



*Massive debris flow near Collbran, Colorado, on May 25, 2014, claimed the lives of three local residents and demonstrated the dynamic nature of Earth's surface.*

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# THE MANCOS SHALE STUDY

By Bill Hood and Rex Cole

As you most likely remember, the Mancos Shale is a very thick marine shale of Upper Cretaceous age that underlies the Grand Valley and numerous areas in western Colorado and eastern Utah. What you may not realize is that the shale has significant potential to be an unconventional energy source, especially for gas.

Economic development of shale-gas and shale-oil reservoir systems requires that the potential shale interval have four favorable characteristics: be mechanically "brittle"; contain organic carbon (kerogen); have been buried deep enough in the geologic past to have the kerogen transformed into crude oil, natural gas (methane) and/or gas liquids (propane, butane, etc.) and have natural fractures produced by past tectonic stresses. The first two characteristics are basic rock properties, whereas the latter two are dependent on the post-depositional history of the strata.

Brittleness is a very important property that makes a shale a potential drilling target. Brittle shales or brittle zones within a thick shale are more likely to be naturally fractured and to respond well to hydraulic fracturing. On the other hand, ductile shales or ductile shale zones act more like seals. They are harder to fracture and when the fracturing pressure is released, the fractures tend to seal back up. Brittleness is largely a function of the mineralogy of the shale. Quartz and calcite, plus some less abundant minerals such as feldspar, dolomite and pyrite, tend to make the shale more brittle whereas clay minerals make it more ductile. Various investigators, working on different shale formations around the country, report that shales containing 40 to 50 percent clay minerals act more like seals rather than potential reservoir rocks, and the best producing shales or producing zones in thick shales have only 10 to 30 percent clay minerals, with quartz and calcite making up most of the rest of the rock.

Exploration and development of shale-gas and shale-oil resources in Colorado and Utah is strongly focused on marine shales that were deposited in Late Cretaceous time, between 72 and 94 million years ago. Two major thick intervals of shale dominate this sequence: the Pierre Shale east of the Rockies, and the Mancos Shale west of the Rockies. These thick (>5,000 feet) packages of siltstone, claystone, limestone and sandstone have been stratigraphically subdivided into subunits. The Niobrara interval of the Pierre/Mancos has been a major boon to hydrocarbon production in the Denver-Julesburg Basin of eastern Colorado, the North Park Basin in north-central Colorado, and the Sand Wash Basin in northwest Colorado. Within the last five years, horizontal, multi-stage-frac, Niobrara wells have been drilled and economically completed in the central Piceance Basin by WPX, Encana, and others. In the southwestern Piceance Basin and adjacent Douglas Creek Arch, the Niobrara interval has produced oil and gas from vertical wells, but to date production has been small. However, the fact that the Niobrara interval of the Mancos Shale has produced oil indicates that it contains zones that have source rock potential and that the rock has been buried deeply enough that the source zones are mature and might produce substantial amounts of oil if they can be hydraulically fractured. On the extreme western side of the Piceance Basin and adjacent Douglas Creek Arch, natural gas and minor oil has been produced for nearly three decades from an unusually sandy interval of the Mancos Shale called the Prairie Canyon Member or Mancos "B". The Niobrara and Prairie Canyon intervals of the Mancos are about 1,520 and 1,150 feet thick, respectively.

In early 2013, Rex Cole, PhD, and Bill Hood, PhD, initiated a study of the Mancos Shale here at Colorado Mesa University with initial funding

from the CMU Unconventional Energy Center and industry donations and support (BP; Walter Fees, Jr. and Son Oil and Gas; Anadarko; WPX). The goal of this project is to generate a stratigraphically calibrated mineralogical, geochemical, radiometric and sedimentological dataset for the total Mancos in the southwest Piceance Basin, southern Douglas Creek Arch and southeast Uinta Basin. The total project area is about 4,185 mi<sup>2</sup>, extending from Cisco, Utah, to Delta, Colo. Input comes from four sources: 1) public-domain well-log data; 2) public-domain organic and inorganic geochemical data; 3) spectral gamma-ray, mineralogical and a partial set of total organic carbon analyses of cuttings from a well about 16 miles north of Fruita, Colo.; and 4) measured sections from the outcrop belt near Grand Junction. In the project area, the Mancos is 3,697 to 4,751 feet thick (average = 4,059 ft) and is subdivided into four "assessment/inventory" intervals: Upper Mancos, Prairie Canyon, Niobrara and Lower Mancos. These intervals are clearly defined on well logs and in outcrop, and have average thicknesses of 865, 1,231, 1,656 and 329 feet, respectively.

Currently, public-domain data have been harvested from 38 wells in the project area, including 559 total-organic-carbon (TOC), 513 RockEval, 95 vitrinite-reflectance (VR), 175 total-carbonate (TC), 12 x-ray diffraction (XRD for bulk mineralogy) and 596 x-ray fluorescence (XRF) analyses. Most analyses (~95%) come from the lower Mancos and Niobrara equivalent. New data have been generated from cuttings in the Fees Federal 2-6-8-101 well (API 05-045-07432), include 169 XRD analyses for quartz, calcite, dolomite, feldspar and pyrite, and 169 spectral gamma-ray (SGR) analyses. Most of the cuttings have also been analyzed for carbonates using a calcimeter. The amount of clay minerals in the samples is being estimated by subtracting the amount of non-clay minerals from 100 percent. Clay mineralogy of the cuttings is being determined by XRD. Our sample set spans the total Mancos and part of the overlying Mesaverde Group and underlying Dakota Sandstone. Outcrop work includes 16 measured sections (2,245 ft) with foot-by-foot gamma-ray measurements (total count and SGR) for about half of the sections.

Current CMU geology students and alumni are playing a major role in this research. Thomas Spain, Anna Dunn and Lilli Clark assisted in the x-ray diffraction analyses. Rob Rice, Richard Bingley, Lilli Clark, and Kelsey Hoffmann collected calcimeter data. Former student Celina Robinson initiated the clay mineralogy work. Students doing outcrop, gamma ray, etc. include Aaron Tofsrud, Richard Root and Rob Rice.

The geosciences program recently applied for an NSF Major Research Instrumentation grant to obtain an X-ray fluorescence spectrometer. If the grant is approved, Cole and Hood will be able to tie the geochemistry of the shale together with the other parameters that they are collecting to obtain a much better understanding of the deposition of the Mancos Shale and its economic potential. As this next phase of research unfolds, Cole and Hood hope to generate outside funding from corporate sponsors and other interested parties. •



Bill Hood and Rex Cole

# COORDINATOR'S CORNER

By Andres Aslan



Welcome to the inaugural edition of the CMU Geosciences newsletter! We hope to re-establish old connections, make new connections and simply do a better job of staying in touch with all our current and former students, friends and supporters. Here is a snapshot of some of the recent happenings in the geosciences program:

**Faculty.** After 15+ years as the program coordinator, Rex Cole has stepped down to develop new petroleum-related research initiatives and industry partnerships. Rex oversaw the progressive growth and expansion of the geosciences program, and has earned a well-deserved rest from coordinator activities. Thank you, Rex, for all you've done for the geosciences program!

I would like to take this opportunity to also welcome several new geology faculty. Larry Jones, PhD, returned to CMU as an instructor of geology in the fall of 2013 after a seven year sabbatical in Montana. Larry's return to the Grand Valley has been a huge benefit to our program! Larry is teaching several new upper-division courses in sedimentary geology as well as a variety of lower-division courses. Larry has also started a student chapter of AAPG and has worked with Dave Wolny and Gigi Richard to improve the seismic display in Wubben Hall.

The geosciences program also welcomes Julia McHugh, PhD, (formerly of Oklahoma State University) as an adjunct faculty member in geology specializing in vertebrate paleontology. Julia will teach several paleontology-related courses including a new field course beginning in the fall of 2014. Julia was hired as part of a new partnership with the Museum of Western Colorado where she will also serve as the Curator of Paleontology. In summary, the current faculty consists of five tenure-track faculty (Andres Aslan, Rex Cole, Verner Johnson, Rick Livaccari, Gigi Richard) and five instructor/adjunct faculty (Jonathan Cooley, Skip Hase, Larry Jones, Don Lorhammer, Julia McHugh).

**Student activities and accomplishments.** The CMU geosciences program currently has ~100 students, and 17 students graduated with BS or AS degrees in May/August, 2014 (see "Student News"). Several of the students will pursue job opportunities with service companies. Other students will begin graduate school including Marisa Boraas (Colorado State University — sedimentary geochemistry), Jeff Hrnrcir (South Dakota School of Mines — economic geology) and Kelly Regimbal (University of Texas at Austin — geophysics). Numerous students are participating in student-faculty research and 17 students presented their work at the CMU Student Showcase and the Grand Junction Geological Society Student Meeting in April. Several students received awards for their academic achievements at CMU including two new awards — the Verner C. Johnson Award for excellence in Geographic Information Systems and geology (awardee was Alex Asay), and the William C. Hood Award for excellence in student research (awardee was Jeff Hrnrcir). Lastly, junior Alexandra Price received the prestigious CMU Aspinall Scholarship in 2014, and was one of only 10

recipients of a national AIPG scholarship. Max Schultz (CMU Geology '13) also received a \$10,000 Society of Exploration Geophysicists graduate school scholarship.

**New initiatives.** One of the short-term goals of the geosciences program is to develop more learning opportunities for students interested in a career in the oil and gas industry. The addition of Larry Jones, PhD, to our faculty was in support of this initiative. Larry is teaching new courses, including Basin Analysis (taught spring 2014) and a field-based depositional systems course (to be taught in fall 2014). In addition, Petra and Petrel will be incorporated in future courses. Does anyone want to donate a dataset to the program?

The faculty is also working towards developing new industry-related research projects. Rex Cole and Bill Hood have developed a major research project focused on Mancos Shale that involves numerous students and financial support from British Petroleum (\$45,000) and the CMU Unconventional Energy Center (\$25,000). This support has allowed us to refurbish and update the XRD system and software, and purchase five new petrographic microscopes. Rex and Bill also applied to NSF for a new XRF unit in support of this research. The other current program initiative is to fund two new geoscience scholarships in partnership with the CMU Foundation. One scholarship (Geosciences Tuition Scholarship) is designed to pay tuition for a deserving geology student. The other scholarship (Geosciences Summer Scholarship) will pay a stipend for a student to conduct student-faculty research during the summer. Additional information regarding these scholarships and possible donations are provided later in the newsletter.

**Upcoming Events.** As always, the Grand Junction Geological Society sponsors monthly talks and this September, one of our own, Alexis Stichler-Navarre, PhD, ('00), will present her research on the geochemistry of Grand Canyon tributaries. Alexis is currently an assistant professor of geology at Colorado School of Mines. We hope that alumni in the area will attend!

The main event for the geosciences program this fall is the Western Slope Field Conference, which will be hosted by CMU the weekend of Sept. 12-14. The field conference will focus on dinosaurs of the Morrison Formation, the Dakota Formation and the recent landslide event in Collbran in May. We are encouraging alumni to attend this event including the Friday evening Barbeque and the Saturday and Sunday field trips (transportation provided). This will be our first official Geology alumni event with more to follow. Details of how to participate are explained later in the newsletter. •

We hope everyone is well and we would love to hear from you, so feel free to email [aaslan@coloradomesa.edu](mailto:aaslan@coloradomesa.edu) or stop by if you are in town.

Andres Aslan  
Geosciences Program Coordinator



## TWO NEW GEOLOGY - SPECIFIC SCHOLARSHIPS CREATED

The geology faculty at CMU are pleased to announce the creation of two new endowments that will fund two scholarships for outstanding geoscience students! These endowments will provide direct financial support to deserving students for the foreseeable future and will strengthen the program by attracting and keeping top quality geoscience students from Colorado and elsewhere. The Geosciences Scholarship (#40263) will provide funds to offset tuition costs to the most deserving student as determined by consensus of the tenured and tenure-track geoscience faculty. Our goal is to eventually fund one student each year for the full cost of tuition for two semesters. Current tuition for a normal, 15 credit hour load is \$8,358. An endowment of at least \$170,000 is needed to ensure that this amount is available annually.

The Geosciences Summer Scholarship (#40262) will eventually fund \$2000 toward a summer research project for a student with exceptional potential for research. This student will be chosen based on their potential as a research scientist as determined by consensus of the geosciences faculty. An annual scholarship of \$2,000 will require an endowment of approximately \$40,000.

The geoscience faculty are actively soliciting contributions of ANY size to either of these scholarships through the CMU Foundation. Contributions are fully tax-deductible, and many employers will match employee contributions. Our goal is to have both scholarships fully endowed in no more than five years.

An old saying goes, "The best time to plant a tree was 30 years ago. The second best time to plant a tree is today." We feel the same way about endowments that can ensure quality education at CMU. Please consider making a donation for tomorrow, today.

It's easy to make a donation by mail or online. If you would like to mail payment, a form has been included with this newsletter. Please fill out the necessary information and mail it in with your donation. If you are on a tight budget but would still like to show your support, the CMU Foundation can arrange to have a small amount paid to the scholarship of your choice every month through your credit card. Please contact the CMU Foundation for details at [coloradomesa.edu/foundation](http://coloradomesa.edu/foundation). You can also make a contribution through the CMU Foundation website at [coloradomesa.edu/giving](http://coloradomesa.edu/giving). Select "click to give to scholarships", then register. You will be asked which specific scholarship you want to support after you enter the amount of your gift. The two scholarships are the Geosciences Scholarship (full tuition for two semesters) and the Geosciences Summer Scholarship (for summer research). Thanks for supporting our geo students! •



## 2014 WESTERN SLOPE FIELD CONFERENCE/CMU GEOLOGY ALUMNI EVENT SEPT. 12-14, 2014

The Western Slope Field Conference (WSFC) will be hosted by CMU this year Sept. 12-14, 2014. The conference will feature a Friday evening barbecue at Colorado National Monument (CNM), a Saturday field trip looking at the geology of Rabbit Valley with an emphasis on dinosaurs of the Morrison Formation and Laramide monoclines and a Sunday half-day field trip featuring recent work by Rex Cole, PhD, on the Dakota Sandstone-lower Mancos Shale along the Colorado-Utah border.

The WSFC is the premier event each year for the geosciences program. Many of you remember attending this field conference and having fun meeting other geology students and faculty as well as seeing the spectacular geology of western Colorado. The CMU geosciences program would like to add a new feature to this year's event. We would like to invite you, the alumni, to attend the field conference and re-connect with the CMU geology family. Alumni who attend will be treated to the CNM barbecue on Friday night and will be transported in CMU vans during the field trips on Saturday and Sunday.

To help offset the cost of the activities and to provide support for the program and students, we request that alumni who plan to attend make a modest donation of \$25 (or more) to one of the following three CMU Foundation geoscience accounts:

1. Geosciences Scholarship (endowed) — donations will be used to help endow a scholarship for a deserving geology student's tuition for one year.
2. Geosciences Summer Scholarship (endowed) — donations will be used to help endow a scholarship for a summer stipend for a deserving geology student to conduct summer student-faculty research.
3. Geosciences Program Fund — donations to this general fund will be used at the discretion of the geosciences program to pay for field trips, equipment and department expenses as needed.

To sign up, please contact Andres Aslan ([aaslan@coloradomesa.edu](mailto:aaslan@coloradomesa.edu); 970.712.3834). The donation can be made using the form enclosed, or by going to the CMU Foundation website at [coloradomesa.edu/giving](http://coloradomesa.edu/giving).

This year's WSFC will be the first of our upcoming Alumni events with future activities including a possible Lodore Canyon or Desolation-Gray raft trip in spring of 2015 during the week following May Commencement ceremonies. Stay tuned! We plan to make an alumni get-together into an annual event.

**WSFC Field Trip to Rabbit Valley:** Jurassic Park with Laramide Monoclines led by Rick Livaccari and Jonathan Cooley, Saturday, Sept. 13.

The Grand Junction area is one of the best places in the world to observe the remains of both Laramide-age monoclines and Jurassic dinosaurs. The Redlands Monocline in Colorado National Monument is the most recognizable Laramide-age monocline in this area, but this is just one of many locally exposed monoclines. Structurally linked to the Redlands Monocline is the Black Rocks Monocline, which is exposed in Rabbit Valley.

Excellent outcrops of the Salt Wash and Brushy Basin members of the Jurassic Morrison Formation are exposed in the same area. We will discuss the sedimentology and fluvial architecture of the Morrison Formation as they pertain to fossil preservation, paleoclimate indicators, and paleobiology of the Morrison fauna. Exceptionally well-preserved dinosaur fossils examined will include several species of sauropod: Allosaurus, Stegosaurus, Dryosaurus and Monoclinosaurus (just kidding). •



## FACULTY PROFILE: VERNER C. JOHNSON, PHD, PROFESSOR OF GEOLOGY AND GIS COORDINATOR

**G**reetings to all of you! I have been teaching geology, geophysics and Geographic Information Systems (GIS) at Colorado Mesa University since 1976 (part-time from 1976 to 1985, full time since 1985), so fall of 2014 will be my 38th anniversary at CMU. I plan to continue teaching for a while.

Many former geology students who graduated from 2014 to 1976 have kept in touch with me over the years. It is truly gratifying to see and hear from you. Please do continue to keep in touch. In case you are wondering, yes, I still teach geophysics, the class that I have been teaching since joining what was Mesa College in 1976.

We now have an alumni newsletter again, the first time since our last one was published in 1993 (I think). So many things have happened and changed in the geology program since 1993. The former geology profs, Jack Roadifer, Jim Johnson and Dell Foutz, have retired and are enjoying retirement life. Occasionally they come to visit us on campus and at the Grand Junction Geological Society meetings. I have had wonderful conversations with them. They have been replaced by Rex Cole, Rick Livaccari, Andre Aslan and Gigi Richard. We now have several adjunct faculty members. The geology program at CMU is much larger than it was in the late 1980s, when there only four geology professors including me. At that time we had 12 geology majors. Now we have more than 100 geology majors, five tenured and four adjunct faculty members. We'll be adding more faculty members in the near future.

While my specialized area is geophysics, I spend the majority of my time in the GIS program. I started the GIS program in 1996 and have seen it grown to large and popular program. We now offer a Geographic Information Systems and Technology (GIS&T) minor and certificate degree. More information about the GIS&T program can be found elsewhere in this newsletter.

Spring semester, 2014, I had 20 students in geophysics class, the largest enrollment since 1980, when there were 32. Usually anywhere between 8-12 students sign up for geophysics class every year, so this past spring was record-breaking. Yes, we still do a magnetic survey in the Gateway area at the very same base station since 1980. I am sure you all still remember that creek area where we took base station magnetic readings. In 1980 the reading was 53353 nT, and in 2014 it was 50536 nT, a decrease of 2817 nT or 5.2%. Are we heading for another magnetic reversal? It sure looks like it.

This year, I am honored that the faculty members named the Verner C. Johnson Outstanding Award in Geology/GIS after me. I am proud to say that Alex Asay is the first recipient of the award for 2013-2014.

I taught summer field camp June 9-13, 2014. As usual, that week was spent in the Henry Mountains area, and 16 students were enrolled. They

learned how to prepare geologic maps, cross-sections and stratigraphic columns. The weather was great. As many of you already know, my specialized teaching and research areas are geology, geophysics and GIS/GPS. I teach the following classes: GIS/GPS, Geophysics, Computer Applications in Geology, Field Camp and Survey of Earth Sciences.

My research interests include geophysical investigation in the Uncompahgre Uplift area near Grand Junction. My other research interest is utilize remote sensing data and GIS to evaluate land desertification processes in Xinjiang, China.



*Johnson's students collecting field data.*

**Pinon Mesa Research Area:** A strong magnetic high was first observed in the national magnetic map in 1980. For many years, students and I have conducted magnetic and geologic surveys of the Pinon Mesa Area near Utah/Colorado state line. A magnetic anomaly has been observed and may be related to a mafic intrusion, possibly a basalt. Abstracts and posters of the magnetic anomaly were presented in the professional and showcase meetings. Plans call for covering larger area to determine the extent and the date of the possible intrusion.

**Land Desertification Research in Xinjiang, China.** Research projects are a collaborative effort with Hsiang-te Kung, PhD, of the University of Memphis, and Fei Zhang, PhD, of Xinjiang University in China. Our work is primarily on the evaluation of land desertification in Xinjiang Province, China. The objective is to determine the relationship between human/natural causes and growing desertification between 1990 and 2010. Work is based on the changes in the remote sensing images taken in 1990 and again in 2010. GIS maps also indicate how the desertification has grown and the impacts on the population. Several papers have been published. Plans call for more research on the effects of desertification in Xinjiang in western part of China using GIS and Remote Sensing. •

### Publications since 2012:

1. HAVEMAN, Benjamin Ross, REDDEN, Nichole, JOHNSON, Verner C., 2013, "A PRELIMINARY GEOLOGICAL/GEOPHYSICAL INVESTIGATION OF THE COOK CANYON MAGNETIC HIGH, NW UNCOMPAGHGRE UPLIFT, COLORADO", Poster session at GSA Rocky Mountain Section, 65th Annual Meeting, Gunnison, Colorado, 15-17 May 2013.
2. REDDEN, Nichole, HAVEMAN, Benjamin R., WEIN, Clayton, and JOHNSON, Verner C., 2013, "GEOLOGICAL INVESTIGATION OF CATACLASTIC RIDGE ON PINON MESA IN COOK CANYON, WESTERN COLORADO", Poster session at GSA Rocky Mountain Section, 65th Annual Meeting, Gunnison, Colorado, 15-17 May 2013.
3. Zhang, F., Tiyp, T., Feng, Z. D., Kung, H-T, Johnson, V. C., Ding, J. L., Tashpolat, M, Sawutt, and Gui, D. W., 2013, "Spatio-Temporal Patterns of Land Use/Cover Changes over the past 20 Years in the Middle Reaches of the Tarium River, Xinjiang, China" Land Degradation & Development, Published online in Wiley Online Library (wileyonlinelibrary.com) DOI 10.1002/ldr.2206.
4. Baker, Ryan, and Johnson, Verner, 2012, "The Geologic Map of the Grand Valley, Mesa County, Colorado, Poster presentation 2012, AAPG-Rocky Mountain Section Meeting, Sept. 9-12, 2012, Hosted by Grand Junction Geological Society.
5. Zhang, Fei, Tiyp, Tashpolat, Ding, Jianli, Kung, Hsiang, Johnson, Verner, Sawut, Mamat, Tashpolat, Nigara, and Gui, Dongwei, 2012, "Studies on the reflectance spectral features of saline soil along the middle reaches of Tarim River: a case study in Xinjiang Autonomous Region, China", Environmental Earth Sciences, Environ Earth Sci DOI 10.1007/s 12665-012-2096-y. This is the first paper published in a professional journal with name included.



## COLLISION COURSE: GEOLOGY 113 HITS SUCCESS!

By Rick Livaccari, Professor of Geology



*Editor's Preface: Each issue of the newsletter will highlight a new geology course, starting with Geology 113, Field-Based Introduction to Physical Geology. This occasionally tongue-in-cheek summary is from the originator, Professor Rick Livaccari.*

Let's face it; geology is the most fun science! Why? Because geologists have such scintillating personalities. Okay, maybe not, but we do a lot of fieldwork in rock'n cool places. Geologists view the world in a completely different context than most people. To us, the scenery is all about geology!

We are trying to teach that the world is geology and geology is the world. In order to convey geologic coolness and significance to freshman-level students I developed GEOL113, Field-Based Introduction to Physical Geology, back in 2002. GEOL113 is a combined lecture-field trip course. The structure is one day per week in classroom lecture and one afternoon field trip per week. There are very few places (if any!) besides Grand Junction where this format is viable because of the long travel times to get to the field in other areas. We live in a TRUE geologic vortex (take that, Sedona!). Spinning close around us are Colorado National Monument, the Book Cliffs, Unaweep Canyon and the Grand Mesa. It's simple — just load the students in some vans (we love those vans) and in minutes, we are on the rocks. The class is fun to teach, the students love it and it's always sad when it ends (can you say that about mineralogy?).

Since its inception twelve years ago, this class has significantly grown in popularity (did I mention my scintillating personality?). The course has grown from half-full classes for the first few years to overflowing classes recently, with many potential students wait-listed. Multiple sections of this course are now offered every semester.

The biggest challenge to this class is getting students into the field and back in a safe and effective manner. The maximum class size is 24 students (basically, two full van loads). Everyone hikes at different speeds, but we cannot lose any stragglers in the field (that could lead to a tough conversation with the university president). The instructor typically leads the way, with a student assistant hanging back to round up the stragglers. So far, we have not lost anyone, and no one has been injured, although there was an incident in 2004 where a student with a known heart condition suffered a heart attack at the Mica Mine. The Flight for Life had to be called in and we made the evening news (how exciting! Well, not really...).

The most important and significant aspect of this course is that we have recruited many students from GEOL113 into the Geology Program. In fact, it has become our primary recruiting course. That's basically because geology rocks and we rock. (Don't forget our scintillating personalities.) •

## THE EDITOR'S CHALLENGE

Two new geosciences program scholarships have been described elsewhere in this newsletter. I'd like to be able to tell you that both have been fully endowed and that funds will be available to students beginning next year, however, that is not yet the case. No, this is just the very beginning of our fund-raising for these two worthy causes.

We believe we have set reasonable goals for the endowments to fund these two scholarships: \$170,000 for the Geosciences Scholarship (full year tuition) and \$40,000 for the Geosciences Summer Scholarship (\$2000 for student summer research), a total of about \$210,000. Some, however, have suggested we will not be able to raise this amount of money. I very strongly disagree. I think the Colorado Mesa University geology alumni and program friends care about the students and will support this effort. I think all of you, like me and the rest of the geology faculty, think CMU has a great geosciences program that is worth supporting.

I'm not just going to talk about it. I'm going to put my money where my mouth is. I have made a personal contribution of \$1,000 to the Geosciences Scholarship, and I challenge each and every alumnus and friend of the program to meet or exceed my contribution! Students here need our support, and I think you will come through for the students. Why am I doing this? Because I believe in the geosciences program students, the faculty and the future.

This newsletter is being sent to approximately 230 alumni and friends of the program. If every one of you matches (or exceeds) my \$1,000 contribution, the endowment for the two scholarships will total \$230,000, just what is needed to provide permanent support for these two scholarships.

I realize \$1,000 seems like a lot of money, and for some of you, particularly recent graduates, a lump sum contribution of that amount simply is not possible right now. The CMU Foundation is very willing to work with you on a payment plan, if necessary, so you can make a small monthly contribution. Many companies will match employee contributions to non-profit organizations (some will even double match), so please be sure to check with your employer — your \$1,000 could easily translate into \$2,000 or even more for the students.

Thanks for reading this, and please carefully consider my request.

**Larry Jones, Newsletter Editor.**

### How to Donate

It's easy to make a donation by mail or online. If you would like to mail payment, an envelope form has been included with this newsletter. Please fill out the necessary information, and mail it in with your donation. You can also make a contribution through the CMU Foundation website at [coloradomesa.edu/giving](http://coloradomesa.edu/giving). Select "click to give to scholarships", then register. You will be asked which specific scholarship you want to support after you enter the amount of your gift. The two scholarships are designated the Geosciences Scholarship (full tuition for two semesters) and the Geosciences Summer Scholarship (for summer research). Thanks for supporting our geology students! •

## MAP IT: GEOGRAPHIC INFORMATION SCIENCE AND TECHNOLOGY PROGRAM AT CMU

By Verner Johnson, GIS Coordinator



*The GIS&T lab hardware was updated in January, 2014, and the lab will be expanded in the near future to meet increased student needs.*

As a part of one of the world's fastest growing industries — information and communication technology — Geographic Information Science & Technology (GIS&T) encompasses technologies for collecting and analyzing geographic information as well as the underlying academic theory or science. Geographic information includes positional data and descriptive information about places on the Earth's surface, which can be graphically presented in maps to convey a great deal of information effectively and quickly.

At present, about 30 students from geology, biology, environmental sciences and archeology minor in GIS&T and five students are majors working toward the GIS&T certificate degree. Students participate in lab exercises and projects in our new state-of-the-art computer lab in Wubben-Science 147. The lab is equipped with 14 new high quality computers, an HP plotter, a color printer, 12 Garmin GPS units, fourteen Trimble handheld GPS units and a Trimble PRO-XR survey-grade GPS unit. Each year our ESRI software package is updated so students work with the latest releases of GIS software. Students are encouraged to participate in class projects relevant to their field of study. Plans call for additional 12 computers and improved technology in the future to meet the needs of this growing program. •

## GOING WITH THE FLOW: WATER-RELATED ACTIVITIES IN CMU'S GEOSCIENCES PROGRAM

By Gigi Richard, Faculty Director, Water Center at CMU



The Watershed Science minor program was created in 2004 for students interested in documenting focused coursework in water-related science courses. The curriculum includes required courses in hydrology, water quality and river dynamics as well as electives in soils, geomorphology, groundwater, environmental chemistry and aquatic restoration. The program is primarily designed for geology and environmental science majors, but has been taken by a handful of students from other science majors. Since the program's roll out in fall 2005, 28 students have received the minor including five geology majors and 22 environmental science majors.

The creation of the Water Center at CMU in 2011 to support education, research and dialogue on water issues in the Upper Colorado River Basin, generated new opportunities for involvement of CMU students in water-related activities on campus. The Water Center hosts an annual Upper Colorado River Basin Water Forum in the fall that is free to students. CMU students have also presented posters at this conference. Also, the Water Center hosts an annual Water Course, Student Mentoring and Networking Event, and in 2014 will host the first Colorado Student Water Field Conference. All of these events provide students with an opportunity to learn more about Colorado water issues and science and about water in the Upper Colorado River Basin.

Beginning in the fall 2014, CMU will also participate in a new River Studies and Leadership Certificate program to be offered by the River Management Society (RMS), which is intended to develop a new generation of river leaders. Teamed with the University of Utah, Utah State University, University of Idaho and Prescott College, CMU offers the courses necessary to satisfy the requirements of the new certificate program. The certificate is designed to complement a natural resources related undergraduate curriculum. CMU will offer the River Science emphasis of the certificate. In addition to required coursework, students in the certificate program are also required to participate in a professional project and to present their project either at an RMS conference or in RMS' "River Journal." Also, students in the certificate program will receive a free one-year membership to RMS and potentially a scholarship to attend an RMS conference to support the students' networking and involvement in the professional river management community. •



## FIELD CAMP FOLLIES: 2014 CMU GEOLOGY FIELD CAMP — A FLOOD OF MEMORIES

Field camp is always a highlight in any geology student's career and leads to memorable experiences and moments. The 2014 camp was no exception due in large part to the Year of the Flood. During the second week of camp, professors Rick Livaccari and Jonathan Cooley led the students on a Colorado River raft trip mapping project through Ruby-Horsethief Canyon. It was a cool and wet spring and these conditions, coupled with heavy snowmelt produced flows up to almost 30,000 cubic feet per second as the campers traversed Ruby-Horsethief. On the third night, the river rose more than two feet and flooded the camp kitchen area and a couple of the tent spots! High winds popped Mike Feil's raft and wreaked havoc on the tents. Needless to say, the flooding trumped the mapping.

The following are some of this year's field camp "awards".

**Best Nickname:** Ryan Bingley, formerly Big Red (in honor of his Halliburton coveralls), is now Elmer Fudd based on his prowess with a BB gun. He also earned the moniker, "Peaches" for his, well... we won't go there.

**Most Stoked Student:** Ryan! Hampton! Yo! Dude! You! Rule!

**Most Rocks in their Pack:** A three-way tie between Rob Rice, Adam Trumbo and Mike Feil. "We never found a rock we didn't like!" •



Marisa Boraas with engraved rock hammer presented by RMAG.

## STUDENT PROFILE: MARISA BORAAS, RECIPIENT OF THE 2014 RMAG NEAL J. HARR STUDENT AWARD

Marisa Boraas graduated in August 2014 with a double major in geosciences and chemistry. Marisa excelled at CMU in numerous ways. She worked tirelessly as a geology, sciences & mathematics tutor, and as a teaching assistant in introductory courses and during the geology field camp. Marisa was also an excellent all-around student and member of Sigma Gamma Epsilon honor society. On top of everything else, she found time to complete a senior thesis studying the detrital zircon signatures of Oligocene fluvial systems in southwestern Wyoming.

On multiple occasions, Marisa's research led her to the Laserchron lab at the University of Arizona where she prepared and analyzed samples. Her research was presented at the 2013 Geological Society of America- Rocky Mountain Section meeting and the 2014 national GSA meeting in Denver where she was a first author on both an oral and poster presentation. Marisa's research was also recognized at the Grand Junction Geological Society student poster sessions in both 2013 and 2014.

As a result of these accomplishments, Marisa was awarded the 2014 RMAG Neal J. Harr Student Award, which is annually given to the top geology student at each college or university in Colorado. She attended the May Rocky Mountain Association of Geologists luncheon, where she received an engraved rock hammer and was recognized for her achievements. In summary, Marisa is the epitome of a go-getter and will undoubtedly succeed in any endeavor she attempts.

Marisa will continue her geologic studies in the fall at Colorado State University in Ft. Collins, Colo. where she will pursue a MS degree in sedimentary geochemistry. •

CMU Geology Field Camp Class of 2014  
Henry Mountains, June 9-13, 2014





## STUDENT NEWS

The 2013-2014 school year was a great one for CMU geoscience majors in terms of both numbers and quality. A record number of 17 geology students received diplomas, and many of those were honored with awards and scholarships. Several students have already been hired and at least three have been accepted for graduate work. Congratulations, graduates!

### Awards, Honors and Scholarships

American Institute of Professional Geologist Scholarship:

**Alexandra Price**

Aspinall Scholarship: **Alexandra Price**

Grand Junction Geological Society Student Presentation Awards:

1st Place: **Jeff Hrcncir**

2nd Place: **Marisa Boraas**

3rd Place: **Doug Nichols**

Grand Junction Geological Society Field Camp Scholarships:

**Erinn Fought**

**Christinn Klaiber**

**Doug Nichols**

Neal J. Harr Outstanding Student Award, Rocky Mountain

Association of Geologists: **Marisa Boraas**

William C. Hood Student Research Award: **Jeff Hrcncir**

Verner C. Johnson Geology/Geographic Information Systems

Award: **Alex Asay**

Jack Roadifer Field Camp Scholarship: **Rob Rice**

### Graduates:

Alex Asay

Marisa Boraas (*accepted, Colorado State University*)

Ryan Bingley

Trevor Burrell

Erinn Fought

Ryan Hampton

Andrew Katen

Nikki Redden

Rob Rice (*accepted, Colorado State University*)

Natalie Smith

Clayton Wein

Jeff Hrcncir (*accepted, South Dakota School of Mines*)

Stacy Bjerk

Rod MacLean

Aaron Tofsrud

Walt Green

Tom Lozier

## STUDENT CLUB ACTIVITIES

Two geology-focused student clubs are now present at Colorado Mesa University. Both are active and popular with geology majors and other students.

Zeta Nu Chapter of Sigma Gamma Epsilon. In 2011, Professors Gigi Richard (geology) and Deb Kennard (environmental science) took over advising the earth science honor society, Sigma Gamma Epsilon (SGE), from Verner Johnson, PhD, who has worked hard since the 1990s to support Mesa's Zeta Nu chapter. Johnson was instrumental in forming the Zeta Nu chapter of SGE in 1995. His efforts are greatly appreciated!

During the last two years, the students of SGE have focused their energies on bringing guest speakers to campus for earth science students, in particular related to career opportunities. They've had archaeologists from Bureau of Land Management, the director of the Colorado Department of Natural Resources, local seismologists, paleontologists and others come talk to students about career opportunities. Other activities have included resume workshops talks about uranium mining in western Colorado and a new graduate program at Western State Colorado University.

In the fall of 2013, Larry Jones, PhD, asked several students if they would be interested in forming an American Association of Petroleum Geologists (AAPG) Student Chapter. The response was, "We'd just been talking about doing that, but need a sponsor." The club was formally recognized by AAPG in December of 2013, and the Grand Junction Geological Society has graciously agreed to be the sponsoring society. At present, the club has between 15 and 20 members.

The club has received generous financial support from Rocky Mountains Section Foundation of AAPG and from an AAPG L. Austin Weeks Scholarship Grant. Funds are used primarily to offset travel expenses for field trips and for occasional pizza during club meetings.

Spring 2014, activities included a field trip to the Colorado School of Mines Experimental Mine in Idaho Springs, and guest speakers Dave Wolney and Jerry Daub. If you would like to meet with the club and give a talk, or lead a field trip or some other activity, please contact club president, Thomas Spain ([tspain@mavs.coloradomesa.edu](mailto:tspain@mavs.coloradomesa.edu)) or club adviser, Larry Jones ([lajones@coloradomesa.edu](mailto:lajones@coloradomesa.edu)). •

*2014 Field Camp geology students in Brown's Park.*



# CURRENT GEOLOGY TEACHING FACULTY AT CMU

## **Andres Aslan**

*PhD University of Colorado at Boulder  
MS University of Colorado at Boulder  
BS Brown University*

### Courses:

Physical Geology (GEOL 111)  
Natural Hazards (GEOL 107)  
Introduction to Field Studies (GEOL 202)  
Geomorphology (GEOL 402)  
Senior Seminar (GEOL 490)

## **Rex Cole**

*PhD University of Utah  
BS Colorado State University  
AS Mesa State Junior College*

### Courses:

Geology of Colorado (GEOL 105)  
Historical Geology (GEOL 112)  
Sedimentology and Stratigraphy (GEOL 444)  
Paleontology (GEOL 411)  
Petroleum Geology  
Mineral Resources (GEOL 361)

## **Jonathon Cooley**

*BA University of Colorado  
MS Montana State University*

### Courses:

Introduction to Dinosaurs (GEOL 106)  
Physical Geology Lab (Geol 111L)  
Field-based Introduction to Physical Geology (GEOL 113)  
Geology of Canyonlands (GEOL 333)  
Paleontology (GEOL 411)  
Summer Field Camp (GEOL 480)

## **Skip Hase**

### Courses:

Survey of Earth Science (GEOL 100)  
Introduction to Physical Geology (GEOL 111)

## **Verner Johnson**

*PhD University of Tennessee at Knoxville  
MS Southern Illinois University  
BA Southern Illinois University*

### Courses:

Survey of Earth Sciences (GEOL 100)  
Computer Applications in Geology (GEOL 204)  
Introduction to GIS (GEOL332)  
Geophysics (GEOL 404)  
Advanced GIS (GEOL332)  
Geodatabase Design (GEOL445)

## **Larry Jones**

*PhD University of Wyoming  
MS Northern Arizona University  
BS Fort Lewis College*

### Courses:

Survey of Earth Science (GEOL 100)  
Geology of Colorado (GEOL 105)  
Principles of Physical Geology (GEOL 111)  
Field Based Introduction to Physical Geology (GEOL 113)  
Topics - Basin Analysis (GEOL 396)  
Topics – Depositional Systems Field Seminar (GEOL 396)  
Applied Geomorphology Lab (GEOL 402L)

## **Rick Livaccari**

*PhD University of New Mexico  
MS State University of New York at Albany  
BS University of New Mexico*

### Courses:

Field Based Introduction to Physical Geology (GEOL 113)  
Structural Geology (GEOL 301)  
Introduction to Remote Sensing (GEOL 321)  
Crystallography & Mineralogy (GEOL 331)  
Igneous & Metamorphic Petrology (GEOL 340)  
Summer Field Camp (GEOL 480)

## **Donn Lorhammer**

*MS Naval Postgraduate School  
BS Meteorology, University of Utah*

### Courses:

Oceanography (GEOL 104)  
Weather and Climate (GEOL 105)

## **Julia McHugh (starting fall 2014)**

*PhD University of Iowa  
MS Idaho State University  
BA Hanover College*

## **Gigi Richard**

*PhD Colorado State University  
MS Colorado State University  
BS Massachusetts Institute of Technology*

### Courses:

Environmental Geology (GEOL 250)  
Cartography for GIS (GEOL 305)  
Basic Hydrology (GEOL 355)  
Renewable Energy (GEOL 370)  
GPS for GIS (GEOL 375)  
Introduction to Ground Water (GEOL 415)  
River Dynamics (GEOL 455)

*Editor's Note: We have not forgotten the former geology faculty members. Look for updates on their activities in the next issue!*



## ALUMNI NEWS



*Dave Wolny, Class of '95 (or was it '96?)*

For those who attended that very first SGE ceremony at the old Mesa State College, you may recall my wife was holding our very young daughter. Our daughter just graduated from CMU with a degree in criminal justice. Time flies when you are having fun.

Over the last 20 years or so I've had the pleasure of working for or with the United States Geological Survey, National Institute for Occupational Safety and Health and a couple of engineering firms. I've also continued to work for the Mesa County government.

I've also had the continuing opportunity to keep searching for earthquakes on the Western Slope through my association with CMU. We started with one seismometer back in 1994 and had only that one seismometer for a long time. We eventually added numbers two and three in the first decade of the new century. This improved the system, but did little except to add to the questions we had regarding seismicity on the Western Slope. We were certainly recording earthquakes in Mesa County and nearby areas, but getting a good epicenter was difficult.

As of this writing we now have six seismometers and expect to be able to add three more. It now actually looks like a network of seismometers. I'm also going to work start working with the small schools at Collbran and Gateway this coming school year, teaching students how to analyze earthquake data collected by the seismometers in those towns. •

### By Dave Wolny

#### *Editor's Note:*

*This column is specifically intended for YOU, CMU geology alumni, to keep in touch with old friends and the department. Please feel free to send a paragraph or two that summarizes your accomplishments and maybe a few good memories to the editor, Larry Jones, [lajones@coloradomesa.edu](mailto:lajones@coloradomesa.edu). Please specify "Alumni News" in your email. Pictures (then or now) are encouraged!*

## BASE LEVEL: FROM THE EDITOR

By Larry Jones



The newly revived Colorado Mesa University Geosciences Program Newsletter will be published on a regular basis. At a minimum, the newsletter will go out annually, probably early each fall. Our intention is to send the newsletter by regular mail and email to alumni and to all others who are interested and want to help support the program.

This past year, the geology program was officially "re-branded" the geosciences program. Old habits die hard, and a few of us (mostly me) are a little confused about the correct use of the terms geology and geoscience. Please bear with me as this nomenclatural transition takes place.

The content of the newsletter will consist of some regular columns, including the Coordinator's Column, Student News, Alumni News and my comments. We plan to have a feature article or two on some specific project or accomplishment in each issue. We will keep you up-to-date on faculty by featuring a biographic sketch of one faculty member, starting with Verner Johnson in this issue. We welcome your input and suggestions. You can contact me directly at [lajones@coloradomesa.edu](mailto:lajones@coloradomesa.edu). •

Larry Jones,  
Newsletter Editor

