

Geosciences Program

NEWSLETTER

For alumni and friends of the geosciences program
Spring 2018


COLORADO MESA
UNIVERSITY
DEPARTMENT OF PHYSICAL AND
ENVIRONMENTAL SCIENCES



*Fault-cored fold in the Gunnison Gorge.
Image courtesy Dr. Cassandra Fenton*

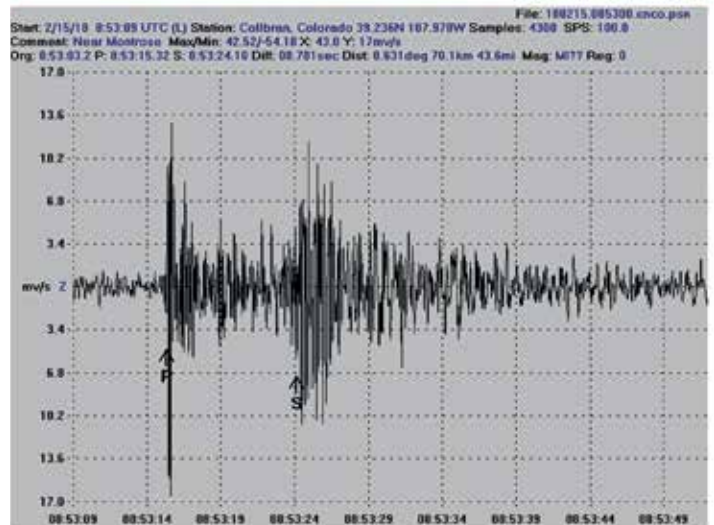
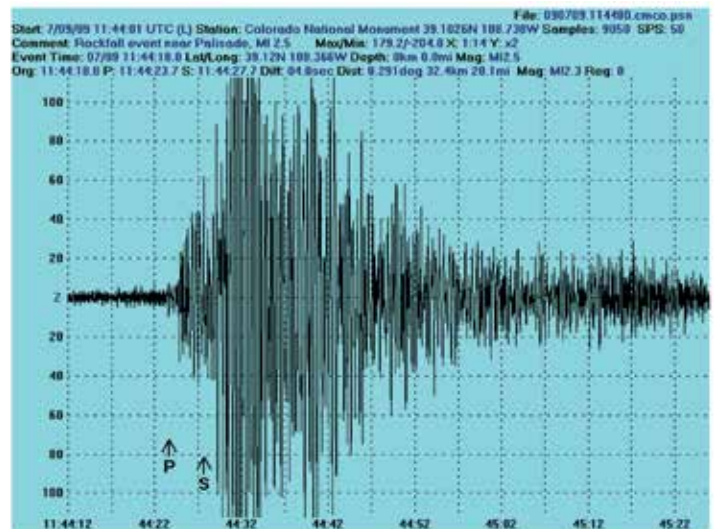
EARTHQUAKES (OR NOT) IN THE GRAND VALLEY

For the past 25 years, Dave Wolny (B.S., 1995) has been monitoring earthquake activity with an emphasis on earthquakes in our area. Equipment and monetary donations have come from the U.S. Geological Survey, Grand Junction Geological Survey, Dr. Bill Hood, and others. A partnership with Mesa County has provided real-time access to a CMU seismometer located near Collbran, CO. Dave has used data collected from various seismometers (one of which used to be on the former Mesa State campus) to provide insight on earthquake activity that would otherwise not be possible, given the scarcity of seismic equipment in western Colorado.

As a case in point, on July 9, 2009, a rockfall occurred along the Book Cliffs escarpment north of I-70 near Palisade. Initial reporting by *The Daily Sentinel* quoted sources who suggested an earthquake had triggered the rockfall. Dave analyzed the seismic data from the event and came up with an alternate explanation: No earthquake occurred at the time of the rockfall, instead, the large rockfall had generated earthquake-like seismic waves. The key observation that led Dave to this conclusion was the geometry and progression of the seismic wave amplitudes that Dave detected on the seismograms from two CMU seismometers that were located closest to the event (see figure of seismographs). Specifically, Dave noted that for the rockfall, the wave amplitudes started small and increased progressively over time to a maximum before decreasing. In contrast, earthquake wave amplitudes typically have a large initial P wave arrival followed by wave amplitudes that decrease over time. The preliminary determination that the event was triggered by an earthquake was based on data from seismometers that were located further from the event than the seismometers placed by CMU, University of Washington, and NIOSH. Further research, however, showed that rockfall events elsewhere, such as Yosemite National Park, produce seismic signatures similar to that shown by the Palisade event. Without the detailed seismic data that the CMU network and others produced, the origin of the 2009 rockfall event would have been misinterpreted.

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Dave analyzes approximately 1,000 regional seismic events per year using the CMU seismic network as well as networks maintained by other agencies. A large number of those events in the Rocky Mountain region are related to mining activity and wastewater injection such as the 2013 event felt in Grand Junction, which was triggered by Bureau of



A comparison of seismographs from a rockfall and an earthquake. Top: The lack of a distinctive P-wave signature suggests that the 2009 Palisade rockfall was not triggered by an earthquake. Bottom: Typical P-wave signature of a natural earthquake near Montrose, CO.

Reclamation brine water injection related to desalination efforts along the Dolores River near Bedrock, CO. Although the number of natural earthquakes recorded is modest, they do tell us that active faults exist in our region. As former State Geologist Vince Matthews suggested in one of his visits to CMU several years ago, the threat of an earthquake event in western Colorado is very real.

Many of the CMU geology students and alumni are probably unaware of Dave's efforts to monitor earthquakes in western Colorado. For anyone who is interested in learning more, please contact Dave at: dwolny@coloradomesa.edu. •

~ Dave Wolny and Andres Aslan

FACULTY PROFILE

Dr. Cassandra Fenton, Instructor of Geology

*University of Rochester (BA),
University of Utah (MS and PhD),
University of Salzburg (MS) (GIS)*

Cassandra (Cassie) Fenton has geologic roots in upstate NY. She grew up in the Adirondack Mountains and went to college at the University of Rochester (UR). It wasn't until she traveled out west, though, that she actually saw a lot of the rocks and structures that she had learned about about as an undergraduate. She could actually see the geology instead of having to imagine it. As an undergraduate student, Cassie set her sights on becoming a geology professor and teaching at a small liberal arts school. She made a plan to attend graduate school and took a 'gap year' between her undergraduate and graduate studies to give herself time to think about which geochemistry program might best suit her research interests. During that year, she worked part-time in the geochemistry clean lab at UR while also scooping ice cream at a small Baskin & Robbins shop to pay her rent. The very slow winter nights at work gave her extra time to read up on the different research programs and draft her application packages. Cassie also continued taking geology and math courses that kept up her study skills and kept her connected to the UR geology department.

Cassie moved to Salt Lake City and attended the University of Utah, where she earned her MS and PhD in Geology. She focused on geochemistry and geochronology in her graduate studies and research, but Cassie took every opportunity she could to be outside on the rocks. Her advisor connected her with several of his colleagues, giving her additional field experience working on glacial deposits in Argentina and pluvial-lake deposits in Nevada and

Oregon. Though her journeys took her to places like Alaska, the Pacific Northwest, and the Great Basin, she was most fascinated with the Colorado Plateau.

Cassie's PhD research focused on Pleistocene outburst-flood deposits related to the failure of basaltic lava dams on the Colorado River in the western region of Grand Canyon National Park, Arizona. The project combined extensive fieldwork, mapping, and stratigraphic and sedimentological analysis of flood deposits with geochemical analysis to determine clast provenance. She applied cosmogenic nuclide dating techniques to determine ages of the floods and lava flows, and hydrological modeling to calculate flood magnitude.

After finishing her Ph. D, Cassie moved to Tucson for a National Research Council post-doc position with the United States Geological Survey. She continued working on Colorado River projects, but moved off the Plateau into the Lower Colorado River Basin. She and her colleagues studied the formation and ages of Plio-Pleistocene alluvial fans shed from the Black Mountains near Needles, CA. Around the time that project was wrapping up, she applied for another job with the European Union research network based at the GeoForschungsZentrum (the Geo-Research Center) in Germany. In spring of 2005, Cassie picked up and moved to Berlin "without knowing a word of German," where she lived and worked



As herself, with students, in her full Halloween regalia.



Cassie Fenton finding fault in the Gunnison Gorge.

on cosmogenic-nuclide research for the following eleven years, aside from a two-year research opportunity at the Scottish Universities Environmental Research Center, near Glasgow, Scotland.

In between research jobs, Cassie also worked at ResearchGate in Berlin, a social media platform for scientists. There she learned the ever-growing importance of data visualization, be it geospatial or otherwise. "Teaching the basics of geology is only half of my goal. The other half is to help students learn how to communicate their knowledge and their data effectively in today's digital world."

Fenton continues her research in the field of cosmogenic nuclides and is helping to refine the global production rates of the whole suite terrestrial cosmogenic nuclides. She uses cosmogenic nuclides to investigate Earth-surface processes and landscape evolution, and tectonic and climate change recorded in Quaternary landforms. Outside the western USA, she has worked on research projects based in Norway, Chile, Israel, and Morocco.

As an Instructor of Geology at CMU, Cassie teaches a variety of Essential Learning courses along with Applied Geochemistry. Her courses vary by

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COORDINATOR'S CORNER

Hello again and welcome to the latest edition of the CMU Geosciences newsletter. First, the bad news. The proposed MS degree program spearheaded by **Drs. Larry Jones and Cassie Fenton** was turned down by the administration due, at least in part, to budgetary concerns. The program concept was well received, but the timing is just not right. Needless to say, we are disappointed. On a happier note, several recent positive announcements include the acquisition of a new magnetometer by **Professor Verner Johnson** through a CMU Unconventional Energy Center grant (see page 6). **Dr. Julia McHugh**, the Curator of Paleontology at the Museum of Western Colorado, and a faculty member in Geosciences at CMU was recently awarded a \$100,000 grant from the David B. Jones Foundation, which supports paleontology research and education. The grant money will fund a digitization lab at the museum, which will allow more detailed examination of fossil bone occurrences at sites such as the Jurassic Morrison Formation Mygatt-Moore quarry in Rabbit Valley.

A \$100,000 grant, awarded to Dr. Julia McHugh, will fund a digitization lab, allowing more detailed examinations of fossil bone occurrences at local sites.

This paleontological work will hopefully include CMU students who will participate via a summer internship program that Julia arranges for CMU students at the Museum of Western Colorado. Lastly, we have several new part-time Geology faculty members helping teach introductory classes and labs this spring. **Mr. David Berry** has a background in hydrogeology and is helping with Physical Geology labs, and **Mr. Peter Herrera** has expertise in a variety of mining and mineral resource issues. Pete is teaching GEOL 100.

2018 CMU Geology Student Presentations at the April Grand Junction Geological Society (GJGS) meeting

Each spring, the April GJGS meeting is set aside to showcase CMU student research. Presentations are a combination of short talks and posters, and this meeting (tentatively scheduled for Wednesday, April 25 at 7:30pm in Saccomanno Hall although posters will be on display closer to 5:30pm) is a great way to see what current students are working on at CMU. This might be a great way to re-connect with the Geosciences program.

Thank you to everyone for your continued interest and support of the CMU Geosciences program. In particular, we are grateful to all of you for donating to the Geology scholarships including the **Geosciences Tuition Scholarship**, which is currently supporting, in part, tuition for Kathleen Dykstra (featured in Fall 2017 newsletter). We hope everyone is well and that we see you soon! •

~ **Andres Aslan**, Geology Program Coordinator

CLUB ACTIVITIES

The **American Association of Petroleum Geologists (AAPG) Student Chapter at Colorado Mesa University** has been keeping busy! Katie Dykstra (President) and Tim Bowers (CAB representative) have been instrumental in initiating AAPG activities and increasing our membership. The club is now 29 students strong and growing! In the fall semester, AAPG organized two separate 'rock hound' field trips, where students went on the hunt for minerals in Unaweep Canyon.

Though we love being outside, our students are just as engaged on CMU's campus. AAPG hosted Dr. William (Bill) Hood as a guest speaker for their November meeting. Bill shared some of his experiences from when he worked in oil and gas, and gave us some sound advice on how to navigate working in a large corporation.

Brushing off our more 'informal' social skills, the AAPG student chapter co-hosted an end-of-the-semester potluck dinner with the Sigma Gamma Epsilon chapter on campus. Geoscience and Environmental Science students shared an afternoon of good food and good laughs with our professors and instructors. We also surprised our advisor (Cassie Fenton) with birthday cake at our latest meeting to help celebrate (Editor's note – the cake was excellent!).

Lastly, our Chapter is interested in hosting speakers, particularly those who would like to talk about local geology or who can provide job-finding guidance to geology graduates. The Chapter would also be interested in hearing from geologists who would like to take students on local field trips. Interested individuals should contact AAPG Student Chapter President Katie Dykstra: kadykstra@mavs.coloradomesa.edu.

Zeta Nu, CMU's chapter of **Sigma Gamma Epsilon (SGE)**, the earth science honor society, initiated nine new members on October 4. Initiates must have a 3.0 GPA. The initiation ceremony included the traditional kissing of the rock, reciting a poem, and celebrating with tasty treats (photos on the Zeta Nu Facebook page [facebook.com/Sigma-Gamma-Epsilon-Zeta-Nu-Chapter-106813392722490](https://www.facebook.com/Sigma-Gamma-Epsilon-Zeta-Nu-Chapter-106813392722490)). This year, the ceremony was held outside at the library fire pit. •

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semester, but she normally teaches some combination of Field-Based Introduction to Physical Geology, Introduction to Physical Geology, Introduction to Physical Geology Laboratory, and Weather and Climate courses. She is also part of the field-camp faculty team, taking CMU students to the San Francisco Volcanic Field near Flagstaff Arizona for a week in June to map and study Quaternary basalt flows and faults. "It's been a real pleasure to work with CMU students. I see a lot of hard work. They rise to meet a challenge, and their curiosity is contagious. It definitely inspires me to be a better instructor." •

STUDENT SPOTLIGHT

Rachael Lohse, senior

Rachael Lohse (expected graduation May '18) is wrapping up a strong academic career at CMU and will receive two BS degrees (Geology, Environmental Geology) and a minor in GIS. Rachael came to CMU from Arvada, CO, with a strong interest in the outdoors. Rachael has taken advantage of numerous field and lab opportunities. As a case in point, one field camp stint wasn't enough for her. Following field camp in 2016, Rachael returned the next summer as van driver and helper for the CMU geology field camp. Rachael is an excellent and engaged student, and has taken advantage of multiple student-faculty research opportunities. Currently, Rachael is working with Dr. Bill Hood on Mancos Shale geochemistry, and she hopes to present her research at the upcoming regional GSA meeting. Rachael is also working on the exhumation history of the upper Colorado River basin using apatite-helium thermochronology, and she has traveled to CU-Boulder on two separate occasions to process outcrop samples she collected from near Parachute and Rifle to establish a cooling history for this portion of the upper Colorado Basin. Rachael has also traveled to New Mexico Tech to help process samples for detrital sanidine $40\text{Ar}/39\text{Ar}$ dating to constrain the age of ancient river terraces in the Colorado and Green River basins. After graduation, Rachael hopes to find an internship and intends to apply to graduate school next fall. •

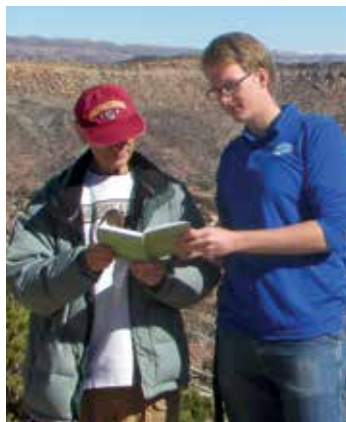


CMU senior Rachael Lohse

STUDENT SPOTLIGHT

Adam Nawacki, senior

Adam Nawacki (expected graduation Aug. '18) arrived at CMU with an AS degree from Pikes Peak Community College in Colorado Springs, where he grew up hiking through Garden of the Gods and gaining an appreciation for the world of geology. One of his professors at Pikes Peak, Mark Izold, inspired him to pursue geology as a major, and he arrived at CMU in 2016. Since that time, Adam has excelled in the Geosciences program. Adam is the 2017-2018 recipient of the Richard D. Dayvault Scholarship in Geosciences, and has been working as an intern for Navarro Engineering on DOE-related uranium studies. Adam's main area of interest is geophysics, and he is working on a senior thesis that combines his interest in geophysics with his work at Navarro. Specifically, Adam is using the program's new magnetometer to delineate shallow uranium ore bodies in the Uravan Mineral Belt. Adam has also applied for a summer internship at NASA's Planetary Geology and Geophysics Undergraduate Research Program. Eventually, Adam would like to attend graduate school to further pursue his interests in geophysics. •



CMU senior Adam Nawacki rocking in the field with faculty Dr. Verner Johnson.



MAVERICK GEOLOGISTS

Barry Brinton (BS, 1981) photo above, took a less traditional route with his degree (received Master in Public Administration from University of Colorado-1990) and entered the geotechnical engineering and construction materials processing field for about ten years, and then moved on to residential and commercial land and real estate development. "I am currently the Development Manager for a real estate venture called Gold Hill Mesa in west Colorado Springs, which was a gold mill that processed rock from 1906-1949 coming down from Cripple Creek by train. The current owners bought the site and decided, after trying to get the remaining gold out of the tailings one more time, to develop residential and commercial lot sites with the approval and oversight from Colorado Department of Public Health and Environment. The remaining tailings left over from the ore processing needed clay to be added to the tailings to eliminate the higher than normal arsenic, and then buried four feet below grade with an identification barrier. We have over 400 current homeowners. The commercial site is yet to be developed and will bring in shops, dining, and entertainment venues. Very exciting. Thanks and can't believe how much the campus has changed since I graduated."

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Keegan Depriest (BS, 2016) is working towards an M.S. at Southern Illinois

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Anthony Seuga-Duncan and Kathleen Dykstra "digging" the groovy geology along the Piñon Mesa Fault

2018 SPRING GEOSCIENCE PROGRAM FIELD TRIP

Please join us on Saturday, April 7 for the rock'n cool, Geoscience Program Field Trip. The plan is to drive into easternmost Utah via DS Road, west of Glade Park. I refer to this area as 'No Man's Land' because, even though it is in Utah, access from the Utah side is nearly impossible because it requires fording the Dolores River (no bridge). Some of you may already be familiar with area because of the Ryan Park project in Summer Field Camp. We can easily access the area by driving west on DS Road until the road ends (about 18 miles), then you are in Utah, but you may not know that because the only indication is a small sign marking the western boundary of Mesa County. The only catch is that we will require 4WD vehicles beyond this point to get to the good geology (it is easy four-wheeling). We are asking for volunteers with 4WD vehicles to help get everyone to the field area. We cannot reimburse you for mileage, but the driving distance is not that far, about 100 miles round trip. Please email me (rlivacca@coloradomesa.edu) if you have a 4WD vehicle that you can drive and tell me how many people you have seats for, so we can make sure we have enough room for everyone.

The first stop is the Piñon Mesa Fault and abandoned mine where we will observe faults with rock'n cool slickenlines (my favorite) and collect minerals (calcite, amethyst, malachite, azurite). The next stop is Red Gap where we can see the regional faulting pattern and small-scale structures with fabulous sense-of-shear (SOS) indicators exposed in the Precambrian rock. The final stop will be the abandoned 'Blue Spar Mine' to collect more minerals (calcite, fluorite). There is also pseudotachylite found along the fault near the Blue Spar mine. We will provide hard hats for those that want to brave the underground world of the Blue Spar mine, but please bring your own flashlight, lunch, rock hammers, sledgehammers and chisels (the mineral collecting is good). •

~ Rick Livaccari, Professor of Geology, rlivacca@coloradomesa.edu

ROCK CRUSHER FUNDRAISER

Nearly half of the geosciences faculty are involved in student-oriented research that involves mineral separation and analysis. With that in mind, a crowd-funding event will be held starting April 10 of this year to raise money to purchase a rock crusher for our mineral-separations laboratory. If you would like to contribute, please visit: supportingcmu.com/mavfunder on or after April 10. You are also welcome to make a contribution by using the postage paid envelope included with the newsletter. Please check "Geosciences Program Fund" and write in "rock crusher" to ensure your donation is applied to the rock crusher.

NEW MAGNETOMETERS FOR GEOPHYSICS

I am very pleased and excited to announce that Geosciences finally received a new proton precession magnetometers thanks to a \$15,000 Unconventional Energy Grant. We now have a GSM-19TW for "walking" (see picture) and a GSM-19T for use as a standalone base station. In the past we had a Barringer Proton Precession Magnetometer and had to return to base station every 2-3 hours for diurnal correction. Remember that when we were in the Gateway area for the geophysics lab exercise? We have had the same magnetometer since 1977. Now, with two new magnetometers, we can leave one at the designated base station and use the walking one in the field. That way we don't have to return to base station every two to three hours. We can set up the base station at the beginning of the survey, do data collection in the field, and then return to the base station to pick up diurnal data for correction. Both magnetometers are also equipped with a GPS unit for the accurate location of the stations. We can even transfer data to ArcGIS! Geoscience students and faculty members already have lots of plans to do magnetic surveys in the Uncompahgre Uplift, Grand Mesa, and Piceance Basin. •

~ Verner Johnson, Professor of Geology



Geoscience students Ryan Mumby (left) and Evan Pellowski (right) check magnetic readings on the GSM-19TW.

GOING WITH THE FLOW

The Ruth Powell Hutchins Water Center at CMU has had a busy year already. In September, we traveled with five CMU students to the Keystone Science School for the 4th Annual Colorado Student Water Forum to join students from CSU, CU-Boulder and Metro State. We braved wind, rain, snow, and cold touring mine sites in French Gulch and took a rocking boat ride on Lake Dillon. Check out more photos on the group's Facebook page [facebook.com/groups/colowaterfieldconf/photos/](https://www.facebook.com/groups/colowaterfieldconf/photos/). Students participated in a mock town hall meeting and grappled with challenging water issues from different perspectives. CMU will host the field conference in September 2018, and plans are in the works for a Roaring Fork Valley focused trip.

The theme of the Seventh Annual Upper Colorado River Basin Water Forum on November 1-2, 2017 was Stories from the Field. The two-day conference drew about 200 people from around the region to discuss water issues in the Colorado River basin. The 2018 forum is scheduled for November 7-8, 2018.

The Hutchins Water Center has many other ongoing activities, including a Scientific and Technical Report series, an annual Water Course, and an Integrated Water Management planning initiative. For more details visit coloradomesa.edu/water-center. •

~ *Gigi Richard*, Professor of Geology

—CONTINUED FROM PAGE 5, MAVERICK GEOLOGISTS

University: "My M.S. research includes evaluation of the Arikaree Creek Field in the Denver Basin discovered by Running Foxes Petroleum. I am primarily concerned with oil migration patterns, answering why hydrocarbons are present in some sub surface structures and absent in others, and creating an analog for other basins that have similar basin evolution.

Life in grad school has been really fun! I am teaching Dinosaur Lab this semester which has been great and have been working on my research. I have gotten to learn a number of oil and gas related programs including Petrel, Petra, and IP, and some geophysical seismic processing. A few pieces of advice I would give to an undergraduate that is looking at obtaining a graduate level degree is that it is very competitive to get in. It is even harder to get funding. I would recommend taking your time and studying the GRE and making sure you have high GPA and good references. The schools I talked to were particular about not only meeting but exceeding

the expectations in ALL areas of your application. Hope everything is going well back in Colorado!"

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Dakota Lindsey (BS, 2016) is also working toward an MS at Southern Illinois University: "Coming from CMU, I've felt that I have a major leg up on field work. Most graduate students have had few chances to get out in the field and actually experience different geologic features other than their time spent in field camp or the occasional road-cut (poor fellows). Graduate life at Southern Illinois Univ. has provided me with phenomenal lab exposure. Here we host a Coal Characterization and Organic Petrology Lab. My thesis work involves testing the reliability of various geochemical proxies used in determining paleoredox conditions of mature organic-rich shales. This has involved the development of a new method of hydrous pyrolysis, open-system hydrous pyrolysis (OSHP). OSHP experimentally mimics the maturation of organic matter, while facilitating a change in

Thanks for the generous donations!

The Geosciences Program and students greatly appreciate the strong financial support provided by the following alumni and friends of the program.

RICHARD D. DAYVAULT ENDOWED MEMORIAL SCHOLARSHIP

Richard and Cathy Barkley

MARK GARMIN SCHOLARSHIP

Max Krey

GEOSCIENCES TUITION SCHOLARSHIP

Verner Johnson
Patricia Powell

GEOLOGY EQUIPMENT

Peggy Pretti

mass balance during maturation (i.e. migration). The hope is to compare the geochemical signature of the immature and artificially matured samples to see if there is any mobilization of trace metals."

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Max Schultz (BS, 2013) completed his MS, "Alteration of Organic Matter and Copper Mineralization in the Midcontinent Rift, USA", at Colorado State University in May of 2017. Max is job hunting and continues to collaborate with Jeff Hrnrcir (BS, 2014) on gold exploration projects. Max is also engaged!

We always like to hear from our former students. Drop by or send an email and let us know what you are doing! •



Geosciences Program Newsletter

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Spring 2018

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FROM THE EDITOR

As many of you know, we haven't had much of a winter here in Grand Junction this year, but we're going to welcome spring anyway with this issue of the Colorado Mesa University

Geosciences Newsletter. At the risk of sounding like a broken record, "Alumni – please let me know what you're up to!" We and your fellow alumni are interested. I would especially like photographs! Current pics, or from the past, but please send me some images related to your time here or your career. I don't care if you graduated 30 years ago, or last year, please send an update. Please be sure to include your name and year of graduation. A big thanks to all of you who have kept us up-to-date on your activities! •

~Larry Jones, Newsletter Editor, Instructor of Geology
lajones@coloradomesa.edu