

Land Acknowledgement

The Geology Department acknowledges that our educational programs are carried out on the homelands of the Ute and other Native peoples and rely on networks of travel paths developed by their ancestors. We also acknowledge that, at their origins, Colorado College and our department was associated with resource extraction and land appropriation that dishonored and diminished the traditional lifeways in this region. These practices displaced indigenous populations, degraded landscapes, and led to unequal distribution of wealth, health, and opportunity in the Rocky Mountain West. In recognition that the Ute and Native populations are living people with a present and a future as well as a past, we strive to honor their history and learn from indigenous knowledge of earth systems to create a more inclusive approach to inquiry. We will seek opportunities to redress the exclusions and erasures the Native peoples have endured.

2021 Antiracism Commitment

We commit to learning, listening and working to become an antiracist department and program, in order to offer a welcoming place of study and home-department for students of all backgrounds and identities. We acknowledge that a culture of racism often works unconsciously in our thoughts, actions, and words (Hill, 2008), and that without an active awareness of racism we as educators and learners may inflict harm. We recognize that the compositional diversity of the U.S. population as a whole is not represented among students and professionals in STEM fields, a disparity that is even more pronounced in the geological sciences. Addressing this limitation will strengthen earth science. Within the CC Geology Department, we are working to: 1) be engaged and actively aware of racism both in academia and everyday life, 2) counter racist expressions and behavior, and 3) take collective action to change, transform, or augment department policies, practices, and policies to be inclusive and equitable. We are participating in URGE, a federally funded semester-long antiracism education workshop in geoscience, that guides our creation of Departmental policies and actions that create an antiracist framework and contribute to Colorado College's mission to become antiracist.

Cited work: Hill, Jane H. 2008. *The Everyday Language of White Racism*. Malden, MA: Wiley-Blackwell.



PAUL MYROW

(Sedimentology/Stratigraphy)

Greetings to everyone! This was a year to remember for all of us, for so many reasons, not many of them great. Despite it all, I am happy to reflect on all of the good things that took place. My year started with a trip to Myanmar with my student Blaize Adler-Ivanbrook and CC class of '99 alumnus Blair Schoene, Professor of Geology at Princeton. We were lucky to get in and out of Myanmar before Covid-19 hit! We collected a boatload of trilobites from Cambrian successions, as well as a pile of tuff samples for U-Pb geochronology that Blair is presently running.



I was granted a leave of absence for the spring, and was lined up to teach for a month at Yale (February) and then teach a spring term class at Caltech. I went to Yale and had a wonderful trip, staying on campus in a beautiful old stone building with Professor Dave Evans and his family. It was a treat to be there, giving lectures and hanging out with faculty and graduate students, including CC graduates Erica Evans and Lexie Millikin. My trip to Pasadena was cancelled due to Covid-19, but I was able to teach Sedimentology to a group of Caltech undergraduate and graduate students online in the spring. I set up a chalkboard in my basement and lectured from there. It was nonideal, but it kept me from going stir-crazy as the college was essentially empty in the spring.

My summer was split between a few professional tasks and one personal. My professional work included two studies with CC students. The first is a study of the Ordovician through Devonian rocks of the Cañon City area. My student Blaize and I measured sections through the upper Ordovician Fremont and Priest Canyon formations, and the Upper Devonian Williams Canyon Formation. We collected hundreds of carbon and oxygen isotope samples, which were run by Dr. David Fike's lab at Washington University. A second project, undertaken with student Mingxi Hu, was a study of the Middle to Upper Devonian Beartooth Butte Formation, Upper Devonian Maywood and Jefferson formations, and Mississippian Madison Formation in Wyoming. The Beartooth Butte Formation is a remarkable unit deposited within deeply incised channels across the top of the underlying Ordovician Bighorn Dolomite. Mingxi and I first worked at Beartooth Butte in NW Wyoming, near the Montana

border. The outcrops were on steep cliffs and it was a real challenge, but it was worth it, in part because the unit has large, well preserved and abundant fish fossils. We then worked in the east side of the Bighorn Mountains in the beautiful Cottonwood Canyon. We collected a suite of small, coiled, calcareous worm tubes called microconchs, and we have a paper already in preparation with a Polish paleontologist on these samples.



Mingxi Hu's thesis site at Beartooth Butte, WY. It shows a red Devonian Beartooth Butte Formation, which infilled a valley cut into the underlying Ordovician Bighorn Dolomite.

My major nonprofessional task this year has been the rebuilding of a 1967 Ford Galaxie 500 convertible that I found in a field outside of Peyton, CO. It was sitting without a cover for over a year, and thus it was a bit weathered...and oh yeah, the entire trunk and body of the car was filled with rodent pellets — layers of them an inch thick in places. After their removal, I started a three-month long mechanical restoration, which I did in my garage almost continuously, weekends and nights included. I admit to being a bit obsessed with it. Workers in the auto parts stores would say "hello Paul" when I walked in, so that is a sign. I rebuilt the brakes; carburetor; and front end bushings, bearings, tie rods, steering mechanisms, and shocks. I replaced every hose, fluid, gasket, and filter, and in the end nearly everything mechanical was either replaced or refurbished. It took months because nearly all parts were rusted in place, as they had not been replaced in decades or even since the car was built! Then I started in with the interior and exterior of the car. It is nearly finished to the degree that I am planning to restore it, and I am driving it around with new seat covers and convertible top. What a load of fun, in part since it is a giant boat of a car with an enormous 390 cu. in. engine.

I had a productive year publishing a number of articles, including four largely paleontological papers on trilobites, brachiopods, organic microfossils, and trace fossils with various co-workers, based on specimens from Thailand, Antarctica, northern India, and Nevada, respectively. I was also pleased to publish a paper on Mesoproterozoic strata with CC alumnus and past paraprofessional Tianran Zhang, who is presently a graduate student working with CC alumnus ('06) Justin Strauss at Dartmouth.

On the home front, I have finished the next CD of my music, although due to Covid its final release has been delayed a bit. Hopefully, it will be available sometime this year. Meanwhile, I am doing a lot of mountain biking and doing what everyone else is... watching movies at home and waiting for a vaccination shot! Please keep in touch and have a great 2021.

SARAH SCHANZ

(Geomorphology)

Hello everyone, and greetings from the home office!



This year kicked off the first set of thesis research that I've supervised at CC, with (socially-distant) field work in Colorado and Washington states. CC students Sam Bower, Spencer Shaw, and I backpacked into the West Elk Wilderness near Gunnison, CO. We surveyed stream transects and grain size to determine how the landscape is responding to damming by landslides and humans. Since the summer, Sam has combined the field observations with a computer model to simulate river valley formation around a landslide dam (rather than through it); this unusual condition is called an epigenetic gorge, and we hope to learn more about the circumstances in which they form through Sam's research!

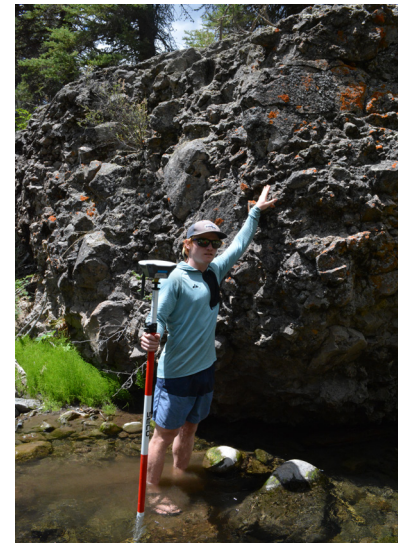
In Washington, I helped CC student Peyton Colee collect radiocarbon samples from earthflows to create a new calibration system that relates surface roughness to landslide age. Peyton created the first detailed landslide map of this area, and through her surface roughness calibration curve, has dated ~300 landslides and determined that they are caused by climate changes in the Holocene. This has huge impli-

cations for the extent and homogeneity of fish habitat in the area! Really exciting work, and we hope to see it published this year.



Field site for Sam Bower and Spencer Shaw in West Elk Mountains where a landslide has blocked the channel, and the downstream channel is reacting to base level change from Blue Mesa Reservoir.

Sam standing next to one of the boulders brought down by the West Elk Creek landslide. These boulders help enforce epigenetic gorge formation, which is what Sam is studying.



Sam and Spencer surveying the stream channel slope with our new high-precision RTK GPS units! Spencer was looking for changes in channel slope compared to valley slope as a result of a new base level from Blue Mesa Reservoir.

Thank goodness for field work with students, as my own work has switched to computer modelling lately! I'm working with collaborators at Indiana University to explore the role sediment has on river response to glaciation, through the creation of a new computer model that combines glacial and river erosion mechanics. We presented results at the first ever virtual AGU meeting in December!

My interest in computer modelling led to the first iteration of GY370: Numerical Methods in Geology, taught last winter and to be repeated this winter. I had such a fun time putting this class together; once we learned the basics of numerical methods, we could explore almost any geologic problem we chose! The students took the lead on investigating new problems, like dating the Cheyenne Mountain rockslide with a 2D diffusion model and modelling PFAS contaminant transport in the groundwater near Fountain, CO.

Of course, one can't talk about teaching in 2020 and not mention online classes...despite initial trepidation, these have been fun to teach – and fun to take for the most part! I taught an online course in the new First Year Program (replacing the old FYEs) on defining the Anthropocene, as well as a mostly online geomorphology course. Without field trips in geomorph, we did detailed GIS studies of watersheds in California, New Mexico, and Pennsylvania, and attend the virtual Geological Society of America meeting. Despite the opportunities virtual work has allowed, I am looking forward to returning to in person classes and field trips in 2021-22 (fingers crossed).

The last year has been pretty calm on the family end, with no major travel. Our dog has finally gotten used to us being home all the time, and is happy with mid-day walks and cuddles. My husband, Trevor, co-taught a course on Antarctica with Christine in the fall; Trevor introduced students to ice sheet modelling and advised them on projects elucidating the state of the Antarctic ice sheet in the Pliocene. Christine had the momentous task of attempting lab work in the middle of a pandemic in coordination with the seminar course, but I'll let her tell you about that!

Stay well all!

CHRISTINE SIDDOWNAY (Structure)



What with Covid-19 and physical distancing ... 2020 turned the Siddoway lodge into an 'academic retreat' alongside South Cheyenne Creek. From March on, Mike and I both taught online courses. Plus, our niece Katie, a junior at Wake Forest University, lived here in Colorado with us and took her courses remotely. Mike and I got to experi-

ence what it's like to have "a college-age kid at home during covid," but with the advantage that Katie liked to go on really long hikes with her auntie and the dog pack. I got glimpses of 'student-side' trends in academic life: Grammarly, for instance (to my horror), and I gave in and started using Venmo. Our home Wifi held up, thank heaven. Around the Department – much as we miss our retired colleagues Jeff Noblett and Eric Leonard, we somewhat admire their "good timing:" they 'escaped' the shifts to online teaching and the unfortunate distance that we have from our students in 2021.

In research? Well, things have taken a real turn. I am working intensely on samples from deep marine cores (not even lithified), that are young (≤ 7 million years), and two separate projects that each concern only a single bed. Who'd have thought it? Most of my past work on West Antarctica was concerned with Gondwana margin tectonics and wide continental extension, but my current NSF projects aim to 'see the world in a grain of sand.' The target material is dropstones and sand grains that melted out of icebergs and fell to the seafloor of the Amundsen Sea – the part of Antarctica that is deglaciating most rapidly. Oh, and one bed of rhyolite ash – special because Neogene felsic pyroclastic deposits are virtually unknown from Antarctica. For this erupted ash to fall out on the open ocean and sink to the seabed, the rhyolite eruption had to be enormous! Such events can play in to global climate, so there's no time to waste, to figure this out. IODP's purpose for recovery of these 800-meter long sediment cores from Amundsen Sea is to acquire geological records that inform about polar climate, including how often and how fast full ice sheet collapse happened in the recent past. It was great fun, this autumn, to bring these questions to the senior seminar, which I team-taught with block-visitor

Trevor Hillebrand, who is an ice sheet modeler at Los Alamos National Lab. Three seniors, one junior, one sophomore, one paraprof, two grad student collaborators joined in, using geological records and models to investigate the dynamic West Antarctic ice sheet. We had dedicated use of CC's GIS lab computing facilities for icesheet modeling, and 10 days' use of instrumentation for age dating at the University of Arizona Laserchron Facility and Radiogenic Helium Lab.



Paraprof Robin Hilderman '20 and student Cade Quigley '22 working in the lab at University of Arizona.

What a block that was – and new progress continues, via Hannah Buchband's senior research and two presentations planned for the virtual EGU meeting in April.

At the same time as I've gotten into minutiae of marine sediment, I've been tapped to synthesize and consolidate Antarctica information on the continental scale – with three review papers in one year! I'm afraid this means I've become an OAE / Old Antarctic Explorer, even though I have no beard. Whatever the situation, it's good timing, to have the bedrock geology of Antarctica pervade my mind, for immediate reference as I sleuth out the sites of origin for iceberg-rafted dropstones that came from past positions of the ice sheet edge. More on those results in next year's newsletter!

HENRY FRICKE (Geochemistry)



Hello Everyone! In looking back at my recent PCB updates I see that I haven't had a 'normal' one since 2017, and given how 'un-normal' this last year has been I suppose the trend will continue.

I began 2020 doing the same things I was doing in 2018 & 2019, which was acting as Director of the

Environmental Program, serving on the all-college committee working to revamp the General Education requirements, and teaching my standard intro and upper level courses. I was looking forward to something different in block 8, where I had a class called 'Life & Death of Dinosaurs' on the books that was scheduled to be co-taught with two curators from the Denver Museum of Nature & Science (including Ian Miller, class of 1999). The plan was to visit a number of different fossil-bearing localities as well as develop projects using fossil collections at the museum. Of course you all know this plan – like those all of us had for spring – was upended, and I had to pivot to creating an online-only option. The biggest change – other than the reliance on Zoom that all of us know too well – was creating virtual field trips to replace all the 'live' ones on the schedule. Doing so involved my driving to all the stops alone, taking videos using my phone and collecting hand-samples. Then I headed back to campus where I made more videos of me pointing out various characteristics of each rock. Next I had my daughter show me how to use iMovie, I dubbed over all the videos with audio that asked students to make interpretations of what they observed in the videos, and asked them to develop a series of explanatory hypotheses. All the videos were then uploaded to Youtube, they were linked to a GoogleEarth project that showed exactly where the field stops were, and they were watched by students as homework. The last step – in class – was to break students into groups to organize their observations & summarize their interpretations before asking them to lead overview discussions of each stop. I'm telling you all this because – despite the seat of the pants nature of the entire enterprise – I really enjoyed this reimagining what 'field work' can look like, and I can see adding virtual trips of different types into all of my courses to some degree in order to increase accessibility & in some cases save time. In fact I needed to create a whole new set of trips for GY140 this fall to replace my

usual 3-day camping trip through central Colorado, so the creation of a more expansive digital 'field trip bank' has already begun!

On the research front, 2020 was largely a lost year. A large multi-institutional trip to the San Juan Basin scheduled for late May had to be cancelled along with all other summer field work plans, analytical facilities shut down across the country, and all attention here turned to helping CC respond to the Covid crisis. It wasn't until the end of August that a few days of fossil-hunting were possible, and this just before the start of the semester. Fortunately, I have so (so) much unpublished data on my computer that it has been possible to support the research/thesis projects of a few students, and their studies of tyrannosaur dinosaur physiology & diet (India Phillips) and carbon/nitrogen cycling across the K-Pg boundary in the Denver Basin (Isobel Steenrod) have continued to move forward. I am also fortunate that 2021 begins with me enjoying a half-year sabbatical, where in addition to rethinking my courses and how they might fit in a revised GY curriculum, I have a chance to write. Hopefully next PCB I'll have a few papers to tell you about!

At home, as at school, the effects of Covid have been front and center. Everyone has remained healthy, but the 'happy' part has definitely been lacking. My 17 year old 'extrovert who plays a team sport' has been impacted the most by months of remote learning and no exercise, while my son began his freshman year in college not knowing what his new friends looked like up close or below the nose. Erin's days as a judge have been thrown into prolonged confusion as the court system tries to figure out how to provide 'due process' when all trials have been postponed indefinitely. Only the dog (our third, in case you are counting) and cat (same one) have been truly happy, as someone is home with them everyday to scratch their ears. Thankfully things are beginning to make a turn for the better for all of us as we enter 2021, and I'm optimistic about the future. I hope the same is true for all of you out there in Alumniland, and as usual I hope we have a chance to visit – in person! – sometime soon.

Take care,
Henry

SOLOMON SEYUM (Structure)



It seems strange to state the following sentiment considering the hardships and anxieties we've faced this year that resulted in elimination of field and classroom interactions, but the 2020-2021 academic year "at" Colorado College granted me valuable teaching and research opportunities. Not so much in the form of fun trips, of course. Most notably, I've made advancements in research with two outstanding geology majors, Charlie Robinson and Cade Quigley. They have made this time of quarantine more manageable for me with their enthusiasm and engagement in geologic research. Their self-motivation and critical thinking abilities meant that they could work independently. And this was invaluable to me because I could prioritize spending that much more time with my growing family.

Cade has produced novel research in geodynamics of continental rifting by explaining, using numerical models, how contrasting strengths of rock suites in the upper lithosphere affect the shapes of rift basins, and applying those results to the San Luis Basin of the Rio Grande Rift in Colorado. Charlie has helped me continue research stemming from my postdoctoral position at the Technical University of Denmark (DTU) on the tectonic stress and rock stiffness properties necessary to form fractures in carbonate rocks (limestones and chalk) containing chert inclusions. This research

has implications on the flow pathway geometries through fractures in otherwise low-permeability reservoir rocks. Their work was supported by Buster Schol arships from the Geology department, the Jackson Fellowship from the Southwest Studies program, and the Faculty-Student Collaborative Research Grant from the Student Opportunities and Advising Hub. Since my post in last year's issue of the Precambrian Basement, I co-taught Structural Geology with Christine Siddoway at the end of the last academic year. I taught Physical Geology (intro geology) during the summer and winter breaks. All three of those classes were taught remotely with video lectures, and with many office hours online. At the time of writing this, I will soon teach Structural Geology independently, and I will conclude the academic year by co-teaching Physical Geology with Sarah Schanz. I am really looking forward to these next teaching opportunities since it will be my first time teaching Structural Geology using my own course design, and I will complete my run of teaching with CC faculty; having already co-taught with Paul, Christine, and Emily, and as a guest lecturer in Henry's class, and as a shadowing jokester in Jeff's and Eric's field components of their courses.

This is my final year as a Riley Scholar at Colorado College, and I am grateful to the students, parapros (Hannah Marshall, Tianran Zhang, Lille Haecker, Ben Lloyd, Michael Hasson, Robin Hilderman, and Heather Grotzinger), faculty, Mandy Sulfrian, and Steve for supporting my teaching, my research, and my family during this time. Cheers!

JEFF NOBLETT

(Igneous Petrology)

Greetings,



I seem to have timed my first year of retirement rather well. My last formal lecture in February was topped off with the department bringing in a lovely cake covered with phase diagrams during the final lecture on the origin of the Pikes Peak Batholith. Spring was slated to be working with Robin Hilderman on her thesis and helping her

prepare a poster for GSA (which was accepted and then the meeting was cancelled) as well as normal

Chair duties. COVID had something to say about that and I can only say I was immensely relieved not to have to learn to teach a class remotely after forty years. It was very special watching my colleagues work together to share ideas and re-think our teaching (especially since in-person field trips were not available). It has been fabulous seeing how they developed (and continue to develop) cool ideas for keeping our students on track. I was especially delighted to discover that even though many of our Witter Family Internships had to be cancelled, there were still a number of students who were able to participate in internships remotely.

Perhaps luckier for me personally was the ability to work and communicate from home, since I developed a cyst within my spine pressing on the sciatic nerve that made it impossible to walk or move much from mid-March until I finally had an operation in October. So, I was pretty much already staying at home when the governor issued his orders! Things are looking better now (though I did something nasty to my knee during this time and still can't really take a hike). Fortunately, I have a houseful of books I was waiting to re-read in retirement (starting with reading all the Agatha Christie mysteries in order!). I enjoy working through random volcanology articles at my leisure rather than in between classes. And I look forward to traveling in the not-too-distant future with an eye towards learning something new about the geology wherever Jenny and I may go.

Best wishes to you all.

ERIC LEONARD

(Geomorphology)

Well, what to say about 2020, my first full year of retirement?



The first eight months of retirement were more or less as I'd anticipated – three trips across the Atlantic – to lead an alumni hiking and geology trip in the Scotland, to present a paper at a conference in Dublin, and to walk along the Camino de Santiago in Portugal and Spain, as well as a couple of road trips in the US and family visits in northern California.

Then March 2020 hit and all

that came to a halt. Since then I have split my time between writing, hiking, working on transcribing an old set of family letters, and preparing for, and re-preparing for, almost ad infinitum, the 2020-2021 regional geology course. I've finally had time to begin writing up some research work from the last several years -- three papers on western US glaciation published during 2020 and several more in the works. I also devoted a fair amount of time over the last six months to developing this year's GY445: Regional Geology course which I am currently (January 2021) teaching with faculty visitor (and volcanologist) Rosario Esposito. It began life as a field-based course to be taught Block 1 in the Canadian Rockies, and then COVID began to dictate some changes in plans. Next, it was to be a field-based course in Montana during block 1, then a block 1 field course in northern California, then a January block field course in southern California, then a January block partially on-campus course on Iceland, and finally completely remote January block course on Iceland (remote being in all of our homes, not in Iceland!). Lots of prep time and lots of learning about how to teach a course, do GIS work, etc. remotely, but the course has been a lot of fun.

I've also embarked on a classic retirement project. During the Second World War, my father was stationed in the South Pacific, while my mother was living and working as an attorney in San Francisco. They wrote to each other almost daily for the two years he was away, and each of them saved the letters. When I was growing up I knew about this huge cache of war letters and I eventually brought them back with me to Colorado. So far I have transcribed about 350 letters and am only about a third of the way through. Fascinating – beyond his experiences at a Naval base on Guadalcanal and hers as a woman in a then completely male-dominated profession, and all sorts of news and insights into family and family friends, my parents were very political (on the left) and there is lots of really interesting commentary about American politics and the wartime alliance, about their views of the potential and dangers of the postwar world, etc. A great way to spend COVID-induced downtime.

After many years as a community-outreach nurse, Lisa retired in October – but is still (almost) as busy as ever. Julia (now 30) and Susan (now 25) have both been able to work from their homes, in Washington DC and Boston respectively. Each spent a couple of months here during the summer, working from our house and joining us on family mountain adventures. It was fun to be able to spend so much time with them as adults. Everyone's healthy. So, we're among the lucky ones in this pandemic world. I hope you have all been so lucky.

Plus ça change, plus c'est la même chose – Eric teaching geology to CC alums and friends in Scotland (photos below courtesy of G. Manion, L. Brown, L. Lebsack)



ROSARIO ESPOSITO (Volcanology)



It was early September when the first snow of the year covered the grass of the park in front of our building. My son Giuseppe Antonio was super excited, because this was the first time he had ever seen snow. In fact, Giuseppe was born in Los Angeles and Colorado Springs was his first geographic reloca-

tion since he was born. We rushed out of our apartment, and Giuseppe touched the snow for the first time. Giuseppe looked at me, and with the typical kid face expression of surprise, he told me "Daddy the snow is cold." He did not expect this.

My Colorado experience projected me into a vortex of thoughts. My son's feeling is the same feeling I encounter when doing research. What you find is always a surprise, and the joy of being a scientist and a teacher is exactly this: being surprised and looking at the world with fascination. This is the way to enjoy being a geologist: looking at the world through the eyes of a kid.

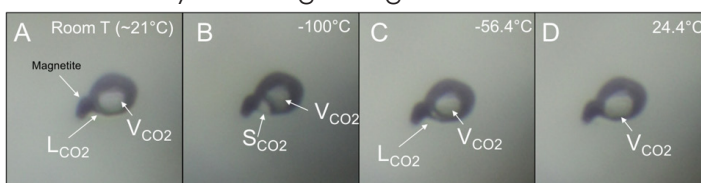
I am Rosario and this year I have been a visiting assistant professor. After 6 years working at UCLA, I decided to jump into this unbelievable adventure with my family. We were fully in the middle of the Covid-19 pandemic, but since learning about the block system, I jumped at the opportunity to work at Colorado College. And here I am! Still in the middle of the Covid-19 pandemic and still thinking that even though there are so many issues to surviving a pandemic, life still offers positive and amazing things.

I wanted to be at Colorado College so I could employ my teaching philosophy while having the full availability of the students. One of the positive things about the pandemic is that, as a white-bearded geologist, I had the opportunity to access many resources about antiracism, inclusion, and equity. We were stuck in the house and were able to look at the world critically. As a catastrophic volcanic eruption exacerbates human political and social behaviors, the same happened during this pandemic: racial injustice was more evident on the street and political division was fueled by the pandemic. As you are watching all of this on a screen you must ask yourself the responsibility you have as a teacher to educate the younger generation. This guided me to bring pop-culture into the geology world and through zoom meetings during my lecture. I was so happy when I had the opportunity to present this topic through an invitation from Christine to give a seminar. Giving that seminar was without a doubt one of the top moments in my academic career.

During my time at Colorado College I had the opportunity to co-teach GY140 with Henry. This was indeed a great opportunity to see a veteran in action. Henry's enthusiasm for teaching was visible and allowed me to see how the block system actually works. Thank you, Henry, for this.

Another important achievement during my time at

Colorado College was the revival of the fluid inclusion USGS stage. The instrument works wonderfully thanks to Jim Reynold's assistance and help. Watching Jim revive the instrument was like watching a father trying to teach his daughter/son how to ride a bike. I am thankful to Steve for his help reviving the instrument as well. The instrument now can be used by students and faculty for projects and teaching activities. In the photo below, you can see a fluid inclusion hosted in a crystal from Yellowstone. Analyzing the fluid inclusion through this instrument allowed us to recognize a mostly CO₂ vapor inclusion. The temperature of homogenization gives us an indication of the pressure at trapping and thus the depth below Yellowstone where this crystal was growing.



Photomicrographs of a CO₂-rich fluid inclusion hosted in a plagioclase crystal from Yellowstone. The photos were taken at different temperature using the USGS fluid inclusion stage revived at Colorado College.

As I write this update, I am co-teaching with Eric Leonard the GY445 regional geology course. This year, the regional geology course has been fully remote, and we are focusing on Iceland. I am learning a lot from this course especially because I had the honor to virtually travel Iceland with Eric. Eric is the most amazing colleague one can hope to co-teach with. Eric has been very supportive and has helped guide me through this course.

In addition, I am also preparing a course on Volcanology, and I am sure it will be such a great experience. Thank you to all of the faculty, staff, and students for making this year such an amazing one. I will miss seeing you around the department when I move back to Italy and start my new professorship in Milan. Best wishes to all!

MANDY SULFRIAN

(Administrative Assistant)

What a year this has been! We hope that you are all well and doing fine with Zoom meetings and working remotely. We've been remote since March and it's been difficult not being around the students but it's becoming the new normal.

We have two new parapros – Robin Hilderman '20

and Heather Grotzinger '20, who is a graduate of Amherst College. They have been incredibly flexible and helpful with all the logistical things for the classes.

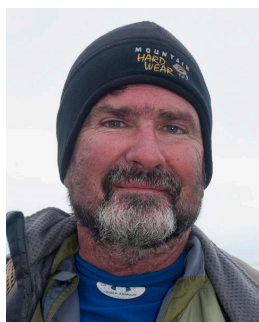
Charlie and I went to Fairbanks, Alaska, in September to visit our daughter and her family. It was great to spend time with our kids and grandkids and such a beautiful place. The weather was nice and we went exploring a couple of times. It was a fun trip! Keep in touch with us! Hopefully by October we can all get together at Homecoming or family weekend. It would be lovely to see you and catch up!

Best, Mandy



STEVE WEAVER

(Geology Technical Director)



It has been another year as Geo Tech Director supporting the Geology Department, but it has been far from a normal year. The Covid-19 pandemic has disrupted my normally vibrant in person student and faculty interactions and the department's usual hands-on student lab work as well as field experiences so important

for teaching and research in geology. I look forward with a bit of optimism for the coming year that we will get back to more normal activities where I can have more usual in person interactions with

our students. One positive note about technology in the department this year has been the resurrection of the Fluid Inclusion system spurred on by visiting Professor Rosario Esposito.

I did manage to indulge some of my creative passion for landscape and nature photography with a mid-summer trip to Wyoming and Montana and a winter break trip to Utah, Nevada and Arizona. During both trips I indulged in extreme social distancing as it was just me and the natural wild environment that is so important to me. As always you can check out my work at my main website: www.stephen-weaver.com and my site on photoshelter: <https://stephenweaver.photoshelter.com/>



Mt. Elbert in the distance
Photo taken by Steve Weaver

Obituary

Jason Stephen Albrecht '00

The following obituary was published in the Tribute Archive.

<https://www.tributearchive.com/obituaries/12683171/Jason-Stephen-Albrecht>



Jason Stephen Albrecht passed away suddenly at work on Wednesday, April 8 just seven days after his 42nd birthday. He was deeply loved by his family and friends. Born April 1, 1978, he was the oldest of three children born to Stephen Edward and Jean Boughton Albrecht of North Myrtle Beach, South Carolina.

Jason attended Marietta High School and Marietta College during his high school years, graduating in 1996. He was the first Marietta High School soccer player to make the ALL OHIO division one team.

He graduated from Colorado College in the year 2000 with a degree in geology. He followed his passion for helping others and became a teacher at Colorado Community College for five years, teaching the ancient art form of Batik, before returning to Marietta.

Jason was a simple man; he experienced more than most through his many world travels, never meeting a stranger along the way. He had a charming and magnetic personality. Drawing in many people who loved and adored him. Jason brought inspiration, love and light to all who were blessed to know him throughout his life. He cherished his love and connection to his parents, sister, brother, fiancée and many friends. He saw value in nature's beauty in ways most don't. He is such an inspiration to all who know and love him. Jason's laugh was contagious, his smile would light up a room, his love was deep, loyal and passionate, his soul was bright, beautiful, adventurous, compassionate, wise and kind.

Among many other beautiful things, he was an artist, a philosopher, great skier and was interested in the wonderful mysteries of the world with a deep connection with nature and people. He wrote about and studied at length the beauty, complexity, and mystery of the dendritic pattern. He had a passionate hunger for knowledge, studying and learning a wide variety of topics throughout his life. Jason also had the ability to make others feel safe allowing them to openly share their fears with him, he in turn validated their feelings with ease, understanding and compassion.

He is survived by his parents Stephen Edward and Jean Boughton Albrecht of North Myrtle Beach South Carolina, his sister Kimberly Anne Albrecht of Marietta, brother Jeremy Silliman Albrecht and his wife Courtney Albrecht and nieces Stella, Evelyn, and Scarlett Albrecht of Westerville, OH, and his fiancée, Tiffany Neill of Marietta.

2020-2021 Seminar Series

Sept 24, **Professor Christine Siddoway**, Colorado College Geology, "Afloat Among Icebergs: a Southern Ocean voyage and quest for new Climate Records" (Women's Educational Society seminar)

Sept 29, **Professor Paul Myrow**, Colorado College Geology, "Bedforms Under Waves, Currents, and Wind: New ideas and Applications to the Rock Record."

Oct 30, **Professor Rosario Esposito**, Colorado College Geology "Entering the Earth Science door through pop-culture, and discovering volcanoes inside micro bubbles."

Dec. 3, 12:30 pm, **Professor Alexis Ault**, Utah State University, "Nanoscale textural and thermochronometry evidence for earthquakes in the rock record."

Feb. 10, 3:30 pm, **Riley Scholar Professor Solomon Seyum**, Colorado College Geology, "Echelon veins in limestone: what they reveal about regional stress."

Faculty Publications

Myrow

Wernette, S.J., Hughes, N.C., **Myrow, P.M.**, and Sardud, A., 2020, *Satunarcus*, a new late Cambrian trilobite genus from southernmost Thailand and a reevaluation of the subfamily *Mansuyiinae* Hupé, 1955: *Journal of Paleontology*, v. 94, p. 867-880.

Wenhui W., Gao, S., Servais, T., Singh, B., and **Myrow, P.M.**, 2020, Preliminary palynological study on the Upper Ordovician Pin Formation in Northern Indian Himalaya: *Palynology*, p. 1-29, <https://doi.org/10.1080/01916122.2020.1808545>.

Faculty Publications (Cont'd)

Wernette, S.J., Hughes, N.C., **Myrow, P.M.**, and Sardud, A., 2020, The Furongian (late Cambrian) trilobite *Thailandium*'s endemicity reassessed along with a new species of *Prosaukia* from Ko Tarutao, Thailand: *Thai Geoscience Journal*, v. 1, p. 68-87.

Claybourn, T.M., Skovsted, C.B., Holmer, L.E., Pan, B., **Myrow, P.M.**, Topper, T.P., and Brock, G.A., 2020, Brachiopods from the Byrd Group (Cambrian Series 2, Stage 4), Central Transantarctic Mountains, East Antarctica: *Papers in Palaeontology*, p. 1-35.

Jin, C., Coco, G., Tinoco, R.O., Perron, J.T., **Myrow, P.M.**, Huppert, K.L., Friedrich, H., Goldstein, E.B., and Gong, Z., 2020, Investigating the response of wave-generated ripples to changes in wave forcing: *Geomorphology*, v. 363, p. 107229.

Myrow, P.M., 2020, Storms and Storm Deposits, in Selley, R.C., Cocks, R., and Pilmer, I., eds., *Encyclopedia of Geology: Reference module in Earth systems and environmental Sciences*, Elsevier Limited, Oxford, UK, revised entry.

Tarhan, L.G., **Myrow, P.M.**, Smith, E.F., Nelson, L.L., and Sadler, P.M., 2020, Infaunal Augurs of the Cambrian Explosion: An Ediacaran Trace Fossil Assemblage from Nevada, USA: *Geobiology*, v. 18, p. 486-496.

Zhang, T., **Myrow, P.M.**, Fike, D.A., McKenzie, N.R., Yuan, J., Zhu, X., Li, W., Tian, X., and Chen, J., 2020, Sedimentology, stratigraphy, and detrital zircon geochronology of Mesoproterozoic strata in the northern Helan Mountains, western margin of the North China Block: *Precambrian Research*, v. 343, p. 105730.

Faculty Publications (Cont'd)

Siddoway

Leonard

Schweinsberg, A.D., Briner, J.P., Licciardi, J.M., Shroba, R.R., **Leonard, E.M.**, 2020. Cosmogenic ^{10}Be exposure dating of Bull Lake and Pinedale glaciations and deglaciation in the upper Arkansas River valley, Colorado Rocky Mountains, U.S.A. *Quaternary Research* 97. [http://doi: 10.1017/qua.2020.21](http://doi:10.1017/qua.2020.21).

Laabs, B.J.C., Licciardi, J.M., **Leonard, E.M.**, J.M., Marchetti, D.W., Munroe, J. S., 2020. Updated cosmogenic chronologies of Pleistocene mountain glaciation in the western United States and associated paleoclimate inferences. *Quaternary Science Reviews* 242. <https://doi.org/10.1016/j.quascirev.2020.106427>

Tulenko, J.P., Caffee, W., Schweinsberg, A.D., Briner, J.P., **Leonard, E.M.**, 2020. Delayed and rapid deglaciation of alpine valleys in the Sawatch Range, southern Rocky Mountains, USA. *Geochronology* 2, 1-11. <http://doi.org/10.5194/gchron-2-1-2020>

Fricke

David E. Fastovsky, Marisol Montellano-Ballesteros, **Henry C. Fricke**, Jahandar Ramezani, Kaori Tsukui, Gregory P. Wilson, Paul Hall, Rene Hernandez-Rivera, Gerardo Alvarez, 2020, Paleoenvironments, taphonomy, and stable isotopic content of the terrestrial, fossil-vertebrate-bearing sequence of the El Disecado Member, El Gallo Formation, Upper Cretaceous, Baja California, México. *Geosphere* doi: <https://doi.org/10.1130/GES02207.1>

Siddoway, C., 2021, Geology of West Antarctica (Chapter 3), in Kleinschmidt, G., ed., *Geology of the Antarctic Continent*; pp. 87-131. Stuttgart: Schweizerbart Science Publishers, ISBN 978-3-443-11034-5.

Siddoway, C., 2020, Antarctica, in Scott Elias, S. and Alderton, D. (eds.), *Encyclopedia of Geology*, 2nd edition; 17 pages. Amsterdam: Academic Press, 10.1016/B978-0-08-102908-4.00136-3.

Jordan, T.A., Riley, T.R. and **Siddoway, C.**, 2020, Geology of West Antarctica, *Nature Reviews Earth and Environment*, 1, 117–133, doi: 10.1038/s43017-019-0013-6.

Flowers, R. M., Macdonald, FA., **Siddoway, C.**, and Havranek, R., 2020, Diachronous development of the Great Unconformity prior to Snowball Earth, *Proceedings of the National Academy of Sciences*, doi: 10.1073/pnas.1913131117.

Current Abstracts:

Siddoway, C., Thomson, S.T., Hemming, S., Buchband, H., Quigley, C., Furlong, H., Hilderman, R., and 6 others, 2021, U-Pb zircon geochronology of dropstones and IRD in the Amundsen Sea, applied to the question of bedrock provenance and Pliocene ice sheet extent in West Antarctica, *European Geophysical Union v-Meeting*, Abstract EGU21-9151.

Iverson, N., **Siddoway C.**, Zimmerer M., Smellie J., Dunbar N., Gohl K. and IODP Exp. 379 scientists, 2021, Rhyolite volcanism in the Marie Byrd Land volcanic province, Antarctica: New evidence for pyroclastic eruptions during latest Pliocene icesheet expansion, *European Geophysical Union v-Meeting*, abstract EGU21-9003.

Student Academic Awards

Rocky Mountain Association of Geologists:

Hannah Runyon '20

Association of Women Geoscientists:

Fai Chanchai '20 and Hannah Runyon '20

Estwing Outstanding Senior Geologist:

Peter Mow '20

RMAG McKenna Scholarship:

India Phillips '21

Buster Scholarship:

Peyton Colee '21

Charlie Robinson '21

Sam Bower '21

Parker Remus '22

Mingxi Hu '21

Cade Quigley '22

Gould Scholarship:

Nerissa Barling '21

Anna Feldman '21

Putman Scholarship:

Jonny Norwine '21

William A Fischer Family Scholarship:

India Phillips '21

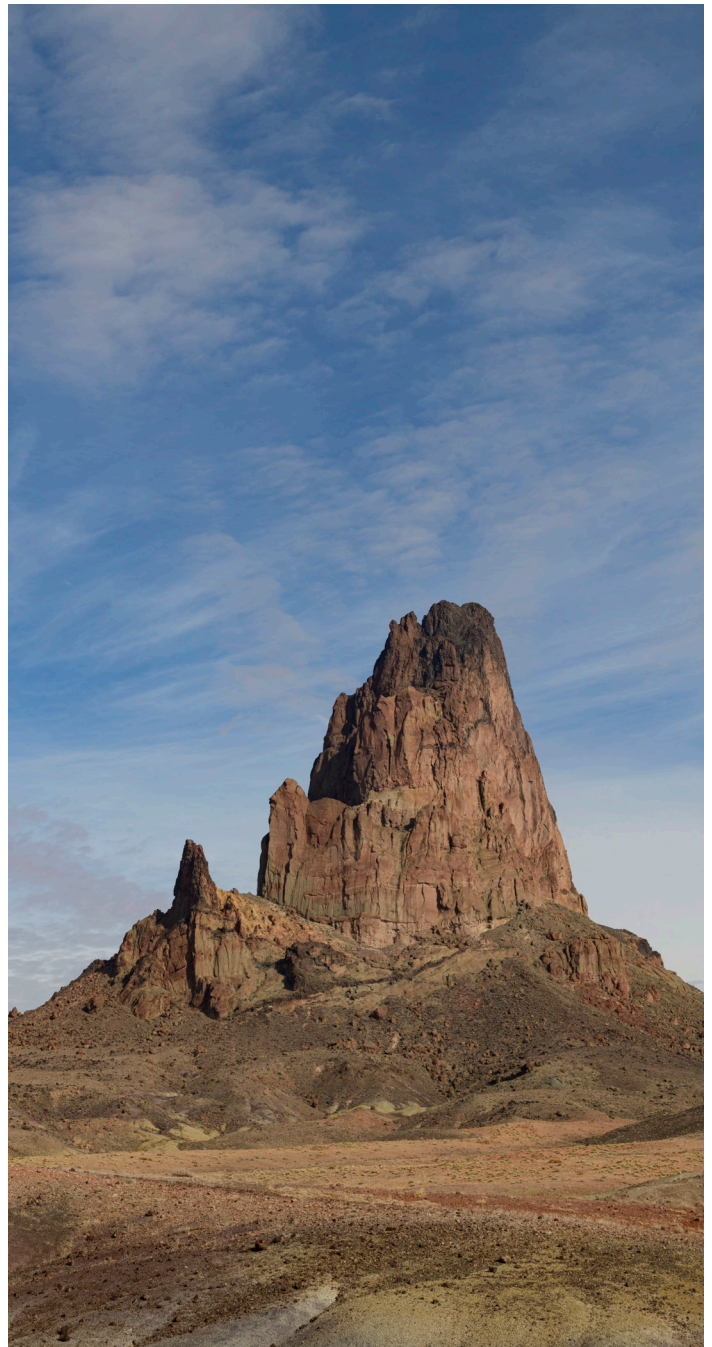
Abby Roat '22

Charles Rhoads Scholarship:

Jonny Norwine '21

Blaize Adler-Ivanbrook '21

Nerissa Barling '21



Agathala Peak in Monument Valley
Photo taken by Steve Weaver

GeoDay 2020

Hannah Runyon "Depositional Systems of Miocene Carbonate Strata, The Majella Platform, Central Apennines, Italy"

Helen Carter "A study of tourmaline thermometry on a suite of metamorphic rocks from the Picuris Range, New Mexico"

Laura Davison "Paleo-climate Reconstruction of the Younger Dryas and Little Ice Age via Numerical Modeling of Engabreen and Fonndalen, Northern Norway"

Fai Chanchai "Magnetic Susceptibility and Mercury Analysis of Ordovician–Silurian Boundary Strata"

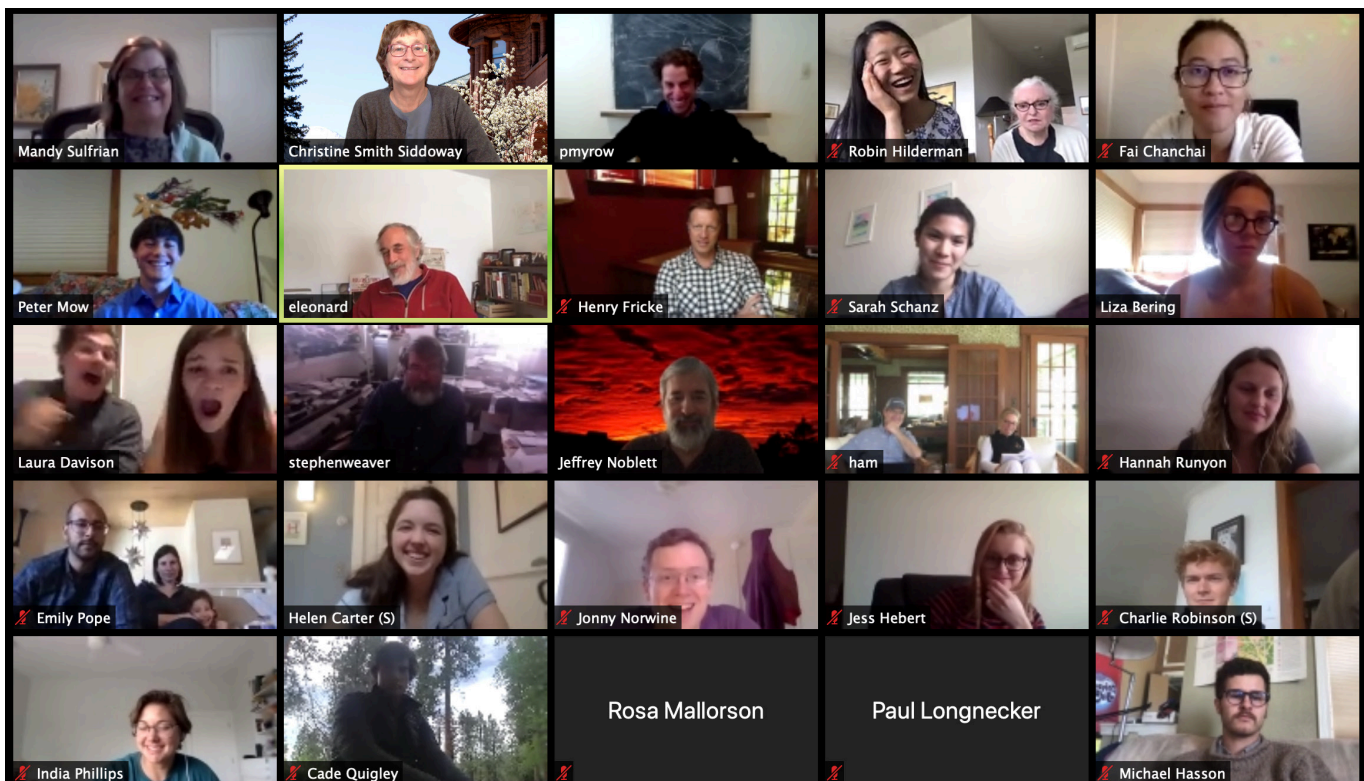
Robin Hilderman "Evolution of the magmatic system beneath the San Juan Mountains; comparing the lava flows of the Conejos and Hinsdale formations"

Jess Hebert "Tracing fluid transfer to the mantle in modern arc systems"

Liza Bering "Launching 'CC Learn Geology': Sharing highlights of a new website for CC Cabin visitors"

Spencer Levy "Environmental change in the aftermath of the K-Pg extinction: a biomarker study of Corral Bluffs, CO"

Peter Mow "Sedimentology, Depositional History, and Chemostratigraphy of Mesoproterozoic Rocks, Ningxia, China"



Always good to see smiling faces on Zoom! (but **what** were Laura and Spencer reacting to ??)

GY400

West Antarctic Ice Sheet History and Dynamics



GY400, a capstone course offered in Fall 2020 by the CC Geology Department, entailed interdisciplinary, collaborative student-faculty investigation of Expansions and retreats of the West Antarctic Ice Sheet (WAIS): Bedrock factors, ice dynamics, paleoclimate, and consequences for sea-level. Led by Professor Christine Siddoway and visiting Professor Trevor Hillebrand, the group employed ice sheet modeling of WAIS behavior and geo/thermochronology for provenance interpretation. The latter has bearing on the character of subglacial bedrock (a boundary condition) and WAIS extent.

The virtual learning format allowed the class to invite researchers from all over the country to give talks. The speakers that were invited to the GY400 seminar are listed below... and in fact YOU can partake in any of these that interest you! *The recorded lectures on YouTube are linked in the title of each talk. We are grateful for positives like these that counterbalance the difficult times, and sincerely thank all the speakers.

[Active investigations of the Thwaites Glacier system Part I](#), Kiya Riverman, Univ. Oregon

Active investigations of the Thwaites Glacier system Part II, Kiya Riverman, Univ. Oregon

[Reconstructions of Antarctic palaeotopography and influence on ice sheet behaviour](#), Guy Paxman. LDEO

[Ice Core Studies of West Antarctic Climate](#), Peter Neff, Univ. Minnesota

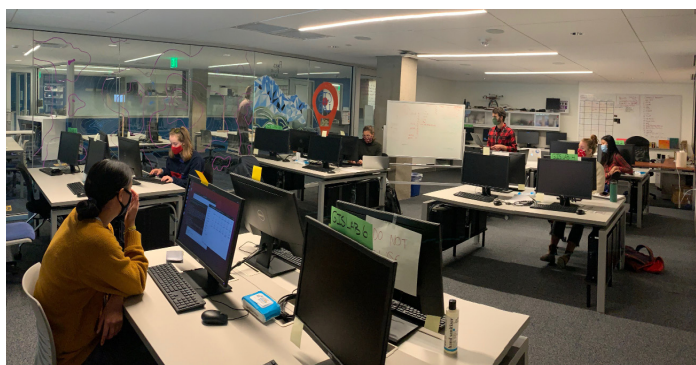
[Introduction to sea level modeling](#), Sophie Coulson, Harvard Univ.

[Model-Data Integration/mid-Miocene Climate & Ice-Sheet Variability](#), Ruthie Halberstadt, UMass Amherst

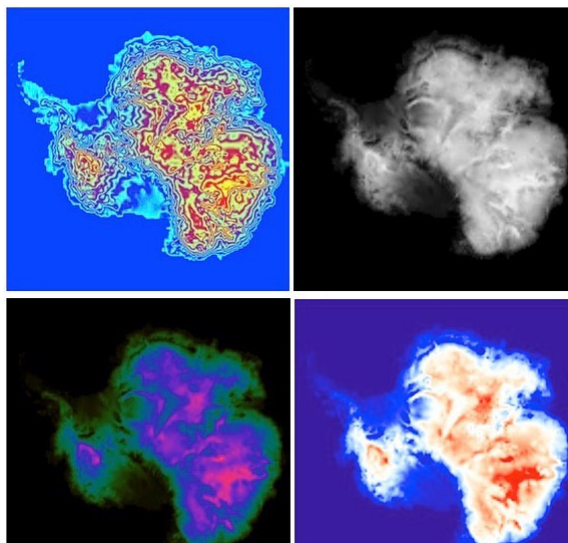
[Dust transport during Interglacials](#), Sarah Aarons, Scripps Institute of Oceanography



Visiting Prof. Trevor Hillebrand giving a lecture on ice-sheet dynamics.



Students working on their ice sheet models in the GIS lab in Tutt Library.



Numerical model outputs: Abby Roat '22

GY445

Regional Studies in Geology: Iceland

The annual GY445 Regional Geology course involves an in-depth study of a geological region that requires senior majors to apply fundamental knowledge and skills acquired through the course of their college education. The course typically involves extended study in a field setting, critical reading of published geological literature, and interpretation and synthesis in oral/written formats. However, because of the Covid -19 pandemic, this year's regionals course had to forgo the fieldtrip component. The professors leading the course this year, Professor Eric Leonard and visiting Professor Rosario Esposito, decided to take advantage of necessity of a virtual course, considering regional settings for the class from around the world. Ultimately they settled on Iceland, as an area of fascinating and very active geology, and one where they could draw on their own strongest areas of expertise – glacial geology and volcanology.

During the first two weeks of the course, the class dived into the literature surrounding Iceland's unique geologic setting. The class read recent research papers covering a wide range of topics, from interactions between mantle melting and ice sheet growth, to how "jokulhlaups" (a glacial outburst floods) propagate through subglacial conduits, to CO₂ degassing during major fissure eruptions. Several of the authors on these research papers gave virtual presentations to the class and department as part of the course. This was a fabulous opportunity for students to ask questions about the research at hand and formulate their own ideas for research projects.

During the second half of the course, students developed their own individual research projects, building from what previous researchers had talked about in their seminars. For their final presentations, students gave formal seminars in "GSA" format to their peers in the Geol-

ogy department. The titles of their talks and figures from their research are included on the next page. The list of speakers who were invited to the class is below.

Thursday January 7, 11:00 AM -- **Eniko Bali** – Associate Professor, University of Iceland, Reykjavik – "Geothermal energy and ore-forming potential of hydrothermal fluids at Iceland" <http://enikobali.hupont.hu/4/main-page>

Friday January 8, 11:00 AM -- **Margaret Hartley** – Senior Lecturer, University of Manchester, UK "A volcanological and petrological tour of the AD 1783 Laki fissure eruption" — <https://www.research.manchester.ac.uk/portal/margaret.hartley.html>

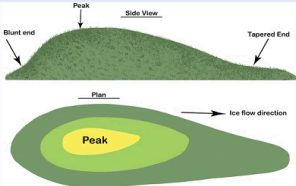
Wednesday, January 13, 9:00 AM -- **Leif Anderson** – Postdoctoral Fellow, University of Lausanne, Switzerland – "Controls on the lifespans of Icelandic ice caps"*— <http://www.leif-anderson.com/Overview.html>

Thursday, January 14, 9:00 AM -- **Gaia Stucky-deQuay** – Postdoctoral Fellow, University of Texas (Austin) — "Holocene uplift and rapid fluvial erosion of Iceland: A record of post-glacial landscape evolution" --<https://www.jsg.utexas.edu/gaia-stucky/>

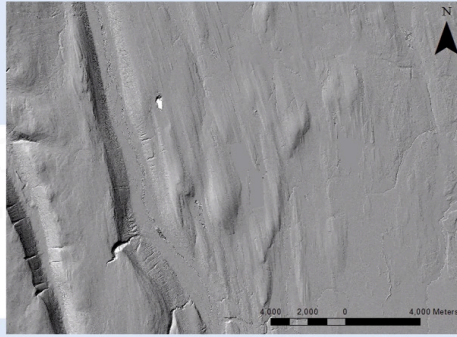
Tuesday, January 19, 1:00 PM -- **Fiona Clerc** – Doctoral Candidate, MIT/Woods Hole – "The effect of deglaciation on mantle melting and dike propagation: Iceland vs. Yellowstone"

Long axis of streamlined landforms indicates ice sheet flow direction

- Mapped using 2m DEM
- Drumlins and mega-scale glacial lineations



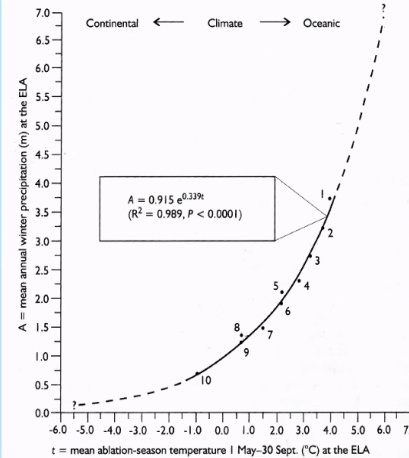
<https://mammothmemory.net/geography/geography-vocabulary/glacial-landscapes/drumlin.html>



Charlie Robinson '21
 "Mapping landforms to determine the extent of the Iceland Ice Sheet during the last glacial maximum"

Ada Bowles '21
 "Testing glacier equilibrium-line sensitivity in Iceland using a model from Norway"

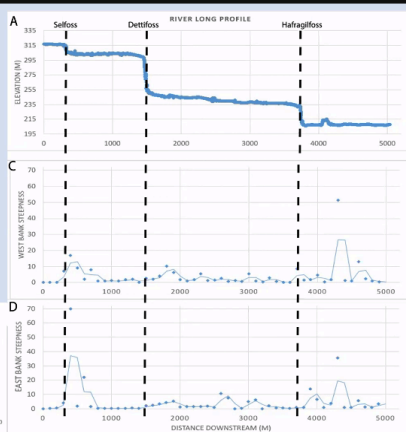
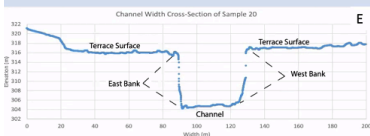
The exponential relationship between mean ablation-season temperature and winter precipitation at the ELA expressed by a regression equation



Bank slope does not show as clear a relationship to the knickpoints.

Pattern:

- Mild steepening slightly delayed downstream of each knickpoint
- Agrees with past work's understanding of bank slope failure



Anna Groves '21
 "Channel Morphology Response to Knickpoint Retreat on the Jökulsá á Fjöllum in Iceland"

GY370 Volcanology

The Volcanology course hosted five seminars spanning not only time periods and regions of the world, but also topics that intersect with volcanology. The first talk was given by one of our paraprofessionals, Robin Hilderman, on the research she conducted during her study abroad, titled "A Multidimensional Research Experience with Hydrothermally Altered Ballistic from the conduit of Whakaari volcano, New Zealand." Dr. Kirsten Nicolaysen, another alumnus and professor of Geology at Whitman College, followed with a talk that focused on how geologic evidence from Holocene volcanism of the Aleutian Islands can be used for interdisciplinary and multidisciplinary study on the movement of people from these areas, specifically the Unangas/Unangax people. Her talk is titled, "The resilience of prehistoric peoples to volcanic activity in the Islands of the Four Mountains, AK." The class was then taken to the opposite end of continental North America, where Dr. Pilar Madrigal from the University of Costa Rica, discussed, "Large and Lively: a recent history of Poas Volcano activity." Phenomenal images and videos were shown from the most recent eruption in 2017. The next speaker, Sriparna Saha, a PhD candidate at the University of Canterbury, presented on how to create resources that make education about volcanic crisis accessible across cultural lines. Her talk, "Co-creation of a bicultural virtual field trip," focused on how digital storytelling can blend the knowledge systems of Te Ao Maori and western science to better understand the Taupo Volcanic Zone. Finally, the last seminar took the students to Italy, where Dr. Francesca Forni, from the Nanyang Technological University, Singapore, presented, "Long-Term magmatic evolution reveals the beginning of a new caldera cycle at Campi Flegrei."

The seminars and course content inspired the students to dive into their own research investigations on a choice volcano. Utilization of software such as IgPet allowed them to make their own plots with real data to uncover the geochemistry and tectonic environments. Pictured to the right is the flyer for the student's mock conference presentation.

Volcanology Talks 2021

02/02 - "A Multidimensional Research Experience with Hydrothermally Altered Ballistic from the conduit of Whakaari volcano, New Zealand"

Robin Hilderman (Paraprof at Colorado College)

02/15 - "The resilience of prehistoric peoples to volcanic activity in the Islands of the Four Mountains, AK"

Kirsten Nicolaysen (Faculty at Whitman College, CC alumnus)

02/15 - "Large and Lively: a recent history of Poas Volcano activity"

Pilar Madrigal (Assistant Professor at Universidad de Costa Rica)

02/16 - "Co-creation of a bicultural virtual field trip, New Zealand / Aotearoa"

Sriparna Saha (PhD Candidate University of Canterbury)

02/18 - "Long-Term magmatic evolution reveals the beginning of a new caldera cycle at Campi Flegrei"

Francesca Forni (Post Doc at Nanyang Technological University, Singapore)



**1st Volcanoes of the world
CONFERENCE AT
COLORADO COLLEGE**

22nd February, 2021

Sponsored by GY370

An online volcanic course during unexpected times

Conveners: Dr. R. Esposito, Dr. R. Hilderman,

Senior Research Projects

For my thesis, I completed an investigation of landslides within the North Fork of the Teanaway River valley in Washington State to understand how landslide sediment affects the formation of salmon habitat. This included creating a detailed landslide map of the study area, dating all the landslides, and estimating sediment transport for each landslide.

-Peyton Colee, '21

For my thesis, I am working with Paul Myrow on the sedimentology, stratigraphy, and paleoenvironment reconstruction on Lower Devonian to Lower Mississippian strata in north and northwest Wyoming. It is very nice working with Paul again :). We did our initial field work in Beartooth Butte, WY., and Cottonwood Canyon, WY. back in August, with a second visit back to the latter site on November.



Close-up of the Beartooth Butte Formation

better understanding of the depositional and paleoenvironmental history of the region, and to identify and correlate possible Frasnian (upper Devonian) and Kinderhookian (lower Mississippian) excursions in C and O isotopes.

-Mingxi Hu '21

"I have been working on a project with Dr. Solomon Seyum investigating the mechanical interaction between fractures and stiff chert inclusions. These interactions are important in determining the role of pervasive structures such as chert nodules in fluid conduction in reservoirs where flow is controlled by fracture networks. I mapped fractures and chert nodules from photographs of chalk cliffs in Denmark and England and in the field in Manitou Springs. I also used mathematical models to determine the key factors that influence stress around the fracture tip and opening."

-Charlie Robinson '21

This past summer, with the generous support of the Witter Family, I had the wonderful opportunity to work with Eric Bilderback '99 and the Geologic Resources Division of the National Park Service. My main tasks were to help Eric, a geomorphologist, to identify and evaluate hazards. At Colorado National Monument, I assisted a Geoscientist-in-the-Park to conduct Unstable Slope Management Program surveys for Federal Land Management to inventory potential rockfalls and landslides to allow management to make informed decisions regarding park safety. At Hawai'i Volcanoes National Park, I worked with the Geologic Resources Division to install displacement meters across fracture zones as part of a long-term ground deformation monitoring program following an eruption in 2018 and was able to present my work at AGU's fall meeting. I have continued to pursue this project, and my senior thesis, co-advised by Sarah



Mingxi at his field site in WY

We worked on four formations — Beartooth Butte Formation, Maywood Formation, Jefferson Formation, and Madison Limestone — that recorded a critical time in middle to late Paleozoic, during which the area was transforming from a passive platform to a foreland system. Several analytical tools were used, including Isotope chemostratigraphy, conodont biostratigraphy, and other biostratigraphy using microspores and microconchids. An ~-7 per mil excursion is identified in C-isotope of the Jefferson Formation and is globally correlated, which could possibly be related to the Alamo Impact event that disrupted the carbonate platform. Most recently, we discovered some microconchids during our second visit that imply unique biological behaviors and ecological conditions. The purpose of this study is to develop a

Schanz and Eric, primarily monitors long-term ground deformation with analyses on wind noise and thermal elastic expansion of instrumentation and rock. Beyond fieldwork, projects involved background reading, looking at and manipulating LiDAR data on ArcGIS, and processing displacement, wind, and temperature data from the Hawai'i instrumentation.

-Nerissa Barling '21



Nerissa at the summit of Kilauea, where she installed the ground deformation monitoring instrumentation



Nerissa working on a survey for the Unstable Slope Management Program with the Geoscientists-in-the-park intern at Colorado National Monument

Summer Research Projects

As a research assistant for Christine Siddoway's NSF ICI-HOT project, I separated sand grains from marine mud recovered from the deep ocean off Antarctica (Amundsen Sea, IODP379). I took photomicrographs of the "coarse fraction," then packaged them up to be refined further and dated using U-Pb, (U-Th)/He, and fission track dating at the University of Arizona. Next summer I will learn geochron methods and collect age data at the University of Arizona, for my senior thesis. I will use the detrital geochronology and information from these sediment cores to discover the timing of past deglaciation events of the West Antarctic Ice Sheet (WAIS).

-Fiona Swope '22

Beginning in June 2020, I helped develop and carry out research on the mechanics of continental rifting applied to the Rio Grande Rift with Riley Scholar and visiting Professor of Geology Solomon Seyum. In this project, I investigated how rocks in rift flanks with contrasting strengths affect rift opening and basin subsidence. I used finite element software to solve linear elastic fracture mechanics and geodynamics problems. I compared model results to basin geometries in maps and seismic cross-sections. We found that rocks of varying strengths around rifts control basin geometries. Specifically, these material properties control strain localization, development of half-graben geometries, and map view asymmetries of rift basins. These results have implications for a greater understanding of rift basin development of young rifts, as well as a mechanism for strain migration during multi-phase rifting of continental break-up.

-Cade Quigley '23

This summer I participated in an 11-week internship with Los Alamos National Laboratory funded by the Witter Foundation. I had the opportunity to work with Trevor Hillebrand and Matthew Hoffman in the Fluid Dynamics and Solid Mechanics Group, numerically modeling ice-sheet behavior in a high performance computing environment. I spent most of the summer modeling subglacial hydrology beneath Humboldt Glacier in northern Greenland using the MPAS Albany Land Ice (MALI) model. My research focused on investigating whether subglacial discharge could focus melting in key locations along the glacier front and induce localized retreat. Additionally, I worked on the ongoing Marine Ice Sheet Model Intercomparison Project, using MALI to model different scenarios of ice sheet melting in an idealized domain.

-Abby Roat '22



Celebrating the FIFTH YEAR of the Witter Family Fund for Internships in Geology

Enormous thanks to **Bill Witter '86** and **Prof. Jeff Noblett**, whose committed efforts successfully launched the Witter intern program. Congratulations to the 32 CC Geology majors who benefited from the Witter experiences over the past 5 years!! In recognition of Jeff Noblett's contributions and the 5-year anniversary, the program will hereafter be known as the Noblett - Witter Family Fund for Internships in Geology.

What are the interns doing now? Here's a sample:

1. Julian Lopez '20 received two Witter internships. He worked for State of Alaska Division of Geological & Geophysical Surveys in 2019, and for the U.S. Bureau of Reclamation in 2020. Now he works for Riley Gold Corp., in Nevada, under the supervision of Exploration Manager/Geo alum Charlie Sulfrian '73.

2. Alec Lockett '17 interned at the Alaska Dept of Natural Resources. This year Alec will attend University of Iowa, conducting MSc research that involves extensive mapping in the Brooks Range, AK.

3. Ellen Smith '16 interned at the USGS, Menlo Park. She completed a MSc degree and is now employed at WebCreek, a software development company. (Ellen is pictured in front of a building very badly damaged—and fenced off -- in the magnitude 7.8 Pedernales earthquake in Ecuador. This was a subduction earthquake.

4. David Sachs '19 interned with Neptune & Co., and following graduation went right in to employment with the same company, as Associate Geologist.

5. Watsawan "Fai" Chanchai '20 – Interned in the mass spectrometry facility at University of Illinois; Watsawan is pursuing a PhD in sedimentary geochemistry / biogeochemical cycles at Penn State (pictured with Craig Lundstrom '87, CC Chemistry alum)

6. Annabelle O'Neill '19 was an intern with Mountain Studies Institute in the San Juan Mountains. She now works at Bishop Brogden Associates Water Consultants: her position is Hydrogeologist.

7. Matt Tankersley '18 – interned at Lamont-Doherty Earth Observatory, and is now immersed in PhD research at Victoria University of Wellington, New Zealand. Matt received the prestigious Antarctica New Zealand Doctoral Scholarship for his investigation of West Antarctic tectonics that bear on icesheet evolution.

8. Ben Lloyd '19 - Interned two times with the Denver Museum of Nature & Science, gaining such skills in paleontology that he was 'snatched up' by the Smithsonian Museum of Natural History, to take on the role of Director of Experimental Operations! (Ben, in black T shirt, is pictured with Vikki Crystal '14, a DMNS affiliate)

Lynne Carpenter '93

Could you give us a quick summary of your path to CC, and how you became a Geo Major?



I am from rural southern Georgia and have some very unusual parents – by the time I was 14, I had been to 49 states and several Canadian provinces. I loved being outside. When I was a junior in high school, two things happened. First, I decided to major in geology after I read about a woman who double-majored in geology and journalism. I remember thinking, “I didn't know you could major in geology!” Second, I received a mailer from CC. I initially thought nothing of CC; my family's farming business was struggling and I knew my family could not afford a private college. However, I liked the thought of the block program, so I applied on a whim. When CC gave me a phenomenal assistance package, attending was possible. Attending CC was a critical part of my personal and professional development.

Are there any particular experiences from your time as a CC Geo Major that have stuck with you?

I was very accustomed to traveling and camping, so that was not especially new. It was not really the geology work that made such an impression – although I will never forget Paul playing guitar while we sang around the campfire. For me, it was eye-opening to get out of the South. I was incredibly naïve about things and had learned to ignore inequities happening right under my nose. Practically everyone in my hometown was either Baptist or Methodist – I remember being shocked that my high-school boyfriend's Episcopal church used actual wine during communion. I had culture shock pretty badly my first college semester and almost did not come back after Christmas break. My semester abroad in Cost Rica cemented my broader worldview. Coming to CC was critical to understanding that people who are different from me are not scary. They are just different, and it's ok to be different. I think everyone should spend at least two years living immersed in a community at least 1,000 miles away from where they grew up. International experience would be even better.

What are some of your best CC memories outside the geology major?

I remember the first time it snowed – It had only snowed one time in my hometown while I was growing up. It was magical. My freshman dorm room was in Loomis hall, with my window looking over to the library. It was beautiful. I still love the first snowfall of the season.



Lynne assessing a field site

Where has geology taken you since CC, up to present day, and where do you hope it continues to take you?

I moved to Golden, CO, where I continue to live, in 1995 to attend the Colorado School of Mines for a Masters degree. In my early years I worked with Lockheed Martin (contracted to the BIA) and with a private geospatial data company. My career has had hiccups – mainly when I was unable to work for a couple of years after a life-threatening pregnancy and long recovery from having twins in 1999. I have worked for the Bureau of Indian Affairs as a Geologist and the Office of the Secretary of the Interior as both a Senior Advisor and Geologist. I just started my new position, as National Geologic Hazards Coordinator for the USDA Forest Service, in October 2020. I'm based out of Lake-

wood, CO, and – as many people are nowadays – am working 100% from home during COVID. It is challenging to start a national-level coordination position while everyone is sequestered in their homes! In “normal” times I would prioritize traveling to each of the Forest Service regions to meet with technical and leadership staff, to begin developing relationships and to understand the geologic hazard challenges that face each region. Making these connections virtually is a special challenge.

I have enjoyed each of my positions because each, in their own way, made a positive difference to someone or something, somewhere. I am looking forward to making positive differences in this new position for a long time. After that, who knows?

What advice do you have for current students or alumni that are thinking of following in similar footsteps to yours?

Network. Networking is key to your success and can help other people's success as well. If, as I suspect anyone reading this believes, you believe that what you are doing makes a positive difference in this world, then leverage that good and help others make a positive difference too. The old saying “It is not what you know but who you know” has a great deal of truth in it. Join organizations. Join student chapters. Go to mixers and meetups (post-COVID of course). Maintain your college friendships and work colleague relationships. Watch webinars and then reach out to the people presenting in those webinars. Ask someone you respect to be your mentor. It is scary at first to reach out, but with time and practice it gets easier. Your network can do greater things together than individually; we can do so much good in this world by working together. If you'd like to connect with me, look me up in LinkedIn: Lynne Chastain Carpenter. I am happy to connect with you!



Lynne taking part in one of her favorite activities - white water boating!

Amber McIntosh '98 and Rob Sanders '99

Good Old Petrology Puts a Gold Mine on the Map

Geology alumni and family Amber McIntosh '98, Rob Sanders '99, and their ten year-old son Riley fired up the generator to activate wifi recently, to be interviewed for the PCB. We wanted to hear about their role in discoveries that led to the Springpole Gold Project in northwestern Ontario--one of Canada's largest new gold occurrences that is to be developed by [First Mining Gold](#).



Amber and Rob posed next to a float plane at Lake Ontario, where their gold-finding adventures frequently took place.

Amber and Rob were both initially contracted through Gold Canyon Resources in 2009 to re-assess the Springpole property's historic core collection and potential for becoming a gold mine. The property had been sitting for 35 years and no one had thought to look at a thin section... Is it a chert layer in a BIF? Or could it be an aphanitic phonolite? Amber's master's research and employment at Cripple Creek, CO, together with Rob's structural geology 'savvy' and expertise on shear zone fabrics, combined to overturn longstanding dogmas surrounding host rocks in Ontario's Red Lake mining district, situated in the Canada's 2740 Ma Birch-Uchi greenstone belt.

Rob and Amber spoke to us from their off-the-grid home in Datil, New Mexico, where their joint work alternates between exploration for economic metals and home-based lavender business [Frolicking Deer Lavender](#).



Amber, Rob, and Riley's beautiful home.



Lavender from the farm.

Some in the CC Geology community will remember that Amber both paraprof'd in the Department and fueled the Keck Consortium summer research engine – in both roles, providing hearty meals and creating a welcoming field base camp for students. In the Palmer Hall paraprof office, one can still marvel at the total on a receipt that is taped to the wall (and preserved for posterity) -- it shows an exorbitant sum charged for the purchase of ingredients for the vegetarian contingent on the 1998 Regional Studies trip to Death Valley. As timeless as it is remote, the Shoshone, CA, gas station convenience store can still charge a premium for vegetarian items! During her CC years, Amber interned with

the Cripple Creek and Victor Gold Mining Company / AngloGold Ashanti, then continued as Junior Mine Geologist in the Cresson pit. This work eventually turned into a master's thesis at the New Mexico Institute of Mining and Technology (2004). While immersed in Cripple Creek geology, she got to know phonolite: low silica lava rock that is rich in K-feldspar and the 'sodic feldspathoid' mineral, nepheline. When hit with a hammer, phonolites make a ringing sound -- that's the origin of the name! These alkaline-type epithermal deposits are among the largest epithermal deposits in the world, and Cripple Creek is one of the premier examples. It is the experience and knowledge gained there that provided Amber with the singular ability to make primary observations that led to the re-discovery of a world-class gold deposit of the same type in Ontario.



The view from their home in Datil, NM!

To Amber, it was absolutely clear: material in drill core, that had been identified as the silica-rich layers within sequences of banded iron formation, in fact was slightly metamorphosed phonolite! Serendipity, circumstances, and the necessity for a structural geologist brought Rob into Springpole. He found clear evidence in the drill core for strain partitioning and fluid migration along shear zones. The thrill of discovery, during that work up North in 2009-2010 (see photos), was initially met with skepticism because these novel interpretations ran counter to conventional wisdom in the region. The two completed the work and returned to New Mexico to look at

thin sections and compile petrographic reports-- and it took a decade for the full impact of their findings to be appreciated by Canadian gold development companies.

Information about the discovery of the Springpole ore body is at <https://www.firstmininggold.com>. Click on Springpole Project, go to Video and Photo Gallery, scroll down to Springpole 3D Conceptual Mine Site Plan for a video animation flyby, which renders the stages planned for water management, excavation, processing, and restoration of the site in northern Ontario.

So what has been the trajectory for these life- and business- partners, since graduation from CC? The two Geology graduates went on to graduate school at New Mexico Tech, and flourished in the academic/field setting of the Rio Grande Rift... that is, until aridity and population pressure got to be too much, and they moved up in elevation, to the piñon-juniper woodland of the Datil-Mogollon volcanic field.

While in Socorro, Amber served a stint as administrative and editorial assistant for GSA Bulletin Editor Karl Karlstrom at UNM, and Rob conducted some pioneering work on the thermal evolution of basement uplifts in the southern Rockies. Rob's PhD work showed that the famed ranges of the Laramide foreland originated during breakup of the Proterozoic supercontinent, Rodinia. Rob found the opportunity while in New Mexico to establish Thief Mountain Mining Company, LLC, and conduct mineral exploration for specimen mineral localities. He now holds mining claims that produce gem amethyst and Herkimer-style quartz crystals. Rob has specimens on display at the Mineral Museum at New Mexico Tech. Both the dark purple, gem-grade amethyst and Herkimer-style quartz are firsts for the state! This gained Rob, and his late mining partner, Dylan Canales, some minor fame amongst New Mexico rockhounding circles. They are true prospectors! Even though they turned down roles on the show... and Amber has just been interviewed to be on Dave Turin's Lost Mine... we'll see what happens!

As many know, the economics of the mineral industry is such that there are regular fluctuations between lean times and boom times. In lean times, this family gets along fine since they do, quite literally, live off the grid, using solar panels to generate power. When income from minerals is slim, the family generates revenue from their lavender business, that basically entails dryland farming aided by frugal irrigation; their fresh water is drawn from a 565 ft deep well. If you are interested in water issues, check out <https://www.sanaugustinwaterreport.org> for our friend Carol's up-to-date news on a water mining attempt to pump the aquifer under the Plains of San

Agustin dry. As geologists, both Rob and Amber have volunteered time and served on the board of the San Agustin Water Coalition.

Lavender production seems a far cry from gold and gem exploration, but when they had the opportunity to purchase Frolicking Deer Lavender in 2014 from the company's founders, neighbors Dennis and Kathy Kanely, Rob and Amber perceived this as just another way to be self-employed and to have a livelihood at home in the expansive wilderness surrounding their backyard. Their son Riley spends most of the days exploring out of doors with 70-pound cat-dog named Zea, and he must be one of the few kids in USA to attend classes in a 2-room schoolhouse. And of course, during the Covid pandemic, it's utterly easy to socially distance where they live!



Professor Christine Siddoway, and Riley, during a recent visit to CC!

Their work in Canada means extensive amounts of time spent away from their home in New Mexico, something that Amber and Rob chose to reduce during their son Riley's childhood. In any case, exploration and mining possibilities were at low ebb during the last decade, therefore Frolicking Deer Farm underwent an expansion. From the original 13 acres and tiny cabin, the family increased the size of the homestead to 75 acres, with a big house, several production and storage shops, two greenhouses, and a horse trough hot tub. Lavender is started from cuttings in the greenhouse and grown in raised rock terraced beds with water efficient irrigation. They consider themselves a boutique lavender farm, as most of the fresh flowers only bloom June to July and were, pre-Covid, sold out at one big show each season. Their biggest lavender client is the Southwest Indian Foundation <https://www.southwestindian.com>, a non-profit that raises funds to support communities of the Navajo Nation. With interest growing in essential oils, especially lavender, the Frolicking Deer business is

booming. In keeping with the indigenous community connections, it's nice to discover that the "Frolicking Deer" logo has a geologic/archeologic context. On their website, Amber and Rob write; "Our logo is inspired by a tattoo discovered on a 2,500 year old female preserved in the permafrost of southern Siberia near the Mongolian border. The National Geographic reported on the remarkable preservation of the elaborate ink tattoo adorning the mysterious, silk-clad Ice Maiden."

Rob and Amber look forward to continuing their lavender production, but geology comes full circle and it's time for another round. This time they are proud to support AurCrest Gold <https://aurcrest.ca>. AurCrest is the first Canadian mining company with First Nation participation and is committed to contributing to the socio-economic development of The Lac Seul First Nation as a neighboring indigenous community. This includes forest carbon offsets as part of a clean energy initiative.

Rob and Amber are currently conducting exploration for AurCrest on several properties between Red Lake and Springpole. Properties are at various stages of development, and the Ranger Lake project has returned exciting SGH soil survey data to coincide with blind targets defined by artificial intelligence.

They plan on visiting the halls of Palmer as soon as they get the chance to take Riley back to their old stomping grounds. One day, the CC Geology Department hopes to send a class of students and professors to study the land near their home in Datil and check out the lavender fields as well - perhaps it will even become a popular field trip stop! Thank you, Amber and Rob, for sharing your journey with us - we wish you the best in future endeavors and hope to see you on campus soon!



Riley at the Herradura Mining claim near Truth or Consequences, NM.

Alumni, Faculty, and Friends In and Around the News!

Thank you to everyone who sent in updates - we love hearing from you every year!

Paul Myrow's Oceanography course in Block 5 was featured in CC's online "Block Features." See the title of the first blog - [From Position 18 on the Waitlist to Getting into the Course](#). Check out the Oceanography author's gripping read!

The department would like to recognize **Candace Santa-Maria**, who retired as of Friday, January 22nd, from the Registrar's office after 23 years at CC. She was extremely helpful in keeping track of student achievements and always recommended that new students take a Geology class during their time at CC. We are so grateful for her help over the years. We sent Candace flowers as a thank you and have included her thoughtful note in response below.

"Please forward my sincerest thank you to all of the geology department for the thoughtful note and beautiful flowers that arrived last evening. The iris remind me of spring and the beginning of this new "season" for me. The note made me tear up and it meant so much that you did that for me, thank you. As you know from previous conversations, Mandy, I have had a great interest in geology most of my life, as I come from a family of "rock heads". Most every student I have advised over the years I recommended they take a geology class while at CC because where better to study geology than Colorado?"

With the help of **Charles Sulfrian '73**, **India Philips '21**, **Nerissa Barling '21**, and **Jonny Norwine '21** have co-founded a CC AIPG Chapter. This past semester, AIPG@CC hosted an online career panel and water right talk that were attended by geology and environmental studies students. We hope to continue to host a variety of speakers in various industry and government positions, embark on field trips across the state, attend and present at conferences, and build community through a mentorship program. If you have interest in being a guest speaker or have any field trip ideas, please reach out to us by contacting Nerissa at n_barling@coloradocollege.edu

Zak Armacost '19 is a Geologist at Stantec in Salt Lake.

Drew Ceglinski '19 just got a contract job with Equinox Gold on the CA/AZ border for 6 months.

Jon Rotzien '07 developed an online version of the New Zealand field course that he and his team offer annually. The Zoom-based sessions offered lectures from petroleum geologists and other investigators

who showcased their work in Norway, UK, Malaysia, Australia, Colombia and USA to show students the range of career paths and applications in sedimentary geology/basins research. The diverse group of experts works in basins all over the world, and commonly join together for AAPG and SEPM symposia focused on deep-water depositional systems. Jon and colleagues also offered in-person field work, that garnered geo-media attention! The field course is described in articles in [GSA Today](#) and [The Professional Geologist](#) (TPG), 2021, January/February/March issue. **Jon** wrote: "Normally, I'm on a field trip to Taranaki right now, but this year we've had to go online with the course. We just finished! For their final project, students interpreted the evolution of a fictitious continental margin using an "11,000-m-long cored interval" resembling what you'd find if you drilled offshore Brazil\Angola today (down to basement). For the NZ part of the course, I showed some pictures of my cruise on the Nathaniel B Palmer and of our regional trip led by you and Eric. I'm so thankful you introduced me to New Zealand. It has been a great adventure so far, and to a large extent, thanks to what you taught our class of 2007.

Mike Taber '86

Well...aside from feeling rather Precambrian myself and feeling like COVID-19 has put me in the basement (literally), I did reach full professor status last year and am generally happy to be working at CC as we continue to be innovative in our teaching.

Eric Johnson '87

I've been doing GIS and related IT work for about 25 years. I also have an apple orchard (250 trees) in cooperation with a neighbor and a local farmer. We'll be producing apples for her use and for a cidery. Part of the orchard is a collection of biodiverse *Malus sieversii* and *Malus orientalis* (wild apples from Eurasia) collected by USDA. We distribute scionwood and seeds from them, and will be growing out and distributing seedlings, all with the aim of getting unique genetics protected and incorporated into new apple varieties. More info at widespreadmalus.com, or find us on Facebook. I'm married to Penny Warren, and we have a 9-year-old daughter, Ellie.

Annabelle O'Neill '19 is a Hydrogeologist at BBA Water Consultants, Inc., working shoulder to shoulder with CC Geo alumni Chris Sanchez '94 and Dan Niemela '00, both of BBA.

Chris Sanchez '94

BBA Water Consultants, formerly known as Bishop-Brogden Associates Inc. is proudly celebrating its 40th Anniversary this year. **Charlie Stanzione '84, Chris Sanchez '94, Dan Niemela '00, Tim Crawford '00,** and the rest of the BBA crew are happy to welcome **Annabelle O'Neill '19** to the BBA team.



The BBA team - pre-Covid!

Bob Blaik '77

- Started career as staff exploration geologist in 1977: Wellsite geology, drilling and completion supervision. Trained as production superintendent and then managed company producing oil and gas properties, including planning/supervising remedial and maintenance operations throughout Oklahoma, Kansas and Texas.

- Independent Oil and Gas Producer in Oklahoma (Mid-Continent) since 1985.

- Generate Geological and Geophysical (3d Seismic) oil and gas prospects targeting stratigraphic reservoirs identified/confirmed with variable seismic attribute analysis

- Member AAPG, SEG and SIPES

Terri Olsen '80

It's hard to believe my 40th reunion would have been this year.

After 38 years in the oil industry, I retired at the end of May from my gig as a consulting petrophysicist and pore-scale imaging specialist. In late September I received the Robert H. Dott Memorial Award for best special publication from the American Association of Petroleum Geologists. I'm currently leading a group called Rocky Mountain Members in Transition, helping folks who've been laid off due to the current downturn and pandemic. I am also active with a



Terri with her Robert H. Dott Memorial Award

Boulder-based group, Energy Should Be, promoting renewable energy. Am helping organize the AAPG annual meeting in Denver for May 2021 as a theme chair for Unconventional Resources.

Beckley Stearns '18 was spotted on CBS news!

"Sharing quarantine with endangered seabirds This summer, during the COVID-19 pandemic, three scientists studying endangered seabirds found themselves on an island off the New Hampshire coast, which they shared with thousands of birds - and no one else. New Yorker magazine contributor Kelefa Sanneh talked with Liz Craig, Aliya Caldwell and Beckley Stearns, from the Shoals Marine Laboratory (run by the University of New Hampshire and Cornell University), about their unique sojourn on the terns' breeding ground at Seavey Island."

Watch the news feature [here!](#)

Jean Lemmon '77

I retired from the Water Quality Division of the Oklahoma Conservation Commission and Bruce and I have moved back to Colorado. We are loving our opportunities to get out into the mountains, but are glad the large fires are almost out. It was distressing to see all of the smoke and ash every day for three months! We are looking forward to connecting with friends in the area once the Covid virus is a bit under control.

Rose Bloom '08

I started yet another new career path in 2020. This time as a metallographer for a material science group at Los Alamos National Laboratory. I finally get to indulge my nerdy microscopy-loving self by looking at metal all day every work day in the optical scope, SEM, microprobe, XRF, etc. I look at and analyze new alloys as well as metals like Be, U, Th, Ce, Zr, Nb, etc. Though it's not rocks and minerals (LAME), it's at least a similar skillset. (Rocks are way cooler than metal.) Surprisingly I even work and share an office with another master in geology. Another piece of news—I will be welcoming my second daughter to this world somewhere around April Fool's Day 2021.

Cody Duckworth '16

Since my last PCB Update (I think I missed the past couple), I graduated with my Masters degree from Western Washington University, worked a field season with the Washington Geological Survey, and then moved back to Colorado where I started a position with the geotechnical consulting firm, BGC Engineering. Grad school was challenging but a great experience for me and it was a great time mapping with the Washington Geological Survey -- I even got to work with fellow CC folks Alec Lockett and Megan Anderson. Since transitioning to 'working in industry' I have been focused on mitigating geologic hazards (landslides, earthquakes, etc.) in various field localities across the US. It has been great to be back in Colorado and I can't wait to catch up in person with old friends once the pandemic mellows out!

Steve Spear '69

Social distancing is easy for geologists.

**Justin Strauss '06**

My wife Elena Mihaly '07 and I still live in Norwich, VT, where I am an Assistant Professor of Earth Sciences at Dartmouth College. We have great CC presence in the Dartmouth lab group, including Postdoctoral Fellow (Timothy Gibson '10) and PhD student Tianran Zhang '18. Ryan McKeon '03 is also right down the hall in Geography. At the moment, my group has a wide variety of ongoing research projects that are mostly focused on Neoproterozoic–Paleozoic strata exposed throughout the circum-Arctic. We are using these records to better understand carbonate depositional systems and broader basin analysis throughout Earth history.

Patrick Williamson '82

I continue to work as an environmental geochemist in the mining sector as a Principal Hydrogeochemist with INTERA Inc, an employee-owned firm based out of Austin, TX with a satellite office in Boulder. My main focus is water supply, mine dewatering, water quality and mine waste characterization/management for base and precious metal mines. Almost all of my projects are in Latin America, most recently in Mexico and Colombia. I split my time between marketing, project development/management and mentoring. In addition to consulting, I am heavily involved with professional societies, including the Environmental Division of the Society of Mining, Metallurgy and Exploration, the Acid Drainage Technology Initiative and the Metals and Mining Society of America.

On the personal front, Sue and I celebrated our 30th anniversary with a vacation in Lake Como (Italy), Paris and London, accompanied by our recently graduated son Bryce (Univ of Utah, Geology). Sue continues to work in health care and physical therapy, while Bryce joined the Albuquerque office of INTERA.

Ben Borkan '11

This PCB, I have several non-geo related announcements: I am engaged to my fiancé Lydia! And, we are also expecting a baby girl in November (I am writing this in October, so while you are reading this, we are enjoying our first few months of being first-time parents)!

Jim Bowman '80

Currently Living in Monument Colorado and part time in Mesa Arizona.

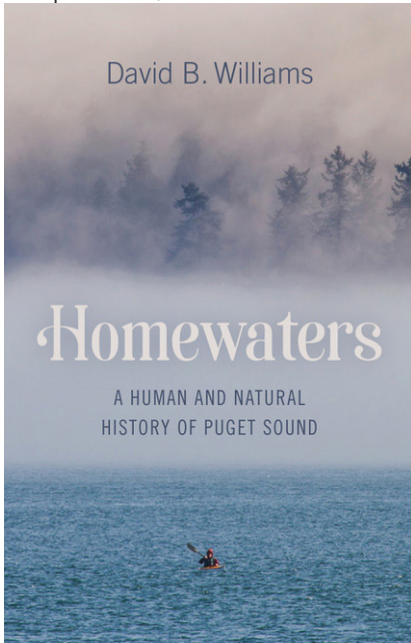
2020 has been an interesting year to put it mildly. I took a three year early retirement from United Airlines in August of 2020, and so far I have not been bored! There have been plenty of things to do in Colorado and Arizona to keep our family busy! We really enjoy hiking in the mountains and desert, plus mountain biking. I plan on getting involved with doing some volunteer work with WWII aircraft preservation. When things allow I'd like get involved with some volunteer work at CC.

Wishing the very best for the faculty and students in the Geology Department.

Tim Boddington '72

Well, being retired and fortunate to have a loving wife, a home and a workshop and a yard I can putter in means I'm doing about as well as can be expected. Historic Preservation in Colorado Springs is where I spend my non-profit time. The art world is all virtual and thriving here. I text and email my four kids everyday and relish news of their continued wellbeing. I'm looking forward to getting my Covid vaccination! I miss seeing people.

David B. Williams '87 is still toiling away in Seattle writing books. His next one, which will be published in April 2021, is *Homewaters: A Human and Natural History of Puget Sound*. He has also been converting a bunch of his in-person walks to virtual tours, including one based on his book *Stories in Stone: Travels Through Urban Geology*. In the tour, he takes participants around the US and Italy weaving together stories about the cultural and geological history of building stone. He can be reached through his website: geologywriter.com.



Senior Lecturer **Nathan English '96** managed to sneak in some dendrochronology field work before COVID in the soggy southern mountains of Tasmania. He's still the Head of Course for Environmental Science at Central Queensland University in Australia.



Nathan out in the field in Tasmania

Sierra Melton '18

Hello from central Pennsylvania! This has been an amazingly strange and eventful year for sure. After finally getting visa approval for my Ethiopian partner (a paleoanthropologist) to move to the U.S., he arrived in the country for the first time. (We had met when I participated in an REU in Ethiopia during my time at CC.) We got married in a very small ceremony a few months later - a requirement for the visa. Now we are living happily in State College, PA, where I am a graduate student in Geosciences at Penn State. I successfully defended my master's thesis on iceberg calving and meltwater drainage from Greenland's Helheim Glacier in October and will continue glaciology research at Penn State for my PhD. As always, I'm missing CC and hoping to visit when possible!



Me with my now-husband Tewabe Negash in front of a glacial valley in Rocky Mountain National Park. It was his third day in America and first time seeing snow!

Pamela Fisco '77

Though on a pandemic hiatus right now, I continue my work as the owner and sole principal of Rocks Talk, an Earth and Planetary Science program composed of classes, field trips, curriculum development and workshops for K-12 students and teachers at public and private schools.

I also continue to work for UC as a California Certified Master Gardener and, in conjunction with Marin Municipal Water District, I run the Marin Garden Walks program, which provides home garden walks to educate residents on sustainable gardening practices and reduced water use. My activities as a residential property manager for Hawk Heights, a small, private

investment, have been substantially reduced, much to my pleasure! In addition, I continue to serve on the Northern California Geologic Society Board where I am the K-12 Outreach Liaison.

Dennis and I still live in Mill Valley, though we spend a fair amount of time in the Sierras, by the ocean and traveling as best we can these days. Happily, my two married sons have moved back to Mill Valley so we see them frequently and my daughter is still enjoying the marine life in Southern Florida.

Sasha Woods '86

Just a quick small world snapshot for you. Laura McCarthy Cota ('05) is the Director of the Livingston Depot Center, in Livingston, MT. Laura and I met at an event last year and quickly discovered we were not only CC grads, but both geology majors!

The Depot Center typically hosts a chili lunch for its members but this year they put together a DIY chili kit instead. Laura and I combined efforts to create the best danged chili kits ever.



Laura and Sasha at the Livingston Depot Center.

Kayla Bronzo '18



I applied to 22 med schools, interviewed with Tufts-Maine Rural Medicine Program, and just got informed that I'm accepted! The interview was virtual, but I still felt like I got a good feel for the program. I had a blast interviewing, and when it was over became overwhelmed : becoming a doctor felt so close. I am supposed to hear from them soon, so fingers crossed. Luckily I had a lots of distractions while I waited to hear about applications. I moved in to San Francisco and started a job I adore. I work full time at an urgent care as an Advanced Clinical Associate which is a combination of a scribe and medical assistant job. Being involved in direct patient care is amazing, especially during these times! We do over a 100 rapid covid tests a day on top of seeing normal patients so we are kept quite busy.

Emily Reinsel Bowman '09

Trevor and I married in 2018, and are happily living in Flagstaff and exploring the desert southwest (less regional exploration these days, with the pandemic, but there's no shortage of local recreation and wild places). I've been working in the pediatric ICU here for over 4 years now as an RN... a natural progression from geology, right ;)

The timing of your email is spot on- I've been in Zoom meetings the past 2 days as a board member of the Ritt Kellogg Memorial Fund, so my days at CC have been front and center in my mind! Although I'm not practicing geology, my CC geo experience was so formative AND so fun. I especially appreciated my time at CC after I went back to school to earn my BSN, a program which lacked the academic rigor,

CAMINO SPICE
Add flavor to your journey!
CAMINO SPICE'S EASY DEPOT CENTER CHILI

The Livingston Depot Foundation has been hosting its annual chili luncheon in gratitude for the support of its membership and the community for decades. With the state of the world, our community included, we want to help you make your own chili this year. Please enjoy this recipe, along with some goodies, as a token of our appreciation.

We are so grateful to be a part of this community, and look forward to sharing fresh chili with you again soon.

Ingredients:
1 lb. lean ground beef
1 large onion, chopped
1 garlic clove, minced
1 28 oz. can crushed Italian tomatoes
1 15 oz. can red kidney beans (optional)
1 Tbsp. chili powder
1 tsp. Divine Inspired Spice (included)
1 tsp. cumin
1 tsp. dried basil
1 4 oz. can green chilis
2 bay leaves

Directions:
1. In a large sauce pot, brown beef over medium heat.
2. Add onions and garlic, and cook, stirring frequently until onions have softened.
3. Stir in tomatoes (undrained), beans, spices, and chilis.
4. Add bay leaves, season with salt and pepper.
5. Reduce heat, cover, and simmer, stirring occasionally, for 20 minutes or until onions are tender and mixture has thickened. Discard bay leaves.
6. Serve with shredded cheddar and sour cream, if desired.

Camino Spice, LLC.
113 W. Park, Ste. 45, Livingston, MT 59047

406-624-9728
caminospice.com

The famous chili recipe - for your convenience!

student engagement, dedicated professors, and so many other qualities of my CC geology experience. You all are really top notch. If my board meeting is in person on campus next year, I will certainly try to sneak in a visit to the geo department to say hi. Hope you all are well!

Matt Tankersley '18

Ended 2020 with a great trip up to one of NZ's glaciers and the awesome Brewster Hut. Met some cool people, shared a bottle of champagne and skinny dipped in some crazy cold water! So lucky to be here in NZ right now.



Matt among awesome rocks in NZ!

Emily Reinsel Bowman '09

Trevor and I married in 2018, and are happily living in Flagstaff and exploring the desert southwest (less regional exploration these days, with the pandemic, but there's no shortage of local recreation and wild places). I've been working in the pediatric ICU here for over 4 years now as an RN... a natural progression from geology, right ;) The timing of your email is spot on- I've been in Zoom meetings the past 2 days as a board member of the Ritt Kellogg Memorial Fund, so my days at CC have been front and center in my mind! Although I'm not practicing geology, my CC geo experience was so formative AND so fun. I especially appreciated my time at CC after I went back to school to earn my BSN, a program which lacked the academic rigor, student engagement, dedicated professors, and so many other qualities of my CC geology experience. You all are really top notch. If my board meeting is in person on campus next year, I will certainly try to sneak in a visit to the geo department to say hi. Hope you all are well!

Zion Klos' '09 position at Marist College is going well! See his website here: <https://www.marist.edu/science/faculty/zion-klos>

It suits Zion to be situated along the Hudson River in Poughkeepsie, NY, where he has access to sailing along the Atlantic seaboard.

Sylvie Fadrhonc Boulva '07 is a Physician Assistant (PA) for University of Utah Health, working in the Division of Pediatric Allergy, Immunology, and Rheumatology. Sylvie and her partner Annik are on the go at all times with two daughters and a lovely pup. Millie (sporting the Covid19 protections) is 2 years old. Big sister Rosie, who is four, has her hands full, since – in addition to Millie – she needs to look out for the year-old silver lab, Chester!

Annik and Sylvie say "The girls love being outside, throwing rocks and sticks, using logs as balance beams and just exploring and discovering. It's the best, how happy and content they are in the outdoors." With all the time outdoors, who knows, once might discover the draw of geology!



The whole family, including their puppy, Chester!
More photos of the family on the next page.



This past year, **Besty Friedlander '07**, who is currently the Senior Project Geologist at Teck Resources Limited in Vancouver, BC got married her to her partner, Christian Welch!



Besty and Christian at their ski-slope side wedding!



Millie (left) with her PPE on, and big sister Rosie (right).

Besty's friend, CC classmate, and fellow past paraprop **Karri Sicard '07** was married to her partner, Craig Soto, in 2020 as well! Karri is a geologist at Jacobs Engineering Group Inc.



Karri and Craig at their beautiful forest wedding.

Eric Daniels '09 lives in nearby Denver, and works for AR2Tech, where he puts his expertise in geostatistics to good use. His company provides geomodeling and uncertainty analysis for industry and environmental-science clients, using an open-source software, SGeMS. His work activity has been uninterrupted by Covid-19 restrictions, since Eric can readily work from his home office... this allows him to spend more time with his family: wife Alexa, and kids, Lucy (3 1/2) and Calvin (11 months). **Jonny Norwine '21** joined AR-2Tech as a Witter intern last summer and Jonny now is employed by the company, working occasionally with Eric Daniels.

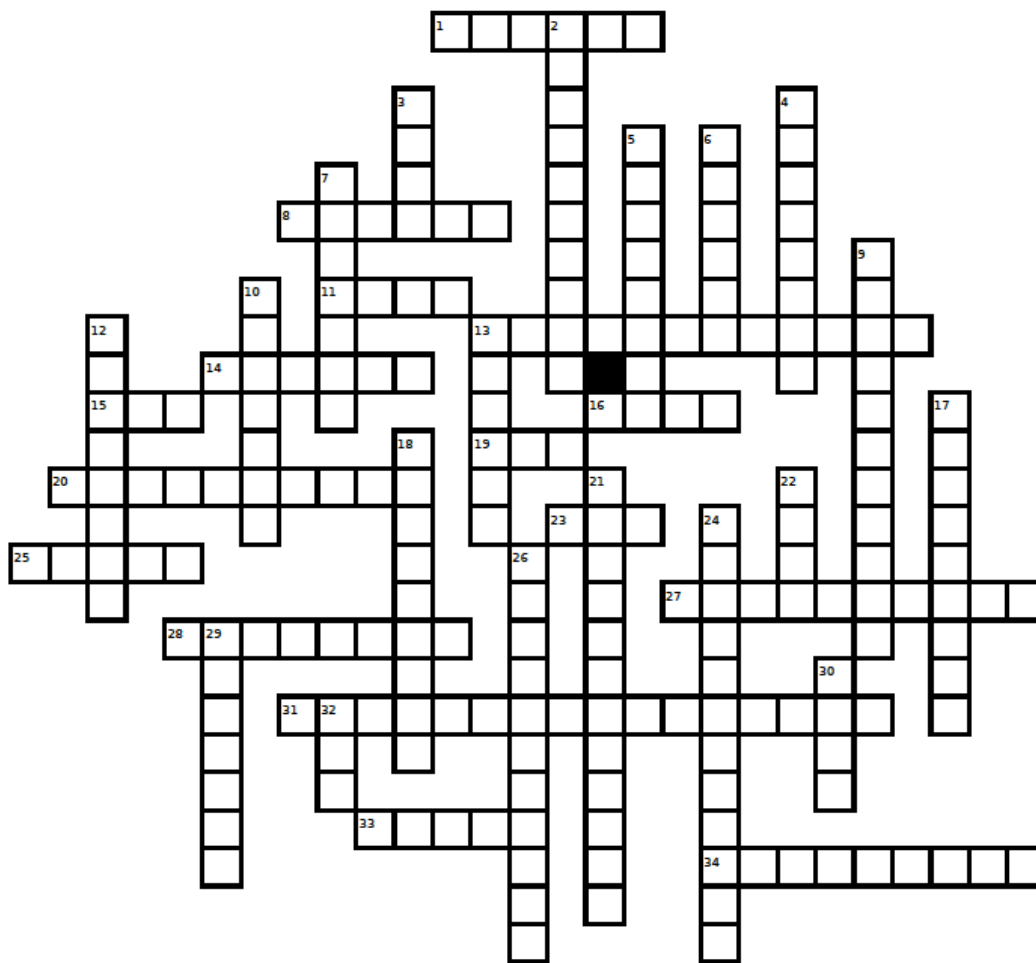


Eric and his daughter Lucy recently visited with CC Geo's very own Mandy Sulfrian.



Professor Christine Siddoway and Karri on a field trip to Mt. Cook.

Rocks! Pandemic Edition.



Down

2. Chain of volcanoes around the Pacific Ocean
3. Ute tribe's name for the 14,115-foot summit that towers over campus
4. Naturally occurring glass
5. A stumper on the Intro Geo mineral ID quiz. Commonly confused with amphibole
6. Concave-shaped valley, formed by glacial erosion
7. Gentle giant - the star of ice age mammals
9. Difficult to measure a stratigraphic section without this
10. Common term in geomorphology to describe river processes
12. Soil horizon
13. Supercontinent
17. Snail-like creature
18. Released into underlying sediment from calving icebergs
21. Inclined sedimentary strata
22. COVID-19 app of the year
24. Helps facilitate group discussion on zoom
26. Type of volcanic explosion that destroyed Pompeii
29. Breaks down entire mountain ranges
30. A geologist's favorite beverage
32. Minerals of economic value

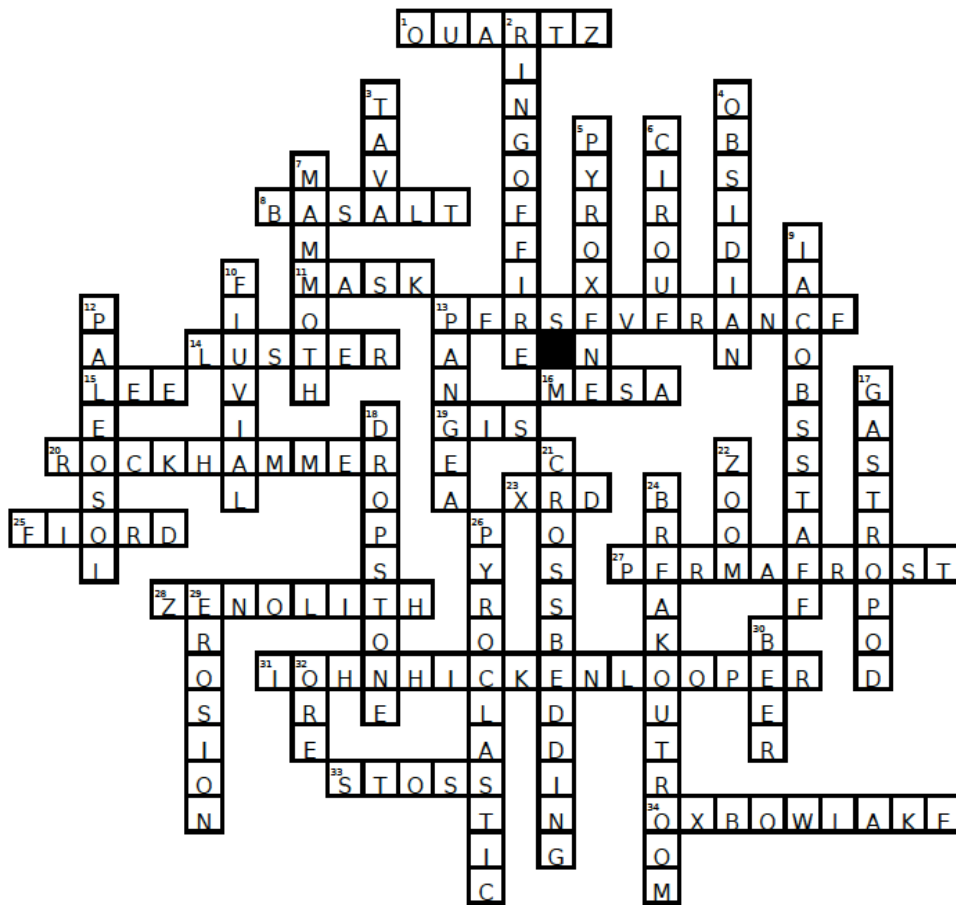
Across:

1. Your non-geologist friends always want to know if this is a valuable mineral... it's not
8. Fine-grained, mafic, igneous rock
11. Conceals your identity AND protects yourself and others
13. Joined it's buddy Curiosity this past February
14. Very subjective mineral property - It's metallic or it's not
15. Steep side of a ripple
16. Natural "tables" found commonly in the SouthWest
19. Computer program used to virtually assess a field site (heavily used in COVID-19 times)
20. A geologists favorite tool
23. Mineral-identifying instrument in Tutt that has been broken the whole year
25. spectacular U shaped valley - commonly found in NZ and Iceland
27. Frozen tundra
28. "Foreign Rock"
31. Colorado's very own politician/geologist/brewer
33. Less steep side of a ripple
34. Created when a meandering river is cut off

***Answer key on the second to last page of the issue!**



Aztec Sandstone - Gold Butte National Monument
Photo Taken by Steve Weaver



Dear Colorado College Geology Alum:

We hope you have enjoyed the 2020-2021 edition of the Precambrian Basement, CC Geology's annual alumni newsletter. We would love to hear what you're up to, where you've been, and where you are now. Please fill out this form and return it to:

The Precambrian Basement
Colorado College
Geology Department
14 E. Cache La Poudre St.
Colorado Springs, CO 80903

OR: email us at precambrianbsmt@coloradocollege.edu

We love pictures!

Last Name _____ First Name _____
Maiden Name or Nickname _____ Year of Graduation _____
Current Address (street) _____
City _____ State _____ Zipcode _____
Home Phone _____ Business Phone _____
Email _____ Website _____

Current Employment or Graduate School Info:

Recent Events, Exciting Adventures, and other Comments

