PROGRAM REVIEW
2021

BACHELOR OF SCIENCE DEGREES
IN THE GEOSCIENCES PROGRAM

Prepared by

The Geosciences Faculty

Compiled and completed by

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# Contents

1. **Introduction and Program Overview**  
   a. Program description  
   b. Brief History of the Program  
   c. Recommendations from the 2012 PES Review  
   d. Mission and Goals  
   e. Support of Other Programs  
   f. Location Advantages  
   g. Unique Characteristics  
   h. Program Diversity, First-Generation & Under-Represented Students  

2. **Curriculum**  
   a. Breadth Depth and Level of Program  
   b. Program Currency  
   c. Description of Program Delivery Locations and Formats  

3. **Analysis of Student Demand and Success**  
   a.–c. Enrollment and Credit Hours by Level  
   d. Analysis of Geosciences Enrollment Data  
   e. Number of Graduates  
   f. Student Successes and Recognition  

4. **Program Resources**  
   a. Faculty  
   b. Financial Information  
   c. Library Assessment  
   d. Physical Facilities  
   e. Instructional Resources  
   f. Efficiencies in Program Operations  

5. **Student Learning Outcomes and Assessments**  
   a. Student Learning Outcomes (SLOs)  
   b. Measurements that assess SLOs (program assessment report)  
   c. Student Satisfaction (alumni survey)  
   d. Program Refinement related to SLOs  

6. **Program Resources**  
   a. Vision  
   b. Strengths and Challenges  
   c. Discipline Trends and Future Program Initiatives  
   d. Recommendations  

7. **COVID Adaptations and Lessons Learned**  
   a. COVID Adaptations  
   b. Lessons Learned
Tables

Table 1. Summary of Geosciences Majors by Degree Program for AY14–AY21

Table 2. Summary of Geosciences Enrollment and Credit Hours by Level for AY14–AY19

Table 3. Number of Geosciences Graduates for AY14–AY21

Table 4a. Percentage of Credit Hours Generated by Geosciences Faculty Type for AY14–AY21

Table 4b. Percentage of Credit Hours Generated by GIST Faculty Type for AY14–AY21

Table 5. Ratio of Full-time Equivalent Students to Full-time Equivalent Faculty for AY14–AY21

Table 6. Geosciences field trip activity AY19

Table 7. Geology Program expenditures in FY14 and FY21
## Appendices

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Title</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appendix A</td>
<td>Curricula Vitae for Full-Time Faculty</td>
<td>37</td>
</tr>
<tr>
<td>Appendix B</td>
<td>Geosciences Library Resources</td>
<td>152</td>
</tr>
<tr>
<td>Appendix C</td>
<td>Geosciences Curriculum Map</td>
<td>161</td>
</tr>
<tr>
<td>Appendix D</td>
<td>Geosciences Assessment Report</td>
<td>165</td>
</tr>
<tr>
<td>Appendix E</td>
<td>Results of CMU Alumni Survey of Geosciences Graduates.</td>
<td>179</td>
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</table>
1. INTRODUCTION AND PROGRAM OVERVIEW

a. Program description

The Geosciences Program—part of the Department of Physical and Environmental Sciences at CMU—offers modern Geology degrees that are comparable to those offered by peer institutions elsewhere in the United States. The program includes majors, minors, and an associate’s degree.

The three B.S. degrees within the Geosciences Program are:
- B.S. Geology
- B.S. Environmental Geology
- B.S. Geosciences, Secondary Education

The Geosciences Program also offers three minors:
- Minor in Geology
- Minor in Geographic Information Science and Technology (GIS&T)
- Minor in Watershed Science

An Associate in Science degree is also available in Geosciences. Detailed course requirements for each degree are provided separately.

b. Brief history of program

Prior to 1993, the geology degree was a component of the Bachelor of Science in Physical and Mathematical Sciences, but subsequent to 1993 Geology became part of the Bachelor of Science in Physical Sciences degree. The Environmental Geology degree was implemented in 1995, and the Geosciences Secondary Teaching degree was added in the fall of 1997. The current stand-alone Geosciences major with three concentration options (Geosciences, Environmental Geology, Geosciences Secondary Teaching) was established in 2013.

c. Recommendations from previous review (2012) by the External Reviewer

Recommendation 1: All programs can justify additional tenure-track faculty positions.

Response: The number of T/TT faculty has increased by one, with the addition of a geochemist in 2019. The current T/TT faculty typically teach 12-14 credit hours (12 hours is the minimum required). The addition of a T/TT faculty member has helped the program so that now all upper-division courses are taught by a full-time faculty member with a Ph.D., and all required upper-division courses are offered once each academic year. However, the reduction of full-time Instructors during the review period from 4 to 1, and the school-wide cap on enrollment in online courses to 40 students has resulted in fewer offerings of Geology 100-level courses and an overall reduction in the number of students served by the Geosciences Program at CMU. For instance, a comparison of Spring 2014 and Spring 2021 course offerings shows that Spring 2014 had 20 sections of 100-level courses with a total enrollment capacity of 1102 students whereas Spring 2016 had 16 sections of 100-level
courses with a total enrollment capacity of 668 students. This decrease also reflects faculty teaching re-assignments that had to take place due to Covid as well as an attempt to offer more sections of GEOL 113/113L, which is a gateway course to the Geology major. To attain similar enrollment numbers that we had at the beginning of the review period, additional personnel would be necessary. Note that in 2014 the Geosciences Program full-time equivalent faculty value was 10 whereas in 2021 it is 7.5.

Recommendation 2: Develop and execute an Assessment Plan for each program (concentration or “major”)  
Response: The Geosciences program has developed and implemented a detailed Assessment Plan.

Recommendation 3: Seek final approval for discrete chemistry, geology, and physics designated major programs.  
Response: As described above in Part 1b, the Geoscience Program now offers three Bachelor of Science Degrees in (1) Geology; (2) Environmental Geology; and (3) Secondary Education, Geosciences.

Recommendation 4: Identify strategies to convert students identified as program majors to graduates.  
Response: The Geoscience faculty have a strategy to maximize the number of program majors that complete their B.S. degrees. The underlying theme is “get them involved.” We have identified seven (7) specific strategies to enhance program majors.

- Strategy 01: Early mentoring of students in required and elective geoscience courses, especially those struggling with basic concepts;
- S02: Involvement of students with ongoing faculty research projects;
- S03: Very strong encouragement for participation in CMU’s Student Showcase;
- S04: Attendance and participation in national and regional meetings of the Geological Society of America;
- S05: Encouraging membership in the Geological Society of America and the American Association of Petroleum Geologists;
- S06: Providing involvement with professional geologists via the Grand Junction Geological Society’s monthly meetings;
- S07: Participation in the annual Western Slope Geological Field Conference.
- S08: Increase awareness of the program across campus through activities such as the Geo-Day Hike.

Recommendation 5: Continue to explore additional program opportunities, particularly at the boundary of traditional disciplines, and which rely on existing resources in so far as possible.  
Response: As previously mentioned (Recommendation 3), the Geoscience Program now has three specific B.S. degrees. In addition, the Program provides cross-discipline opportunities
for students interested in the Earth System: Associate of Science in Geology (Liberal Arts), a Watershed Science Minor, a minor in Geographic Information Science and Technology, and a Professional Certificate in Geographic Science and Technology. In particular, the GIS courses offered by the Geosciences Program serves many students in biology, environmental science, engineering, business, the social sciences, etc.

Recommendation 6: As the future is contemplated, develop a firm, persuasive version (or “sense of self”) for the physical sciences disciplines.

Response: Although not a viable option at present, a greater sense-of-self could be obtained if the Geoscience Program were to become a separate department. This would require a large increase in majors that may follow from full and continued implementation of the seven strategies outlined in Recommendation 4. An additional mechanism to enhance recognition of the Geology Program would be development of a professional master’s degree (non-thesis). This was proposed (unsuccessfully) recently, and may be considered again in the future.

Other Recommendations made by the External Reviewer:

Regarding faculty evaluation, broaden the physical sciences “definition” for the scholarly expectation

Response: Most of T/TT faculty are involved in research, publication, and participation in professional conferences. These achievements have provided important recognition from outside CMU and have created important educational opportunities for Geology students. The “teacher-scholar” philosophy has been embraced by the Geosciences for the past 20 years as demonstrated by ongoing faculty research and integrated student participation.

Regarding CMU Catalog descriptions, review course descriptions for CHEM, GEOL, and PHYS to ensure accurate and informative copy.

Response: Changes to the GEOL catalog descriptions have received attention, including the recent addition of both lower and upper level courses (e.g., GEOL 108 Water, People, and Environment; GEOL 443 Field-Based Depositional Systems; GEOL 445 Geospatial Database and Design; and GEOL 455 River Dynamics). In addition, all of the traditional courses are evaluated by the faculty of record to make sure the catalog descriptions correspond to what is being taught.

Regarding laboratory-based instruction, such offerings to accompany lecture course counterparts seem to be at a minimum (perhaps based on staffing space considerations).

Response: The majority of the required and elective Geoscience courses have lecture and laboratory components (e.g., GEOL 111/111L, 112/112L, 113/113L, 301/301L, 331/331L, 340/340L, 402/402L, 404/404L, 411/411L, 415/415L, 443/443L, 444/444L, and 455/455L). Thus, we think we are meeting the standard.
Regarding preservice secondary teaching education; investigate the State of Colorado guidelines for licensure for teaching middle and secondary school “science” subjects (inclusive of biology/life science, chemistry, earth science, and physics).

Response: The curriculum requirements for the Secondary Education, Geoscience (B.S.) meet the stated requirements put forth by the State of Colorado. Should these requirements change, we will modify accordingly.

d. Mission statement and goals

Colorado Mesa University serves the citizens of Colorado, in general, with a specific emphasis on increasing the level of educational attainment of residents in its 14-county region in Western Colorado. Colorado Mesa University’s mission, established by the Colorado Legislature, is contained in Colorado Revised Statutes (C.R.S.) 23-53-101:

There is hereby established a College at Grand Junction, Colorado, to be known as Colorado Mesa University, which shall be a general baccalaureate and graduate institution with selective admission standards. Colorado Mesa University shall offer liberal arts and sciences, professional and technical degree programs, and a limited number of graduate programs. Colorado Mesa University shall also maintain a community college role and mission, including career and technical education programs. Colorado Mesa University shall receive resident credit for two-year course offerings in its commission-approved service area. Colorado Mesa University shall also serve as a regional education provider.

The CMU Board of Trustees’ has also established an Institutional Mission Statement:

Committed to a personal approach, Colorado Mesa University is a dynamic learning environment that offers abundant opportunities for students and the larger community to grow intellectually, professionally, and personally. By celebrating exceptional teaching, academic excellence, scholarly and creative activities, and by encouraging diversity, critical thinking, and social responsibility, CMU advances the common good of Colorado and beyond.

e. Geosciences Program's support of other majors/minors and general education requirements

The Geosciences Program provides a number of courses that are integral to other disciplines at CMU, but few are required for non-Geosciences degrees. The three minors (Geology, Geographic Information Science and Technology (GIS&T), and Watershed Science) are offered to principally support students in the biological sciences, environmental science, chemistry, physics, mathematics, and the landman concentration in the Business Program. GEOL 111/111L (Physical Geology) or GEOL 113/113L (Field-based Physical Geology), and GEOL 112/112L (Historical Geology) are required for the Biology, Secondary Education degree.
To provide broad and diverse support for CMU’s Essential Learning platform, the Geology Program routinely offers 10 courses (either every semester or every other semester):

- GEOL 100 (Survey of Earth Science)
- GEOL 103 (Weather and Climate)
- GEOL 104 (Oceanography)
- GEOL 105 (Geology of Colorado)
- GEOL 106 (Introduction to Dinosaurs)
- GEOL 107 (Natural Hazards and Environmental Geology)
- GEOL 108 (Water, People and the Environment)
- GEOL 111/111L (Principles of Physical Geology and Lab)
- GEOL 112/112L (Principles of Historical Geology and Lab)
- GEOL 113/113L (Field-Based Introduction to Physical Geology and Lab)

The total number of students served by these ten courses between 2013 and 2021 (eight years) is 19,667, or 51,095 student credit hours (based on information provided by the CMU Institutional Research Group).

f. Location advantage

CMU is uniquely located in a geologically diverse region that serves as a natural laboratory for the Geosciences program. Geology courses at CMU make extensive use of field trips to places including Colorado National Monument, the Book Cliffs, Grand Mesa, Grand Canyon, Canyonlands, Ouray, and the San Juan Mountains. Collectively, Geology courses include approximately 100 field trips (lab trips and weekend trips) each academic year.

g. Unique characteristics of the program

- **Strong emphasis on field-based learning.** Geology courses involve ~100 field trips each year. Field-based Physical Geology and lab (GEOL 113/113L) is probably one of the only introductory geology courses in the U.S. that is largely taught in the field; each section of this class goes on a 3-hour field trip each week as well as a weekend field trip.

  Geology majors take a 3-credit sophomore-level field course (GEOL 202) as well as the capstone 6-week, 6-credit-hour senior-level summer field course (GEOL 480). Most geology majors in the U.S. take a 6-credit hour field course but few programs require 9 total credit hours of field geology. The Geosciences program also offers a Spring Break 6-day, 1-credit hour upper-division elective field course (GEOL 333) and an upper-division elective 4-credit hour course, Field-based Depositional Systems (GEOL 443/443L) that are also largely taught in the field. Lastly, all upper-division courses in the major also require field trips.

- **Exceptional student-faculty research activity.** Since 2013, 100 students in the Geosciences Program were involved in individual (not group) senior capstone research
projects. Of these, 33 students presented research at regional and national professional geology meetings.

In addition, a combined total of 104 student presentations—several students gave multiple presentations—were given at the annual CMU Student Showcase (among the most of any discipline at CMU), and at the annual April meeting of the Grand Junction Geological Society. One of the students within the reporting period who presented their research at the Grand Junction Geological Society received >$200K in start-up funding from private investors who attended the presentation. This student is currently CEO of his own gold exploration company.

Student research is completed as part of the capstone Senior Seminar (GEOL 490) course, as well as through independent studies, Structured Research, or simply as participation in ongoing faculty research. Students spend 1-3 semesters working on their senior projects.

- **Dynamic faculty.** In addition to teaching a minimum of 12 credit hours each semester, Geosciences faculty supervise research, independent studies, and senior theses. Since 2012, these efforts along with research projects involving other academic institutions and energy companies have resulted in internal and external grants totaling more than $525,000 as well as 33 peer-reviewed publications and 74 published abstracts many of which include student co-authors (undergraduate students were lead authors in some instances).

  Faculty spend a significant amount of time outside of formal class activity in helping students with projects outside of the classroom, in the field, and in the laboratory. Faculty have also made special efforts to involve students in projects involving cutting-edge analytical facilities and collaborations with researchers at U. of Oklahoma, New Mexico Tech, U. of Arizona, Arizona Geological Survey, CU-Boulder, and the U.S. Geological Survey-Denver.

- **Program Activities.** The Geosciences Program organizes two program-wide field trips each year: 1) the Western Slope Field Conference and 2) the Spring semester field trip (now the “Adam Trumbo Memorial Field Trip”). In addition, the Geosciences Program also sponsors an annual “Senior Day” where graduating seniors give presentations on their research and receive awards and recognition for achievements during their careers at CMU.

  The Western Slope Field Conference typically involves participation by geology faculty and students from CMU, Ft Lewis College, Western Colorado Univ., and Adams State Univ. Each institution alternates hosting this weekend-long field conference, and CMU routinely has 30-40 students attend this Colorado-centric community-building event.

  The Trumbo Field Trip is a 1-day field trip in the Spring semester that is open to geology students from all levels. Past trips have included touring: Canyonlands,
San Rafael Swell, Moab, and the Book Cliffs. These trips are an important way for students and faculty to get to know one another and to learn more about the local geology.

- **Strong emphasis on GIS technology.** A GIS&T minor and professional certificate program are offered, and many of our students have received internships and jobs in the private sector as well as with local and regional government agencies. This program serves many students outside of the Geosciences program (e.g., Biology, Environmental Science, Humanities and Social Sciences, and Business).

- **Collaboration with the Grand Junction Geological Society.** Another unique aspect of the Geosciences program is its close relationship with the Grand Junction Geological Society (GJGS). The monthly GJGS meeting and professional presentations afford excellent opportunities for Geology students to learn about professional career paths and network with professionals. The GJGS also provides scholarships for the summer Field Camp course as well as awards for student research, which is presented annually at the April GJGS meeting.

- **Collaboration with the Museums of Western Colorado.** Dr. Julia McHugh is Curator of Paleontology at the Museum and an Adjunct faculty member in Geosciences at CMU. Through this connection 1-3 students work as summer interns each year at the museum and conduct paleontological research with Dr. McHugh.

- **Dynamic geology club.** The student chapter of the American Association of Petroleum Geologists (AAPG) is active and sponsors talks, field trips, and a variety of fundraising activities.

- **Forrest Nelson Endowment.** The Geosciences Program received a significant donation (currently ~$700K) from Mr. Forrest Nelson in 2018. This donation produces $15-25K in interest each year, the majority of which is used for Geology student scholarships.

**h. Program diversity and first-generation & under-represented students**

Program diversity: The full-time Geosciences Program faculty ($n = 7$ as of Fall 2021) includes two women faculty, one Hispanic faculty member, and one faculty member that is hearing impaired. Two of the faculty were first-generation undergraduate students. Through the faculty composition, students are exposed to a variety of viewpoints and approaches regarding the pursuit of educational goals and professional careers. The Program also has several program-wide field trips (one per semester) that allows Geology students, regardless of class standing, to interact among themselves, which helps promote awareness and cooperation among the Geology student body as a whole. Lab assignments and field trips always involve project teamwork, which further promotes collegiality and cooperation among students of varying backgrounds. The outstanding female geology students are recognized annually through the Association of Women Geoscientists’ luncheon.
First-generation and under-represented students: The Geosciences Program has served a significant number of first-generation students during the reporting period. No quantitative data exists for this statement, but because of the large number of Essential Learning courses offered in the Geosciences ($n = 10$), our faculty have interacted with many of the first-generation students that make up a significant portion of CMU’s student population. Geoscience students similarly include numerous under-represented students. Most of the majors in the Geosciences Program come from family situations with very modest financial resources – the majority of our majors work ~20 hrs/week, including work-study positions within the Geosciences Program. Roughly 20-30% of the Geosciences students are female in a given year, and there are generally a small, but significant number of Hispanic students in the program. Currently the program has one student from Nigeria. The Geosciences Program has sponsored a Geo-Day Hike the past few semesters that is designed, in part, to help first-generation and under-represented students become aware of the Geology curriculum and potential careers in the Earth Sciences.

2. **CURRICULUM**

a. **Description of breadth, depth, and level**

In addition to CMU’s Essential Learning requirements, the Geology, Environmental Geology and Geosciences Secondary Education B.S. curricula all require foundation courses in math and science and geology core courses. The foundation courses include general chemistry (one semester), physics (one semester), probability and statistics and calculus (one semester each). Students that plan to attend graduate school are advised to take two semesters of chemistry, physics and calculus, and some of these credits count as restricted electives for the major. The core geology courses include four lower-division geology courses: physical and historical geology, field studies, and computer applications. Six upper-division geology classes are also included in the geology core: structural, crystallography and mineralogy, geomorphology, stratigraphy and sedimentation, summer field camp and senior seminar. The latter two courses are capstone experiences for our geology students.

Beyond the Geology core courses, the three degrees diverge. The Geology degree requires petrology and geophysics, while the Environmental Geology degree requires environmental geology, geochemistry and ground water. It should be noted that we are currently redesigning the Environmental Geology curriculum based on the recent hire of a geochemistry faculty member. The Geosciences Secondary Education degree does not require further geology courses, but the students must take 29 hours of additional education courses.

The Geology and Environmental Geology degrees require that students take nine credit hours of classes from a list of restricted electives. The selected electives were designed to allow students to either focus their studies more deeply into an area of interest, or to take additional math, chemistry or physics if they are planning to apply to graduate school.

The structure of the degree programs with foundation courses, core geology courses, and restricted electives provide students with a strong and broad foundation in science and math,
as well as an ability to focus their studies more deeply into a particular area of interest in geology or environmental geology.

b. Program currency

The depth of the Geosciences Program curriculum (as defined by number of class types offered and the frequency of the offerings) is comparable with the curricula of our regional peer institutions (Western Colorado University, Ft. Lewis College, Adams State University). The Geosciences Program continues to offer a 6-week summer Field Camp course, which is a capstone course for geology programs throughout the U.S. The Geosciences curriculum is generally on par with schools across the U.S. that offer a B.S. degree in Geology.

The Geosciences Program has evolved over the reporting period. Courses have been continually updated and expanded as new developments in the Earth Sciences emerge in the literature, and as the job market evolves. For example, the Environmental Geology curriculum is being updated to include stronger emphases on geochemistry, hydrogeology, and drone technology. Likewise, Geology faculty use their research to enhance subject matter that they teach; thus, ensuring that material presented to the students is state-of-the-art and continues to evolve with modern trends.

c. Description of program delivery locations and formats

The Geosciences Program offers the majority (~99%) of its courses on the main CMU campus. Two courses (GEOL 100 and GEOL 111/111L) are offered periodically on the Montrose campus. GEOL 111/111L is also offered through a cooperative agreement between CMU and Grand Junction High School. This particular course at the high school is currently being taught by a former CMU Geology student.

As stated previously, Geology courses emphasize field-based learning. Courses delivered on the main campus use a lecture format, usually amplified by digital presentations (e.g., PowerPoint). Computer-oriented courses and labs use appropriate software (e.g., ArcGIS Pro, Petra, GoogleEarth). GEOL 100, GEOL 104, GEOL 105, and GEOL 107 (Essential Learning courses) are also offered online most semesters.

3. ANALYSIS OF STUDENT DEMAND AND SUCCESS

a. Enrollment by major, concentration(s) and minors

Seven enrollment categories are included in the data from CMU’s Institutional Research Group (Table 1):

- Professional Certificate in Geographic Information Science and Technology
- Assoc. of Science (Liberal Arts Geology)
- Geology B.S. (Provisional)
- Geosciences/Geology-Geology B.S.
Currently there are 84 students working towards a Geology-related degree and of these, 68 are B.S. degree candidates (Table 1). For the reporting period (2013-2021), the total number of B.S. majors declined from 104 in 2013-2014 to 68 in 2020-2021. The decline in B.S. majors over the reporting period has been primarily in the Geology degree, but the number of students pursuing the Environmental Geology degree is increasing. The total number of students pursuing geosciences credentials, including all degrees and certificates, also declined from 138 to 84 over the reporting period (Table 1). The most popular degree is Geology, followed closely by the Environmental Geology degree. Few students pursue the Secondary Education degree.

### Table 1. Summary of Geosciences Majors by Degree Program for AY14-21.

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### b. Enrollment and student credit hours by student level

Table 2 summarizes 2013-2021 enrollment by student level. Over the eight-year reporting period, an average of 2249 students enrolled in geology courses. Note – this data does not include enrollment data for the GIST program, which is contained within Geosciences. Enrollment has declined ~25% over the reporting period. Table 2 also summarizes 2013-2021 data for student credit hours by student level. Student credit hours also declined ~25% over the six-year period.
c. Enrollment and student credit hours by course level

Table 2 summarizes 2013-2021 enrollment by course level. 100-level Geosciences courses are by far and away the most popular geology courses at CMU. Using the annual average values, ~84.5% (1892 out of 2238) of CMU students who take a geology course enroll in a 100-level class. Enrollment in 100-, 200-, 300-, and 400-level geology courses has declined over the reporting period. Table 2 also summarizes 2013-2021 data for student credit hours by course level. On average, the vast majority (~87%) of student credit hours generated by the Geosciences program are at the 100-level. Over the reporting period, the number of student credit hours generated by all course levels have declined significantly.

Table 2. Summary of Geosciences Enrollment by Credit Hours and Level for AY14-21.

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<td><strong>Enrollment by student level</strong></td>
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<td>-29</td>
</tr>
<tr>
<td>Junior</td>
<td>366</td>
<td>393</td>
<td>305</td>
<td>-22</td>
</tr>
<tr>
<td>Senior</td>
<td>456</td>
<td>554</td>
<td>392</td>
<td>-29</td>
</tr>
<tr>
<td>Non-degree</td>
<td>20</td>
<td>11</td>
<td>19</td>
<td>+73</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2249</strong></td>
<td><strong>2523</strong></td>
<td><strong>1908</strong></td>
<td><strong>-24</strong></td>
</tr>
<tr>
<td><strong>Student credit hours by student level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Freshman</td>
<td>1528</td>
<td>1605</td>
<td>1392</td>
<td>-13</td>
</tr>
<tr>
<td>Sophomore</td>
<td>2245</td>
<td>2584</td>
<td>1794</td>
<td>-31</td>
</tr>
<tr>
<td>Junior</td>
<td>931</td>
<td>978</td>
<td>775</td>
<td>-21</td>
</tr>
<tr>
<td>Senior</td>
<td>1055</td>
<td>1245</td>
<td>907</td>
<td>-27</td>
</tr>
<tr>
<td>Non-degree</td>
<td>52</td>
<td>29</td>
<td>51</td>
<td>+76</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5811</strong></td>
<td><strong>6441</strong></td>
<td><strong>4919</strong></td>
<td><strong>-24</strong></td>
</tr>
<tr>
<td><strong>Enrollment by course level</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>1892</td>
<td>2047</td>
<td>1640</td>
<td>-20</td>
</tr>
<tr>
<td>200</td>
<td>53</td>
<td>65</td>
<td>48</td>
<td>-26</td>
</tr>
<tr>
<td>300</td>
<td>148</td>
<td>222</td>
<td>82</td>
<td>-63</td>
</tr>
<tr>
<td>400</td>
<td>145</td>
<td>191</td>
<td>134</td>
<td>-30</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>2238</strong></td>
<td><strong>2525</strong></td>
<td><strong>1904</strong></td>
<td><strong>-25</strong></td>
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</table>
### Student credit hours by course level

<table>
<thead>
<tr>
<th>Course Level</th>
<th>Total</th>
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<th>200</th>
<th>300</th>
<th>400</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>5048</td>
<td>5447</td>
<td>4318</td>
<td>-21</td>
<td>-26</td>
<td>5780</td>
</tr>
<tr>
<td>200</td>
<td>160</td>
<td>195</td>
<td>144</td>
<td>-61</td>
<td>-24</td>
<td>4318</td>
</tr>
<tr>
<td>300</td>
<td>297</td>
<td>437</td>
<td>172</td>
<td>-24</td>
<td>-24</td>
<td>4913</td>
</tr>
<tr>
<td>400</td>
<td>275</td>
<td>368</td>
<td>279</td>
<td>-24</td>
<td>-24</td>
<td>5447</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5780</strong></td>
<td><strong>6447</strong></td>
<td><strong>4913</strong></td>
<td><strong>-24</strong></td>
<td><strong>-24</strong></td>
<td><strong>780</strong></td>
</tr>
</tbody>
</table>

### Analysis of Geosciences enrollment data

One important factor influencing the decline in Geosciences enrollment data has been a significant decrease in the number of full-time Geosciences faculty and a commensurate reduction in course offerings. For example, the number of sections offered in specific 100-level courses decreased significantly during the reporting period, which is consistent with the decrease in the 100-level enrollments and credit hours. From 2013 to 2021 the number of sections (offered annually) of GEOL 100 decreased from 7 to 4, GEOL 105 decreased from 5 to 3, and GEOL 111L (Physical Geology lab) decreased from 12 to 9.

In 2013, there were 9 full-time Geosciences faculty (5 T/TT faculty and 4 full-time Instructors (Jones, Cooley, Hase, Lorhammer)). The retirement and/or resignation of three Instructors and the resignation of Dr. Gigi Richard, left only 6 full-time Geosciences faculty in 2018 (4 T/TT and 2 full-time Instructors (Fenton, Riley)). In 2019, two new TT faculty were hired (Baker, Fenton), but Rex Cole retired in 2020 leaving the Geosciences Program still with 6 full-time faculty (5 T/TT and 1 full-time Instructor (Riley)). In 2021, one new TT faculty member was hired (Tellez); the Geosciences faculty currently consists of 6 T/TT faculty (3 Professors, 1 Assoc. Prof., 2 Asst. Prof.) and 1 full-time Instructor. In summary, the Geosciences program has been short-handed during much of the reporting period due to a loss of full-time Instructors, and the reporting period has involved significant faculty transition. We are optimistic that enrollments will increase as the new TT faculty members establish their presence on campus. The potential impacts of COVID on enrollments is hard to assess but there have been several specific instances where the impact was obvious – GEOL 480 Field Camp was effectively cancelled in the summer of 2020 (2 students enrolled) and GEOL 202 Field Studies was cancelled in Fall 2020.

### Number of graduates

Over the 8-year reporting period, a total of 93 students graduated with a B.S. in Geosciences, and 120 students graduated with an A.S., B.S. or professional certificate (Table 3). The total number of certificates, A.S. degrees, and B.S. degrees in Geology and Environmental Geology awarded were lowest in the 2020-21 COVID year (Table 3). Since 2013, the majority of the graduates received Geology degrees.
Table 3. Number of Geosciences Graduates for AY14-21.

<table>
<thead>
<tr>
<th>Degree</th>
<th>Code</th>
<th>Major</th>
<th>13-14</th>
<th>14-15</th>
<th>15-16</th>
<th>16-17</th>
<th>17-18</th>
<th>18-19</th>
<th>19-20</th>
<th>20-21</th>
<th>Totals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prof. Cert.</td>
<td>1770</td>
<td>Geographic Info Science</td>
<td>0</td>
<td>2</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>2</td>
<td>1</td>
<td>1</td>
<td>16</td>
</tr>
<tr>
<td>A.S.</td>
<td>2431</td>
<td>Liberal Arts – Geology</td>
<td>2</td>
<td>3</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>0</td>
<td>11</td>
</tr>
<tr>
<td>B.S.</td>
<td>3460</td>
<td>Geology</td>
<td>9</td>
<td>11</td>
<td>13</td>
<td>10</td>
<td>12</td>
<td>8</td>
<td>6</td>
<td>3</td>
<td>72</td>
</tr>
<tr>
<td></td>
<td>3473</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.S.</td>
<td>3462</td>
<td>Environmental Geology</td>
<td>1</td>
<td>4</td>
<td>0</td>
<td>5</td>
<td>2</td>
<td>2</td>
<td>5</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td></td>
<td>3472</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>B.S.</td>
<td></td>
<td>Geosciences Second. Ed</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total B.S.</td>
<td></td>
<td>Graduates</td>
<td>10</td>
<td>15</td>
<td>13</td>
<td>15</td>
<td>14</td>
<td>10</td>
<td>11</td>
<td>5</td>
<td>93</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total A.S., B.S., and Certificate Graduates</td>
<td>12</td>
<td>20</td>
<td>16</td>
<td>23</td>
<td>18</td>
<td>12</td>
<td>13</td>
<td>6</td>
<td>120</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

f. Student successes and recognition

The primary objective of the Geosciences Program is student success, as measured by students’ skills and a successful transition to graduate school and/or into professional employment. The interaction between the Geosciences faculty and students is strong. Documentation of this synergy is reflected by the following student metrics and/or recognitions:

- During the 8-year reporting period, 14 students enrolled in graduate school in a geology-related field at several institutions (Colorado State University, University of New Mexico, Clemson University, University of Northern Colorado, Southern Illinois University, Central Washington University, and Emporia State). Subsequently, eight of these students received M.S. degrees; the remainder are still working on M.S. degrees.

Other notable achievements related to post-graduate studies since the 2012 program review include: (1) two former students received tenure at their current teaching institutions (Dr. Alexis Navarre-Sitchler, Colo School of Mines; Dr. Sally Potter-McIntyre, Southern Illinois Univ.), (2) another student (Dr. Andy Darling) is currently employed as research faculty at U. of Georgia, and (3) another student (Dr. Mary Benage) received her Ph.D., from Georgia Tech and is a U.S. Geological Survey Research Geophysicist, at the Cascades Volcano Observatory in Vancouver.

- Using our program’s data, which tracks graduates’ career paths, 44 graduates obtained jobs in the geosciences and 8 have GIS-related jobs. **Including the students that pursued graduate studies, 71% of the B.S. Geosciences students that come through our program since 2013 have found employment in geology/GIS**
companies or pursued post-graduate degrees. Employers include the U.S. Army, various state and federal agencies (e.g., CDOT, U.S. Forest Service), mining and mineral resource companies, petroleum companies, oil-and-gas service companies (mudlogging and directional drilling), and GIS consulting.

- 33 student researchers presented their work at professional meetings including regional and national meetings of the Geological Society of America and the Society of Vertebrate Paleontology.

- 1 student was awarded the prestigious CMU Aspinall Scholarship.

- 5 students received external undergraduate research or travel grants to attend professional meetings.

- 1 student received a field camp scholarship from the Association of Women Geoscientists. Another student received a field camp scholarship from RMAG.

- 2 students received scholarships from the American Institute of Professional Geologists

- Each year, Geology students receive academic scholarships from endowed CMU Foundation scholarships including the Forrest Nelson Fund (principal = $700K), Geosciences Tuition Scholarship, the Richard D. Dayvault Memorial Scholarship, the Mark Garman Scholarship, and the Grand Junction Geological Society. A new scholarship to help fund student research is currently being finalized through the generous support of an alumna, Alexis Sitchler, and her husband.

- Each year, the top Geology students are recognized during Senior Day and receive non-cash awards including the Neal J. Harr Memorial Outstanding Geology Student Award given by the Rocky Mountain Association of Geologists in Denver, the Association of Women Geoscientists, the Verner C. Johnson GIS award, and the William C. Hood student research award.

4. PROGRAM RESOURCES

a. Faculty – curricula vitae are in Appendix A.

The Geosciences Program has six doctoral-level, tenured/tenure-track faculty members who became tenure-track faculty at CMU between 1985 and 2021 (two of the faculty began as full-time Instructors):

- Verner Johnson Ph.D. 1985-present Professor
- Rick Livaccari Ph.D. 1997-present Professor
- Andres Aslan Ph.D. 1999-present Professor
- Cassandra Fenton Ph.D. 2019-present Asst. Professor
- Greg Baker Ph.D. 2019-present Assoc. Professor
The Geosciences Program currently has one full-time faculty Instructor:

Kerry Riley  Ph.D.  2018-present  Instructor

The Geosciences Program currently has several part-time Adjunct faculty members only two of whom will be teaching in 2022:

Julia McHugh  Ph.D.  2014-present  Museum of Western Colorado
James Walker  M.S.  2008-present  Technical Librarian
Marisa Connors  M.S.  2021  Yeh and Associates
Eric Farmer  M.S.  2021  Grand Junction High School

NOTE: Dr. Bill Hood has been an unpaid, non-teaching faculty member in Geosciences since 1998. Dr. Hood has played an integral role in procuring, operating, and maintaining the x-ray diffractometer, the x-ray fluorescence spectrometer, and supervises Geology students through Unconventional Energy Center grants. Without Dr. Hood’s efforts, we would be unable to maintain our limited analytical facilities without compromising the collective efforts of the current faculty.

While each faculty member is required to teach a minimum of 24 credit hours per academic year (~4 courses per semester), almost all of the full-time faculty teach overloads due to program needs as well as due to Summer requirements (i.e. GEOL 480 Field Camp), which is not counted as part of the normal 24-credit load.

1) Student credit hours per FTE, faculty composition, and FTES:FTEF data

Table 4a presents data for the tenured/tenure-track Geosciences faculty, and indicates that they typically generate slightly less than 50% of the total student credit hours except for the past two years, which reflects the hiring of two new TT faculty. Between 2013-2019, the percentage of total student credit hours generated by full-time temporary faculty (Instructors) declined from 49% to 34% whereas the percentage increased for part-time faculty (Adjuncts) (2% to 26% in 2018-2019). These changes reflected the resignation/retirement of Instructors discussed previously. The proportion of credit hours taught by TT faculty has increased significantly since 2019 as new TT faculty were added. Table 4b presents data that indicate that T/TT faculty are responsible for the vast majority of GIS-related student credit hours since 2017.

<table>
<thead>
<tr>
<th>AY</th>
<th>Total Student Credit Hours</th>
<th>Tenured/Tenure-Track</th>
<th>Full-Time Temporary</th>
<th>Part-Time</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013-2014</td>
<td>6495</td>
<td>49%</td>
<td>49%</td>
<td>2%</td>
</tr>
<tr>
<td>2014-2015</td>
<td>5760</td>
<td>47%</td>
<td>50%</td>
<td>3%</td>
</tr>
<tr>
<td>2015-2016</td>
<td>6695</td>
<td>45%</td>
<td>51%</td>
<td>4%</td>
</tr>
<tr>
<td>2016-2017</td>
<td>5890</td>
<td>43%</td>
<td>38%</td>
<td>19%</td>
</tr>
<tr>
<td>Year</td>
<td>Total Student Credit Hours</td>
<td>Tenured/Tenure-Track</td>
<td>Full-Time Temporary</td>
<td>Part-Time</td>
</tr>
<tr>
<td>------------</td>
<td>----------------------------</td>
<td>----------------------</td>
<td>---------------------</td>
<td>-----------</td>
</tr>
<tr>
<td>2017-2018</td>
<td>180</td>
<td>93%</td>
<td>0%</td>
<td>7%</td>
</tr>
<tr>
<td>2018-2019</td>
<td>168</td>
<td>70%</td>
<td>20%</td>
<td>10%</td>
</tr>
<tr>
<td>2019-2020</td>
<td>225</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
<tr>
<td>2020-2021</td>
<td>230</td>
<td>100%</td>
<td>0%</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table 4b. Percentage of Credit Hours Generated by GIST Faculty Type AY18-21.

<table>
<thead>
<tr>
<th>Academic Year</th>
<th>FTES</th>
<th>FTEF</th>
<th>FTES:FTEF</th>
<th>% Change in FTES:FTEF</th>
</tr>
</thead>
<tbody>
<tr>
<td>2014-2015</td>
<td>192</td>
<td>10</td>
<td>19.2</td>
<td>16.7%</td>
</tr>
<tr>
<td>2015-2016</td>
<td>223.2</td>
<td>10</td>
<td>22.4</td>
<td>0.02%</td>
</tr>
<tr>
<td>2016-2017</td>
<td>196.3</td>
<td>8.6</td>
<td>22.9</td>
<td>0.01%</td>
</tr>
<tr>
<td>2017-2018</td>
<td>176.5</td>
<td>7.7</td>
<td>23</td>
<td>0.01%</td>
</tr>
<tr>
<td>2018-2019</td>
<td>191.3</td>
<td>7.7</td>
<td>25</td>
<td>8.7%</td>
</tr>
<tr>
<td>2019-2020</td>
<td>196</td>
<td>7.9</td>
<td>24.8</td>
<td>-0.01%</td>
</tr>
<tr>
<td>2020-2021</td>
<td>163.8</td>
<td>7.5</td>
<td>21.7</td>
<td>-12.5%</td>
</tr>
</tbody>
</table>

Table 5 presents data indicating that the FTES:FTEF value increased steadily from 19.2 to 25 prior to 2019, which reflected substantial enrollment in 100-level courses despite the gradual decline in the number of full-time Geology Instructors. The marked decrease (12.5%) in 2020-2021 reflects a reduction in 100-level course offerings that was triggered by the retirement of two faculty members and re-assignment of existing faculties’ teaching duties to cover upper-division courses.

2) Faculty successes/quality/recognitions

Geology faculty have been highly productive both in and out of the classroom. Over the reporting period, the majority of the tenure-track faculty publish their research (commonly with student co-authors) in peer-reviewed journals and have given presentations at regional, national, and international professional meetings (see CVs).

During the reporting period, a total of 33 peer-reviewed papers and 74 abstracts were published, and 22 professional presentations were made by the Geosciences faculty. Many of the abstracts and several of the papers include CMU geology student co-authors. Faculty routinely lead field trips for professionals and the general public, and, in addition to professional presentations, give lectures to local community groups including the Grand Junction Geological Society, the Grand Junction Petroleum Club, and the Grand Junction Gem & Mineral Club. Over the reporting period, Geosciences
faculty have also given invited lectures at other universities (Colo State University, Southern Illinois University).

For the current reporting period, one Geosciences faculty member received the Outstanding Faculty Award. Geosciences faculty are frequently awarded the highest categories on their annual evaluations. Several of the faculty serve on graduate committees of students from other schools (U. of Oklahoma, Texas A&M, CU-Boulder). One faculty member was selected to participate in a special geology research forum (Thompson Field Forum), which involves a competitive application process (28 researchers from the U.S. and abroad were selected to participate). One faculty member was the Chair of the Rocky Mountain Section of the Geological Society of America and served on the advisory board of the Department of Geological Sciences at CU-Boulder.

One of the most underappreciated aspects of the Geosciences faculty efforts is the immense amount of time we spend on field trips with students not including student-faculty research efforts, which involves additional time spent with students in the field.

Table 6 presents data from a typical year (2018-2019) in the Geology Program. The data indicate that Geology Program faculty run ~100 field trips involving >700 students and >150,000 total student-hours (assuming weekend field trips are 8 hrs and weekday field trips are 2 hrs in length, which is an underestimate). This effort includes 35 days in the field (~280 hrs) on weekends, and does not include our efforts during the 6-week summer Field Camp.

For comparison a single 3-credit course at CMU is expected to involve 45 hrs/credit or 135 hrs of effort. The Geology Program faculty efforts on weekends therefore are producing the equivalent of two additional 3-credit courses each academic year.

These data demonstrate often-unmeasured component of the Geosciences Program (from the perspective of faculty time/effort accounting), but highlight the commitment of the entire faculty in continuing to provide exciting, hands-on, expert-led field experiences to CMU students.

<table>
<thead>
<tr>
<th></th>
<th># of field trips</th>
<th># of field trip days</th>
<th># of students</th>
</tr>
</thead>
<tbody>
<tr>
<td>Course-related</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>weekday</td>
<td>90</td>
<td>96</td>
<td>639</td>
</tr>
<tr>
<td>weekend</td>
<td>71</td>
<td>71</td>
<td>214</td>
</tr>
<tr>
<td>Program-related</td>
<td>7</td>
<td>10</td>
<td>99</td>
</tr>
<tr>
<td>weekday</td>
<td>0</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>weekend</td>
<td>7</td>
<td>10</td>
<td>99</td>
</tr>
<tr>
<td>TOTALS</td>
<td>97</td>
<td>106</td>
<td>738</td>
</tr>
</tbody>
</table>
b. Financial Information

The department head submits a budget request to the administration each January for the upcoming fiscal year, which begins on July 1. Inasmuch as it has been many years since we have had to endure budget cuts, our working assumption is that we will receive the same amount as in the preceding year. Requests for one-time funds or base-building increases are approved based on justification and availability of funds. Recent examples of such one-time funds are for the purchase of a ~$8K rock crusher and additional funding to hire a second instructor for field camp.

The Geosciences Program collects course fees to offset the costs of lab supplies and field trips. Table 7 shows costs for the Geosciences Program in the 2013-2014 (FY14) and 2018-2019 (FY19) fiscal years. Hourly compensation is for student assistants. Other current expenses include supplies, software, equipment purchase and repair, copier lease, and similar costs. Travel costs in the budget allocation category refer to faculty and student travel; much of this total is for field trips. Internal charges are for phones and phone calls.

Table 7. Expenditures in 2013-2014 (FY 14) and 2018-2019 (FY 19). Student credit hours include all Geosciences classes (GEOL and GIST prefixes).

<table>
<thead>
<tr>
<th>Description</th>
<th>FY 14</th>
<th>FY19</th>
</tr>
</thead>
<tbody>
<tr>
<td>STATE CLASSIFIED WAGES</td>
<td>$8,146.89</td>
<td>$7,316.13</td>
</tr>
<tr>
<td>STATE CLASSIFIED BENEFITS</td>
<td>$1,664.05</td>
<td>$3,997.03</td>
</tr>
<tr>
<td>FACULTY ADMIN REGULAR WAGES</td>
<td>$372,274.98</td>
<td>$347,348.00</td>
</tr>
<tr>
<td>FACULTY ADMIN TEMP WAGES</td>
<td>$164,391.48</td>
<td>$139,188.71</td>
</tr>
<tr>
<td>FACULTY ADMIN BENEFITS</td>
<td>$123,008.87</td>
<td>$102,261.63</td>
</tr>
<tr>
<td>HOURLY COMPENSATION</td>
<td>$2,628.19</td>
<td>$3,165.31</td>
</tr>
<tr>
<td>OTHER CURRENT EXPENSE</td>
<td>$33,946.73</td>
<td>$42,811.51</td>
</tr>
<tr>
<td>TRAVEL</td>
<td>$32,866.79</td>
<td>$41,883.93</td>
</tr>
<tr>
<td>INTERNAL CHARGES</td>
<td>$3,247.80</td>
<td>$2,453.05</td>
</tr>
<tr>
<td>TOTAL</td>
<td>$742,175.78</td>
<td>$690,425.30</td>
</tr>
</tbody>
</table>

Student Credit Hours | 6447 | 5908

Dollars per Credit Hour | $115.12 | $116.86

1) Internal/External funding related to faculty grants

Geosciences faculty have received approximately $525,000 in funding since the last program review. Nearly $100K came from the National Science Foundation (PI – Aslan in 2011-2014). Grants from the CMU Unconventional Energy Center (PIs Aslan, Cole, Hood, and Johnson) totaled approximately $157K. The Grand Junction Geological Society awarded ~$5K to research projects by Rex Cole and equipment upgrades related to Bill Hood’s research. Bill Hood received $3,725 from the CMU Hutchinson Water Center for a student-faculty research project, and Bill procured approximately $130K from various oil companies to upgrade our XRD, purchase a new XRF and muffle furnace, and to repair equipment. Faculty have also received a large
number of Faculty Professional Development Fund Grants (generally $1-2K each) during the reporting period.

Since 2013, ESRI donated nearly $400,000 worth of Virtual Campus Courses and evaluation copies of ArcGIS software to students in the Geosciences and GIS&T programs.

c. **Library assessment**

Library personnel have prepared an assessment of holdings related to the Geosciences program. See Appendix B.

d. **Physical facilities**

The Geosciences program has facilities in the Wubben Science Center, including:

- WS 150 Classroom (for upper-level geology courses)
- WS 152 Student work room and mineral separation lab
- WS 152A Faculty preparation and storage room
- WS 152B William C. Hood and John Scholes X-ray diffraction lab
- WS 154 Noble Energy classroom (for upper-level geology courses)
- WS 147 GIS&T Lab (for GIS-GPS and other computer-oriented courses, 18 person)
- WS 163 Physical and Historical Geology Lab (24 person)
- WS 145 Storage space
- WS 143 Storage space
- WS 102 Storage space

e. **Instructional resources, materials, technology, and equipment**

Equipment holdings in geology include:

- Rigaku Miniflex x-ray diffractometer
- hand-held Bruker x-ray fluorescence unit
- magnetometer
- portable refraction seismometer
- 8 functioning binocular polarizing microscopes
- 15 functioning binocular microscopes
- 12 recreational-grade geographic positioning system (GPS) units
- 1 survey-grade GPS unit
- oil-bath diamond saw
- thin section machines (1 is operable)
- 2 stream tables
- 1 outcrop mini-permeameter
The computer resources in the GIS&T lab include computationally fast, high-memory-capacity computers for students and one for the instructor, one high-resolution plotter, one large light table, one color printer, and one color plotter. Computers in the lab were replaced in 2021. Participation in the ESRI statewide license agreement now allows for GIS software to be used in this lab and throughout campus. Rooms WS 150 and 152 also have a total of 3 general-use computers.

f. **Efficiencies in the way program is operated**

Equipment is shared among many courses and is used by Physics and Environmental Science faculty on occasion (e.g., x-ray diffractometer). The GIS software site license is obtained by a collaboration between most Colorado institutions, which allows us to obtain the license from ESRI at a discount. In addition, the equipment is often critical to student research projects as well as interfaces with local and regional research partners.

5. **STUDENT LEARNING OUTCOMES AND ASSESSMENTS**

a. **Geosciences student learning outcomes (SLOs)**

In the spring semester of 2014, the Geosciences faculty composed and instituted the programmatic student learning outcomes (SLOs) listed below for all Geosciences degrees. These SLOs were designed to contribute toward the Geoscience program’s mission and goals as well as to aid students in achieving the institution-wide SLOs.

<table>
<thead>
<tr>
<th>Geosciences Student Learning Outcomes (SLOs)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Articulate the fundamental knowledge base and ideas of the major fields of geoscience (specialized skills in geoscience)</td>
</tr>
<tr>
<td>2. Collect and interpret geoscience field data (problem solving skills)</td>
</tr>
<tr>
<td>3. Collect and interpret geoscience laboratory data (problem solving skills)</td>
</tr>
<tr>
<td>4. Use technology (e.g. computer software) for evaluating quantitative geoscience data (technology skills)</td>
</tr>
<tr>
<td>5. Write an effective report on a geoscience study (communication skills)</td>
</tr>
<tr>
<td>6. Demonstrate an effective oral presentation on a geoscience study (communication skills)</td>
</tr>
</tbody>
</table>

These SLOs were chosen so that Geosciences graduates will be well-prepared for graduate schools, industry jobs, and a variety of other positions within the sciences. Furthermore, these SLOs are set up to give students the skills necessary for on-going independent learning beyond the classroom. The curriculum map for the Geosciences Program indicates the courses in which these SLOs are covered, and it is included in Appendix C.

As a result of aligning the program SLOs with the institutional SLOs (e.g., Critical Thinking, Communication Fluency, Applied Learning, and Quantitative Literacy) geology students are prepared for a wide variety of positions outside the sciences. In the Geosciences courses that serve CMU’s Essential Learning Curriculum (GEOL 100, 103, 104, 106, 107, 108, 111, 111L, 112, 112L, 113, and 113L) students are given tools to help them progress...
toward the University’s Essential Learning SLOs such as Critical Thinking, Applied Learning and Quantitative Literacy.

b. Measurements that assess SLOs (Program Assessment Report)

The SLOs are assessed by analyzing several measurement implements, including entire exams, specific exam questions, written reports, oral presentations, laboratory work, data analyses, and proposed procedures. These assessments, along with their results and resultant actions, are described in the Program Outcome and Assessment Report (Appendix D). Each SLO is assessed at a minimum of two levels from the beginning, developing, and advanced levels of the Geosciences curriculum. By assessing at more than one level, we are able to get a better picture of where issues may be occurring with respect to students’ attainment of the SLOs.

Beyond the assessments described in the Program Outcome and Assessment Report, the Geosciences program also assesses itself through reflection on how readily students are able to obtain positions following graduation. The Geosciences program faculty generally receive the compiled assessment data and meet to discuss it once a year. Since the beginning of 2014, a timeline has been kept of when the Geoscience faculty have reviewed and discussed assessment data, and this timeline is included at the beginning of the Program Outcome and Assessment Report (Appendix D).

SLO #1: Articulate the fundamental knowledge base and ideas of the major fields of geoscience (specialized skills in geoscience).

At the advanced level, SLO #1 is assessed using the Geoscience exit exam. This exam was compiled from questions submitted by all Geosciences faulty. The Geoscience exit exam for senior geoscience students is a part of the capstone GEOL490 Senior Seminar course. It assesses the students overall Geoscience knowledge and problem-solving skills. We require all of our senior Geoscience students to take this exam during the semester before they graduate.

Summary results of the Geoscience Exit Exam

<table>
<thead>
<tr>
<th></th>
<th>Number of Students</th>
<th>Number of Sections</th>
<th>Average Score</th>
<th>Median Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2014 – 2021</td>
<td>100</td>
<td>8</td>
<td>78%</td>
<td>78%</td>
</tr>
</tbody>
</table>

The expectation agreed upon by the Geoscience faculty is that the students must attain a score of >65% on this exam to be eligible for graduation. From 2014 to 2021, 94% of students scored >65% and only 6% of students scored <65%. Several of the students that did not do well on the exit exam were students that transferred to CMU.

While the Geoscience exit exam assesses students’ technical fluency in the major fields of Geoscience (SLO #1) at the advanced level, this SLO is also assessed at the beginning level using final exams in GEOL111 and GEOL 113. In order to obtain a clear picture of how
all the students at these levels are performing, these scores are assessed on a yearly basis, and the results are tracked over time.

Assessment exam scores for GEOL111 and GEOL113 showed an average increase of 94% from the beginning to the end of each semester (including all sections) for the data collected from Spring 2014 to Spring 2021 ($n = 1278$ students; 43 sections). This indicates that the students are achieving satisfactory levels of fluency in these subjects at the beginning level.

*SLO #2: Collect and interpret geoscience field data (problem solving skills).*

SLO #2 is assessed at the developing level in GEOL 202: Introduction to Field Studies and at the advanced level in our capstone course GEOL 480: Summer Field Camp (A). All Geoscience majors are required to take both of these courses.

At the developing level, SLO #2 is assessed with a final project, which is a geologic field mapping project. This field mapping project is delivered as the final project for GEOL 202. The students are assessed based on the accuracy of their geologic mapping (50 pts), the accuracy of the accompanying cross section (20 pts), and the quality of the field observations recorded in field notebooks (30 pts).

**Summary results of the GEOL 202 Field Mapping Project**

<table>
<thead>
<tr>
<th></th>
<th>Number of Students</th>
<th>Number of Sections</th>
<th>Average Score</th>
<th>Median Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2013 – Spring 2021</td>
<td>122</td>
<td>12</td>
<td>87%</td>
<td>90%</td>
</tr>
</tbody>
</table>

Every year, our goal was to have at least 80% of the students score >70% on the final mapping project. The result was that 100% of students scored >70% on the final mapping project, so we achieved our goal.

At the advanced level, SLO #2 is assessed in the GEOL 480: Field Camp course, which is offered every summer. In GEOL 480 students complete six week-long field projects. GEOL480 students are assessed based on the accuracy of their geologic mapping (50 pts), the accuracy of the accompanying cross section (25 pts), and the quality of the field observations recorded in field notebooks (25 pts).
Summary results of the GEOL 480 Field Mapping Project

<table>
<thead>
<tr>
<th></th>
<th>Number of Students</th>
<th>Number of Sections</th>
<th>Average Score</th>
<th>Median Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2016 – 2021</td>
<td>88</td>
<td>8</td>
<td>86%</td>
<td>87%</td>
</tr>
</tbody>
</table>

Consistent scores averaging 86% are considered a positive indication that Geoscience graduates are proficient at field geology and geologic problem solving.

SLO #3: Collect and interpret geoscience laboratory data (problem solving skills)

SLO #3 is evaluated at both the developing and advanced levels. At the developing level, students in GEOL 331L: Crystallography and Mineralogy Lab, are evaluated based on their ability to identify unknown mineral specimens. They are also expected to collect minerals in the field as part of a mineral collection that they turn in at the end of the semester for lab credit. To be successful at mineral identification students must use the textbook reading materials on the physical properties of minerals. In the lab, students are given about 30 unknown mineral specimens every two weeks. Students must use the physical properties of minerals such as crystal form, hardness, cleavage, twinning, color, etc. to identify these minerals. In the field, students must collect and identify minerals based on their physical properties for use in their mineral collection that they turn in at the end of the semester. The target score we set for this exercise is 70%. Overall class average score for the 3-year period of 84% exceeds the target score of 70%.

At the advanced level, SLO #3 is assessed in GEOL444/444L: Sedimentology and Stratigraphy and Lab. This assessment involves a final project of fluvial depositional systems using information presented in lecture (GEOL444) coupled with a six- to eight-hour field exercise (GEOL444L) where data are collected on an ancient fluvial sequence at Riggs Hill near Grand Junction. In lecture (GEOL444), students are given reading materials on the spectrum of fluvial depositional systems, coupled with detailed lectures. In the field (GEOL444L), students must generate sedimentologic data (sandstone-body thickness, lithofacies types, stratal surfaces, paleocurrents, and three-dimensional architecture) on a fluvial complex at the Jurassic-Cretaceous boundary. Students are required to use their field data to interpret the origin of the sandstone body based on the materials presented in lecture and the reading assignments. Students are required to write a report discussing their data and interpretations. This exercise is worth 100 points; the grading breakdown is as follows: accuracy of sedimentology data collected in field (50 points), quality of final report (40 points), and neatness (10 points). The students evaluated from Spring 2015 to 2021 earned an average score of 91% indicating that they are performing very well with respect to SLO #3.

Summary results of the GEOL444/444L Final Project

<table>
<thead>
<tr>
<th></th>
<th>Number of Students</th>
<th>Number of Sections</th>
<th>Average Score</th>
<th>Median Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spring 2015 – 2021</td>
<td>86</td>
<td>7</td>
<td>91%</td>
<td>91%</td>
</tr>
</tbody>
</table>
SLO #4 Use technology (e.g. computer software) for evaluating quantitative geoscience data (technology skills).

SLO #4 is assessed at the developing level in GEOL204: Computer Applications in Geology. In this course, students are required to develop computer skills for geologic-related problems and utilize the following software: Excel, PowerPoint, and ArcGIS. The final project includes both subsurface geologic maps (well location map and contour maps) of the Dakota Group from the petroleum well data in ArcGIS and includes a five-page written report. The students are assessed based on the accuracy of their geologic maps (60 pts), the quality of the petroleum information (location, depth, and production history) in Excel (10 pts), and a written report (30 pts). The written report includes an abstract, introduction, production history, data gathering, computer generation, and analysis.

The goal is a class average that exceeds 70 points (total = 100 points); i.e., a minimal "C" grade. The results given in the below table indicates that the students are doing an excellent job with respect to this SLO.

Summary results of the GEOL204 Final Computer Project

<table>
<thead>
<tr>
<th></th>
<th>Number of Students</th>
<th>Number of Sections</th>
<th>Average Score</th>
<th>Median Score</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall 2013 – Spring 2021</td>
<td>92</td>
<td>13</td>
<td>87%</td>
<td>8%</td>
</tr>
</tbody>
</table>

SLO #5: Write an effective report on a geoscience study (communication skills).

At the advanced level, SLO #5 is assessed in GEOL 490: Seminar. In this course, students write a 15-page (not including figures and tables) report that covers the independent research completed during GEOL 490. This project is assessed via rubric to rate students on a scale of 1-to-5 for the following categories: 1) depth of research/content and analysis; 2) appropriateness of methods and approach, 3) organization and professionalism of the report, and 4) clarity of writing and proper use of grammar and terminology.

90% of the students scored ≥4.0 in two of the four categories, indicating that the students are doing an excellent job with respect to this SLO. This high performance is based in part on the fact that the students are required to present their findings two times in the Spring semester (CMU Student Showcase, April meeting of the Grand Junction Geological Society) so the students generally do a thorough job.

Note that with the addition of new faculty, this SLO is also being evaluated using another 200-level course (GEO 204), but data has yet to be collected in this course.

SLO #6: Demonstrate an effective oral presentation on a geoscience study (communication skills).

SLO #6 has been evaluated at the advanced level in two courses GEOL 359: Survey of Energy Resources and GEOL 490: Seminar. However, with the retirement of Rex Cole,
GEOL 359 is not currently taught. As in the case of SLO #5, GEOL 204 will be used to further evaluate this SLO in the future.

In GEOL 490, students are assessed with a 15-minute presentation that covers independent research completed during GEOL 490. In addition, 5-10 minutes of questions by peers and the instructor follow the presentation. This project is assessed using a rubric that rates them on a scale of 1 – 5 for the following categories: 1) depth of content and analysis; 2) quality and professionalism of presentation including organization and preparedness, 3) quality of PowerPoint slides including their clarity and depiction of appropriate material and grammar, and 4) ability to answer questions. 92% of students in each section scored a ≥4.0 in two of the four categories suggesting that students are performing well in this SLO. Again, the high performance is based in part on the fact that the students are required to present their findings two times in the Spring semester (CMU Student Showcase, April meeting of the Grand Junction Geological Society).

In GEOL 359 student assessment is based on a fossil-energy topic that students choose early in the semester and research for approximately two months. During the last 1-2 weeks of the class, each student makes a 20-minute oral presentation using slides, videos, transparencies, or PowerPoint on the topic, followed by five minutes of questions. A handout (with abstract) summarizing their presentation is also provided to the other students and the professor. Evaluation involves input from fellow students (peer review) and the professor. A total of 100 points (equivalent to one exam) are tied to the project. Students from the three sections assessed scored an average of 85% suggesting that they are doing well in this SLO.

c. **Student satisfaction (Summary of CMU alumni survey)**

Responses of alumni from the Geosciences Program ($n = 20$) are compared with responses of Colorado Mesa University (CMU) alumni in general ($n = 778$). The alumni survey results are in Appendix E. Responses from Geosciences alumni were comparable to or more positive than responses from CMU alumni overall regarding their education. All of the Geosciences alumni stated that they were “Very Satisfied” (55%) or “Generally Satisfied” (45%) with their undergraduate education, and all but two of them rated the quality of their education within the Geosciences program as “Very High” or “High”. The remaining two rated the overall quality of their geosciences education as “Average.”

The Geosciences faculty take pride in the personal instruction, mentoring, and student-faculty research that we offer, and this was reflected in alumni responses to: “While an undergraduate, about how often did you have conversations with faculty outside of class?” Sixty percent (60%) of our Geosciences alumni responded with “Very Often (at least once a week),” indicating frequent interaction with Geosciences faculty outside of class activities. In sharp contrast, only 38% of CMU alumni responded “Very Often (at least once a week).” Thirty percent of Geosciences alumni noted they interacted with faculty “Often (once every two weeks).” All Geosciences alumni responded that they at least had conversations with faculty “Occasionally (3-5 times per semester).”
Seventy-one percent (71%) of our Geosciences alumni participated in student-faculty research, and describe their experiences as very beneficial to beneficial, particularly with regard to how research prepared them for future employment. Eighty-five percent (85%) and 75% of our Geosciences alumni “Agreed” or “Strongly Agreed” that Geosciences faculty cared about the students’ education and well-being, respectively. Specific alumni comments were mainly positive with statements that faculty were supportive. Geosciences alumni also stated that their degree prepared them well for employment and further education. Multiple alumni praised the Geoscience faculty’s use of Colorado/Utah geology in field labs and studies to emphasize topics introduced in the classroom. The alumni generally agreed that this extra hands-on field approach gave them a better understanding of geology. There were a few comments, however, that the Geosciences program would benefit from more and new laboratory equipment, to teach basic laboratory analysis skills.

Perhaps the main area in which Geosciences alumni thought the CMU Geosciences program lagged behind was in career services. Geosciences alumni indicate they generally felt that there could be increased opportunities for networking with local and regional employers. Alumni also underscored what they saw as a lack of information about career paths and employment opportunities. The Geosciences Program has already begun to address these issues. In spring 2019, we updated our website to include a “Geosciences Job Outlook” section based on statistics published by the Bureau of Labor. We have also added a new webpage “Geosciences Resources” that directs CMU students and potential recruits to resources they can use to find information about employment, internship, graduate school, and funding opportunities.

Employment statistics show a very positive reflection of employment and earnings of our Geosciences alumni. In the survey, 90% of the Geosciences alumni that responded were working full-time for pay, and all but three were working in a position related to geosciences. The Geosciences alumni all responded that CMU prepared them “Very Well”, “More than Adequately”, or “Adequately” for their current careers. The majority of the Geosciences alumni (53.4%) who responded are earning between $50,000 and $74,999 annual gross income (before taxes). In contrast, sixty-two percent (62%) of CMU alumni overall earn less than $49,999 annual gross income (before taxes).

Of the four geosciences alumni that pursued further education and responded to the alumni survey, two graduates responded that CMU had prepared them “More than Adequately” for their post-graduate education program; two alumni responded with “Adequately”. Among these students, three alumni were pursuing master’s degrees in geosciences or hydrogeology. The other alumnus is pursuing a Master’s in Business Administration. Institutions where alumni are working on or have completed their post-graduate degrees include Clemson University, University of Texas Permian Basin, Emporia State University, and an undisclosed institution (MBA program). Two graduates completed their educational program and two were in the process of completing their program.
d. **How are student learning outcomes being refined?**

Evaluation of our assessment techniques has led the Geosciences faculty to conclude we have successfully accomplished our goals, meeting our benchmarks for educating and assessing our students. The above-average percentage (in the 80s) also leads us to conclude that we should review our assessment techniques. In our opinion, these values might indicate we are not ‘challenging’ our students enough. We have recently hired two new TT faculty, and we are preparing to revamp our Environmental Geology curriculum. As our program evolves over the next several years, we will use the time to re-evaluate our Assessment Plan.

6. **FUTURE PROGRAM PLANS**

a. **Vision for Geology**

The Geology program offers up-to-date degree programs that provide students with technical and professional skills necessary for careers in the geosciences or further education in graduate school. Given the quality and experience of the tenure-track faculty and our location in western Colorado, the CMU Geosciences Program could be one of the best geology programs in the western region among similar 4-year institutions. The Geosciences Program has the potential to offer a M.S. professional (non-thesis) degree in Geology.

b. **Strengths and challenges facing the Geosciences program**

**Strengths**

- **Field-based learning opportunities.** Numerous Geology class field trips such as the Western Slope Field Conference and the 6-week summer Field Camp course ensure that CMU Geology students gain substantial field experience during their undergraduate careers.

- **Student-faculty research.** Each geology student completes an individual research project that is presented at the CMU Student Showcase and the Grand Junction Geological Society. Students are afforded a large number of research-based learning opportunities outside of the classroom, which help in their preparation for careers in the geosciences as well as graduate studies.

- **Innovative degree options.** The Watershed Science minor and related hydrology-oriented courses are a rare curriculum option for a 4-yr undergraduate institution. The GIS&T minor and certificate program also afford students with additional career options, in addition to traditional Geology careers.

- **Active student club.** The student chapter of the American Association of Petroleum Geologists provides interested students to attend lectures, professional meetings and field trips that enhance their career opportunities.
• **Forrest Nelson Fund.** The generous donation to create the endowed Forrest Nelson Fund permitted the Geosciences Program to allocate $15-25K to student scholarships over the past two years (began in 2019; this will continue into the future). This money is critical to the needs of our under-represented students who have limited financial resources.

**Challenges**

• **Recruitment of Geology majors.** Geology is an “opportunistic” major. Very few (usually <5 based on surveys that the program takes in 200-level courses) students show up at CMU with the intention of majoring in Geology. Like most colleges and universities, Geology majors transfer into the degree program from some other major as a result of taking a 100-level course. One recent innovation to recruit Geology majors is the GeoDay Hike, which is offered over the weekend between Orientation and the first day of classes in fall semester.

• **Equipment and Research Lab space.** We would significantly benefit from 1) a research workroom for describing, processing and analyzing sediment samples and cores (work/dirty lab), 2) a new XRD, and 3) a research-grade XRF.

• **Maintenance of existing equipment.** We do not have adequate human resources to maintain existing equipment such as the XRD. Dr. Bill Hood has done this for the program as an unpaid adjunct faculty member. When Bill Hood “retires” from this role, we will be in trouble.

c. **Discipline trends and future program initiatives in Geosciences**

Environmental geology is currently the main source of employment in the Geosciences. We are undertaking a re-organization of the Environmental Geology B.S. curriculum, and are modernizing the degree by implementing new classes and degree requirements. These changes will go into effect in 2022 and include the addition of a geochemistry course, strengthening of the ground water hydrology requirement, and the creation of a new course that combines surface water hydrology and river dynamics. These courses will also support the Environmental Science curriculum at CMU.

d. **Recommendations**

1) **Infrastructure --** Develop a financial plan for maintaining and replacing existing equipment such as the x-ray diffractometer (~$100K piece of equipment) and procure new research space. Students need more lab facilities (equipment/instrumentation) to work on research projects. We also need help with the maintenance of research-grade equipment – Bill Hood, a retired geologist and non-teaching adjunct, has donated his time and energy to fulfill this role, but relying on Bill is not sustainable in the long term.
2) **Create a Geosciences Program Board** – Solicit professional geologists from the area to help improve student job and funding opportunities as well as to provide advice on program activities and initiatives.

3) **3-D Visualization Lab** – One technologically oriented suggestion is to create a 3-D Visualization Lab. This lab would be used in courses across all levels and for student-faculty research. This type of facility is used elsewhere in the petroleum industry and would significantly enhance technology skills of Geology students.

7. **COVID ADAPTATIONS AND LESSONS LEARNED**

a. **COVID adaptations**

   In March of 2020, the CMU campus transitioned to online course delivery. In Fall of 2020, online delivery continued in conjunction with hybrid (partial in-person and online) courses. Spring and Fall 2021 saw the return of traditional in-person classes supplemented by online courses. COVID impacts on the Geosciences Program teaching were very substantial. Because of our field-based course emphases and our specific field courses (GEOL 113/113L – Field-based Physical Geology & Lab; GEOL 202 - Introduction to Field Studies; GEOL 480 – 6-week Summer Field Camp), the transition to online teaching was disruptive, to put it mildly. Adaptations included the following: GEOL 113 required students to drive themselves on field trips, GEOL 202 was cancelled, and GEOL 480 only enrolled 2 students – we encouraged students to hold off on Field Camp until they could take it over a “normal” summer. Prof. Rex Cole retired in Spring of 2020 and although a faculty search was underway and within days of completion, the position was frozen so that the faculty were short-handed during Fall of 2020 and Spring 2021. Faculty adapted by teaching overloads and teaching courses that they had not taught previously. It was literally all-hands-on-deck. Several of the faculty (Aslan, Fenton) taught 100% online for parts of 2020 and 2021 so the presence of Geosciences faculty on campus was greatly reduced during COVID. As of Fall 2021, the entire faculty are back on campus.

b. **Lessons learned**

   Online teaching has a dramatic impact on teaching geology courses, especially for a field-based program such as ours. The quality of education for students that have taken upper-division geology courses online is probably less than those who previously (pre-COVID) took in-person classes with field components.
APPENDIX A

Curricula Vitae for Full-Time Faculty
ANDRES ASLAN

Dept. of Physical and Environmental Sciences, Geosciences Program
Colorado Mesa University (formerly Mesa State College)
(970) 248-1614, aaslan@coloradomesa.edu

TECHNICAL EXPERTISE & RESEARCH INTERESTS

Geomorphology (Rocky Mountains, Colorado Plateau)
Modern and Ancient Depositional Systems (Mississippi River/Delta, Orinoco Delta)
Quaternary Age Dating and Landscape Evolution (Colorado & Green Rivers)
Sedimentology of Siliciclastic Sedimentary Systems (Colorado Plateau)
Sea Level, Climatic, and Tectonic Influences on Stratigraphic Architecture (Gulf of Mexico)
Detrital Zircon and Sanidine studies (Rocky Mtns, Colorado Plateau)
Paleosols and Paleoclimate Records (Rocky Mtn region)

Research Gate Profile: https://www.researchgate.net/profile/Andres-Aslan/stats
RG Score = 27.6

ADMINISTRATIVE & PROFESSIONAL SERVICE EXPERIENCE
2013-present, Coordinator, Geosciences Program, Colorado Mesa University
Past Chair & Board Member, Rocky Mtn Section, Geological Society of America
Past Member, Advisory Board, CU-Boulder Geosciences
Past Member, CREST (Colorado Rockies Experiment and Seismic Transects)

EDUCATION
Ph.D. Geology (1994)  University of Colorado-Boulder
M.S. Geology (1990)  University of Colorado-Boulder
B.S. Geology (1986)  Brown University

PROFESSIONAL AND TEACHING POSITIONS
Colorado Mesa U.  Geosciences Program Coordinator, 2013 to present
Professor of Geology, 2007 to present
Associate Professor of Geology, 2002-2007
Assistant Professor of Geology, 1999-2002

Mary Washington College, Senior Lecturer, 1997-1998.
Virginia Wesleyan College, Visiting Assistant Professor, 1996-1997.
Oberlin College, Visiting Assistant Professor, 1995-1996.

RESEARCH AND WORK EXPERIENCE SUMMARY
Colorado Mesa University/Mesa State College, Faculty 1999-2021. I have supervised >100
senior theses and have had numerous research students present at local and national geologic meetings. Research projects have included:

1) **Long-term evolution of the Colorado and Green River systems.** Work involves field mapping, detrital zircon/sanidine studies, and cosmogenic dating of fluvial terraces to document spatial and temporal patterns of river incision. Innovative use of detrital sanidine data offers potential to transform dating of fluvial deposits.

2) **Late Cenozoic mantle-driven uplift of the Colorado Rockies.** Combines data on ancient river histories with mantle tomography to decipher Neogene uplift history.

3) **Neogene (U/Th)/He apatite thermochronology and exhumation history of western Colorado.** Complimentary to investigation of river incision histories; HeFTy modeling of He data to constrain exhumation in upper Colorado River basin.

4) **U-Pb detrital-zircon geochronology and paleogeography of Tertiary fluvial systems, southwestern Green River basin, and northwestern Colorado.** Field mapping and DZ data are combined to constrain timing and provenance of late Eocene through Miocene evolution of fluvial systems.

5) **K-T boundary and enigmatic fluvial conglomerates of western Colorado and eastern Utah.** Mapping, stratigraphic studies, and DZ data are used to correlate and interpret conglomeratic units of the Tertiary(?) Dark Cyn Mbr of the Wasatch Fm and the Cretaceous(?) Ohio Ck Conglomerate.

6) **Avulsion history of the Mississippi-Atchafalaya River system, Louisiana.** Used shallow cores and $^{14}$C data to document timing and factors responsible for avulsion of large river systems.

**Courses taught at CMU include:**

Physical Geology, Historical Geology, Natural Hazards & Environmental Geology, Geology of Colorado, Geomorphology, Sedimentology, Senior Seminar, Field Camp, Structured Research

**Homeland Uranium, Inc.,** Sedimentologic consultant 2007-2009. *Sedimentology of uranium-bearing ore deposits in the Salt Wash Mbr. of the Morrison Fm., southwest Colorado (Uravan district).* Duties included field studies, core description, log correlation, resource assessment.

**Bureau of Economic Geology, U. of Texas at Austin,** Project sedimentologist 1998 to 1999. *Geo-environmental study of the Orinoco Delta in Venezuela.* Designed and executed field studies, used remote sensing (radar, Landsat TM) and field data (GPS surveys, shallow cores) to document depositional systems and active geologic processes of the Delta. Member of multidisciplinary team in the Environmental Group at the BEG.


**University of Nebraska,** Sedimentologic consultant summers of 1995 and 1996. *Avulsion, paleosols, and Quaternary evolution of the Colorado and Trinity Rivers, south Texas.* Conducted field, mineralogic, and petrographic studies of Quaternary fluvial deposits and alluvial paleosols along the Texas Coastal Plain. Collaborator: Dr. M.D. Blum (U. Kansas).

1. Holocene evolution of the Mississippi River floodplain, south Louisiana.
Ph.D. dissertation: Field studies including shallow coring of fluvial-deltaic sediments, geologic mapping, and petrographic and geochemical analyses of Holocene floodplain sedimentation and soil formation in the Lower Mississippi Valley.

2. Paleosols and paleohydrology of the Eocene Willwood Fm., Bighorn Basin, WY.
M.S thesis: Used field, petrographic, and geochemical data to decipher depositional and hydrologic histories of alluvial paleosols in Wyoming.


Shell Oil Co. Houston, TX, Geologist in Gulf Coast Tertiary Exploration summer of 1990.

Regional study of deltaic sandstones of the Eocene Wilcox Fm., south Texas. Used electric well logs and correlations to produce a computer database for generating stratigraphic cross sections and sand isopach maps.


RESEARCH GRANTS
$33,000 (2019-present) Detrital sanidine dating of ancient sedimentary rocks. Unconventional Energy Center, Colorado Mesa U.

ADMINISTRATIVE AND SERVICE EXPERIENCE
Geosciences Program Coordinator & Faculty Member. >20 years of experience teaching; the last 5 years coordinating the Geosciences program at CMU. Coordinator duties include supervising program activities, organizing faculty schedules and teaching assignments, review of program budgets and geosciences CMU Foundation accounts, coordinating program initiatives, and serving as the point person for Geology activities on campus. Faculty duties include teaching 10-12 classes per year, maintaining a research program that involves undergraduate students, serving on campus-wide committees, advising students, and maintaining an active professional role in the Geosciences community. To do all of the above, especially given the significant teaching load, requires strong organizational and time-management skills. Specific contributions that I have made to the CMU campus and the Geosciences program include:

Coordinator of the Student Scholars Symposium for ~10 years prior to its transformation to a campus-wide event (Student Showcase). I kept the Symposium “alive” until
it was recognized that this valuable student-centered activity should be made into a campus-wide event.

**Geosciences Senior Day** – I created this event to honor graduating seniors, recognize specific students for individual achievement, and to prepare seniors for their capstone presentations, which they then present to the Grand Jct Geological Society and at the Student Showcase. I organize and “emcee” this event each year.

**Geosciences presentations to the Grand Jct Geological Society** – I am in charge of organizing all the senior student presentations at the April GJGS meeting each year.

**Spring Geosciences program field trip** – I developed a spring field trip (the Adam Trumbo Memorial Field Trip) to provide the program with a spring “event” to allow students and faculty to interact each year in a meaningful way.

**Western Slope Field Conference** – I am the main faculty member that attends and organizes student attendance at this annual event among CMU, Western State, and Ft. Lewis College.

**CMU. Tenure & Promotion Committee (numerous years), Pre-Tenure & Promotion Committee (past Chair), Student Showcase/Scholars Day (past Chair), Professional Development Fund (past Chair), Faculty Search Committees (past Chair)**

**Chair & Board Member, Rocky Mt Section, Geological Society of America.** From 2011-2014 served the Rocky Mt Section of GSA organizing board meetings, reviewing financial information, developing initiatives, reviewing grant proposals.

**CREST (Colorado Rockies Experiment and Seismic Transects) project.** Participated from 2007-2010 in multi-disciplinary Geology research program involving ~10 U.S. geology institutions and ~30 researchers with expertise in seismology, geodynamics, structural geology, stratigraphy, geochronology, geochemistry, thermochronology, and geomophology. This project provided me with invaluable experience with regard to working on a large-scale project involving a wide range of scientific expertise.

**SELECTED PROFESSIONAL ACTIVITIES**

2019 – Theme session co-Chair, GSA National Meeting, Phoenix  
2018 – Theme session co-Chair, Rocky Mt Section, GSA Meeting  
2016 – Theme Session co-Chair and Field Trip Leader, GSA National Meeting  
2011-2014 –Chair & Mbr Rocky Mt Section Mgt Board, Rocky Mt Section of GSA  
2013 – Theme Session Chair and Field Trip Leader, GSA National Meeting  
2010 – Theme Session Chair and Field Trip Leader, GSA National Meeting  
2007 – Theme Session Chair and Field Trip Leader, GSA National Meeting  
2005 – Technical Program Co-Chair, GSA Rocky Mt Section meeting  
2005 - Field Trip Leader, GSA Rocky Mountain Section Meeting  
2005 - Technical Session Co-Chair, GSA Rocky Mountain Section Meeting  
2001 - Field Trip Leader 7th International Fluvial Sedimentology Conference

**PEER-REVIEWED JOURNALS & BOOK CONTRIBUTIONS (CMU faculty/students in bold):**

America Bulletin.


Potter-McIntyre, S., Boraas, M., DePriest, K., and Aslan, A. 2016, Middle Jurassic landscape evolution of southwest Laurentia using detrital zircon geochronology. Lithosphere. doi:10.1130/L467.1


Darling, A.L., Karlstrom, K.E., Granger, D.E., Aslan, A., Kirby, E., Ouimet, W.B., Lazear,


Aslan, A., Karlstrom, K., Hood, W., Cole, R.D., Oesleby, T., Betton, C., Sandoval, M., Darling,


**ADDITIONAL GUIDEBOOK ARTICLES:**


UNPUBLISHED REPORTS:


ABSTRACTS:


Schlag, J., Aslan, A., Cole, R.D., Heizler, M.T. 2020. 40Ar/39Ar Dating of Detrital Sanidine in the Goodenough Unit, Grand Mesa, Colorado. Abstract accepted for the Rocky Mt Section of the American Association of Petroleum Geologists meeting, meeting was cancelled.


duration of incision along the Colorado River near Rifle, CO suggest a tectonic driver for post-10 Ma landscape evolution. Geological Society of America, Abstracts with Program, v. 51, no. 7.


Aslan, A., Karlstrom, K.E., Heizler, M., Kirby, E., Granger, D., Hanson, P., Feathers, J., and Mahan, S. 2018. Controls on patterns of upper Colorado River bedrock incision, Geological Society of America Abstracts with Programs, Rocky Mountain Section 70th meeting, v. 50, no. 5.


Karlstrom, K.E., Liu, Lijun, Aslan, A., Quan, Zhou, and Heizler, M.T. 2018. Ongoing mantle-driven uplift of the Colorado Plateau-Rocky Mountain region, Geological Society of America Abstracts with Programs, Rocky Mountain Section 70th meeting, v. 50, no. 5.

Heizler, M., Karlstrom, K.E., and Aslan, A. 2018. Detrital sanidine geochronology: breakthrough method for dating sedimentary rocks, Geological Society of America Abstracts with Programs, Rocky Mountain Section 70th meeting, v. 50, no. 5.


Jarrin, D., Aslan, A., Mahan, S., and Hanson, P. 2016. Geochronology of Late Pleistocene glacial deposits near Ridgway, Colorado, northern San Juan Mountains, Geological Society of America Abstracts with Programs. v. 48, no. 7.

Ragsdale, J., Lohse, R., Metcalf, J., and Aslan, A. 2016. Apatite (U/Th)/He geochronology and erosional history Grand and Battlement Mesas, western Colorado: implications for late
Cenozoic erosional history of the upper Colorado River basin, Geological Society of America Abstracts with Programs. v. 48, no. 7.


Aslan, A. and Hanson, P. 2009. Late Pleistocene Colorado River terraces, western Colorado: a test of the stream power model. Geological Society of America Abstracts with Programs,


* Awarded Outstanding Student Paper at the 2006 Rocky Mountain Section of the Geological Society of America meeting, Gunnison, Colorado.


Baker, G. and Aslan, A. 2005. Integrating geology and geophysics to determine the origin of Unaweep Canyon and Late Cenozoic fluvial incision in the Colorado Plateau-Rocky Mountain region. GSA Abstracts with Programs.


Aslan, A., Autin, W.J. and Blum, M.J. 2001. Responses of the Mississippi and Texas Coastal Plain Rivers to Late Quaternary Sea-Level Rise, 7th International Fluvial Sedimentology Conference, Abstract with Programs p. 49.


Aslan, A., Riley, A., and Blum, M.D. 1997. Late Quaternary incised valley fills and alluvial
paleosols of the Colorado River, Texas Coastal Plain, GSA Abstracts with Programs, v. 29, n. 6, p. 113.


21, no. 6, p. 127.

CURRICULUM VITAE

Name: GREGORY S. BAKER
Address: Colorado Mesa University
         Grand Junction, CO
Tel: 865-771-2819
Email: gbaker@coloradomesa.edu
Web: www.geoavatar.com

Education
Ph.D., Geology (Honors), “Seismic Imaging Shallower than Three Meters,” The University of
Kansas, Lawrence, Kansas, 1999 (Don W. Steeples, Advisor).

M.S., Geological Sciences, “An Examination of Triassic Cyclostratigraphy in the Newark Basin
from Shallow Seismic Profiles and Geophysical Logs,” Lehigh University, Bethlehem,

B.S., Geological Sciences (Honors), “Paleomagnetic Evidence for Block Rotation in the
Fransiscan Terrane, Point San Pedro, CA,” Lehigh University, Bethlehem, Pennsylvania,
1992 (Kenneth P. Kodama, Advisor).

Professional Experience
Assoc. Professor of Geology, Dept. of Physical & Env. Sci., Colorado Mesa Univ., 2019-present
Pilot/Owner/Operator, GeoAvatar Inc., Drone Solutions, 2016-present
Adjunct Associate Professor, Geology, University of Kansas, 2017-present
Adjunct Associate Professor, Geology & Geological Engineering, South Dakota School of Mines
& Technology, 2014-present
Instructor, Johnson County Community College, 2018-present
Visiting Associate Professor, Geology, University of Kansas, 2015-2016
Adjunct Associate Professor, Environmental Studies, Illinois Wesleyan University, 2014-2015
Jones/Bibee Endowed Associate Professor of Geophysics, Dept. of Earth and Planetary Sciences,
Research Associate Professor, Dept. of Geology, University at Buffalo, 2005-2012
Technical Chair, Environmental & Engineering Geophys. Soc. conference (SAGEEP), 2011
Board of Directors, Environmental & Engineering Geophysical Society, 2007-2010
Editorial Board Member, The Leading Edge, 2010-2013
Associate Editor, Journal of Geoscience Education, 2006-2009
Associate Editor, Geophysics, 2001-2004
Visiting Instructor, National Science Foundation Research Experience for Undergraduates
Research Assistant, Dept. of Geology, University of Kansas, 1996-1999
Research Assistant, Dept. of Earth and Env. Sci., Lehigh University, 1995-1996
Funding

Pending Support


Active Support

1. No current active support. All previous projects completed.

Recent Support (2001 – present) in Reverse Chronological Order of End Date

1. U.S. Department of Energy ($412,000; Sole Investigator; UT-B 4000059241), “Multiscale investigations on the rates and mechanisms of targeted immobilization and natural attenuation of metal, radionuclide, and co-contaminants in the subsurface” Total attributed to UT: $412,000; 100% to GSBaker). Active 2/1/07-1/31/13.
2. TASC, Inc. ($292,000; PI), “Geophysical Technologies for Underground Tunnel and Facilities Detection and Characterization” (Total attributed to UT: $292,000; 50% to GSBaker). Active 1/1/10-12/31/10.
3. National Science Foundation ($81,609; PI; GEO-0704077), “OEDG Phase 1: Enhancing Diversity via Targeted Education and Outreach Through the East Tennessee Geosciences Program (ETGP)” Total attributed to UT: $81,609; 90% to GSBaker). Active 06/01/07-05/31/10.
4. U.S. Department of Agriculture ($61,080; Sole Investigator; USDA-06-JV-11221682-040), “Using Near Surface Geophysics to Understand Alluvial Fans and Meadow Complexes in the Central Great Basin” Total attributed to UT: $61,080; 100% to GSBaker). Active 08/01/03-07/30/09.
5. National Science Foundation ($604,561; PI; GEO-0119871), “Enhancing Diversity in Buffalo, New York, Area Geoscience Programs” Total attributed to UB: $604,561; 90% to GSBaker). Active 1/1/02-12/31/06.
6. National Science Foundation ($32,000; Sole Investigator; INT-0243524), “Archaeological Geophysics in Humayma, Jordan” Total attributed to UB: $32,000; 100% to GSBaker). Active 6/1/03-6/1/06.
7. Social Sciences and Humanities Research Council of Canada ($230,752; Project Director), “Excavation and study of the Roman fort, bath, and associated settlement at Hawara (modern Humayma), Jordan” Total attributed to UB: $0 (Research expenses paid by PI through the University of British Columbia); 0% to GSBaker. Active 5/1/02-9/1/06.
8. The Taggert Foundation (Private) ($10,332; Sole Investigator), “Excavation and study of the Roman fort, bath, and associated settlement at Hawara (modern Humayma), Jordan” Total
attributed to UB: $10,332; 100% to GSBaker. Active 5/1/02-9/1/06. (Used to cover student salary not covered through the SSHRC grant.)

9. University of Tennessee College of Arts & Sciences Instructional Equipment Grant ($10,000, PI), “Acquisition of Ground Conductivity Equipment” Total attributed to UT: $10,000; 100% to GSBaker. Active 1/1/06-6/1/06.

10. U.S. Department of Agriculture, Forest Service ($20,080; Sole Investigator), “Phase 2: Using Near Surface Geophysics to Understand Alluvial Fans and Meadow Complexes in the Central Great Basin” Total attributed to UT: $20,080; 100% to GSBaker. Active 12/31/05-12/31/06.

11. U.S. Department of Defense ($233,833; Sole Investigator; DACA42-01-C-0051), “Using Near-Surface Seismic Techniques for Improved Environmental Site Characterization” Total attributed to UB: $233,833; 100% to GSBaker. Active 10/20/01-10/19/06.

12. National Science Foundation ($118,443; Co-PI; GEO-0207720), “Integrating Hydraulic, Tracer, and Geophysical Methods to Image Flow-Channeling Behavior in Fractured Bedrock” Total attributed to UB: $118,443; 50% to GSBaker. Active 8/1/02-7/31/05.

13. U.S. Department of Agriculture, Forest Service ($61,170; Sole Investigator), “Phase 1: Using High Resolution Seismic Data to Understand Alluvial Fans and Meadow Complexes in the Central Great Basin” Total attributed to UB: $61,170; 100% to GSBaker. Active 6/1/03-5/31/06.

14. National Science Foundation ($38,529; Sole Investigator), “Acquisition of Equipment for Investigating Coincident Seismic and GPR Imaging” Total attributed to UB: $38,529; 100% to GSBaker. Active 8/1/00-7/31/02.

15. National Science Foundation TEA Supplement ($10,100; Sole Investigator), “Geophysical Investigations of Ice Flow Velocities on the Matanuska Glacier” Total attributed to UB: $10,100; 100% to GSBaker. Active 6/1/02-7/31/03.

16. National Science Foundation TEA Supplement ($10,100; Sole Investigator), “Geophysical Investigations on the Matanuska Glacier” Total attributed to UB: $10,100; 100% to GSBaker. Active 6/1/01-7/31/02.

17. Seismic Mocro-Technology (SMT), Inc. ($495,161; Sole Investigator), Software grant for 16 licenses of KINGDOM Suite+ including annual maintenance fee. Total attributed to UB: $495,161; 100% to GSBaker. Active 8/1/03-8/1/06.

18. Environment and Society Institute (Univ. at Buffalo) Environmental Management Alternatives Program ($19,900; Principal Investigator), “Integrated geophysical, geochemical, and structural site characterization near the West Valley Demonstration Project” Total attributed to UB: $19,900; 60% to GSBaker. Active 9/1/2000-10/30/01.

19. University at Buffalo Environmental Management Alternatives Program (EMAP) ($21,793; Principal Investigator), “Integrated Geophysical, Geochemical, and Structural Site Characterization Near the West Valley Demonstration Project” Total attributed to UB: $21,793; 50% to GSBaker. Active 10/1/00-12/30/01.

20. University at Buffalo Pilot Program $21,793; Principal Investigator), “Direct detection of nonaqueous-phase liquid contaminants using amplitude-variation-with-offset analysis on ground penetrating radar data” Total attributed to UB: $15,000; 60% to GSBaker. Active 8/1/2000-10/30/01.

21. University at Buffalo Faculty Educational Technology Development Grant ($8,988, Co-PI), “Hydrogeophysical monitoring at the Duttweiller Property” Total attributed to UB: $8,988; 50% to GSBaker. Active 6/1/02-9/30/03.
22. U.S. Coast Guard Support Center, Elizabeth City, North Carolina ($2,756: co-PI), "Field testing APVO analysis of GPR data across a site containing an extensive jet propellant release" Active 6/1/02-12/31/02.

23. U.S. Department of Defense, Mayport, Florida ($5,955: co-PI), "Field testing APVO analysis of GPR data across a site containing an extensive diesel fuel release" Active 6/1/02-12/31/02.


Publications

ORCID: 0000-0003-4184-8000
SCOPUS AUTHOR ID: 36764687100
CURRENT H-INDEX ESTIMATES: 21 (Google Scholar); 18 (ResearchGate); 16 (Scopus)
CURRENT i10 INDEX ESTIMATES: 29 (Google Scholar)
TOTAL CITATIONS ESTIMATES: 1391 (Google Scholar); 1051 (ResearchGate); 760 (Scopus)
TOTAL READs ESTIMATE: 25,260 (ResearchGate)
RG SCORE ESTIMATE: 26.30 (ResearchGate)
RESEARCH ITEMS: 161 (Google Scholar); 117 (ResearchGate); 68 (Scopus)

Books, Monographs, Edited Volumes (* denoted supervised student)


Refereed Journal Articles (* denoted supervised student) in Chronological Order

Published

First-Authored Publications

quality: Invited contribution to *The Leading Edge* Special Issue, 27, 1526-1534.


**Supervised-Student Authored Publications**


**Other Peer-Reviewed Publications**


Nonrefereed Publications (* denoted supervised student) in Chronological Order


**Conference Proceedings in Chronological Order**

*Invited Abstracts (* denoted supervised student)*


Plain Formation, and Glaciotectonics, Matanuska Glacier, Alaska: Eos, Transactions, American Geophysical Union, Spring Meeting.

Abstracts Resulting in Awards (* denoted supervised student)


First-Authored, Peer-Reviewed Expanded Abstracts (* denoted supervised student)


*Student-Authored, Peer-Reviewed Expanded Abstracts (* denoted supervised student)


*Abstracts for International Meetings (* denoted supervised student)

First-Authored & Presented Abstracts (* denoted supervised student)


Student Authored, Student Presented Abstracts (* denoted supervised student)


Detection: *Eos. Trans. AGU* 89(53), Fall Meeting Suppl., Abstract IN51C-1177.


17. *Stokes, P.J., Baker, G.S., Laub, R.S., Briner, J.P.,* 2007, Correlating georadar facies to subsurface lithology: An approach to understanding the Late Quaternary Hiscock Site, western New York State: *Geological Society of America Abstracts with Programs*.


*Other Abstracts (* denoted supervised student)*


Stochastic inversion of seismic refraction data with borehole depth constraints for watershed-scale characterization of aquifer geometry: *Eos. Trans. AGU* 89(53), Fall Meeting Suppl., Abstract H44C-06.


72

Professional Service

Short Courses/Workshops

19. “Near-Surface Seismic Reflection Data Acquisition & Processing” Workshop, Department of Geology and Geophysics, Texas A & M, invited workshop, College Station, TX, April 2006.

Technical Program Chair


Technical Program Committee Member

Professional Meeting Session Advocate/Convener

1. Savor the Cryosphere, Society of America 2015 Annual Meeting, Baltimore MD.
2. Practical Faculty-Related Issues Associated with Classroom Transformation, Society of America 2015 Annual Meeting, Baltimore MD.
12. Recent Advances in Hydrogeophysics, Geological Association of Canada, the Mineralogical Association of Canada 2004 Annual Meeting, St. Catharines, ON, Canada.

Professional Meeting Session Chairman/Co-Chairman

1. Savor the Cryosphere, Society of America 2015 Annual Meeting, Baltimore MD.
2. Practical Faculty-Related Issues Associated with Classroom Transformation, Society of America 2015 Annual Meeting, Baltimore MD.

Organizational Memberships and Offices Held

1. American Geophysical Union, Member, 1994-present
2. Environmental and Engineering Geophysics Society
   Member, 1998-present
   Member At Large, Board of Directors, 2006-2010
3. Geological Society of America, Member, 1993-present
4. National Association of Geoscience Teachers (NAGT), Member, 1999-present
   Member, NAGT/USGS/AASG cooperative group, 2003-2010
5. NSCOMM, Inter-Society Committee for the Advancement of Near-Surface Geophysics.
   Composed of Rosemary Knight-Stanford Univ, Jeff Daniels-Ohio State Univ; Louise
   Pellerin-European SEG representative; Jeff Wynn-US Geological Survey and 2002
   president of the EEGS society; Susan Hubbard-Lawrence Berkley Nat’l Lab; Pat Berge-
   Lawrence Livermore Nat’l Lab, and Gregory S Baker EEGS representative
6. Sigma Xi (Full Member), 2000-present
7. Society of Exploration Geophysicists: Elected Active Member 1999-present
   Past-President of Near-Surface Geophysics Section of SEG, 2004-2005
   President of Near-Surface Geophysics Section of SEG, 2003-2004
   President-Elect of Near-Surface Geophysics Section of SEG, 2002-2003
   Vice-President of Near-Surface Geophysics Section of SEG, 2001-2002
   Editor of the Near-Surface Geophysics Section bimonthly newsletter, 2000-2001
   Secretary of Near Surface Geophysics Section of SEG, 1999-2000
Scientific Reviews

Journal Manuscript Reviews


Grant Proposal Reviews

3. Natural Environment Research Council (1, 2000; 1, 2002; 1, 2005; 1, 2009)
4. Swiss National Science Foundation (1, 2009)

Abstract Reviews


Book Reviews

1. American Association for the Advancement of Science (2, 2000; 1, 2001; 1, 2002; 1, 2003; 1, 2007)
Invited Lectures and Presentations (without published abstract)

1. “Advances in Hydrogeophysics” Invited seminar presented to the Department of Physical & Environmental Sciences, Colorado Mesa University, April 2019.
2. “Advances in Hydrogeophysics” Invited seminar presented to the Department of Geology, Slippery Rock University AND The Pittsburgh Geological Society, Pittsburgh, Jan 2012.
3. “Advances in Hydrogeophysics” Invited seminar presented to the Department of Geology, West Chester University, West Chester PA, November 2012.
4. “Advances in Hydrogeophysics” Invited seminar presented to the Department of Geology & Geophysics, Univ. of Wyoming, Laramie, September 2012.
5. “Improving student comprehension of scientific and societal complexities associated with energy resources through a field-based strategy” Invited workshop presentation for a workshop on Teaching Energy Awareness: Understanding Sources and Uses sponsored by the Climate Literacy and Energy Awareness (CLEAN) Pathway project, April 2011.
6. “Advances in Hydrogeophysics” Invited seminar presented to the Department of Geology, Univ. of Kentucky, Lexington, October 2010.
7. “Advances in Hydrogeophysics” Invited seminar presented to the Department of Geology, Williams College, Massachusetts, April 2010.
8. “Geophysics for Water Resources and Contaminants” Invited seminar for EEGU (the public educational forum of the Environmental and Engineering Geophysical Society), Fort Worth TX, April 2009.
12. "Recent advances of seismic applications in environmental geophysics," Invited lecture presented at the International Conference on Environment and Engineering Geophysics (ICEEG), Wuhan, China, June 16-20, 2008. (Special invited guest of the China University of Geosciences.)
13. “Advances in Hydrogeophysics” Invited seminar presented to the Department of Geology and Geophysics, Texas A & M, invited workshop, College Station, TX, April 2006.
27. “Geophysical Reflection Imaging of Near-Surface Stratigraphy,” Invited seminar presented to the Dept. of Geology at Wright State University, April 8, 1999.
30. “Geophysical Reflection Imaging of Near-Surface Stratigraphy,” Invited seminar presented to the Dept. of Earth and Atmospheric Science at Purdue University, March 2, 1999.

Public Relations/Publicity
1. “Understanding the KY earthquake,” interviewed by Ben Senger and filmed, WBIR Channel 10 news, and aired on 11/8/12.
2. “University professor incorporates Japan earthquake tragedy into course,” interviewed by Ben Senger and lecture/students filmed, WBIR Channel 10 news, and aired on 4/8/11.
5. “Knoxville roofs catch some rays—solar tour to display panels at private homes/businesses,” interviewed by David Smith, Knoxville News Sentinel, and published 9/30/08.
6. “Karst and sinkholes in East Tennessee,” interviewed by Ben Senger, WBIR Channel 10 news, and aired on 2/24/06.

Professional and Academic Honors in Chronological Order

2. TASC, Inc. (The Analytic Sciences Corporation), Recognition Award (“For outstanding contributions to TASC in the 2010 IRAD Program”), September 15 2010.
3. Early Career Award, awarded in 2008 by the Environmental & Engineering Geophysical Society, to acknowledge “academic excellence in the field of near-surface geophysics.” The award, presented annually to a full-time faculty member who is within ten years following completion of the Ph.D., acknowledges “significant and ongoing contributions to environmental and engineering geophysics.”
4. Quest Scholar of the Week, University of Tennessee, April 10 2009
5. Outstanding Service award, Near-surface Geophysics Section of the Society of Exploration Geophysicists, Presented Fall 2005
6. Certificate of Recognition, University at Buffalo Class of 2003 “Year After Graduation”
Student Survey of Undergraduate and Graduate Students, Presented Spring 2005
7. Selected to University at Buffalo, College of Arts and Sciences Honor Roll of Top Teachers, 2003-2004
8. Selected to University at Buffalo, College of Arts and Sciences Honor Roll of Top Teachers, 2002-2003
9. Selected to University at Buffalo, College of Arts and Sciences Honor Roll of Top Teachers, 2001-2002
10. Milton Plesur 2001 Excellence in Teaching Award, presented by the Student Association of the University at Buffalo (SUNY) to recognize teaching excellence and commitment to students. Recipients of the Plesur award are student-nominated and selected.
11. Top-25 ranked technical presentation (out of 587) at Society of Exploration Geophysicists (SEG) 1999 National meeting
12. Erasmus Haworth Graduate Honors Award for Outstanding Doctoral Student, Dept. of Geology, Univ. of Kansas, 1999
13. Outstanding Graduate Teaching Award, Dept. of Physics and Astronomy (Intro. to Meteorology), Univ. of Kansas, 1998
14. Dean A. McGee Scholarship, Dept. of Geology, Univ. of Kansas, 1996 - 1998
16. Donnel Foster Hewett Award, Dept. of Earth and Env. Sci., Lehigh University, 1992
17. Top Field Geologist Award, Dept. of Earth and Env. Sci., Lehigh University, 1991

University Service (Colorado Mesa University, 2019-present)

University
1. Assessment Committee, 2020-present
2. Ad Hoc Essential Learning Working Group, 2020-2021
3. Sabbatical Committee, 2019-present
4. Steering Committee for CMU Water Ed Needs Assessment, Hutchins Water Center, 2020-present
5. Participant in CRM Advise training workshop, February 2020
6. Mesa Experience representative, PES, February 2020 & October 2019
7. Table Host, Etiquette Dinner, Sponsored by Career Services, Fall 2020 & Fall 2019

Department of Physical and Environmental Sciences
1. Majors Fair Department Representative, Spring 2021
2. Assessment Coordinator, Dept. of Physical & Environmental Sciences, 2020-present
3. Faculty advisor, Sigma Gamma Epsilon (SGE) Honors Society, Zeta Nu Chapter, 2019-present
4. Search committee member, Field Camp Instructor, 2020-2021
5. Faculty search committee member, Clastic Sedimentologist, 2019-2020
**Geology Program**
1. Ad Hoc Committee: Environmental Geology Major & Watershed Science Minor curriculum redesign, 2019-present

**University Service (University of Kansas, 2015-2019)**

**University**
1. N/A

**College of Arts and Sciences**

**Department of Geology**
1. Introductory Course Lab Redesign, Dept. of Geology, 2016

**University Service (University of Tennessee, 2005-2014)**

**University**
1. Undergraduate Council, 2012-2014
2. Ambassador: University of Tennessee Teaching & Learning Center (TENN TLC), 2009-2014
3. Member: Classroom & Instructional Technology Improvement Subcommittee (Dr. Bill Dunne, Subcommittee Chair), 2006-2010
4. Member: Synchronous Learning Task Force (Dr. Bill Dunne, Task Force Chair), 2007-2008

**College of Arts and Sciences**
1. Undergraduate Curriculum Committee, College of Arts and Sciences, 2012-2014
2. Undergraduate Advisor, College of Arts and Sciences Advising Center, 2005-2009
3. Member, Earth & Planetary Sciences Department Head search committee, 2008-2009

**Department of Earth & Planetary Sciences**
1. Director of Undergraduate Studies, Dept. of Earth and Planetary Sciences, 2010-2012
3. Chair, Departmental Teaching Peer Review Committee (Dr. Devon Burr), 2011
5. Chair, Adjunct Faculty Appointments Committee, 2008-2010
6. Chair, Departmental Teaching Peer Review Committee (Dr. Micah Jessup), 2009
7. Chair, Geology Introductory Course Sequence Evaluation Committee (GICSEC), 2006-2007
8. Member: Faculty Search Committee, Structural Geologist Position, Fall 2005
University Service (University at Buffalo, 1999-2005)

University
1. Alternate Representative, University at Buffalo Faculty Senate, 1999-2004
2. Founder, *University at Buffalo Journal of Undergraduate Research* (UBJUR), 2001
3. Editor, *University at Buffalo Journal of Undergraduate Research* (UBJUR), 2001-2005

College of Arts and Sciences
1. Member, College of Arts and Sciences Student Academic Life Committee, Univ. at Buffalo, 2000-2004

Department of Geology
1. Director of Undergraduate Studies, Department of Geology, 2000-2005
2. Director, Summer Geology Field Program (“Field Camp”), Department of Geology, 2001-2005
3. Departmental Web Site Supervisor, Dept. of Geology, 2000-2004
4. Chairman, Department of Geology Rock Garden Committee, Dept. of Geology, 2000-2002
5. Member, Technician Search Committee, Dept. of Geology, 2002
6. Member, BS Degree Program Development Committee, Dept. of Geology, 2000
7. Member, Introductory Course Restructuring Committee, Dept. of Geology, 2000-2002

Community Service
2. Member, 2009 Knox County Solar Tour, Knoxville TN, 2009, 2010
3. Pro-bono consulting for Old Virginia Beaureu of Investigation, Roanoke VA, 2007
4. Board of Directors, Western New York Land Conservancy, East Aurora, NY, 2000-2004
5. Pro-bono consulting for Old Fort Niagara Association at the Fort Niagara Site, Niagara Falls, NY, 2001-2004
6. Pro-bono consulting for Gettysburg Historical Association at a site near the Gettysburg battlefield, Gettysburg, PA, 2002-2004
7. Pro-bono consulting for Buffalo Conservation Coalition at the Erie Canal Terminus Site, Downtown Buffalo, NY, 2000
### Courses Taught (Colorado Mesa University, 2019-present)

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course*</th>
<th>Title</th>
<th>Credit Hours</th>
<th>Enrol.</th>
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</thead>
<tbody>
<tr>
<td>Summer 2021</td>
<td>GEOL 480</td>
<td>Summer Field Camp (taught 2 weeks out of 6 total)</td>
<td>2 (6)</td>
<td>16</td>
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<tr>
<td>Spring 2021</td>
<td>GEOL100</td>
<td>Survey of Earth Science</td>
<td>3</td>
<td>28</td>
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<tr>
<td>Spring 2021</td>
<td>GEOL 113/113L</td>
<td>Field Based Introduction to Physical Geology</td>
<td>4</td>
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<tr>
<td>Spring 2021</td>
<td>GEOL496/496L</td>
<td>Topics: Introduction to Drones in the Earth Sciences</td>
<td>4</td>
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<tr>
<td>Fall 2020</td>
<td>GEOL 100</td>
<td>Survey of Earth Science</td>
<td>3</td>
<td>33</td>
</tr>
<tr>
<td>Fall 2020</td>
<td>GEOL 103</td>
<td>Weather and Climate</td>
<td>2</td>
<td>97</td>
</tr>
<tr>
<td>Fall 2020</td>
<td>GEOL 113/113L</td>
<td>Field Based Introduction to Physical Geology</td>
<td>4</td>
<td>16</td>
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<tr>
<td>Fall 2020</td>
<td>GEOL 415/415L</td>
<td>Introduction to Ground Water</td>
<td>4</td>
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<tr>
<td>Summer 2020</td>
<td>GEOL 496</td>
<td>Topics: Field Methods in Hydrogeology</td>
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<td>GEOL100</td>
<td>Survey of Earth Science</td>
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<td>Field Based Introduction to Physical Geology</td>
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<td>Introduction to Ground Water</td>
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<td>GEOL 100</td>
<td>Survey of Earth Science</td>
<td>3</td>
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<td>Fall 2019</td>
<td>GEOL 103</td>
<td>Weather and Climate</td>
<td>2</td>
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<td>GEOL 111L</td>
<td>Geology Laboratory (Section 001)</td>
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<td>Fall 2019</td>
<td>GEOL 111L</td>
<td>Geology Laboratory (Section 007)</td>
<td>1</td>
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<td>Fall 2019</td>
<td>GEOL 355</td>
<td>Basic Hydrology</td>
<td>3</td>
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### Courses Taught (University of Kansas, 2015-2017)

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course*</th>
<th>Title</th>
<th>Credit Hours</th>
<th>Enrmt.</th>
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</thead>
<tbody>
<tr>
<td>Fall 2017</td>
<td>Geology 171</td>
<td>Earthquakes and Natural Disasters</td>
<td>3</td>
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<td>Fall 2017</td>
<td>Geology 103</td>
<td>Introductory Geology Laboratory</td>
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<tr>
<td>Spring 2016</td>
<td>Geology 171</td>
<td>Earthquakes and Natural Disasters</td>
<td>3</td>
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<td>Fall 2015</td>
<td>Geology 775</td>
<td>Near Surface Seismology</td>
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### Courses Taught (Johnson County Community College, 2018-2019)

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<th>Semester</th>
<th>Course*</th>
<th>Title</th>
<th>Credit Hours</th>
<th>Enrmt.</th>
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<tbody>
<tr>
<td>Winter 2018</td>
<td>JCCC 2675</td>
<td>Part 107 Test Preparation for Drone Pilot License</td>
<td>1</td>
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</tr>
<tr>
<td>Summer 2018</td>
<td>JCCC 2675</td>
<td>Part 107 Test Preparation for Drone Pilot License</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
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<td>JCCC 2675</td>
<td>Part 107 Test Preparation for Drone Pilot License</td>
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### Courses Taught (South Dakota School of Mines and Technology, 2014-2018)

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course*</th>
<th>Title</th>
<th>Credit Hours</th>
<th>Enrmt.</th>
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</thead>
<tbody>
<tr>
<td>Summer 2018</td>
<td>Geology 410</td>
<td>Field Geology (South Dakota and Wyoming)</td>
<td>6</td>
<td>21</td>
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<tr>
<td>Summer 2017</td>
<td>Geology 410</td>
<td>Field Geology (South Dakota and Wyoming)</td>
<td>6</td>
<td>28</td>
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<tr>
<td>Summer 2016</td>
<td>Geology 410</td>
<td>Field Geology (South Dakota and Wyoming)</td>
<td>6</td>
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<td>Geology 410</td>
<td>Field Geology (South Dakota and Wyoming)</td>
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<td>Summer 2014</td>
<td>Geology 410</td>
<td>Field Geology (South Dakota and Wyoming)</td>
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### Courses Taught (Illinois Wesleyan University, 2014-2015)

<table>
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<th>Credit Hours</th>
<th>Enrmt.</th>
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<tbody>
<tr>
<td>Spring 2015</td>
<td>ENST 110</td>
<td>Earth Systems Science</td>
<td>3</td>
<td>25</td>
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<tr>
<td>Fall 2014</td>
<td>ENST 115/PHYS 120</td>
<td>Energy and Society</td>
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<td>14</td>
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<td>ENST 110</td>
<td>Earth Systems Science</td>
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<td>14</td>
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<tr>
<td>Spring 2014</td>
<td>ENST 270</td>
<td>Introduction to GIS</td>
<td>3</td>
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<td>Spring 2014</td>
<td>ENST 110</td>
<td>Earth Systems Science</td>
<td>3</td>
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### Courses Taught (University of Tennessee, 2005-2013)

<table>
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<th>Course*</th>
<th>Title</th>
<th>Credit Hours</th>
<th>Enrmt.</th>
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</thead>
<tbody>
<tr>
<td>Spring 2013</td>
<td>Geology 548</td>
<td>Sequence Stratigraphy</td>
<td>3</td>
<td>4/8</td>
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<tr>
<td>Spring 2013</td>
<td>Geology 596</td>
<td>Oral Communication of Scientific Ideas</td>
<td>1</td>
<td>10</td>
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<tr>
<td>Fall 2012</td>
<td>Geology 101</td>
<td>Dynamic Earth</td>
<td>4</td>
<td>213</td>
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<td>Spring 2012</td>
<td>Geology 471</td>
<td>Applied Geophysics</td>
<td>3</td>
<td>16</td>
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<tr>
<td>Fall 2012</td>
<td>Geology 101</td>
<td>Dynamic Earth</td>
<td>4</td>
<td>283</td>
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<tr>
<td>Spring 2011</td>
<td>Geology 470/570</td>
<td>Applied Geophysics</td>
<td>3</td>
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<td>Fall 2010</td>
<td>Geology 101</td>
<td>Dynamic Earth</td>
<td>4</td>
<td>148/0</td>
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<tr>
<td>Spring 2010</td>
<td>Geology 590</td>
<td>Sequence Stratigraphy</td>
<td>4</td>
<td>3/9</td>
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<td>Dynamic Earth</td>
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<td>Geology 107</td>
<td>Honors: Energy Resources Field Course</td>
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<td>Spring 2009</td>
<td>Geology 470</td>
<td>Applied Geophysics</td>
<td>3</td>
<td>10/3</td>
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<tr>
<td>Spring 2009</td>
<td>Geology 675</td>
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<td>Fall 2008</td>
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<td>Semester</td>
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<tr>
<td>Sum 2008</td>
<td>Geology 471</td>
<td>TINGS (Near-Surface Geophysics Field Course)</td>
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<td>Spring 2008</td>
<td>Geology 590</td>
<td>Sequence Stratigraphy</td>
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<td>0/6</td>
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<td>Fall 2007</td>
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<td>Dynamic Earth</td>
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<td>Fall 2006</td>
<td>Geology 101</td>
<td>Dynamic Earth</td>
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<td>Sum 2006</td>
<td>Geology 471</td>
<td>TINGS (Near-Surface Geophysics Field Course)</td>
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<td>Geology 101</td>
<td>Dynamic Earth</td>
<td>4</td>
<td>148/0</td>
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</tbody>
</table>

*100-level course are introductory sequences, 400/500-level courses are upper-level undergraduate electives and/or lower level graduate courses, and 600-level courses and above are graduate courses.

Courses Taught (University at Buffalo, 1999-2005)

<table>
<thead>
<tr>
<th>Semester</th>
<th>Course*</th>
<th>Title</th>
<th>Credit Hours</th>
<th>Enrmt, Ugr/Gr</th>
</tr>
</thead>
<tbody>
<tr>
<td>Summer 2005</td>
<td>GLY 407/507</td>
<td>Geological Field Training (Director)</td>
<td>6/2</td>
<td>40/0</td>
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<tr>
<td>Spring 2005</td>
<td>GLY 419/519</td>
<td>Environmental Geophysics</td>
<td>3/3</td>
<td>15/5</td>
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<td>Fall 2004</td>
<td>GLY 101</td>
<td>Global Environmental Science</td>
<td>4</td>
<td>240</td>
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<td>GLY 325</td>
<td>Geophysics/Tectonics</td>
<td>4</td>
<td>30</td>
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<tr>
<td>Summer 2004</td>
<td>GLY 407/507</td>
<td>Geological Field Training (Director)</td>
<td>6/2</td>
<td>38/2</td>
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<tr>
<td>Fall 2003</td>
<td>GLY 101</td>
<td>Global Environmental Science</td>
<td>4</td>
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<td>GLY 521</td>
<td>Geophysics/Tectonics</td>
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<td>Summer 2003</td>
<td>GLY 407/507</td>
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<td>6/2</td>
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<td>Environmental Geophysics</td>
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<td>GLY 325</td>
<td>Geophysics/Tectonics</td>
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<td>Geological Field Training (Director)</td>
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<td>Spring 2002</td>
<td>GLY 419/519</td>
<td>Environmental Geophysics</td>
<td>3/3</td>
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<td>Global Environmental Science</td>
<td>4</td>
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<td>Geological Field Training (Instructor)</td>
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<td>GLY 419/519</td>
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<td>3/3</td>
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</table>

*100-level course are introductory sequences, 300-level courses are upper-level undergraduate major sequence courses, 400-level courses are upper-level undergraduate electives, and 500-level courses are graduate courses. Courses indicated with two numbers (4**/5**) are cross-listed for both undergraduate and graduate students.
### Other Teaching Activities

#### Formal

<table>
<thead>
<tr>
<th>Semester</th>
<th>Institution</th>
<th>Course #</th>
<th>Course Name</th>
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<tr>
<td>Sum 2009</td>
<td>UT</td>
<td>Geol 101</td>
<td>Earth’s Energy Resources (Introductory Honors Field Course in WY, CO, UT</td>
<td>3 wks/ 1 cr</td>
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<td>Spr 2009</td>
<td>EEGS</td>
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<td>Geophysics for Water Resources and Contaminants</td>
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<td>Spr 2008</td>
<td>EEGS</td>
<td>N/A</td>
<td>Geophysics for Water Resources and Contaminants</td>
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<td>15</td>
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<td>Spr 2007</td>
<td>SUNY Geneseo</td>
<td>N/A</td>
<td>Geophysics for Water Resources and Contaminants</td>
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<td>Spr 2006</td>
<td>TX A&amp;M</td>
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<td>Geophysics for Water Resources and Contaminants</td>
<td>1 wk n/a</td>
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<td>NW Missouri</td>
<td>N/A</td>
<td>NSF Research Experiences for Undergrads (REU) Program, Matanuska Glacier,</td>
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<td>Sum 2001</td>
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<td>N/A</td>
<td>NSF Research Experiences for Undergrads (REU) Program, Matanuska Glacier,</td>
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<td>Sum 2000</td>
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<td>N/A</td>
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<td>4 wks</td>
<td>6</td>
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<tr>
<td>Sum 1999</td>
<td>Lehigh Univ.</td>
<td>EES 41</td>
<td>Introductory Geology in the Rocky Mountains</td>
<td>6.5 wks/ 6 cr</td>
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<td>Sum 1998</td>
<td>Lehigh Univ</td>
<td>EES 41</td>
<td>Introductory Geology in the Rocky Mountains</td>
<td>6.5 wks/ 6 cr</td>
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<td>Sum 1997</td>
<td>Lehigh Univ</td>
<td>EES 41</td>
<td>Introductory Geology in the Rocky Mountains</td>
<td>6.5 wks/ 6 cr</td>
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<td>Sum 1996</td>
<td>Lehigh Univ</td>
<td>EES 41</td>
<td>Introductory Geology in the Rocky Mountains</td>
<td>6.5 wks/ 6 cr</td>
<td>26</td>
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</tbody>
</table>
Informal

1. Led optional 4-day field trip for students attending the American Geophysical Union conference (5 students attending) through the Sierra Nevada Mountains and Yosemite Nat’l Park (California), Fall 2008.
2. Led optional 4-day field trip for students attending the Geological Society of America conference (7 students attending) through the Northern Rocky Mountains (Wyoming, Colorado), Fall 2006.
5. Organized and participated in van trip to Boston, MA, for a national geology conference (GSA), and led informal field trips in the region (16 students attended) Fall 2001.
6. Organized and participated in van trip to Burlington, VT, for a regional geology conference (NE-GSA), and led informal field trips in the region (15 students attended) Fall 2000.
7. Organized and participated in van trip to Denver, CO, for a national geology conference (GSA), and led informal field trips in the Rocky Mountains (9 students attended: 7 graduate students from SUNY Buffalo; 2 from SUNY Fredonia), Fall 1999.

Supervised Students

Graduate Students, Major Advisor

Graduated Ph.D.

1. Megan Carr, Ph.D. 2013, Quantitative integration of multiple near-surface geophysical techniques for improved subsurface imaging
2. Prasanta Yeluru, Ph.D. 2013, Determining engineering properties of the upper 30 m of the Lunar subsurface using surface wave techniques
In Progress M.S.


Graduated M.S.

Graduate Students, Thesis/Dissertation Committee Member

Graduated

1. Kathleen Warrell, MS 2013, Detailed geologic studies of paleoseismic features in the Earth Tennessee Seismic Zone: Evidence for large prehistoric earthquakes, University of Tennessee.
2. Craig Hardgrove, PhD 2010, Hyperspectral imaging of potential alluvial fans on Mars, University of Tennessee.
4. Peter Knappett, PhD 2010, Fate and transport of fecal contaminants in Bangladesh, University of Tennessee.
7. Cruz, Cheri, MS 2005, Comparison of lineament analysis from remote sensing data with field data: University at Buffalo.
11. Nettles, Jeff, PhD 2007, Characterization of the least-melted chondrules in meteorites and impact on nebular sorting: PhD University of Tennessee.

Graduate Students, Other Activities

1. Todd C. Witmer, Independent Graduate Research, 2001
2. Lucas Bundy, Independent Graduate Research, 2001
3. Paul Zaratin, Independent Graduate Research, 2000
Undergraduate Students, Supervised research and other activities

1. Sara Long, Independent Research, Fall 2012-Spring 2013
2. Andrea Gregg, Independent Research, Fall 2010-Spring 2012
5. Matthew Edmunds, Independent Research, Fall 2009-Spring 2010
7. Morgan Braxton-Sears, Independent Research, Fall 2007-Spring 2009
8. Brittany Davis, Senior Thesis Research, Spring 2006
10. Mike Dunlap, Independent Research, Spring 2000
17. James Pratt, Independent Research, 2007-present

Honors and Awards of Supervised Students

1. Noah McDougall (undergraduate research) was awarded the University of Tennessee Chancellors Honors Award for “Undergraduate Extraordinary Professional Promise” April 12 2011.
4. McLaughlin Undergraduate Award ($650), Brittany Davis for undergraduate coursework work at the University of Tennessee.
5. Reginald H. Pegrum Student Travel Grant ($350), Kristin Sturtevant for Geological Society of America National Meeting, M.S. Candidate.
6. **Kenneth N. Weaver Student Travel Grant ($250)**, Kristin Sturtevant for Geological Society of America Northeastern Section Meeting, M.S. Candidate.
7. **Reginald H. Pegrum Student Travel Grant ($350)**, Phil J. Stokes for Geological Society of America National Meeting, M.S. Candidate.
8. **Kenneth N. Weaver Student Travel Grant ($250)**, Phil J. Stokes for Geological Society of America Northeastern Section Meeting, M.S. Candidate.
9. **Mark Diamond Research Fund, University at Buffalo Graduate Student Association ($450)**, Phil J. Stokes for “Geophysical imaging of a fossiliferous Pleistocene basin in Western New York” M.S. Candidate.
12. **Kenneth N. Weaver Student Travel Grant ($250)**, Phil J. Stokes for Geological Society of America Northeastern Section Meeting, M.S. Candidate.
13. **Geological Society of America Research Grant ($1500)**, Phil J. Stokes for “Geophysical imaging of a fossiliferous Pleistocene basin in Western New York” M.S. Candidate.
14. **Geophysics Division Award** (Geological Society of America) for best student paper, Klaus Beyrl for “Using multiple polarization of ground penetrating radar to generate three-dimensional subsurface images of bedrock fractures” M.S. Candidate.
16. Sigma Xi Research Award, Calista McIntyre (Mayer) for “Azimuthal resistivity analysis using a capacitively-coupled resistivity meter for the determination of fracture orientations” M.S. candidate.
PROFESSIONAL CURRICULUM VITAE

REX D. COLE
Ph.D., P.G. (retired in Spring 2020; currently Emeritus)
Professor of Geology
Colorado Mesa University

October 2019

EDUCATION

Ph.D. in Geology (1975) University of Utah, Salt Lake City, UT
Advisors: Drs. M. Dane Picard and M. Leroy Jensen
B.S. in Geology (1970) Colorado State University, Fort Collins, CO
Advisor: Dr. Stanley A. Schumm
A.S. in Geology (1968) Mesa College, Grand Junction, CO
Advisor: Dr. Robert G. Young
High School Diploma (1966) Delta High School, Delta, CO

PROFESSIONAL REGISTRATION

Registered Professional Geologist (Wyoming) since 1992; Number PG-463

PROFESSIONAL EXPERIENCE

2011- Professor of Geology; Department of Physical and Environmental Sciences, Colorado Mesa University, Grand Junction, CO; also Geology Program Coordinator from 2009-2013.
1999-11 Professor of Geology; Department of Physical and Environmental Sciences, Mesa State College, Grand Junction, CO; also Geology Program Coordinator.
1995-99 Associate Professor of Geology; Department of Physical and Environmental Sciences, Mesa State College, Grand Junction, CO.
1983-95 Sr. Advising Geologist; Unocal Corp., Production and Development Technology Group, Brea, CA.
1982- Consulting Geologist; R.D. Cole and Associates, Grand Junction, CO.
1980-82 Manager of Geotechnical Operations; Multi Mineral Corp., Grand Junction, CO.
1978-80 Staff Geoscientist IV; Bendix Field Engineering Corporation, Grand Junction, CO.
1975-77 Assistant Professor of Geology; Department of Geology, Southern Illinois University, Carbondale, IL.
1973-75 Exploration Geologist; American Smelting and Refining Company, Salt Lake City, UT (part time).
1970-73 Teaching Fellow and Research Assistant; Department of Geology and Geophysics, University of Utah, Salt Lake City, UT (academic months).
1971 Exploration Geologist; Inspiration Development Company, Spokane, WA (summer).
1970 Exploration Geologist; Duval Corporation, Salt Lake City, UT (summer).
1968 Assistant Geologist; Petro-Nuclear Ltd., Naturita, CO (summer).

EXPERTISE

Sedimentology, stratigraphy, siliciclastic reservoir characterization, energy resources, mineral resources, geochemistry, geotechnical writing/editing, project management, and administration.

ANALYTICAL QUALIFICATIONS AND SKILLS

Petrographic microscope, gas-source mass spectrometer, x-ray diffractometer, x-ray fluorescence spectrometer, scanning-electron microscope, gamma-ray spectrometer, GIS/GPS, database management, well-log analysis (PETRA), and bore-hole imaging techniques.

UNIVERSITY AND COLLEGE COURSES TAUGHT

Physical Geology and Laboratory (Southern Illinois University and Mesa State College)
Historical Geology and Laboratory (Mesa State College and Colorado Mesa University)
Introduction to Field Studies (Mesa State College)
Geology of Colorado (Mesa State College and Colorado Mesa University)
Stratigraphy and Sedimentology (Southern Illinois University and Mesa State College)
Sedimentology and Stratigraphy (Mesa State College and Colorado Mesa University)
Invertebrate Paleontology and Laboratory (Mesa State College)
Survey of Energy-Related Natural Resources (Mesa State College and Colorado Mesa University)
Survey of Mineral-Related Natural Resources (Mesa State College)
Summer Field Camp (Mesa State College and Colorado Mesa University)
Stable-Isotope Geochemistry (Southern Illinois University)
Senior Seminar (Mesa State College)
Independent Study (Mesa State College)
Structured Research for Undergraduates (Mesa State College and Colorado Mesa University)
Subsurface Methods and Technology (Mesa State College and Colorado Mesa University)
Introduction to Well-Log Analysis (PETRA) (Colorado Mesa University)

PROFESSIONAL AFFILIATIONS

Geologic Society of America (since 1975)
New Mexico Geological Society (since 2017)
GRANTS AND FUNDING

2017  Received a $1,000 grant from Colorado Mesa University (Faculty Development Fund) to purchase an unmanned aerial vehicle (drone) to support field research.
2016  Received $26,344 grant from Unconventional Energy Center at Colorado Mesa University to support the X-ray Mineralogy-Geochemistry Laboratory at Colorado Mesa University. Dr. William Hood was co-principle investigator.
2016  Received a $2,390 grant from the Grand Junction Geological Society to study the geochemistry of and mineralogy of the Green River Formation. Dr. William Hood was co-principle investigator.
2015  Received a $1,750.50 grant from the Grand Junction Geological Society to study the geochemistry of mafic flows and dikes in the Grand Mesa volcanic field, western Colorado.
2015  Received a $906.25 grant from Colorado Mesa University (Faculty Development Fund) to prepare petrographic thin sections of mafic flows and dikes from the Grand Mesa volcanic field, western Colorado.
2013  Received a $789.45 grant from Colorado Mesa University (Faculty Development Fund) to attend training sessions for the PETRA software system.
2013  Received a $22,661.00 grant from the Unconventional Energy Center at Colorado Mesa University to study the mineralogy and geochemistry of the Mancos Shale in western Colorado. Dr. William Hood was co-principle investigator.
2011  Received a $2,787.50 grant from Colorado Mesa University (Faculty Development Fund) for geochemical analyses of basaltic rock samples from Grand Mesa, Colorado.
2011  Received $5,000 from the Reservoir Characterization and Modeling Laboratory at the University of Colorado, Boulder, for Phase VI research on the Williams Fork Formation; funding was via the Williams Fork Consortium (funded by 10 energy companies).
2010  Coordinated acquisition of an in-kind academic license for the PETRA™ software system (market value is ~$300,000).
2009  Received a grant ($32,387) from Colorado School of Mines for research on the Williams Fork Formation in the Piceance Creek Basin, CO. Funding source was from RPSEA/U.S. Dept. of Energy (project title: “Reservoir Connectivity and Stimulating Gas Flow in Tight Sands; Task 4 – Development of Static Reservoir Models”). Project completed in 2011.
2009  Received $51,125 from the Reservoir Characterization and Modeling Laboratory at the University of Colorado, Boulder, for Phase V research on the Williams Fork Formation; funding was via the Williams Fork Consortium (funded by 16 energy companies).
2007  Received $10,000 from the Reservoir Characterization and Modeling Laboratory at the University of Colorado, Boulder, for Phase IV research on the Williams Fork Formation; funding was via the Williams Fork Consortium (funded by 12 energy companies).
2005  Co-investigator on a National Science Foundation REU grant ($362,586) to Mesa State College.
2004  Received $5,000 from the Reservoir Characterization and Modeling Laboratory at the University of Colorado, Boulder, for Phase III research on the Williams Fork Formation; funding was via the Williams Fork Consortium (funded by 12 energy companies).
1977  Received $1,500 grant from the Office of Research and Projects, Southern Illinois University.
1976 Received $29,140 grant from the Coal Research Center, Southern Illinois University.
1976 Received $9,000 grant from the American Chemical Society (Petroleum Research Fund).
1973 Received $450 grant from Sigma Xi to partially fund graduate research program.

HONORS AND AWARDS

2014 Invited speaker for the monthly meeting of the Rocky Mountain Section of the Society of Economic Paleontologists and Mineralogists, Denver.
2008 Received (with Matt Pranter) the A.I. Levorsen Award for best oral presentation at the Rocky Mountain Section Meeting of the American Association of Petroleum Geologists.
2006 Received Outstanding Achievement in Scholarship Award from Mesa State College.
2005 Receive Best Paper of the Year (2005) Award from the Rocky Mountain Association of Geologists (Denver) for paper with Steve Cumella in the Mountain Geologist.
2004 Selected as General Chair for the 57th Meeting (2005) of the Rocky Mountain Section of the Geological Society of America.
2004 Elected Chair of the Rocky Mountain Section of the Geological Society of America.
2004 Nominated for a distinguished faculty award (overall) at Mesa State College.
2003 Invited speaker for the monthly meeting of the Rocky Mountain Association of Geologists, Denver.
2003 Nominated for a distinguished faculty award (overall) at Mesa State College.
2002 Nominated for a distinguished faculty award (research) at Mesa State College.
1994 Nominated for a creativity award from Unocal Corporation for geological research.
1993 Nominated for a creativity award from Unocal Corporation for geological research.
1992 Invited speaker at Department of Geosciences, New Mexico Institute of Mining and Technology, Soccoro.
1992 Received special commendation from Unocal Corporation for participation in a special business venture in New Mexico.
1992 Received a creativity award from Unocal Corporation for geological research.
1991 Invited speaker at Department of Geology and Geophysics, Louisiana State University, Baton Rouge.
1990 Invited speaker at Colorado School of Mines, Golden.
1985 Invited speaker at University of Colorado, Denver.
1977 Elected chair of the Graduate Admissions Committee, Department of Geology and Geophysics, Southern Illinois University.
1976 Elected to the College of Science's Molecular Science Faculty (interdepartmental Ph.D.-granting program) at Southern Illinois University.
GRADUATE STUDENT INVOLVEMENT

In addition to his professional duties at Mesa State College, now Colorado Mesa University, Dr. Cole has served as an outside committee member for graduate students working in western Colorado, including the following universities:

- Southern Illinois University-Carbondale (1977-1979; 2 M.S. students)
- Long Beach State University (1989-1992; 1 M.S. student)
- New Mexico Tech. (1990-1997; 2 M.S. students)
- Northern Arizona University (1999-2003; 1 M.S. student)
- University of Colorado, Boulder (2002-2015; 18 M.S. students)
- University of Oklahoma (2016-2019; 3 M.S. students and 1 Ph.D. student)

SHORT COURSES, RESEARCH SYMPOSIA AND SUPPLEMENTAL TRAINING

2014  PETRA software training, conducted at the Colorado School of Mines, CO (two days).
1995  Reservoir characterization and geostatistics computer workshop, conducted by the R3 Group, in Brea, CA (five days).
1995  Invited participant in a sequence stratigraphy research/field conference conducted by the Society of Sedimentary Geology (SEPM) and American Association of Petroleum Geologists (five days, Wyoming).
1992  Reservoir characterization and geostatistics computer workshop, conducted by Mohan Kelkar in Brea, CA (three days).
1991  Invited participant in a sequence stratigraphy research/field conference conducted by the American Association of Petroleum Geologists (seven days, Utah and New Mexico), conducted by John Van Wagoner.
1988  Sequence stratigraphy of Tertiary strata in Mississippi, Alabama, and Georgia (field symposium), conducted by P.R. Vail (one week).
1988  Seismic stratigraphic and seismic facies analysis of deep-water siliciclastic systems, (short course), conducted by Geoquest International, Inc. (one week).
1988  Sequence stratigraphy and sea-level changes (field trip and workshop), conducted by Working Group I of Global Sedimentary Geology Program (three days).
1987  Sequence stratigraphy (short course), conducted by P.R. Vail (two days).
1986  Shelf sands and strandline systems (short course), conducted by the American Association of Petroleum Geologists (two days).
1986  Depositional sequences and shelf sandstones in Cretaceous strata of the San Juan basin, New Mexico (field symposium), conducted by Gulf Coast Section of Society of Economic Paleontologists and Mineralogists (three days).
1985  Seismic facies analysis (short course), conducted by Geoquest International, Inc. (one week).
1978  Depositional and ground-water flow systems in the exploration for uranium (short course), conducted by the Bureau of Economic Geology, University of Texas at Austin (two days).
1976  Carbonate depositional environments (short course), conducted by G. Friedman (one day).
DISSERTATION


ARTICLES PUBLISHED (Peer Reviewed Unless Noted)


based on cosmogenic burial dating of terraces: Implications for regional controls on Quaternary incision: Geosphere, v. 8, no. 5, p. 1020-1041.


2009 A.L. Darling, K.E. Karlstrom, A.A. Aslan, R. Cole, C. Betton, and E. Wan, Quaternary incision rates and drainage evolution of the Uncompahgre and Gunnison Rivers, western Colorado, as calibrated by the Lava Creek B ash: Rocky Mountain Geology, v. 44, Issue 1, p. 71-83.

2009 Rex Cole, Matt Pranter, Steve Cumella, and Mark Kirschbaum, SEPM Field Trip 12 – Iles-Williams Fork field trip, southern Piceance Basin, Colorado: Society of Economic Paleontologists and Mineralogists; held in conjunction with the 2009 national meeting of the American Association of Petroleum Geologists, Denver. (no peer review)


2005 **R. Cole**, M. Kirschbaum, and R. Young, Stratigraphy, sedimentology, and energy resources of Cretaceous Rocks in the Book Cliffs area, Western Colorado and eastern Utah, in Guidebook for the Rocky Mountain Section of the Geological Society of America annual meeting: Grand Junction Geological Society, 76 p. (no peer review)


R.D. Cole and R.G. Young, Facies characterization and architecture of a muddy shelf-sandstone complex: Mancos B interval of Upper Cretaceous Mancos Shale, northwest


**ABSTRACTS PUBLISHED IN SUPPORT OF ORAL AND POSTER PRESENTATIONS**


2016  W.C. Hood and **R.D. Cole**, Geochemistry of the Mancos Shale as shown by the Fees Federal 2-6-8-101 well, Mesa County, CO: AAPG Rocky Mountain Section Convention, Las Vegas, NV.


2013  J. McFadden, M. J. Pranter, and **R. D. Cole**, Reservoir-scale facies and stratigraphic architecture of the middle and upper Williams Fork Formation, upper Philadelphia Creek, Douglas Creek Arch, Colorado, AAPG Rocky Mountain Section Convention, Salt Lake City, Utah.

2013  R. Sharma, M. J. Pranter, **R. D. Cole**, and P. E. Patterson, Sedimentology and fluvial architecture of the upper Williams Fork Formation, Plateau Creek Canyon, Piceance Basin, Colorado, AAPG Rocky Mountain Section Convention, Salt Lake City, Utah.
2013 R. Cole, M. Zeek, and A. Stork, Reconnaissance mapping of high-potassium mafic flows in the western Grand Mesa volcanic field (western Colorado) using spectral gamma-ray data: Rocky Mountain Section of the Geologic Society of America, Gunnison, CO.


2012 K. Hlava, M. Pranter, and R. Cole, Sequence-stratigraphic controls on reservoir-scale architecture of the middle Mesaverde Group, Douglas Creek Arch, Colorado: Rocky Mountain Section of American Association of Petroleum Geologists, Grand Junction, CO.


2011 E. Harper, K. Hlava, R. Cole, and M. Pranter, Stratigraphic variability of coastal-plain and marginal-marine deposits of the middle Mesaverde Group, Douglas Creek Arch,
Colorado: American Association of Petroleum Geologists National Meeting, Houston, TX.


2005 C. Betton, A. Aslan, and **R. Cole**, Late Cenozoic erosional history and major drainage changes of the Colorado-Gunnison River systems, western Colorado: Rocky Mountain Section of Geological Society of America Program with Abstracts, p. 35.

2005 **R. Cole**, Characterization of fluvial sand bodies in the lower Williams Fork Formation (Campanian), Coal Canyon Area, Colorado: Rocky Mountain Section of Geological Society of America Program with Abstracts, p. 44.


2003  A. Ellison, M. Pranter, R. Cole, and P. Patterson, Stratigraphic architecture of the Upper Cretaceous Williams Fork Formation, Piceance Basin, western Colorado through outcrop studies and high-resolution Lidar imaging: Geological Society of America Program with Abstracts (annual meeting).


2001  J. Petermen and R.D. Cole, Petrographic and petrophysical characteristics of the McCracken Sandstone Member of Elbert Formation, Lisbon Field, Paradox Basin, Utah: Geological Society of America Program with Abstracts (annual meeting).

2001  R.D. Cole and A. Aslan, Late Cenozoic erosional evolution of Grand Mesa, western Colorado: Geological Society of America Program with Abstracts (Rocky Mountain Sectional meeting).


1999  R.D. Cole, W.C. Hood, and R.B. Scott, Sedimentologic reevaluation, high-resolution gamma-ray log, and landslide hazards of the stratigraphic section at Colorado National


1979 D.L. Boyer and **R.D. Cole**, Total-sulfur content and morphology of iron-disulfide minerals in the Parachute Creek Member of Green River Formation, Piceance Creek basin, Colorado: Geological Society of America Abstracts with Programs, v. 11, no. 6, p. 267.


**CONSORTIUM PROCEEDINGS**


2008 M. Pranter, R. Cole, N. Sommer, Q. German, B. Binford, and A. Aboktef. From rocks to models: outcrop-based analysis and statistics for subsurface characterization of fluvial reservoir geometry and connectivity, Williams Fork Formation, Piceance Basin, Colorado: Proceedings from the Williams Fork Consortium Phase IV Sponsor Meeting. (CD)


BOOK REVIEWS PUBLISHED (Journal of Sedimentary Petrology, J.S.P. or Journal of Sedimentary Research, J.S.R.)


CASSANDRA R. FENTON

ResearchGate Profile: http://www.researchgate.net/profile/Cassandra_Fenton

Google Scholar Profile: https://scholar.google.de/citations?hl=de&user=Kuu7EwwAAAAJ

EDUCATION

MS Geographical Information Science & Systems 2015
University of Salzburg – Interfaculty Department of Geoinformatics - Z_GIS, Salzburg, AT
Thesis: A combined approach using FastScape χ-values and 10Be erosion rates to evaluate topographic equilibrium in evolving landscapes: Examples from Namibia and the central Himalaya

PhD Geology 2002
University of Utah, Department of Geology and Geophysics, Salt Lake City, Utah, USA
Dissertation: Pleistocene lava-dam outburst floods, western Grand Canyon, Arizona

MS Geology 1998
University of Utah, Department of Geology and Geophysics, Salt Lake City, Utah, USA
Thesis: Cosmogenic 3-Helium dating of lava-dam outburst floods in western Grand Canyon, Arizona

BA Geology 1994
Certificate in Management Studies: Public Policy Analysis 1994
University of Rochester, Department of Earth and Environmental Sciences Rochester, New York, USA

TEACHING EXPERIENCE

Assistant Professor in Geology, Colorado Mesa University, Grand Junction, CO 2019 – present
Teaching 12 – 13 credit hours per semester.
Courses taught include:
- GEOL 103 Weather & Climate
- GEOL 105 Geology of Colorado (Developed Course)
- GEOL 111/111L Principles of Physical Geology
- GEOL 113/113L Field-Based Introduction to Physical Geology
- GEOL 204 Computer Applications in Geology (Developed course)
- GEOL 351 Applied Geochemistry
- GEOL 480  Summer Field Camp (one week mapping project)  
  Quaternary lava flows and faults (San Francisco Volcanic Field, AZ)

GEOL 496  (Topics Course) Climate Change: The Science (Developed Course)

GEOL 497  Structured Research (Supervised research with undergraduate Geosciences and Chemistry Students)

Geology Instructor, Colorado Mesa University, Grand Junction, CO  
2016 – 2019

Teaching 12 – 13 credit hours per semester, plus one week of Summer field camp. Courses taught include:
- GEOL 103  Weather & Climate
- GEOL 111/111L  Principles of Physical Geology
- GEOL 113/113L  Field-Based Introduction to Physical Geology
- GEOL 351  Applied Geochemistry
- GEOL 355  Basic Hydrology
- GEOL 496  (Topics Course) Critical Thinking: Calling BS
- GEOL 480  Summer Field Camp (one week)

Workshop / Seminar Instructor, Marie Curie Research and Training Network,  
GFZ-Potsdam, Potsdam, DE  
2005 – 2008

Field Course Instructor for Grand Canyon Research River Trip  
University of Arizona, Tucson, USA  
March 2003

Co-taught a 16-day geomorphology field course in Grand Canyon. Responsibilities included preparing lectures and teaching/guiding hands-on field projects for graduate-level students and organizing/co-leading a 16-day, 16-person Grand Canyon research river trip.

Teaching Assistant, University of Utah, Salt Lake City, USA  
1995 – 2002

Prepared lab lectures, graded labs and homework assignments, organized and participated in field trips, presented in-class lectures, and held office hours and review sessions for students in the following undergraduate and graduate courses:
- Geochemistry
- Earth Materials II (Petrology and Introduction to Groundwater)
- Field Methods
- Physical Geology
- Geology of Utah
- Natural Disasters (General Education class)
- Architecture of the Earth (General Education class).

Study Skills Support and Note-Taker for Students with Disabilities,  
Center for Excellence in Teaching and Learning, University of Rochester, NY, USA  
1991 – 1993
Outdoor Environmental Educator, Maplewood Family YMCA, Rochester NY, USA 1992

Tutor (Math, Science, Spanish), Town of Webb High Schools, NY, USA 1986 – 1990

Research Experience

Principal Investigator on the SPICE Project 2015 – present
Continued involvement in the SPICE Project. Lead author on talks and manuscripts produced as result of ongoing cosmogenic nuclide analyses.

Research Fellow – Principal Investigator on the SPICE Project 2015 – 2016
University of Cologne, Cologne, DE
Cross-calibration of production rates of cosmogenic $^3$He, $^{10}$Be, $^{14}$C, $^{21}$Ne, $^{26}$Al, and $^{36}$Cl in co-existing quartz, olivine, pyroxene, and whole-rock basalt.

Guest Scientist 2010 – present
Helmholtz-Zentrum Potsdam - Deutsches GeoForschungsZentrum, Potsdam, DE
Cross-calibration of production rates of cosmogenic $^3$He, $^{10}$Be, $^{14}$C, $^{21}$Ne, $^{26}$Al, and $^{36}$Cl in co-existing quartz, olivine, pyroxene, and whole-rock basalt.

Scientific Interface Team 2014 – 2015
ResearchGate, Berlin, DE,
Scientific content management; Level 1 customer support with 24-hour targets; maintaining user satisfaction to ensure growth; online research and data entry; reviewing scientific content; trend identification; communication with supervisor about product feedback.

Research Fellow at NERC-funded Cosmogenic Isotope Analysis Facility (CIAF) 2008 – 2010
Ex-officio Member of and Secretary to the Steering Committee for the Cosmogenic Isotope Analysis Facility (CIAF) at SUERC (Scottish Universities Environmental Research Centre) University of Glasgow, UK
Designed, planned, lead or participated in, and implemented 11 different projects leading to 13 peer-reviewed journal publications. Co-managed two lab technicians. Helped applicants write proposals to meet Steering Committee criteria, in order to compete for funding at the CIAF, which specializes in cosmogenic $^{10}$Be, $^{26}$Al, and $^{36}$Cl research. Trained users of laboratory facility.

Marie Curie Research Fellow in CRONUS-EU 2005 – 2008
Helmholtz-Zentrum Potsdam - Deutsches GeoForschungsZentrum, Potsdam, DE
Designed and implemented 3 different projects leading to 6 peer-reviewed journal publications. Supervised PhD student. Determined primary calibration of $^{10}$Be production rate in Norway. Evaluated production rates of cosmogenic $^3$He and $^{21}$Ne in olivine/pyroxene from Pleistocene basalt flows in AZ, USA.
with U.S. Geological Survey, Tucson, AZ, USA
Studied the timing of Plio-Pleistocene cycles of aggradation and incision in the Colorado River basin in canyons of the Colorado Plateau in Utah and Arizona, which lead to 1 peer-reviewed publication. Managed lab technician.

AWU Summer Intern, Idaho National Engineering and Environmental Laboratories, USA 1999
Performed infiltration tests in basalt flows to evaluate the chaotic nature of unsaturated flow in fractured rock and managed the resulting data, Idaho Falls, ID. (AWU = Associated Western Universities)

NAGT Summer Intern, U.S. Geological Survey, Denver, CO, USA 1996
Prepared plant samples from Florida Everglades for analysis of heavy metal concentrations. (NAGT = National Association of Geoscience Teachers)

Clean Laboratory Research Assistant, University of Rochester, USA 1993 – 1995
Prepared samples for TIMS and ICP-MS using mineral separation processes, acid digestion, and column chromatography.

HONORS, AWARDS, GRANTS, FELLOWSHIPS, AND SCHOLARSHIPS

• Exemplary Faculty Member Merit Award (Colorado Mesa University) 2021
• Merit Award (Colorado Mesa University) 2020
• WeCSIP Proposal partially funded by CMU Professional Development Fund ($2391) 2019 (Western Colorado Stable Isotopes in Precipitation Network)
• Exemplary Faculty Member Merit Award (Colorado Mesa University) 2019
• Merit Award (Colorado Mesa University) 2017 - 2018
• Lead Scientist 2016 – 2017
  Cosmogenic Be-10 dating of a major Holocene watershed-damming rockslide in the central Wasatch Mountains, UT, USA: the Little Cottonwood Canyon case study. ANSTO Research Portal, $25,000
• Principal Investigator 2015 – 2017
The SPICE Project: The SP Flow Production-Rate Inter-Calibration Site for Cosmogenic-Nuclide Evaluations. Peer-reviewed Deutsches Forschungsgemeinschaft (DFG) Research Grant; €202,800
• Natural Environmental Research Council Renewal Grant 2009 – 2014
  co-author; 50% of writing; £2,167,100, over 5 years; for continued funding of the Cosmogenic Isotope Analysis Facility at SUERC, UK
• CRONUS-EU Experienced Researcher in Marie Curie Research Training Network 2005 – 2008
  • Gladys W. Cole Memorial Research Award, Geological Society of America $10,000 2002
  • Phi Kappa Phi inductee 2002
• Outstanding PhD Student Award. University of Utah 2002
• GSA Student Research Grant awarded for PhD research 1999
• Sigma Xi Student Research Grant awarded for MS research 1998
• Outstanding MS Student Award. University of Utah 1998
• Stokes and Eardley Fellowship. University of Utah 1998
• Best Field Geologist Award. Lehigh University Field Camp 1995
• Bausch & Lomb Scholarship. University of Rochester 1994

ADDITIONAL SKILLS

COMPUTER EXPERIENCE:
• ESRI ArcGIS 10.x, ArcGlobe, ArcGIS Online, ArcGIS for Server, ArcGIS Model Builder
• Open-Source Software: QGIS 2.0 and LandSerf 2.3
• Remote Sensing: ERDAS Imagine/LPS2013, eCognition Developer 9.0
• Databases: SQL, PL/SQL, Oracle Spatial, PhpMyAdmin and MySQL
• Adobe Acrobat 8 Professional, Illustrator CS3 and Photoshop CS3
• Google Docs / Drive; Blackboard; Microsoft Office 2007 & 2008
• Windows 7 and Mac OS X
• Steady and unsteady flood modeling with HEC-RAS and FLDWAV
• Groundwater Modeling System (GMS) including MODFLOW

ANALYTICAL INSTRUMENTATION:
• Noble gas mass spectrometry (MAP 215-50 and VG 5400)
• Ionically coupled plasma mass spectrometry (ICP-MS)
• Electron Microprobe ( Cameca SX-50)
• Electronic Total Station (Electronic Theodolite integrated with an Electronic Distance Meter)
• Vacuum systems
• Basic wet chemistry and mineral separation processes

**LANGUAGES:** Native English speaker; German (B2 CEFR level); some proficiency in Spanish.

**PROFESSIONAL ACTIVITIES AND SERVICE**

- Co-Chair, [Teacher to Teacher (T2T)](#), August 2020 – present
- Organizing Committee Member, [Teacher to Teacher (T2T)](#), August 2019 – present
- Committee Member, Retention Committee (Academic Affairs committee), March 2020 – present
- Committee Member, Advising Committee (Subcommittee to Retention Committee), March 2020 – present
- Member, CRM Faculty Focus Group August 2020 – present
- Organizing Committee Member, [Student Showcase](#) Planning Committee, August 2019 – June 2020
- Chair, Ad Hoc Committee on Curriculum for Environmental Geology (BS) and Watershed Science minor, August 2019 – present
- Member, Search Committee, Geoscience Program search for Professor in Sedimentology
- Chair, Ad Hoc Committee on Geosciences Website Licensure, 2021– present.
- Member, Ad Hoc Committee on Geographic Information Science and Technology, 2016 – present
- Member, Ad Hoc Committee for Geosciences Scholarship Selection, August 2018 – present
- Participated in Academic Affairs “Faculty Brainstorm” session about covid protocols and faculty questions/concerns (online; July 2020)
- Co-creator, organizer and leader of [Annual GeoDay Hike](#) for First Year students, August 2018 – present
- Faculty host to guest speakers from local community in my introductory geology courses to show connection between geology, our community, and possible career paths / employment opportunities in geosciences
- Recruitment activities for CMU Geosciences
  - Geosciences Representation for First-Year PES Orientation event (August 20, 2021). Toured Geosciences Program labs and classroom space, promoted our program degrees.
  - Worked with President and Regional Directors of the National Earth Science Teachers Association (NESTA) to publish information in their newsletters about CMU Geosciences Program and degrees (including Geosciences Secondary Education degree), Feb-March 2021
  - Mesa Experience PES representative for the Geosciences Program (March 7, 2020). Toured Geosciences Program labs and classroom space, promoted our program degrees.
  - Invited speaker on Climate-Change Panel for the Grand Valley Students United action group (online community-wide meeting; Earth Day, April 2020). Promoted inclusivity of CMU’s Geosciences Program and courses we offer covering climate change.
• Invited speaker on Climate Change for an online ESL course (English as a Second Language) for Japanese students at Genesee Community College. Promoted inclusivity of CMU’s Geosciences Program and courses we offer covering climate change.
• Digital editor of CMU Geosciences Program website, keeping website current, April 2018 – present https://www.coloradomesa.edu/geosciences/index.html
• Created “Geoscience Resources” webpage, provide information about careers, employment, scholarships, grants, and graduate school to students
• Collaborating with CMU Marketing Department (CMU Now) to publish online articles that highlight student activities and success in CMU Geosciences Program, August 2019 – present
  o Down to earth geology students excel at national conference
  o From CMU to the San Juans: incoming students hike to new heights
  o Etiquette Dinner dishes out research opportunity
  o Organized and staffed Geosciences Program recruitment table in University Center (CMU), 10/29/2019
  o Geosciences Faculty Representative at Department of Physical and Environmental Sciences recruiting event, met with 16 guidance counselors from Colorado state high schools, 11/5/2019
• Active fundraiser to raise money for a rock crusher for the Geosciences Program, 2017 - 2019
  – Organized purchase of rock crusher for Geoscience Program, September 2019
• Invited Speaker, CMU First-Generation Day Kick-off Event, 11/8/19
• Table Host at CMU Annual Etiquette Dinner, 10/29/2019
• Organized and implemented Welcome Cookout for Western Slope Field Conference, September 2019
  – Coordinated with CMU Alumni Association to send invitation to Welcome Cookout to all Geosciences Alumni in our mailing list
• Contributor to CMU Geosciences Program Review (2013 – 2019), conducted alumni survey and compiled results
• Presented to the CMU Physics Program and the Grand Junction Geological Society, 2017: "The SPICE Project: Preliminary cosmogenic nuclide production rates in quartz calibrated at the ~70 ka SP lava flow, AZ, USA."
• Co-convener of 2004 GSA Annual meeting session: “Geologic History and Processes of the Colorado River”
• Presider at 2003 GSA Annual meeting session: Quaternary Geology/Geomorphology I: Streams and Slopes
SOCIETY AFFILIATIONS

American Association of Petroleum Geologists  ●  American Geophysical Union  ●  Association for Women Geoscientists  ●  Geological Society of America  ●  Geochemical Society  ●  Grand Junction Geological Society

FIELD EXPERIENCE

Basaltic Volcanism, Lava Dams and Outburst Floods
Investigating the volcanic features in the San Francisco and Uinkaret volcanic fields and studying the interaction among Quaternary faulting, basaltic volcanism and fluvial processes and the effects on the Colorado River in western Grand Canyon National Park and on the Owyhee River, Oregon, USA. Includes cosmogenic sampling and mapping of basalt flows, lava dams, and associated lava-dam outburst-flood deposits. MS, PhD, and post-doctoral research. [http://www.abc.net.au/science/articles/2008/02/15/2164047.htm]

Neotectonics: Normal Faulting
Profiling fault scarps and cosmogenic sampling of displaced surfaces to determine displacement rates on the active Hurricane and Toroweap faults (in AZ and UT), faults in the Volcanic Tableland of the Bishop Tuff (CA), and the Mead Slope fault near Hoover Dam (AZ/NV).

Natural Hazards: Debris Flows
Investigation of historic and Pleistocene/Holocene debris flows at the base of the Santa Catalina Mountains, Tucson, AZ ([http://www.azgs.az.gov/hazard_dfcatalinas08.shtml](http://www.azgs.az.gov/hazard_dfcatalinas08.shtml)). The study began after five consecutive days of monsoonal storms in July 2006 caused hundreds of debris flows in southeastern Arizona.

Rock Avalanches and Landslides Investigation of and sampling for Optically Stimulated Luminescence, radiocarbon, and cosmogenic-exposure dating of rock avalanches, landslides, and related lacustrine material in Israel, Norway, Argentina, and USA (Grand Canyon National Park, AZ).

Surface Water Hydrology

Alluvial Fans and Fluvial Deposits: Fluvial Incision and Aggradation
Dating of Quaternary fluvial and alluvial deposits in the Colorado River basin in Utah and Arizona USA and comparison of ages of aggradation and incision to known ages of Quaternary
climate change. Includes cosmogenic sampling and mapping of alluvial fans in the Black Mountains and Gila Bend Mountains, AZ and river-terrace gravels on the Green, San Juan and Colorado Rivers, UT and AZ.

Investigation of the impacts of abundant Holocene debris-flow activity on the longitudinal profile of the Colorado River in Cataract Canyon, southern Utah; includes cosmogenic sampling and mapping of debris flows and Pleistocene Colorado River terraces.

**Pluvial Lakes**
Cosmogenic sampling of beach-ridge gravels at and below the Provo shoreline of pluvial Lake Bonneville, Bonneville basin, UT. Cosmogenic sampling of flood deposits related to the catastrophic draining of pluvial Lake Alvord, southeastern OR. Mapping of Pre-Pleistocene pluvial lake deposits in the Lake Lahontan basin, Nevada.

**Glacial Geology**
Cosmogenic sampling of Pleistocene glacial moraines, outwash terraces, river gravel terraces and bedrock straths in the Andes between northern Patagonia and Mendoza, Argentina. Glaciers and glacial-landforms field trips in Alaska, Germany, and the Swiss Alps.

**FEATURED SURFACE-PROCESSES RELATED PUBLICATIONS**


Vermeesch, P., **Fenton, C.R.,** Kober, F., Wiggs, G., Bristow, C.S., and Xu, S., 2010. One million year residence time of Namib dune sand measured with cosmogenic $^{10}$Be, $^{26}$Al, and $^{21}$Ne, Nature Geoscience 3, 862-865.


**PUBLICATIONS (IN REVERSE CHRONOLOGICAL ORDER)**

**Fenton, C.R.,** Binnie, S., Dunia, T., and Niedermann, S., Dunai, T., 2021. The SPICE Project: Calibrated cosmogenic $^{26}$Al production rates and cross-calibrated $^{26}$Al/$^{10}$Be, $^{26}$Al/$^{14}$C, and $^{26}$Al/$^{21}$Ne ratios in quartz from the SP basalt flow, AZ, USA.
Fenton, C.R., Niedermann, S., Dunai, R., Binnie, S., 2019. The SPICE Project: Production rates of cosmogenic $^{21}$Ne, $^{10}$Be, and $^{14}$C in quartz from the 72 ka SP basalt flow, Arizona USA. Quaternary Geochronology. https://doi.org/10.1016/j.quageo.2019.101019


Evaluation of cosmogenic $^3$He and $^{21}$Ne production rates in olivine and pyroxene from two Pleistocene basalt flows, western Grand Canyon, AZ, USA. Quat. Geochron. 4, 475-492.


Curriculum Vitae

Verner C. Johnson, Ph. D.
Professor of Geology and GIS Coordinator
Department of Physical and Environmental Sciences
Colorado Mesa University
Grand Junction, CO 81501

Professional Experience:
My background is teaching in any of my specialized areas including GIS/GPS, geophysics, hydrogeology, computer applications in geology, environmental geology, and engineering geology. I have more than thirty years of geophysical, geological, and GIS/GPS related experiences including proposing and organizing plans for research and teaching, acquiring and interpreting data, problem solving, and preparing verbal and written communication.

Education:
Ph. D., Geology, University of Tennessee at Knoxville, 1975
M.S., Geology, Southern Illinois University at Carbondale, 1970
B.A., Geology, Southern Illinois University at Carbondale, 1967

Research Interests:
I continue to do research project, jointly with BLM, on geophysics data of the Uncompahgre Uplift. For years, my students and I have gathered magnetic data over Pinon Mesa where the strong magnetic anomaly was spotted in 1980 NURE Aerial Magnetic Map. We published posters and papers and will do more in the next few years.
Dr. Hsiang-te Kung of The University of Memphis, Dr. Fei Zhang of the Xinjiang University, China, and I will continue to do more research using GIS and Remote Sensing data of the salinity problems in NW China. Currently we are making plans to do more research and have a paper published in the next few years. In addition, Jad Tahouri of the Ben Abdellah University, Morocco, co-author with us doing GIS/Remote Sensing projects in the Morocco area.

Publications:
Livaccari, Rick, Trumbo, Adam, **Johnson, V. C.**, and Feil, Michael, as field trip guides in “Preliminary Structural, and Geochemical Investigations of the Unaweep Canyon Fieldtrip” in Geosciences Students & Alumni 3rd Annual Spring Field Trip, sponsored by CMU Geoscience program, April 23, 2017.

Fei Zhang, Hsiangte Kung, **Verner Carl Johnson**, Bethany Iris LaGrone, and Juan Wang, 2017, “Change detection of land surface (LST) and some related parameters using landsat image: a case study of Ebinur Lake Watershed, Xinjiang, China”, Journal of the Society of Wetland Scientists (Springer Publisher), on-line journal, doi.org/10.1007/s13157-017-0957-6, 16 pages (PDF).


Zhang, Fei, Tiyip, Tashpolat, Kung, Hsiang-te, **Johnson, Verner**, Maimaitiyiming, Mathew, Zhou, Mei, and Wang, Juan, 2016, “Dynamics of land surface temperature (LST) in response to land use and land cover (LULC) changes in the Weigan and Kuqa river oasis, Xinjiang, China”; Arab Journal of Geosciences, v. 9, p. 499-513.

**Verner C. Johnson** (invited guest speaker), Adam Trumbo, Michael Feil, Joe Mazza, Alexandra Price, and Marc Fischer, “Preliminary Structural Development of the La Sal Mountains and Uncompahgre Plateau in Relation to the Tectonic Implications from Upper Mantle Tomography” presented orally to the Geology Colloquium at Southern Illinois University Carbondale, Illinois, September 8, 2016.


Supervision of Student Research/Projects:


Mumby, Ryan, 2019, “New mapping of magnetic anomalies using proton precession magnetometers within the northeastern part of the Uncompahgre Plateau” poster presentation in Showcase and GJ Geological Society (April, 2019).


Melani Jensen, 2012, “Proposed Kokopelli Extension of the Riverfront Trail” (poster presentation in Student Showcase, April 25, 2012 received outstanding award)
Miller, Roger, 2012, “A geologist's guide to the Mesozoic Rocks of Canyonlands and Arches National Parks, Utah” (sponsor, GEOL495, Independent Study Project - summer)
Graham, Jennifer, 2012, “GIS Makes it possible for oil and gas exploration” (sponsor: GEOL 497 Structured Research Project, presented in student showcase)

**Conference Presentations:**
*Voted by attendees for the best poster in student category in GeCO Conference
Haveman, Benjamin Ross, Redden, Nichole, Johnson, Verner C., 2013, “A preliminary geological/geophysical investigation of the Cook Canyon magnetic high, NW Uncompahgre Uplift, Colorado”, Poster session at GSA Rocky Mountain Section, 65th Annual Meeting, Gunnison, Colorado, 15 -17 May 2013
Other: Grant preparations
I prepared $25,000 grant proposal to purchase new refraction seismometer to the Unconventional Energy Grants in December, 2018, and was approved in April, 2019. Currently the instrument is under order.
I prepared $15,000 grant proposal to purchase new magnetometers to the Unconventional Energy Grants and was approved in March, 2017. New magnetometer arrived in December, 2017.
2005 - 2015: BLM GIS Internship grants. The original grant contract from the BLM, began in January 13, 2005. We have obtained approximately $95,000 since 2005 for student assistants working for BLM. Each semester, two students in the GIS program work for BLM performing tasks that include GIS, GPS, and Remote Sensing. Funds is used to pay salary and benefits for students working on BLM projects.
2006-2008: Took part of the National Science Foundation-Research Experiences for the Undergraduate on "A Field -Based Study of Landscape Evolution of Western Colorado" from 2006-2008
2003 - 2005: Forest Service Internship grants. Similar to the BLM Internship grants. We have obtained approximately $45,000 from the Forest Service to hire one or two students to do GIS projects in the forest service offices in Delta and Grand Junction, Colorado.

Professional Memberships:
American Association of Professional Geologists American Geophysical Union
Society of Exploration Geophysicists
Grand Junction Geological Society
  3 - Year Consular (2014-2017)
  Past-President (since 1998)
  President (1996)
  Vice _ President (1997)
Zeta-Nu Chapter Sigma Gamma Epsilon
  Faculty Advisor of the CMU Zeta Nu Chapter (1990 - 2011)
Geological Society of America

Advising 2013-Present:
Teacher Licensure Advisor: I advised three earth science teacher licensure majors. Because of my involvement with NCAT, I was best fit to advice students who wish to pursue teaching earth science in secondary schools. I checked their records to be sure they had taken required geology and education courses. I encouraged them to go for “student assistantship” and be lab assistant in any or combination of GEOL111, GEOL113, and GEOL112 labs during the last semester before internship. Purpose was to give them teaching experience so they can be better prepared for EDUC 499, Teacher Internship.
GIS&T Advisor: I advised GIS&T minor and/or Certificate students as to what courses they need to take before completing GIS&T Minor and/or Certificate program. I proposed scheduling of GIS courses they need to take each semester pending on how much time they have left before graduation. I also advised non-students (not enrolled in any other program) as to what they need to take which they can complete all the required courses in one year. I advised more than 20 students going into GIS&T minor or certificate.
Geology Advisor: I advised 34 geology and environmental geology majors.
BLM Internship Advisor: A federal government organization, BLM, has internship contracts with Mesa State College. My responsibility includes finding qualified students and signing payroll forms. I also watch budget to be sure that we are within the budget. I do advice prospect interns to prepare resumes and interview for the BLM positions.

**Honors and Awards:**
Received Outstanding Teacher Award from Colorado Mesa University (formerly Mesa State College) for the 2002-2003 academic year.
Curriculum Vitae

Dr. Richard F. Livaccari

Education

- **Ph.D.** 1994, University of New Mexico, Albuquerque, NM, Geology
- **M.Sc.** 1980, State University of New York at Albany, Albany, NY, Geology
- **B.Sc.** 1977, University of New Mexico, Albuquerque, NM, Geology/Math

Professional Experience

**Mesa State College, Department of Physical & Environmental Sciences, Grand Junction, CO**

**Full Professor**

1997 - current

Responsible for teaching Introduction to Physical Geology, Structural Geology, Mineralogy, Igneous & Metamorphic Petrology, Remote Sensing & Structured Research.

**Santa Fe Pacific Gold Corporation, Albuquerque, NM (through GeoTemps in Tucson, AZ)**

1996 - 1997

**Assistant Geologist**

Compiled precious metal production and reserves data in GIS format (for Australia, Papua New Guinea, and Canada). Prepared presentation graphics of geologic data from current exploration projects.

**Department of Earth & Planetary Sciences, University of New Mexico, Albuquerque, NM**

1994 - 1996

**Post-Doctorate Researcher**

Conducted paleomagnetic field sampling, mapping and structural analysis of metamorphic core complexes in western Arizona and southeastern California (Harquahala, Hacruvar, Buckskin, and Whipple Mountains). Managed budget ($110,000) of NSF research grant. Supervised undergraduate research assistants. Organized and instructed graduate level courses in Cordilleran tectonics (with Prof. Karl E. Karlstrom).

**Department of Earth & Planetary Sciences, University of New Mexico, Albuquerque, NM**

1990 - 1994

**Teaching and Research Assistant**

Prepared and instructed Introduction to Physical Geology labs and performed paleomagnetic experiments.

**MagmaChem Exploration, Phoenix, AZ & Evergreen, CO**

1985 - 1990

**Senior Geologist**
Conducted tectonic analysis, regional mineral assessment and compilation of metallic ore production data in the western U.S. and South American Cordilleras. Performed field mapping, mineral sampling, well logging, and evaluation of assay data for mineral exploration projects in central Nevada and western Arizona.

Earth Satellite Corporation, Chevy Chase, MD
1981 - 1984
Staff Geologist
Conducted tectonic analysis and hydrocarbon exploration with Landsat imagery, photogrammetry and field mapping.

GRANTS AND AWARDS

U.S. Geological Survey EDMAP program (Educational Component of the National Cooperative Geologic Mapping Program) 2005-2006 Academic year: "Evaluation of Quaternary-Age Faulting and Laramide-Age Fault Kinematics along the Northern Uncompahgre Plateau, Western Colorado ". $6,375

National Science Foundation, Research Experiences for Undergraduates 2005 to 2007 (co-Principal Investigator): “REU Site: A Field-Based Study of Landscape Evolution in Western Colorado”. $344,586

U.S. Geological Survey EDMAP program (Educational Component of the National Cooperative Geologic Mapping Program) 2004-2005 Academic year: "Evaluation of Quaternary Faulting along the East-Central Uncompahgre Plateau, Western Colorado". $6,000

Mesa State College Professional Development Monies (OSC) 2000-2001 Academic year: $450.00 for the purchase of petrographic thin sections for the Geology Program.

Mesa State College Professional Development Monies (OSC) 1999-2000 Academic year: $850.00 for the purchase of a digital camera for the Geology Program.

National Science Foundation proposal entitled (1995): “Footwall deformation and regional crustal structure of 'deep'-type metamorphic core complexes, western Arizona and southeastern California: Evaluation with paleomagnetism” (with Dr. J.W. Geissman; Award # EAR-92-06524 for $160,000)

National Science Foundation proposal entitled (1992): “A paleomagnetic assessment of footwall tilting during large magnitude extensional deformation: A case study of the Miocene South Mountains metamorphic core complex, south central Arizona”. (with Dr. J.W. Geissman; Award # EAR-92-05893 for $62,000)

Publications


Recent Papers Presented at Professional Meetings


J. JAVIER TELLEZ
Assistant Professor in Geosciences
Colorado Mesa University
970.248.1663 – jtellez@coloradomesa.edu
LinkedIn: https://www.linkedin.com/in/javier-tellez-49664955/ ORCID Profile: https://orcid.org/0000-0001-8799-6557

Academic Experience

Assistant Professor of Geosciences
Colorado Mesa University, Grand Junction, CO (Current)
• Sedimentology and stratigraphy, Geology of Colorado, Physical Geology, Depositional environments and Historical Geology

Ph.D. in Geosciences
University of Oklahoma, Norman, OK (Spring 2021)
• Dissertation: Integrated characterization of tight siliciclastic reservoirs: examples from the Cretaceous Burro Canyon Formation, Colorado and Mississippian Meramec strata, Oklahoma
• Jon R. Withrow Named Grant, AAPG Foundation Grants-in-Aid
• Society of Exploration Geophysicists / Chevron Student Leadership Grant
• Robert K. Goldhammer Fellowship for Technical Excellence
• Robberson Conference Presentation and Creative Exhibition Travel Grant
• Best Collaborating Internship Project, Baker Hughes
• Advisor: Dr. Matthew J. Pranter

M.S. in Geology
University of Oklahoma, Norman, OK (Fall 2015)
• Thesis: Seismic sequence-stratigraphic framework and architectural-element identification based on attributes and well logs for Tertiary strata at the Rankin Platform sub-basin, North Carnarvon Basin, Australia
• Robert K. Goldhammer Fellowship for Technical Excellence
• COUAA Colombian Alumni Association grant
• Advisor: Dr. Roger M. Slatt

B.S. in Geology
Universidad Nacional de Colombia, Bogota, Colombia (Fall 2008)
• Thesis: Integration of 3-D seismic interpretation and well-log data to evaluate the potential for new development wells in the Matanegra Block, Llanos Basin, Colombia
• Researcher in structural geology – Seed project -National Agency for Hydrocarbons
• Researcher in basin analysis project - Colciencias – National Agency for Hydrocarbons
• Scholarship for Outstanding Performance
• Advisor: Dr. Andreas Kammer
Professional Experience

Geoscience Intern
Baker Hughes, Oklahoma City, OK (Jun-Aug 2018)
• Integrated geological and engineering data with machine learning to analyze
drilling performance in the STACK, SCOOP, and Merge areas, Anadarko Basin,
Oklahoma

Geology Intern
Pathfinder Exploration LLC, Norman, OK (Feb-Aug 2015)
• Created 3-D geological models to evaluate prospective areas, Anadarko Basin, Oklahoma

Reservoir Geologist
Occidental Oil and Gas, Bogota, Colombia (Jan 2011-Jan 2014)
• Conducted stratigraphic evaluations and provided support for reserves estimation.
• Constructed reservoir models to propose >100 new development wells in the Llanos Basin

Junior Geologist
Occidental Oil and Gas, Bogota, Colombia (Oct 2008-Jan 2011)
• Proposed >50 workovers through geological evaluations to improve reservoir performance
• Provided support for technical meetings with industry partners (Ecopetrol and Repsol)

Geology Intern
Occidental Oil and Gas, Bogota, Colombia (Jan-Oct 2008)
• Generated maps and cross-sections using OpenWorks and Geographix for well prognosis
• Integrated seismic and well data to evaluate the potential for new development wells

RESEARCH

Graduate Research Assistant
Reservoir Characterization and Modeling Laboratory
(RCML) University of Oklahoma, Norman, OK (Spring
2016-Present)
• Investigate outcrop to subsurface stratigraphy of tight fluvial sandstones, Colorado
• Generate UAS-based photogrammetry outcrop models for facies interpretation and
fluvial architecture definition, Colorado.
• Conduct reservoir characterization and seismic-constrained Modeling of
Mississippian strata, STACK Play, Oklahoma

Attribute Assisted Seismic Interpretation (AASPI)
Consortium University of Oklahoma, Norman, OK (Spring
2016-Present)
• Identified and quantified parasequences using Expectation-Maximization filter
• Used machine-learning techniques for mapping dolomitic facies in calcareous reservoirs
• Applied deep-convolutional neural networks to estimate porosity from thin-section images
Institute of Reservoir Characterization (IRC)
University of Oklahoma, Norman, OK (Spring 2014-Fall 2015)
• Mapped and correlated the Woodford Shale, Ardmore Basin, Oklahoma
• Interpreted seismic-sequence stratigraphy of deepwater seismic-facies, Australia
• Used Self-Organize-Maps for facies mapping and architectural elements definition

Research Geologist
National Agency for Hydrocarbons, Colombia (Fall 2007)
Generated E&P licensing round prospect report for the eastern Cordillera Block, Colombia

TEACHING

Instructor and Co-instructor
Mewbourne College of Earth and Energy, University of Oklahoma, Norman, OK
• Introductory Petroleum Geology and Geophysics (GPHY 3423; required course for Petroleum Engineering majors). Addresses conventional and unconventional petroleum resources, basic sedimentary and structural geology, the petroleum system, source rocks, types of traps and seals, reservoir rock properties, exploration and development methods, basic seismic interpretation, seismic attributes, basic reservoir modeling, and volumetric reserves calculations. Enrollment: ~100 students. Co-instructor for Fall 2016, and 2017. Solely instructor, Fall 2018, Summer 2020.

School of Geosciences, University of Oklahoma and Los Andes University, Bogota, Colombia
• Reservoir Characterization and Modeling – Study Abroad in Bogotá, Colombia (GEOL 4970-5970) introduces concepts and methods of geological reservoir characterization and Modeling. Extensive use of Petrel software. Enrollment: 5 OU students with 30 students from the University of Los Andes and industry. Co-instructed with Dr. Matthew Pranter, Summer 2018

Graduate Teaching Assistant
School of Geosciences, University of Oklahoma, Norman, OK


Universidad Nacional de Colombia, Bogota, Colombia


Short Course Teaching Assistant

AAPG Student Expo at the University of Oklahoma, Norman, OK

- 3-D Reservoir Modeling. Introduces basic concepts and methods of 3-D Modeling. Enrollment: 25 students. Spring 2017

SERVICE

Professional Society Service
- 2018-present: Reviewer for SEG journal Interpretation
- 2018-present: Reviewer for AAPG bulletin journal
- 2017 Poster judge, AAPG annual meeting, Houston, TX
- Vice President, AAPG Student Chapter, 2016-2017
- Vice President, SEG Student Chapter, 2017-2018 – Summit level achievement

Colombian Geological Society
- 2007-2008 Geonotas Associated Editor

Alumni Society
- 2007-2008 COUAA Colombian Alumni Association

Student Associations
- 2007-2008 COLSA Columbian Student Association. Exchange Students Coordinator Chair

PROFESSIONAL AFFILIATIONS

- American Association of Petroleum Geologists (AAPG)
- Colombian Association of Geologist and Geophysicist (ACGGP)
- Society for Sedimentary Geology (SEPM)
- Society of Exploration Geophysicists (SEG)
- Rocky Mountain Association of Geologists (RMAG)
- Geological Society of America (GSA)

PUBLICATIONS AND POSTERS


- Ortiz, L., Tellez, J.J., Bedle, H, 2020, Application of unsupervised machine learning
techniques in sequence stratigraphy and seismic geomorphology: A case of study in the Cenozoic deep-water deposits in Northern Carnarvon Basin, Australia, SEG Technical Program Expanded Abstracts 2020, /doi.org/10.1190/segam2020-3424849.1

- Ortiz, L., Tellez, J.J., Bedle, H, 2020, Seismic characterization of a blocky mass transport deposit in the Traella Limestone Formation, North Carnarvon Basin, Australia, Interpretation, vol:8, iss:4

- La Marca Molina, K., Bedle, H., Tellez, J., 2020, Seismic attributes and analogs to characterize a large fold in the Taranaki Basin. Interpretation, vol:8 iss:4


- Cervantes, A, J. J. Tellez, K. La Marca, 2019, Using machine learning techniques for mapping dolomitic facies in a triple porosity calcareous reservoir. Campeche Sound, Gulf of Mexico, AAPG International Conference & Exhibition, Argentina, Aug 2019


**INVITED TALKS / WORKSHOPS**


**PROFESSIONAL DEVELOPMENT**

Professional Short Courses, Workshops, and Field Trips
- Risk Analysis and Decision Making using Crystal Ball. Dr. James Murtha. Oct 5, 2012
- Integrated Reservoir Analysis. Dan Hartmann and Jhon Farina. Occidental Petroleum, Sep 08, 2010
- Ferron Sandstone Outcrops in Utah – Field trip, Tom Ryer. Occidental Petroleum, Aug
28, 2010
• Reservoir Characterization of Fluvio-Deltaic systems. Tom Ryer. Occidental Petroleum Mar 9, 2010
• Petroleum Geoengineering. Patrick Corbett. SEG Short Course, Jul 2009
• Seismic Interpretation and Analysis in Thrust Belts. Roberto Linares, Aug 13 – 14, 2007

HONORS AND AWARDS

• 2018 Provost Award of Excellence in Teaching: Certificate of Distinction for top 10 percent of all graduate assistants across campus by student evaluations for courses taught during the Fall 2018 semester, University of Oklahoma

• 2017 ETCS Award for Most Dedicated International Instructor, Graduate College of the University of Oklahoma. Fall 2017 semester, University of Oklahoma

• 2018 Best Collaborating Internship Project, Baker Hughes. Awarded for integrating disciplines to achieve the project objective, Summer 2018, Oklahoma City, OK


• 2008 First Place Award, intern project at Occidental Oil and Gas: Integration of petrophysical data and 3D seismic interpretation for potential new development wells in Matanegra Block. Cano Limon Field, Colombia
EDUCATION:
Ph.D. (Geology) 2019
Utah State University, Logan, UT
Adviser: Dr. Tammy Rittenour
Committee members: Dr. Joel Pederson, Dr. Patrick Belmont, Dr. Joe Wheaton, Dr. Justin DeRose

M.A. (Hydrologic Science) 2012
Boise State University, Boise, ID
Thesis: *A 14,000-year Record of Fire and Alluvial Fan Deposition Reveals Relationships Among Fire, Climate, Vegetation and Sediment Yields in the Middle Fork Salmon River, Idaho*
Adviser: Dr. Jennifer Pierce
Committee members: Dr. Ben Crosby, Dr. Elowyn Yager

B.A. (Majors: Physical Geography and Environmental Science) 2004
University of Colorado, Boulder, CO

TEACHING EXPERIENCE:
Instructor of Geology – (2018-2021)

- **GEOL 103 Weather and Climate** – Colorado Mesa University
- **GEOL 104 Oceanography** – Colorado Mesa University
- **GEOL 250 Environmental Geology** – Colorado Mesa University
- **GIST 332 Introduction to GIS** – Colorado Mesa University
- **GEOL 305 Cartography** – Colorado Mesa University
- **GEOL 333 Geology of Canyon Country** – Colorado Mesa University
- **GEOL 402/402L Geomorphology** – Colorado Mesa University
- **GEOL 455/455L River Dynamics** – Colorado Mesa University
- **GEOL 480 Summer Field Camp** – Colorado Mesa University

Instructor – (2012-2016)

- **GEOL 3100 Natural Disasters** - Utah State University: Summer - 2015 / 2016 (3 credit, 21 and 19 enrollment)
- **USU 1010 Connections** - Utah State University: Fall - 2013 (1 credit, 18 enrollment)
USU 1010 Natural Connections - Utah State University: Fall - 2014 (1 credit, 31 enrollment)

GEOS 313 Geomorphology, Boise State University: Spring - 2012 (4 credit, 25 enrollment)

Teaching Assistant – (Utah State University, UT)

Course: Geol 1115 Physical Geology Spring 2018 (4 credit, 45 students).
Course: Geol 6800 Optically Stimulated Luminescence Short Course Summer 2013 (3 credit, 9 students)

GK-12 National Science Foundation Fellowship - (2010-2011) Boise State University, ID
A teaching collaboration between Boise State University and the Foothills Environmental Education Learning Center integrating scientific research into non-traditional informal education.

PUBLICATIONS AND REPORTS


PUBLICATIONS IN PREPARATION


INVITED TALKS

Geological Society of America National Conference (Denver, CO - 2016) – “Using Cosmogenic Nuclides to Understand the Connection between Erosion Rates, Environmental Factors, and Landscape Response”

American Fisheries Association Talk (Boise, ID - 2013) - “Climate, fire, and vegetation change provide primary controls on geomorphic response in the MFSR: Evidence from a 14,000-year record”

PROFESSIONAL DEVELOPMENT AND SERVICE:
STEM fair for high school on the Navajo Reservation in SE Utah (Montezuma Creek, UT – 2018)
Friends of the Pleistocene Field Trip Participant (Moab – 2018)
Preparing for an Academic Career in Geosciences Workshop (Madison, WI - 2015)
Internship at the University of Wyoming (Laramie, WY – 2015) – Cosmogenic Nuclide Berryllium-10 Laboratory
Internship at the University of California Irvine (Irvine, CA – 2015) – Radiocarbon AMS Laboratory
Grant Writing Workshop (Logan, UT – 2013 and 2015)
Sediment Transport Short Course (Logan, UT – 2013)
Optically Stimulated Luminescence Short Course (Logan, UT – 2012)
Software Carpentry Bootcamp (Logan, UT – 2013) – Two-day programming workshop
Friends of the Pleistocene Field Trip Participant (Owyhee’s – 2011)
Friends of the Pleistocene Field Trip Participant (Path of the Bonneville Flood – 2011)
GK-12 Presentation Boot Camp (Washington DC - 2011)
EPSCOR National Conference (Cœur d’Alene, ID - 2011) – Student Event Coordinator
Boise Watershed Environmental Education Center volunteer (Boise, ID – 2009 - 2010)
Friends of the Pleistocene Field Trip Participant (Henry Mountains Utah - 2010)
Internship at the University of Arizona Accelerator Mass Spectrometry Lab (Tucson, AZ- 2010)
North American Dendro-ecological Field week (Hampshire College, MA - 2009)
Women’s Leadership Conference (Boise, ID - 2009)
Friends of the Pleistocene Field Trip Participant (Lees Ferry, AZ - 2009)
AmeriCorps Member (Gainesville, FL - 2008)
National Interpretive Guide Training and Certification (Syringa, ID - 2005)

AWARDS AND SPECIAL RECOGNITION

– Outstanding Graduate Researcher from Utah State University (2016)

– Outstanding Student Paper Award, American Geophysical Union (2011) - Wildfires, debris flows, and climate: Using modern and ancient deposits to reconstruct Holocene sediment yields in central Idaho.

– EPSCOR Western Consortium Tristate Conference Best Student Poster Award (2011)

– Science in Minute Finalist (2011) – Contest top four finalists: created 90-second video using new technology demonstrating an exploding volcano to grade K-12 students.

– John Montagne Award (2010) – GSA Student Research Grant recipient and award. This monetary award supports research in the field of Quaternary geomorphology.

PROFESSIONAL ORGANIZATIONS AND SERVICE:


CHAIED CONFERENCE SESSIONS

Geological Society of America (Denver, CO - 2016)
   T60. Quantifying and Interpreting the Role of Climate, Tectonics, and Autogenic Processes in Landscape Dynamics
   T179. Quaternary Geochronometers: Applications of Multi- Technique Approaches in Geomorphology and Archeology

Geological Society of America (Baltimore, MD - 2015)
   T188. Inside or Out? Investigations into Driving Forces in Fluvial Systems
   T189. New Applications of Geochronologic Techniques to Quaternary and Archaeological Settings

American Geophysical Union (San Francisco, CA - 2015)
   EP43C. Distinguishing Climate, Tectonic, and Autogenic Drivers in Fluvial Records

GK-12 National Conference (Washington DC - 2011)
   The benefits of outdoor learning to STEM curriculums

GRANTS AND FUNDING (~ $40,000 TOTAL)

2017 Utah State University School of Graduate Studies Dissertation Fellowship - $5000
2017 Utah State University Center for Women and Gender Scholarship - $1196
2016 Association of Women Geoscientist Chrysalis Scholarship – $2000
2016 Utah State University Center for Women and Gender Weinshenker Scholarship - $1000
2015 NSF Doctoral Dissertation Research Improvement Grant: Use of cosmogenic nuclides to understand relations among climate change, erosion rates, and landscape response in Grand Staircase region of Colorado. - $16,000
2015 Utah State University Enhancement Grant – $4,000
2015 Utah State University Geology Department Robeson Grant - $300
2014 Utah State University Geology Department Springer Memorial Scholarship – $800
2014 Utah State University Ecology Center Grant - $2,500
2013 Geological Society of America Student Research Grant - $1,875
2013 Colorado Scientific Society Grant - $800
2013 Geology Department Robeson Grant - $300
2010 Geological Society of America Student Research Grant - $3,500

CONFERENCE ABSTRACTS AND PRESENTATIONS:


2015. Riley, K. and Rittenour, T., Mid-Late Holocene Arroyo Stratigraphy in Southern Utah; Balance between Climate Forcing and Geomorphic Thresholds. American Geophysical Union National Conference (San Francisco, CA) – Poster.


2010. **Riley, K.** and Pierce, J., The role of episodic fire-related debris flows on long-term (10^3-10^4) sediment yields in the Middle Fork Salmon River Watershed, in central Idaho. American Geophysical Union National Conference (San Francisco, CA) – Poster.


2010. **Riley, K.** and Pierce, J., Fire history reconstruction and sediment yields in the Middle Fork Salmon River throughout the Holocene. Idaho EPSCOR Conference (Boise, ID) - Poster.

2009. **Riley, K.** and Pierce, J., Fire history reconstruction and sediment yields in the Middle Fork Salmon River throughout the Holocene. Idaho EPSCOR Conference (Moscow, ID) - Poster.
APPENDIX B

Geosciences Library Resources
Date of Assessment: October 2021

Program under review: Geosciences

Description of Program: Students pursuing a degree in the Geosciences programs will develop skills in field, analytical, and computational aspects of the Geosciences, and will produce a project that will require independent research.

Program Level/s: Bachelors

Liaison: Jamie Walker

1. Collection Assessment

The assessment covers five areas: Reference sources, Monographs, Electronic resources, Periodicals, and Media. The assessment methodology, supporting data and resource lists are included in the Appendices.

<table>
<thead>
<tr>
<th>Appendix</th>
<th>Description</th>
<th>Pages</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Reference Sources</td>
<td>3</td>
</tr>
<tr>
<td>B</td>
<td>Monographs</td>
<td>3</td>
</tr>
<tr>
<td>C</td>
<td>Electronic Resources</td>
<td>5</td>
</tr>
<tr>
<td>D</td>
<td>Periodicals</td>
<td>6</td>
</tr>
<tr>
<td>E</td>
<td>Media</td>
<td>7</td>
</tr>
<tr>
<td>F</td>
<td>Additional Resources</td>
<td>7</td>
</tr>
<tr>
<td>G</td>
<td>Research Instruction</td>
<td>7</td>
</tr>
</tbody>
</table>

Collection development is the joint responsibility of the Geosciences faculty and the Physical and Environmental Sciences Librarian. Review slips are sent to the faculty each month for their review. They may also recommend titles found in their journal reading, publishers’ advertisements, or other sources. Titles recommended are sent to the librarian, who reviews them and sends them on for purchase as funds allow. 288 titles were purchased in the last 5 years distributed per below. The pandemic recently reduced orders, but that is expected to return to normal.

<table>
<thead>
<tr>
<th>Fiscal Year</th>
<th>FY 2016/17</th>
<th>FY 2017/18</th>
<th>FY 2018/19</th>
<th>FY 2019/20</th>
<th>FY 2020/21</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>106</td>
<td>62</td>
<td>64</td>
<td>43</td>
<td>13</td>
</tr>
</tbody>
</table>

The budget line is also supplemented by the SpringerLink, ScienceDirect (Elsevier), and Oxford e-book collections.

2. Evaluation of the total collection

a. Strengths

Journals, books, reports, and maps are all important resources for CMU geoscience faculty and majors. The indexing (particularly GeoRef) and full-text provided by
CMU's database subscriptions provide access to much current scholarship in the field, strengthening the Library's resources for geoscience research. While not extensive, the Library's reference collection supports the need for authoritative concise geoscience information. The Library's e-book collection is strong in the sciences and the geosciences are well represented. E-books on both general and esoteric topics are readily available. The Library's DVD, and Films on Demand collections provide useful resources, especially for general and introductory needs. The circulating geoscience book collection receives regular use and sufficiently supports coursework for undergraduate geoscience majors.

b. Weaknesses

As the geosciences monographic collection is expanded, effort should be made to order additional materials covering subject areas with fewer resources, such as environmental geology or geological education. If there is interest in media materials for more advanced students, additional materials could be purchased for this purpose, as well as to replace older VHS titles.

3. Recommendations

The purchase of newer titles in the geosciences should continue, and the current scope of electronic resources should be maintained.

Library Director:  

Sylvia L. Rael

Date: October 19, 2021
APPENDIX A: Reference sources
The print reference collection provides concise authoritative information with 27 print titles on the general subject of geology. Additional support is provided by online resources.

Sample print and online Reference titles:

- Dictionary of ecology (online, 2015)
- A dictionary of environment and conservation (online, 2017)
- A dictionary of geology and earth sciences (online, 2020)
- Encyclopedia of quaternary science (print, online, 2013)
- Encyclopedia of sediments and sedimentary rocks (print, 2003)
- Glossary of geology (print, 2011)
- Oxford companion to the earth (online, 2000)

APPENDIX B: Monographs
Method of analysis: Within the B.S. Geosciences degree, three concentrations are offered: Geology, Environmental Geology, and Secondary Education (Geology). Minors are offered in Geology, Watershed Science, and Geographic Information Systems and Technology. Each of these major terms was searched in the library catalog by date range using the Library of Congress Subject Headings (LCSH). Results are below. All were searched as keywords within the subject index, except for Geographic Information Systems which was an exact subject search.

Age Analysis: For the print/media portion of the collection analyzed by subject in the charts below, about 3% were published since 2010, with about 13% published since 2000. For electronic materials, about 18% have been published since 2010, a third since 2000. For the collection analyzed by classification number, about 5% were published since 2010, with 11% since 2000. Print/Media includes physical items in the collection excluding maps. Maps include both print and e-maps. Electronic materials include all online access materials such as government documents, streaming videos, e-books, or maps. For geology, both current and historical documents are of value.

<table>
<thead>
<tr>
<th>Geology</th>
<th>Print/ Media</th>
<th>Maps</th>
<th>Electronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-</td>
<td>293</td>
<td>25</td>
<td>1498</td>
</tr>
<tr>
<td>2000-2009</td>
<td>611</td>
<td>108</td>
<td>1180</td>
</tr>
<tr>
<td>1990-1999</td>
<td>2259</td>
<td>455</td>
<td>630</td>
</tr>
<tr>
<td>1980-1989</td>
<td>2046</td>
<td>617</td>
<td>732</td>
</tr>
<tr>
<td>1970-1979</td>
<td>1548</td>
<td>1227</td>
<td>634</td>
</tr>
<tr>
<td>Pre 1970</td>
<td>3907</td>
<td>1765</td>
<td>1683</td>
</tr>
<tr>
<td>TOTAL</td>
<td>10664</td>
<td>4197</td>
<td>6357</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Geology – Study and teaching</th>
<th>Print/ Media</th>
<th>Electronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-</td>
<td>5</td>
<td>17</td>
</tr>
<tr>
<td>2000-2009</td>
<td>3</td>
<td>19</td>
</tr>
<tr>
<td>1990-1999</td>
<td>9</td>
<td>1</td>
</tr>
<tr>
<td>1980-1989</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>1970-1979</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>Pre 1970</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>TOTAL</td>
<td>23</td>
<td>39</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Environmental Geology</th>
<th>Print/ Media</th>
<th>Electronic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Watershed (as word contained in LCSH)</td>
<td>Print/ Media</td>
<td>Maps</td>
</tr>
</tbody>
</table>
Another way of analyzing the collection is by LC Classification Number range which examines primarily print books. Highlighted here are sections of the geoscience portions of the LCCN schedule.

<table>
<thead>
<tr>
<th>Call number ranges</th>
<th>Geology</th>
<th>QE 38 Environmental Geology</th>
<th>TC 401-527 Watershed Management and River, Lake, Water-Supply Engineering</th>
<th>G 70.212-70.217 Geog. Inf. Systems</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010-</td>
<td>365</td>
<td>1</td>
<td>14</td>
<td>15</td>
</tr>
<tr>
<td>2000-2009</td>
<td>459</td>
<td>2</td>
<td>15</td>
<td>21</td>
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<tr>
<td>1990-1999</td>
<td>529</td>
<td>1</td>
<td>8</td>
<td>14</td>
</tr>
<tr>
<td>1980-1989</td>
<td>955</td>
<td>0</td>
<td>19</td>
<td>0</td>
</tr>
<tr>
<td>1970-1979</td>
<td>1,563</td>
<td>0</td>
<td>61</td>
<td>0</td>
</tr>
<tr>
<td>Pre 1970</td>
<td>3,762</td>
<td>0</td>
<td>59</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>7,633</td>
<td>4</td>
<td>176</td>
<td>50</td>
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</table>
Recent monographic purchases of geoscience interest:

- Behringer, W., Selwyn, P. E., 2019, *Tambora and the year without a summer, how a volcano plunged the world into crisis*: Cambridge, Massachusetts, Polity Press, 334 p.

As a partial government depository, the Library also makes available a large number of federal documents. For the geosciences, included are those published by a variety of governmental agencies including the U.S. Geological Survey. These are available in a variety of formats with most recent documents online.

**APPENDIX C:** Electronic Resources

Indexes/Databases: Two databases were selected for analysis.

*Academic Search Complete:* A general subject academic journal database that contains over 100 journals related to the geosciences. Coverage goes back to the late 1960s.

*GeoRef:* A geosciences specific database containing over 4 million references with coverage back to 1666. GeoRef is an index only, and does not natively contain full text, although linked full text is often available.

Journal Articles:
Subject searches for some of the topics to be covered in the courses for this program were done in Academic Search Complete (ASC) and GeoRef databases to illustrate available resources. The journal literature is rich in articles for this program. The chart below shows a sampling of the resources available.

<table>
<thead>
<tr>
<th>Subject/Topic</th>
<th>ASC Total Articles</th>
<th>ASC 2010- Articles</th>
<th>ASC 2010- Peer reviewed</th>
<th>ASC 2010- Peer reviewed, full-text</th>
<th>GeoRef Total Articles</th>
<th>GeoRef 2010- Articles</th>
<th>GeoRef 2010- Articles w/ Linked Full Text</th>
</tr>
</thead>
<tbody>
<tr>
<td>Geology</td>
<td>78,114</td>
<td>47,107</td>
<td>44,082</td>
<td>35,868</td>
<td>793,419</td>
<td>26,468</td>
<td>12,558</td>
</tr>
<tr>
<td>Geology w/ Education</td>
<td>682</td>
<td>371</td>
<td>237</td>
<td>162</td>
<td>13,652</td>
<td>1,912</td>
<td>639</td>
</tr>
<tr>
<td>Environmental geology</td>
<td>416</td>
<td>290</td>
<td>234</td>
<td>163</td>
<td>50,888</td>
<td>537</td>
<td>205</td>
</tr>
<tr>
<td>Watershed</td>
<td>28,844</td>
<td>22,758</td>
<td>21,606</td>
<td>17,005</td>
<td>21,565</td>
<td>5,608</td>
<td>3,658</td>
</tr>
<tr>
<td>Geographic Info. Systems</td>
<td>21,329</td>
<td>15,605</td>
<td>14,476</td>
<td>11,472</td>
<td>32,402</td>
<td>9,207</td>
<td>5,257</td>
</tr>
</tbody>
</table>

Other Databases

Other databases of possible interest include Science Direct and Wiley.

**APPENDIX D: Periodicals**

Many geoscience journal titles which formerly were held in print have moved to online access and are maintained through individual subscriptions, or are contained in science databases such as ScienceDirect (Elsevier), Wiley, or Academic Search Complete. There also remain a number of print only titles. The following titles highlight available journals and include some CMU former print titles now online.

- AAPG Bulletin
- American Mineralogist
- Annual Review of Environment and Resources
- Economic Geology
- Engineering and Mining Journal
- EOS
- Geological Society of America Bulletin
- Geology
- Geomorphology
- Geophysics
- Geoscience Canada
- Groundwater
- Groundwater Monitoring and Remediation
- Journal of Geology
- Journal of Sedimentary Research
Mineralogical Record
Mining Magazine
Mountain Geologist
Oil and Gas Journal
Water Well Journal
Zeitschrift für Geomorphologie

A search of the subject "geology" in our Journal Finder retrieved 230 full-text journal titles. CMU students and faculty have a large number of quality titles from which to choose.

APPENDIX E: Media
The Library holds physical DVDs and VHS, and also subscribes to Films on Demand (FoD), a streaming video service from Films Media Group. Films on Demand includes educational videos, documentaries, and PBS publications. Links to streaming media can be inserted into D2L to facilitate viewing. A subject search of "geology" in the library catalog brings up over 300 titles, most of which are available by streaming online. Most streaming materials are introductory or intermediate in nature, although some may be appropriate for more advanced students. Some titles that might be appropriate for this program are:

Asthenosphere (4 min., FoD, 2010)
Bushveld complex (30 min., VHS, 1982)
Continental deformation creating the Basin & Range (8 min., FoD, 2012)
Earth revealed (840 min. on 7 DVDs, 1992)
Earth's changing surface (33 min., FoD, 2013)
Extensional tectonics (23 min., VHS, 1987)
Geologic time (18 min., FoD, 1999)
Lighting the frontier, the story of Colorado's Florence oil field (71 min., DVD, 1988)
Metamorphic rocks (15 min., FoD, 1999)
Mountains and mountain-building processes (25 min., FoD, 2012)
The Rockies (45 min., FoD, 2011)
Saving the Dead Sea (52 min., FoD, 2019)
Watershed revolution (30 min., FoD, 2014)

APPENDIX F: Additional Resources
Journal literature not available through Colorado Mesa University, including those titles not available because of publisher embargo, can be provided by the Interlibrary Loan Department. The average amount of time it takes to fill an article request is 12 hours. Physical items such as books and DVDs not owned by Colorado Mesa University can be borrowed from other libraries within the state or region through programs such as Prospector, and when necessary, throughout the world. Items from regional libraries typically arrive in 3-5 business days.

APPENDIX G: Research Instruction and Guidance
Librarians provide instruction on how to find, use, and cite materials. They can customize instruction for the specific topic at hand, including the intricacies of finding materials in a particular subject area. Sessions can be introductory or advanced in nature. Instruction can
be provided in the regular classroom, in the library classroom, or remotely. Customized web materials can also be created to guide students to use and discover appropriate resources, which can be embedded in D2L.

Students may receive personal assistance from professional degreed librarians through the Research Help Desk. The desk is staffed most hours the library is open. Help is available in-person, via telephone, email, and 24/7 chat.
APPENDIX C

Geosciences Curriculum Map
<table>
<thead>
<tr>
<th>Course GEOL</th>
<th>SLO1 Special Knowledge</th>
<th>SLO2 Field Data Collection</th>
<th>SLO3 Lab Data Collection</th>
<th>SLO4 Technology</th>
<th>SLO5 Writing</th>
<th>SLO6 Oral Comm</th>
</tr>
</thead>
<tbody>
<tr>
<td>100 Survey Earth Sci</td>
<td></td>
<td></td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>103 Weather &amp; Clim</td>
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<td></td>
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<tr>
<td>104 Oceanography</td>
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<tr>
<td>105 Colorado Geol</td>
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<tr>
<td>106 Dinosaurs</td>
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<tr>
<td>107 Nat Hazards</td>
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<tr>
<td>111 Phys Geol</td>
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<td>112 Historical</td>
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<td>113 Field Physical</td>
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<td>113L Field Phys Lab</td>
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<td>202 Field Studies</td>
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<td>204 Comp Apps</td>
<td>Y</td>
<td>Y</td>
<td>X</td>
<td>X</td>
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<td>250 Environ Geol</td>
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<td>Y</td>
<td></td>
<td>Y</td>
<td>Y</td>
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<tr>
<td>301 Structure</td>
<td>Y</td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>301L Structure Lab</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td>Y</td>
<td></td>
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<tr>
<td>331 Mineralogy</td>
<td>Y</td>
<td></td>
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<td></td>
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<tr>
<td>331L Mineralogy Lab</td>
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<td>Y</td>
<td>X</td>
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<td>333 Canyon Country</td>
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<td>340 Petrology</td>
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<tr>
<td>340L Petrology Lab</td>
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<td>X</td>
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<tr>
<td>402 Geomorph</td>
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<td>402L Geomorph Lab</td>
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<td>Y</td>
<td>Y</td>
<td>Y</td>
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<td>404 Geophysics</td>
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<td></td>
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<td>404L Geophys Lab</td>
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<td>415 Ground water</td>
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<td>415L GW Lab</td>
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<tr>
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<td>Y</td>
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</tr>
</tbody>
</table>

X – denotes part of current Assessment Plan; Y- denotes SLO is completed but not assessed.
X – denotes part of current Assessment Plan but data has yet to be collected.
X - denotes course will not be used for assessment after this reporting period.
NOTE: New CMU-wide SLO’s #7 and #8 related to social responsibility and information literacy were not collected during the reporting period.
APPENDIX D

Geosciences Assessment Report
<table>
<thead>
<tr>
<th>Program Outcomes</th>
<th>Courses/Educational Strategies Indicate if outcome is Beginning(B), Developing(D) or Advanced(A)</th>
<th>Assessment Method(s)</th>
<th>Time of Data Collection/Person Responsible</th>
<th>Results of Assessment</th>
<th>Actions Taken</th>
</tr>
</thead>
<tbody>
<tr>
<td>Outcome #1</td>
<td>Articulate the fundamental knowledge base and ideas of the major fields of geoscience (specialized skills in geoscience)</td>
<td>GEOL 111: Physical Geology (B)</td>
<td>What: Geology Assessment Exam</td>
<td>Who: All professors teaching GEOL 111</td>
<td>Results: Fall &amp; Spring 2013-2021: (850 students in 23 sections) Avg.: 76.0 % Avg. of Med.: 76 % Mean of Top 5 %: 96.5 % Mean of Bot. 5%: 49%</td>
</tr>
</tbody>
</table>

Key Findings: Results are encouraging, but could be higher.

Conclusions: Students in these courses are performing at
<table>
<thead>
<tr>
<th>Course</th>
<th>What</th>
<th>Who</th>
<th>Results</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 113:</td>
<td>Geology Assessment</td>
<td>All professors teaching GEOL 113</td>
<td>Fall &amp; Spring 2014 - 2021: total 428 students in 20 sections)</td>
<td>Continue what we are doing in this course, the data indicates that the students are learning the required material.</td>
</tr>
<tr>
<td>Field-based</td>
<td>Exam</td>
<td></td>
<td>Avg.: 80 %</td>
<td></td>
</tr>
<tr>
<td>Physical Geology</td>
<td></td>
<td></td>
<td>Avg. of Med.: 85%</td>
<td></td>
</tr>
<tr>
<td>(B)</td>
<td></td>
<td></td>
<td>Mean of Top 5 %: 97%</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean of Bot. 5%: 41%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>How: Delivered as the</td>
<td></td>
<td>Key Findings:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>final exam in GEOL 113</td>
<td></td>
<td>Students in this course are performing very well.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>When: As the final</td>
<td></td>
<td>Conclusions:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>exam for every GEOL</td>
<td></td>
<td>Students continue to demonstrate solid learning performance in this</td>
<td></td>
</tr>
<tr>
<td></td>
<td>113 section in all</td>
<td></td>
<td>course.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>semesters.</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Action:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Continue what we are doing in this course, the data indicates that the students are learning the required material.</td>
<td></td>
</tr>
<tr>
<td>GEOL 490:</td>
<td>Geology Exit Exam</td>
<td>The CMU Testing Center will administer</td>
<td>Spring 2014 – Spring 2021 (100 students in 8 sections)</td>
<td>None at this time.</td>
</tr>
<tr>
<td>Seminar (A);</td>
<td></td>
<td>the test, and a spring semester GEOL 490</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>instructor will collect the results.</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Results:</td>
<td></td>
</tr>
<tr>
<td></td>
<td>How: Seniors are</td>
<td></td>
<td>Avg.: 78 %</td>
<td></td>
</tr>
<tr>
<td></td>
<td>required to take the</td>
<td></td>
<td>Median: 78%</td>
<td></td>
</tr>
<tr>
<td></td>
<td>test before they can</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>graduate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Re-evaluation Date:</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Nov 2021</td>
<td></td>
</tr>
<tr>
<td>Outcome #2</td>
<td>Collect and interpret geoscience field data (problem solving skills)</td>
<td>GEOL 202: Introduction to Field Studies (D);</td>
<td><strong>What:</strong> The final project, which is a geologic field mapping project.</td>
<td><strong>Who:</strong> All professors teaching GEOL 202</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td><strong>When:</strong> The final field mapping project for every GEOL 202 section in all semesters.</td>
<td><strong>How:</strong> Delivered as the final project for GEOL 202. The students will be assessed based on the accuracy of their geologic mapping (50 pts), the accuracy of the accompanying cross section (20 pts), the quality of the field observations recorded in field notebooks (30 pts).</td>
<td><strong>Results:</strong> Spring 2013 - Spring 2021 (total of 122 students in 12 sections) Average score: 87% Median: 90% Mean of Top 5%: 98% Mean of Bot. 5%: 62%</td>
<td><strong>Key Findings:</strong> 95% of students scored &gt;70% on the final mapping project.</td>
<td></td>
</tr>
</tbody>
</table>
Conclusions:
Our goal was to have at least 80% of the students score >70% on the final mapping project, so we achieved our goal.

GEOL 480: Summer Field Camp (A)

What: Six week-long mapping projects

How: Delivered as weekly final projects. The students will be assessed based on the accuracy of their geologic mapping (50 pts), the accuracy of the accompanying cross section (25 pts), the quality of the field observations recorded in field notebooks (25 pts).

Who: All professors teaching GEOL 480

When: The mapping projects are done each time this required class is conducted, (alternate Summer Semesters).

Results: Summers 2014-2021 (88 students in 8 sections)
Avg Grade: 86%
Median: 87%
Mean of top 5%: 95%
Mean of bottom 5%: 51%

Key Findings: 95% of students have earned a cumulative score of at least 70% on these projects.

Conclusions: None at this time

Action: None at this time.

Re-evaluation Date: Nov 2021
| **Outcome #3** | **GEOL 331L Crystallography & Mineralogy Lab (D)** | **What:** Throughout the semester the students are expected to identify unknown mineral specimens. They are also expected to collect minerals in the field as part of a mineral collection that they turn in at the end of the semester for lab credit. | **Who:** All professors teaching GEOL 331L | **When:** The mineral collection project and lab exams are done each time this required class is conducted, (every Fall Semester). | **Results:** The overall class average should exceed 70 points (total = 100 points); i.e., a minimal "C" grade. Fall 2014 – Fall 2020: 92 students in 7 sections Avg Score: 84% Median: 87% Mean of top 5%: 100% Mean of bottom 5%: 50% | **Key Findings:** Overall class average score exceeded 70%. Students are performing very well in this course. | **Conclusions:** None at this time. | **Action:** None taken at this time. **Re-evaluation Date:** Sept 2021 |

**What:** Throughout the semester the students are expected to identify unknown mineral specimens. They are also expected to collect minerals in the field as part of a mineral collection that they turn in at the end of the semester for lab credit.  

**How:** Students use textbook reading materials on the physical properties of minerals and lectures on same. In the lab students are given about 30 unknown mineral specimens every two weeks. Students must use the physical properties of minerals such as crystal form, hardness, cleavage, twinning, color, etc. to identify these minerals. In the field, students must collect and identify minerals based on their
<table>
<thead>
<tr>
<th>What: A final project that involves interpretation of fluvial depositional systems using information presented in lecture (GEOL 444) coupled with a six to eight hour field exercise (GEOL 444L) where data are collected on an ancient fluvial sequence at Riggs Hill near Grand Junction.</th>
<th>Who: All professors teaching GEOL 444/444L</th>
<th>Results: Fall 2013 &amp; Spring 2021: 86 students in 7 sections</th>
<th>Action: None at this time</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOL 444/444L: Sedimentology and Stratigraphy and Lab (A)</td>
<td>When: The final lecture/lab project is done each time this required class is conducted, (every Spring Semester).</td>
<td>Scores for Rigg’s Hill Project: Average: 91% Median: 91% Min: 81% Max: 96%</td>
<td>Re-evaluation Date: Nov 2021</td>
</tr>
<tr>
<td>How: In lecture (GEOL 444), students are given reading materials on the spectrum of fluvial depositional systems, coupled with detailed lectures on same. In the field (GEOL 444L), students must generate sedimentologic properties for use in their mineral collection that they turn in at the end of the semester.</td>
<td>Key Findings: Students are performing exceptionally well on this project</td>
<td>Conclusions: None at this time</td>
<td></td>
</tr>
</tbody>
</table>
data (sandstone-body thickness, lithofacies types, stratal surfaces, paleocurrents, and three-dimensional architecture) on a fluvial complex at the Jurassic-Cretaceous boundary. Students are required to use their field data to interpret the genetic type of the sandstone body based on the materials presented in lecture and the reading assignments. Students are required to write a brief report discussing their data and interpretations. This exercise is worth 100 points; breakdown is as follows: accuracy of sedimentologic data collected in field (50 points), quality of final report (40 points), and neatness (10 points).

<p>| GEOL 415/415L Intro to Ground Water and Lab (A) | <strong>What:</strong> Lab exercises require that student collect lab data from a variety of | <strong>Who:</strong> All professors teaching GEOL 415/415L | <strong>Results:</strong> Spring 2014 (8 students, one section) | <strong>Action:</strong> None at this time |</p>
<table>
<thead>
<tr>
<th>Outcome #4</th>
<th><strong>Use technology (e.g. computer software) for evaluating quantitative geoscience data (technology skills)</strong></th>
<th><strong>What:</strong> The final projects, which are computer-generated geologic maps and written report.</th>
<th><strong>Who:</strong> Geology professor teaching GEOL 204</th>
<th><strong>When:</strong> During every section of GEOL 204 which is delivered every semester. Students will take GEOL 204 in either fall or spring during their sophomore year.</th>
<th><strong>Results:</strong> Goal: The class average should exceed 70 points (total = 100 points); i.e., a minimal &quot;C&quot; grade. Fall 2013 - Spring 2021; Total of 92 students in 13 sections. Class Average: 87% Class Median: 88% Mean of top 5%: 95% Mean of bottom 5%: 61%</th>
<th><strong>Action:</strong> None at this time</th>
<th><strong>Re-evaluation Date:</strong> Nov 2021</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GEOL 204: Computer Applications in Geology (B)</strong></td>
<td><strong>How:</strong> Students are required to develop computer skill in the geologic-related problems and utilize the following software: Excel, PowerPoint, and ArcGIS. The final project includes both subsurface geologic maps (well location map and contour maps) of the Dakota Group from the</td>
<td></td>
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</tr>
</tbody>
</table>
petroleum well data in ArcGIS and five-page written report. The students will be assessed based on the accuracy of their geologic maps (60 pts), the quality of the petroleum information (location, depth, and production history) in Excel (10 pts), and written report which includes abstract, introduction, production history, data gathering, computer generation, and analysis (30 pts)

<table>
<thead>
<tr>
<th>Outcome #5</th>
<th>GEOL 490: Seminar (A)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>What:</strong> Written report at the end of the course.</td>
<td><strong>Who:</strong> The GEOL 490 instructor.</td>
</tr>
<tr>
<td><strong>How:</strong> This report will be 15 pages (not including figures and tables), and will cover independent research completed during GEOL 490. This project will be assessed using a rubric that rates students on a scale of 1 – 5 for</td>
<td><strong>When:</strong> During every section of GEOL 490, which is delivered every spring semester.</td>
</tr>
<tr>
<td><strong>Results:</strong></td>
<td><strong>Action:</strong> No action has been taken because of the very limited data.</td>
</tr>
<tr>
<td><strong>Depth of research (out of 5 possible points):</strong> 4.2</td>
<td><strong>Re-evaluation Date:</strong> Nov 2021</td>
</tr>
<tr>
<td><strong>Appropriate Methods (out of 5 possible points):</strong> 4.4</td>
<td></td>
</tr>
<tr>
<td><strong>Organization (out of 5</strong></td>
<td></td>
</tr>
</tbody>
</table>
the following categories: 1) depth of research/content & analysis; 2) appropriateness of methods and approach, 3) organization and professionalism of the report, and 4) clarity of writing and proper use of grammar and terminology.

Possible points: 4.3
Technical Writing (out of 5 possible points): 4.3

**Key Findings:**
90% students scored a “4” or higher in two of the four categories.

**Conclusions:**
Students are performing very well in this course.

---

**Outcome #6**
Demonstrate an effective oral presentation on a geoscience study (communication skills)

**What:** Oral presentation at the end of the course.

**How:** This presentation will last 15 minutes and will cover independent research completed during GEOL 490. In addition, 5-10 minutes of questions by peers and instructor will follow the presentation. This project will be assessed using

**Depth of content (out of 5 possible points): 4.2**

**Quality of Presentation (out of 5 possible points): 4.3**

**Results:**
Spring 2014 – Spring 2021: 100 students in 8 sections

- Depth of content (out of 5 possible points): 4.2
- Quality of Presentation (out of 5 possible points): 4.3

**Action:** None at this time

**Re-evaluation Date:** Nov 2021
| GEOL 359: Survey of Energy Resources (A) | **What:** An oral presentation with handout at the end of the course. **How:** Students choose a fossil-energy topic early in the semester and do research for approximately two months. During the last 1-2 weeks of the class, each student makes a 20 minute oral presentation using slides, videos, transparencies, or PowerPoint on the topic, | **Who:** All professors teaching GEOL 359 **When:** Each time the class is conducted (Fall Semester, on alternating years). | **Results:** Fall 2014 (6 students, one section) Average: 88.0% Median: 89.2% | **Action:** None at this time. **Re-evaluation Date:** no data after 2016 |

A rubric that rates them on a scale of 1 – 5 for the following categories: 1) depth of content & analysis; 2) quality and professionalism of presentation including organization and preparedness, 3) quality of power point slides including their clarity and depiction of appropriate material and grammar, and 4) ability to answer questions.

(out of 5 possible points): 4.5

Ability to Answer Questions (out of 5 possible points): 4.4

**Key Findings:** 92% of students in each section scored a “4” in two of the four categories.
followed by five minutes of questions. A handout (with abstract) summarizing their presentation is also provided to the other students and professor. Evaluation involves input from fellow students (peer review) and the professor. A total of 100 points (equivalent to one exam) are tied to the project based on overall effort (30 points),
APPENDIX E

Alumni Survey of Geosciences Graduates
Alumni Survey Results for Geosciences Graduates - 2019
(n = 20)

Overall, how satisfied are you with your CMU education?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Satisfied</td>
<td>11</td>
<td>55.0</td>
</tr>
<tr>
<td>Generally Satisfied</td>
<td>9</td>
<td>45.0</td>
</tr>
<tr>
<td>Ambivalent</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Generally Dissatisfied</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Very Dissatisfied</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

While a student, about how often did you have conversations with faculty outside of class?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Rarely (1-2 times per semester)</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Occasionally (3-5 times per semester)</td>
<td>2</td>
<td>10.0</td>
</tr>
<tr>
<td>Often (once every two weeks)</td>
<td>6</td>
<td>30.0</td>
</tr>
<tr>
<td>Very Often (at least once a week)</td>
<td>12</td>
<td>60.0</td>
</tr>
</tbody>
</table>

Would you encourage a current high school senior to attend CMU?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitely Would</td>
<td>12</td>
<td>60.0</td>
</tr>
<tr>
<td>Probably Would</td>
<td>5</td>
<td>25.0</td>
</tr>
<tr>
<td>Maybe</td>
<td>2</td>
<td>10.0</td>
</tr>
<tr>
<td>Probably Would Not</td>
<td>1</td>
<td>5.0</td>
</tr>
<tr>
<td>Definitely Would Not</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

In what year did you graduate from the major/certificate you chose above?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2018</td>
<td>6</td>
<td>30.0</td>
</tr>
<tr>
<td>2017</td>
<td>2</td>
<td>10.0</td>
</tr>
<tr>
<td>2016</td>
<td>6</td>
<td>30.0</td>
</tr>
<tr>
<td>2015</td>
<td>1</td>
<td>5.0</td>
</tr>
<tr>
<td>2014</td>
<td>5</td>
<td>25.0</td>
</tr>
<tr>
<td>2013</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
How would you rate the overall quality of your education within that degree/certificate program?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>7</td>
<td>35.0</td>
</tr>
<tr>
<td>High</td>
<td>11</td>
<td>55.0</td>
</tr>
<tr>
<td>Average</td>
<td>2</td>
<td>10.0</td>
</tr>
<tr>
<td>Low</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Very Low</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

What degree did you receive?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>B.S. Geosciences, Geology</td>
<td>19</td>
<td>95.0</td>
</tr>
<tr>
<td>B.S. Geosciences, Environmental</td>
<td>1</td>
<td>5.0</td>
</tr>
<tr>
<td>B.S. Geosciences, Secondary Education</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>A.S. Liberal Arts, Geology</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Based on interactions while an undergraduate, CMU Geosciences faculty cared about my education.

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Strongly Disagree</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>3</td>
<td>3</td>
<td>15.0</td>
</tr>
<tr>
<td>4</td>
<td>7</td>
<td>35.0</td>
</tr>
<tr>
<td>5-Strongly Agree</td>
<td>10</td>
<td>50.0</td>
</tr>
</tbody>
</table>

Based on interactions while an undergraduate, CMU Geosciences faculty cared about my overall well-being.

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>1-Strongly Disagree</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>2</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>3</td>
<td>5</td>
<td>25.0</td>
</tr>
<tr>
<td>4</td>
<td>6</td>
<td>30.0</td>
</tr>
<tr>
<td>5-Strongly Agree</td>
<td>9</td>
<td>45.0</td>
</tr>
</tbody>
</table>
Did you participate in student-faculty research?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>12</td>
<td>70.6</td>
</tr>
<tr>
<td>No</td>
<td>5</td>
<td>29.4</td>
</tr>
<tr>
<td>Total</td>
<td>17</td>
<td>100.0</td>
</tr>
</tbody>
</table>

If you participated in student-faculty research, please describe whether or not it was beneficial and how it was or was not beneficial.

- Very beneficial and student-oriented
- The research I participated was greatly beneficial. It allowed me to process and gather data, interpret results, and collaborate with other students/faculty not only from CMU but from other universities as well. I learned that asking questions and being engaged produces better results. My own projects allowed me to network with others who were also conducting research of their own. Those connections were invaluable because I developed some lifelong friendships and I would've never stumbled upon student-faculty research is beneficial through the application of classroom learned skills, and the experience gained from completing tasks associated with future employment.
- It was incredibly beneficial. Doing research hands on was the most beneficial concept. I got a job doing what my research was and that was because I had the experience.
- It was beneficial, I even Presented my research at the GSA in Indianapolis.
- It was beneficial as it gave me lab experience and field experience.
- I was expect to present information that was above my education level. I felt embarrassed when I was expected to present faculty research without having taken the classes necessary to understand the research.
- Good prep for grad work
- Both of my student-faculty research projects were very beneficial, as they prepared me for some of the types of field work and analytical thinking I have since had to use regularly on the job.
In what field of geosciences is your principal employment?

<table>
<thead>
<tr>
<th>Field</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Higher Education</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Elementary or Secondary</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Environmental Geology</td>
<td>6</td>
<td>30.0</td>
</tr>
<tr>
<td>Petroleum Geology</td>
<td>4</td>
<td>20.0</td>
</tr>
<tr>
<td>Mining (including sand and gravel)</td>
<td>3</td>
<td>15.0</td>
</tr>
<tr>
<td>Principal employment is</td>
<td>2</td>
<td>10.0</td>
</tr>
<tr>
<td>Other</td>
<td>5</td>
<td>25.0</td>
</tr>
<tr>
<td>Total</td>
<td>20</td>
<td>100.0</td>
</tr>
</tbody>
</table>

Other Responses:
- Business
- Construction/Roadway Geology
- Environmental Regulation and Compliance/GIS
- Environmental/Gov Contact

What aspect of the CMU Geosciences Program helped you the most in your employment or your life?
- Working with Bill Hood doing research and using XRD/XRF
- While little has changed in my life since graduating, I can say that any knowledge gained through structured research and study of new concepts is always an improvement in life.
- The opportunities to conduct research, present, and TA/internship
- The high number of field trips and in field discussions
- The GIS / GPS training: general sampling procedures; general field work
- The field camp and extra field trips outside the classroom gives great field skills.
- The faculty and amount of field work.
- Public speaking
- My knowledge of geology helps me when I am testing various properties of rocks. While I could test aggregate without this knowledge, it gives me a better understanding of what I am doing, overall.
- Minoring in GIS and basic understanding of how energy resources work.
- Honestly just having a geology degree helped me get my job. Knowing how lab tests work.
- Field work and GIS skills
- Field based support for the lectures. Learning the material then going outside and identifying examples.
- Construction
CMU's accessibility to exposed field geology is immaculate, and I felt like it was used to its full advantage. The field trips, Western Slope field conference, and field camp class allowed me gain better comprehension on what I was learning in class. The field based introduction to geology, field methods, and depositional systems are the best course examples. The talks at GJGS exposed me to a variety of different topics in and outside the Grand Valley. As I progressed through the program, I real

What else could the CMU Geosciences Program have done to help you with your goals for the future?

- They should have pushed us more to do an internship. Finding a job with absolutely no experience was extremely hard. They also should have pushed us to work on our resumes a lot more and helped us make them look a bit more professional to have a fighting chance with candidates that have experience.
- The Geology Department could use more equipment, to improve our knowledge of Laboratory work.
- Push more internship announcements and job opportunities.
- Prepare more for jobs in local economy
- My goals were not centered on employment more oriented towards furthering my own education, along a path of interest. I am not sure that CMU could have done much better.
- My advice to the CMU Geosciences Program would be to stay more up-to-date with technology. For example, have students create a scientific poster in Adobe Illustrator. Use ArcGIS instead of TOPO! Keep teaching programs in the industry like Petra.
- More support for the taking the GRE as well as requiring students to take the FG, GIT fundamentals exam.
- More real life experience. AAPG trips can only get so in depth.
- Make you think and work out problems that arise. How to research and thing like a scientist. Learning to utilize field based data into a proper conclusion.
- Maintaining internship relationships with entities outside academia.
- Increased the amount of networking opportunities
- I wish I learned early on what industries employed geologists work in, what the different schedules and work locations would look like, what classes would benefit what industries, etc. I also wish I had time to take more classes, I understand the university has certain diversity of education requirements, but if I could have taken hydrology, more GIS, Soils classes, instead of Social Sciences, Biology, Humanities, it would have improved my skill as a geologist.
- Connecting students with employers
- Biology students have a list of relevant types of jobs they are qualified for when they graduate. I always wished the geology students had one of those.
- Better job placement programs.
- Better job placement contacts
Comments about your work experience that will help improve the CMU Geosciences Program:

- Required AutoCAD, rockworks, GIS labs for all geology majors.
- My work primarily involves the identification of various lithologies and trace elements. A mass spec would improve the students understanding of trace element analysis.
- More emphasis on understanding geophysics. The material I was taught was "dubbed" down.
- I would offer a course like ore deposits or reintroduce basin analysis. These topics are essential to a student looking to get into the exploration field in the oil and gas or mining industry. An even more hands on approach.
- I didn't get a job in geology till almost 2 years after graduation and even then its not even completely geology related.
- Experience! The one thing that is difficult to impossible to teach in a classroom. CMU could help by further developing base skills that all employees need. Computer/Social/Communication even adding budget, finance and cost analysis would be helpful.
- Engage students in both academic and private sector applications of geology, some staff focused heavily on academic research which was not helpful for students not planning on graduate school.
- Doing more field based exercises. For example Dep systems was sooooo beneficial because being hands on and understanding and then writing a scientific paper really was beneficial in my job now.
- Career planning/support is always helpful.
- Asking questions and staying inquisitive will help in university and throughout your career. Also making friends and being friendly in the workplace is a valuable skill.
Based on what you know now, how well do you think your undergraduate experience prepared you to:

<table>
<thead>
<tr>
<th>Task</th>
<th>Very Well</th>
<th>More than Adequately</th>
<th>Adequately</th>
<th>Less Than Adequately</th>
<th>Very Poorly</th>
</tr>
</thead>
<tbody>
<tr>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
<td>#</td>
<td>%</td>
</tr>
<tr>
<td>Articulate the fundamental knowledge base and ideas of the major fields of geoscience</td>
<td>7 35.0</td>
<td>7 35.0</td>
<td>6 30.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
</tr>
<tr>
<td>Collect and interpret geoscience field data</td>
<td>10 50.0</td>
<td>6 30.0</td>
<td>4 20.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
</tr>
<tr>
<td>Collect and interpret geoscience laboratory data (Problem-Solving Skills)</td>
<td>8 40.0</td>
<td>5 25.0</td>
<td>7 35.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
</tr>
<tr>
<td>Use technology (e.g. computer software) for evaluating quantitative geoscience data (Technology Skills)</td>
<td>3 15.0</td>
<td>8 40.0</td>
<td>9 45.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
</tr>
<tr>
<td>Write an effective report on a geoscience study (Communication Skills)</td>
<td>5 25.0</td>
<td>11 55.0</td>
<td>4 20.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
</tr>
<tr>
<td>Give an effective oral presentation on a geoscience study (Communication Skills)</td>
<td>6 30.0</td>
<td>13 65.0</td>
<td>1 5.0</td>
<td>0 0.0</td>
<td>0 0.0</td>
</tr>
</tbody>
</table>
Baccalaureate Student Learning Outcomes

Based on what you know now, how well do you think your undergraduate experience prepared you to:

<table>
<thead>
<tr>
<th></th>
<th>Very Well</th>
<th>More than Adequately</th>
<th>Adequately</th>
<th>Less Than Adequately</th>
<th>Very Poorly</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Construct a summative project, paper or practiced-based performance that draws on</strong></td>
<td>5</td>
<td>25.0</td>
<td>9</td>
<td>45.0</td>
<td>0</td>
</tr>
<tr>
<td><strong>current research, scholarship and/or techniques, and specialized knowledge in the</strong></td>
<td></td>
<td></td>
<td>6</td>
<td>30.0</td>
<td>0</td>
</tr>
<tr>
<td><strong>discipline (Applied Learning/Specialized Knowledge)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Analyze data critically, reason logically, and apply quantitative analysis methods</strong></td>
<td>5</td>
<td>25.0</td>
<td>10</td>
<td>50.0</td>
<td>0</td>
</tr>
<tr>
<td><strong>correctly to develop appropriate conclusions (Intellectual Skills: Quantitative Fluency)</strong></td>
<td></td>
<td></td>
<td>5</td>
<td>25.0</td>
<td>0</td>
</tr>
<tr>
<td><strong>Make and defend assertions about a specialized topic in an extended well-organized</strong></td>
<td>6</td>
<td>30.0</td>
<td>9</td>
<td>45.0</td>
<td>1</td>
</tr>
<tr>
<td><strong>document and an oral presentation that is appropriate to the discipline (Intellectual</strong></td>
<td></td>
<td></td>
<td>4</td>
<td>20.0</td>
<td>5.0</td>
</tr>
<tr>
<td><strong>Skills: Communication Fluency)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Identify assumptions, evaluate hypotheses or alternative views, articulate</strong></td>
<td>6</td>
<td>30.0</td>
<td>10</td>
<td>50.0</td>
<td>0</td>
</tr>
<tr>
<td><strong>implications and formulate conclusions (Intellectual Skills: Critical Thinking)</strong></td>
<td></td>
<td></td>
<td>4</td>
<td>20.0</td>
<td>0</td>
</tr>
</tbody>
</table>
Job and Career Questions:
Are you working for pay right now?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, full-time</td>
<td>18</td>
<td>90.0</td>
</tr>
<tr>
<td>Yes, part-time</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Only respondents who answered "Yes" they are working for pay right now answered the following questions.
In what type of organization is your principal employment? Mark the one best answer.

<table>
<thead>
<tr>
<th>Organization Type</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-employed in own business or professional non-group practice</td>
<td>2</td>
</tr>
<tr>
<td>Private for-profit corporation/company/group/group-practice</td>
<td>10</td>
</tr>
<tr>
<td>Higher education (public or private)</td>
<td>0</td>
</tr>
<tr>
<td>Elementary or secondary education (public or private)</td>
<td>0</td>
</tr>
<tr>
<td>International organization in the US</td>
<td>0</td>
</tr>
<tr>
<td>International organization outside of the US</td>
<td>0</td>
</tr>
<tr>
<td>US Military</td>
<td>0</td>
</tr>
<tr>
<td>Federal Government (except military)</td>
<td>3</td>
</tr>
<tr>
<td>State and local government, institution, or agency (except education)</td>
<td>1</td>
</tr>
<tr>
<td>Private non-profit organization (except education and international)</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>2</td>
</tr>
<tr>
<td>Other responses: Construction, Landscape</td>
<td></td>
</tr>
</tbody>
</table>

Which of the following best describes your current position?

<table>
<thead>
<tr>
<th>Level</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level</td>
<td>9</td>
<td>50.0</td>
</tr>
<tr>
<td>Mid-Level</td>
<td>7</td>
<td>38.9</td>
</tr>
<tr>
<td>Senior Level</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Executive Level (except for chief executive)</td>
<td>1</td>
<td>5.6</td>
</tr>
<tr>
<td>Chief Executive (CEO, COO, CFO, GM or)</td>
<td>1</td>
<td>5.6</td>
</tr>
</tbody>
</table>

How many years have you been in your current job type?

<table>
<thead>
<tr>
<th>Years</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3 years</td>
<td>15</td>
<td>83.3</td>
</tr>
<tr>
<td>3-5 years</td>
<td>2</td>
<td>11.1</td>
</tr>
<tr>
<td>6-9 years</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>10 or more years</td>
<td>1</td>
<td>5.6</td>
</tr>
</tbody>
</table>
Job and Career Questions (continued):

Is your current position related to your CMU field(s) of study?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, related to major(s)</td>
<td>15</td>
<td>83.3</td>
</tr>
<tr>
<td>No, not related</td>
<td>3</td>
<td>16.7</td>
</tr>
</tbody>
</table>

How well did CMU prepare you for your current career?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Well</td>
<td>2</td>
<td>11.1</td>
</tr>
<tr>
<td>More than Adequately</td>
<td>5</td>
<td>27.8</td>
</tr>
<tr>
<td>Adequately</td>
<td>9</td>
<td>50.0</td>
</tr>
<tr>
<td>Less Than Adequately</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Very Poorly</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NA</td>
<td>2</td>
<td>11.1</td>
</tr>
</tbody>
</table>

What is your approximate annual gross income (before taxes)?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under $20,000</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>$20,000 - $29,999</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>$30,000 - $39,999</td>
<td>2</td>
<td>13.3</td>
</tr>
<tr>
<td>$40,000 - $49,999</td>
<td>2</td>
<td>13.3</td>
</tr>
<tr>
<td>$50,000 - $59,999</td>
<td>4</td>
<td>26.7</td>
</tr>
<tr>
<td>$60,000 - $74,999</td>
<td>4</td>
<td>26.7</td>
</tr>
<tr>
<td>$75,000 - $99,999</td>
<td>2</td>
<td>13.3</td>
</tr>
<tr>
<td>$100,000 - $149,999</td>
<td>1</td>
<td>6.7</td>
</tr>
<tr>
<td>$150,000 - $249,999</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>$250,000 - $499,999</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Over $500,000</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>
Job and Career Questions (continued):

Comments about your work experience that will help improve CMU:

- What else you can do with a geology degree, besides geology research, mapping, etc.
- Treat assignments and projects like they are your job. Don't just get in a habit of halfheartedly doing projects to turn something in and get a grade. Actually think about them, actually put yourself into them, and then be willing to take the criticism from your professors. This is your opportunity to find your strengths and weaknesses and get help with them, in my opinion this is why you are in college, these are some of the most beneficial and applicable things that you can take away from your time here. Better to take the criticism now from your professors, than take it later from your employer.
- Push students to do internships stress the importance of it and have a resume workshop. Maybe also push them to do the full year or physics, chem, and calculus. As a back up if they can't find a job then they could easily go to grad school and not have to worry about taking 3 extra classes before they can get in.
- Need a job placement program!
- Keep the strong Geoscience professors. They are class acts!
- Instead of being told what to do explain why it would be useful to think and do on your own. For example, if you need a data base to organize data, learn on your own and make one. It's not just geology you will be doing it is always learning, growing and learning how to solve problems on your own.
- Get GIS experience. Everything now is kept in maps or is stored in databases and having a background in GIS can be beneficial.
- Already expressed in an earlier question.

Only respondents who answered "No" they are not working for pay right now answered the following question:

Why are you not currently working for pay? (Please mark all that apply)  

<table>
<thead>
<tr>
<th>Reason</th>
<th># of times checked</th>
</tr>
</thead>
<tbody>
<tr>
<td>I chose not to enter the workforce at this time.</td>
<td>0</td>
</tr>
<tr>
<td>It has been difficult to find a position in my field.</td>
<td>1</td>
</tr>
<tr>
<td>It has been difficult to find a position paying an appropriate</td>
<td>1</td>
</tr>
<tr>
<td>I am raising a family.</td>
<td>2</td>
</tr>
<tr>
<td>I am currently a student.</td>
<td>1</td>
</tr>
<tr>
<td>I am doing volunteer work.</td>
<td>0</td>
</tr>
<tr>
<td>I am retired.</td>
<td>0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
</tr>
</tbody>
</table>

If you have comments about previous employment, work experience, or job hunting that will help improve CMU,

- Need a masters in this field unless you become a mudlogger
Education since College:

Have you enrolled in a graduate, professional, or other degree/certificate program since graduating from CMU?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>4</td>
<td>20.0</td>
</tr>
<tr>
<td>No</td>
<td>13</td>
<td>65.0</td>
</tr>
<tr>
<td>No, but I plan to enroll in</td>
<td>3</td>
<td>15.0</td>
</tr>
</tbody>
</table>

Only respondents who answered "Yes" I have enrolled in another degree/certificate program since graduating from CMU answered the following questions.

Are you enrolled in this program now?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, I am a full-time student</td>
<td>1</td>
<td>25.0</td>
</tr>
<tr>
<td>Yes, I am a part-time student</td>
<td>1</td>
<td>25.0</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>50.0</td>
</tr>
</tbody>
</table>

How long after you graduated from the degree/certificate program this survey pertains to did you start this program?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediately (following fall or</td>
<td>1</td>
<td>25.0</td>
</tr>
<tr>
<td>1 Year later</td>
<td>2</td>
<td>50.0</td>
</tr>
<tr>
<td>2-3 years later</td>
<td>1</td>
<td>25.0</td>
</tr>
<tr>
<td>4-6 years later</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NA</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Altogether, how many years have/did you attend(ed) further schooling? Mark the best answer.

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>1</td>
<td>33.3</td>
</tr>
<tr>
<td>1 - 2 years</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>3 - 4 years</td>
<td>1</td>
<td>33.3</td>
</tr>
<tr>
<td>5 - 6 years</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NA</td>
<td>1</td>
<td>33.3</td>
</tr>
</tbody>
</table>
Education since College (continued):

How well did CMU prepare you for this educational program?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Well</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>More than Adequately</td>
<td>2</td>
<td>50.0</td>
</tr>
<tr>
<td>Adequately</td>
<td>2</td>
<td>50.0</td>
</tr>
<tr>
<td>Less Than Adequately</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Very Poorly</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>NA</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

What level of education are/were you pursing?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Associate</td>
<td>1</td>
<td>25.0</td>
</tr>
<tr>
<td>Baccalaureate</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Post-Bacc Certificate</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Master's</td>
<td>3</td>
<td>75.0</td>
</tr>
<tr>
<td>J.D.</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Doctoral</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

In which field and program are/were you studying and what is the name of the College/University you attended(ed)?

- Hydrogeology Clemson University
- M.S. geology University of Texas Permian Basin
- Geosciences Emporia State University
- MBA program

Did you complete this program?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>2</td>
<td>50.0</td>
</tr>
<tr>
<td>No</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>In the process of finishing</td>
<td>2</td>
<td>50.0</td>
</tr>
</tbody>
</table>

Other comments about furthering your education:

- Require 1 semester of differential equations for the geology degree.
Suggestions for improving the degree/certificate program:

- Stated earlier, but Students need to know what field of geoscience they think they would fit well into based on many factors such as pay, location, culture, work/life balance, economic opportunity etc.. and select classes, research, and internships appropriate to the perceived desires...
- Opportunities to develop skills in technology, writing, program management, and economics/business are always helpful -- for any career field!
- More Lab equipment so we can keep up with data analysis
- More field based classes like dep systems. We live in the heart of geology. Also, learn more about different basins that are beneficial in oil and gas.
- It would be very important to talk to students about the ASBOG for the PG. While Colorado doesn't have a license program for geology, students may find work in other states after graduation that do require this certification. In the 4 years at CMU, I heard zero mention of it until I found out about it online when looking at job prospects in my third year at CMU.
- Career counseling needs to be better. Students are almost left to their own to understand the degree process and what degrees paths are available based on their current credits and accomplishments. Small details like what degrees could be completed concurrently or with a little extra work what other degrees could be pursued. I found out in my senior year that I could have double majored if I had only taken two additional credits, unfortunately one of those classes was not offered during my senior year, however I could have taken it the prior semester, fulfilling both the needed credit and an elective.
- A master's program would be great to see. The field opportunities of the west slope is rare.

Additional Comments:

- Great Program, I learned an incredible amount and can bullshit geologists old and young in common terminology and logical geoscience thought processes. give yourselves a pat on the back and keep going into the field and get those kids to write reports on all those trips. Writing reports is a big part of most of the Post BS jobs I've had.
- The teachers are so incredibly great! The field trips are AWESOME
- None.
Demographic Questions:

What is your gender?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>12</td>
<td>60.0</td>
</tr>
<tr>
<td>Female</td>
<td>7</td>
<td>35.0</td>
</tr>
<tr>
<td>Prefer not to respond</td>
<td>1</td>
<td>5.0</td>
</tr>
</tbody>
</table>

What is your ethnicity?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Indian or Alaskan</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Asian</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Black or African American</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Hispanic of any race</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Native Hawaiian or Pacific</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>White</td>
<td>18</td>
<td>90.0</td>
</tr>
<tr>
<td>Two or more races</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Race and ethnicity unknown</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Non-Resident Alien (of any race)</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Prefer not to respond</td>
<td>2</td>
<td>10.0</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

What is your current age?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under 21</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>21-24</td>
<td>4</td>
<td>20.0</td>
</tr>
<tr>
<td>25-34</td>
<td>10</td>
<td>50.0</td>
</tr>
<tr>
<td>35-44</td>
<td>3</td>
<td>15.0</td>
</tr>
<tr>
<td>45-54</td>
<td>1</td>
<td>5.0</td>
</tr>
<tr>
<td>55 or older</td>
<td>0</td>
<td>0.0</td>
</tr>
<tr>
<td>Prefer not to respond</td>
<td>2</td>
<td>10.0</td>
</tr>
</tbody>
</table>

Do you live in the state of Colorado?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>18</td>
<td>90.0</td>
</tr>
<tr>
<td>No</td>
<td>2</td>
<td>10.0</td>
</tr>
</tbody>
</table>
Demographic Questions (continued):

If yes, do you live in Western Colorado?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>16</td>
<td>80.0</td>
</tr>
<tr>
<td>No</td>
<td>4</td>
<td>20.0</td>
</tr>
</tbody>
</table>

CMU Alumni Survey Results - Combined 2013-2019

n=778

Year of survey

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>2013</td>
<td>38</td>
<td>4.9</td>
</tr>
<tr>
<td>2014</td>
<td>68</td>
<td>8.7</td>
</tr>
<tr>
<td>2015</td>
<td>127</td>
<td>16.3</td>
</tr>
<tr>
<td>2016</td>
<td>187</td>
<td>24.0</td>
</tr>
<tr>
<td>2017</td>
<td>73</td>
<td>9.4</td>
</tr>
<tr>
<td>2018</td>
<td>158</td>
<td>20.3</td>
</tr>
<tr>
<td>2019</td>
<td>127</td>
<td>16.3</td>
</tr>
</tbody>
</table>

Overall, how satisfied are you with your undergraduate education?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Satisfied</td>
<td>349</td>
<td>45.2</td>
</tr>
<tr>
<td>Generally Satisfied</td>
<td>358</td>
<td>46.4</td>
</tr>
<tr>
<td>Ambivalent</td>
<td>40</td>
<td>5.2</td>
</tr>
<tr>
<td>Generally Dissatisfied</td>
<td>19</td>
<td>2.5</td>
</tr>
<tr>
<td>Very Dissatisfied</td>
<td>6</td>
<td>0.8</td>
</tr>
</tbody>
</table>

While an undergraduate, about how often did you have conversations with faculty outside of class?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Never</td>
<td>24</td>
<td>3.1</td>
</tr>
<tr>
<td>Rarely (1-2 times per semester)</td>
<td>97</td>
<td>12.5</td>
</tr>
<tr>
<td>Occasionally (3-5 times per semester)</td>
<td>184</td>
<td>23.7</td>
</tr>
<tr>
<td>Often (once every two weeks)</td>
<td>178</td>
<td>23.0</td>
</tr>
<tr>
<td>Very Often (at least once a week)</td>
<td>292</td>
<td>37.7</td>
</tr>
</tbody>
</table>
Demographic Questions (continued):

Would you encourage a current high school senior to attend CMU?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Definitely Would</td>
<td>469</td>
<td>60.5</td>
</tr>
<tr>
<td>Probably Would</td>
<td>210</td>
<td>27.1</td>
</tr>
<tr>
<td>Maybe</td>
<td>73</td>
<td>9.4</td>
</tr>
<tr>
<td>Probably Would Not</td>
<td>12</td>
<td>1.5</td>
</tr>
<tr>
<td>Definitely Would Not</td>
<td>11</td>
<td>1.4</td>
</tr>
</tbody>
</table>

How would you rate the overall quality of your education within that degree/certificate program?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very High</td>
<td>284</td>
<td>36.5</td>
</tr>
<tr>
<td>High</td>
<td>341</td>
<td>43.8</td>
</tr>
<tr>
<td>Average</td>
<td>130</td>
<td>16.7</td>
</tr>
<tr>
<td>Low</td>
<td>18</td>
<td>2.3</td>
</tr>
<tr>
<td>Very Low</td>
<td>5</td>
<td>0.6</td>
</tr>
</tbody>
</table>

Job and Career Questions:

Are you working for pay right now?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, work full-time</td>
<td>611</td>
<td>78.5</td>
</tr>
<tr>
<td>Yes, work part-time</td>
<td>85</td>
<td>10.9</td>
</tr>
<tr>
<td>No</td>
<td>82</td>
<td>10.5</td>
</tr>
</tbody>
</table>

Only respondents who answered "Yes," they are working for pay right now, answered the following questions.
Job and Career Questions (continued):

In what type of organization is your principal employment? Mark the one best answer.

<table>
<thead>
<tr>
<th>Organization</th>
<th>#</th>
</tr>
</thead>
<tbody>
<tr>
<td>Self-employed in own business or professional non-group practice</td>
<td>35</td>
</tr>
<tr>
<td>Private for profit corporation/company/group/group-practice</td>
<td>242</td>
</tr>
<tr>
<td>Higher education (public or private)</td>
<td>50</td>
</tr>
<tr>
<td>Elementary or secondary education (public or private)</td>
<td>86</td>
</tr>
<tr>
<td>International organization in the US</td>
<td>15</td>
</tr>
<tr>
<td>International organization outside of the US</td>
<td>6</td>
</tr>
<tr>
<td>US Military</td>
<td>7</td>
</tr>
<tr>
<td>Federal Government (except military)</td>
<td>25</td>
</tr>
<tr>
<td>State and local government, institution, or agency (except education)</td>
<td>87</td>
</tr>
<tr>
<td>Private non-profit organization (except education and international organizations)</td>
<td>86</td>
</tr>
<tr>
<td>Other - 501c6 &amp; 501c3 organization, Archery company, Banking, Corporate Mortgage Company, Internet Marketing, Oil &amp; Gas Industry, Restaurant, Work for higher education, physical labor, Research Assistant, special district, Trucking…</td>
<td>41</td>
</tr>
</tbody>
</table>

Which of the following best describes your current position?

<table>
<thead>
<tr>
<th>Position</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Entry Level</td>
<td>250</td>
<td>36.3</td>
</tr>
<tr>
<td>Mid-Level</td>
<td>331</td>
<td>48.0</td>
</tr>
<tr>
<td>Senior Level</td>
<td>79</td>
<td>11.5</td>
</tr>
<tr>
<td>Executive Level (except for chief executive)</td>
<td>12</td>
<td>1.7</td>
</tr>
<tr>
<td>Chief Executive (CEO, COO, CFO, GM or principal in a business of other organization)</td>
<td>13</td>
<td>1.9</td>
</tr>
<tr>
<td>Graduate Assistant</td>
<td>4</td>
<td>0.6</td>
</tr>
</tbody>
</table>

How many years have you been in your current job type?

<table>
<thead>
<tr>
<th>Years</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 3 years</td>
<td>452</td>
<td>65.1</td>
</tr>
<tr>
<td>3-5 years</td>
<td>172</td>
<td>24.8</td>
</tr>
<tr>
<td>6-9 years</td>
<td>40</td>
<td>5.8</td>
</tr>
<tr>
<td>10 or more years</td>
<td>30</td>
<td>4.3</td>
</tr>
</tbody>
</table>
Job and Career Questions (continued):

Is your current position related to your undergraduate field(s) of study?

<table>
<thead>
<tr>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, related to major(s)</td>
<td>520</td>
</tr>
<tr>
<td>No, not related</td>
<td>172</td>
</tr>
</tbody>
</table>

How well did CMU prepare you for your current career?

<table>
<thead>
<tr>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Well</td>
<td>177</td>
</tr>
<tr>
<td>More than Adequately</td>
<td>198</td>
</tr>
<tr>
<td>Adequately</td>
<td>240</td>
</tr>
<tr>
<td>Less Than Adequately</td>
<td>27</td>
</tr>
<tr>
<td>Very Poorly</td>
<td>15</td>
</tr>
<tr>
<td>NA</td>
<td>32</td>
</tr>
</tbody>
</table>

What is your approximate annual gross income (before taxes)?

<table>
<thead>
<tr>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Under $20,000</td>
<td>46</td>
</tr>
<tr>
<td>$20,000 - $29,999</td>
<td>83</td>
</tr>
<tr>
<td>$30,000 - $39,999</td>
<td>143</td>
</tr>
<tr>
<td>$40,000 - $49,999</td>
<td>111</td>
</tr>
<tr>
<td>$50,000 - $59,999</td>
<td>94</td>
</tr>
<tr>
<td>$60,000 - $74,999</td>
<td>67</td>
</tr>
<tr>
<td>$75,000 - $99,999</td>
<td>47</td>
</tr>
<tr>
<td>$100,000 - $149,999</td>
<td>19</td>
</tr>
<tr>
<td>$150,000 - $249,999</td>
<td>3</td>
</tr>
<tr>
<td>$250,000 - $499,999</td>
<td>2</td>
</tr>
<tr>
<td>Over $500,000</td>
<td>1</td>
</tr>
</tbody>
</table>
Job and Career Questions (continued):

Only respondents who answered "No," they are not working for pay right now, answered the following question.

Why are you not currently working for pay? (Please mark all that apply)  

<table>
<thead>
<tr>
<th>Reason</th>
<th># of times checked</th>
</tr>
</thead>
<tbody>
<tr>
<td>I chose not to enter the workforce at this time.</td>
<td>9</td>
</tr>
<tr>
<td>It has been difficult to find a position in my field.</td>
<td>24</td>
</tr>
<tr>
<td>It has been difficult to find a position paying an appropriate salary.</td>
<td>15</td>
</tr>
<tr>
<td>I am raising a family.</td>
<td>16</td>
</tr>
<tr>
<td>I am currently a student.</td>
<td>44</td>
</tr>
<tr>
<td>I am doing volunteer work.</td>
<td>6</td>
</tr>
<tr>
<td>I am retired.</td>
<td>4</td>
</tr>
<tr>
<td>Other</td>
<td>32</td>
</tr>
</tbody>
</table>

Education since College:

Have you enrolled in a graduate, professional, or other degree/certificate program since graduating from CMU?

<table>
<thead>
<tr>
<th>Status</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>241</td>
<td>31.0</td>
</tr>
<tr>
<td>No</td>
<td>367</td>
<td>47.2</td>
</tr>
<tr>
<td>No, but I plan to enroll in the next two years.</td>
<td>170</td>
<td>21.9</td>
</tr>
</tbody>
</table>

Only respondents who answered "Yes" I have enrolled in another degree/certificate program since graduating from CMU answered the following questions.

Are you enrolled in this program now?

<table>
<thead>
<tr>
<th>Status</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes, I am a full-time student</td>
<td>102</td>
<td>42.5</td>
</tr>
<tr>
<td>Yes, I am a part-time student</td>
<td>32</td>
<td>13.3</td>
</tr>
<tr>
<td>No</td>
<td>106</td>
<td>44.2</td>
</tr>
</tbody>
</table>
Education since College (continued):

How long after you graduated from the degree/certificate program this survey pertains to did you start this program?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Immediately (following fall or spring)</td>
<td>111</td>
<td>46.1</td>
</tr>
<tr>
<td>1 Year later</td>
<td>51</td>
<td>21.2</td>
</tr>
<tr>
<td>2-3 years later</td>
<td>59</td>
<td>24.5</td>
</tr>
<tr>
<td>4-6 years later</td>
<td>15</td>
<td>6.2</td>
</tr>
<tr>
<td>NA</td>
<td>5</td>
<td>2.1</td>
</tr>
</tbody>
</table>

Altogether, how many years have/did you attend(ed) further schooling? Mark the best answer.

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>None</td>
<td>15</td>
<td>6.3</td>
</tr>
<tr>
<td>1 to 2 years</td>
<td>141</td>
<td>59.2</td>
</tr>
<tr>
<td>3 to 4 years</td>
<td>59</td>
<td>24.8</td>
</tr>
<tr>
<td>5 to 6 years</td>
<td>15</td>
<td>6.3</td>
</tr>
<tr>
<td>NA</td>
<td>8</td>
<td>3.4</td>
</tr>
</tbody>
</table>

How well did CMU prepare you for this educational program?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very Well</td>
<td>87</td>
<td>36.3</td>
</tr>
<tr>
<td>More than Adequately</td>
<td>67</td>
<td>27.9</td>
</tr>
<tr>
<td>Adequately</td>
<td>64</td>
<td>26.7</td>
</tr>
<tr>
<td>Less Than Adequately</td>
<td>9</td>
<td>3.8</td>
</tr>
<tr>
<td>Very Poorly</td>
<td>4</td>
<td>1.7</td>
</tr>
<tr>
<td>NA</td>
<td>9</td>
<td>3.8</td>
</tr>
</tbody>
</table>
Education since College (continued):

What level of education are/were you pursuing?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Certificate</td>
<td>19</td>
<td>8.0</td>
</tr>
<tr>
<td>Associate</td>
<td>12</td>
<td>5.1</td>
</tr>
<tr>
<td>Baccalaureate</td>
<td>25</td>
<td>10.5</td>
</tr>
<tr>
<td>Post-Bacc Certificate</td>
<td>5</td>
<td>2.1</td>
</tr>
<tr>
<td>Master's</td>
<td>118</td>
<td>49.8</td>
</tr>
<tr>
<td>J.D.</td>
<td>19</td>
<td>8.0</td>
</tr>
<tr>
<td>Doctoral</td>
<td>39</td>
<td>16.5</td>
</tr>
<tr>
<td>Other</td>
<td>0</td>
<td>0.0</td>
</tr>
</tbody>
</table>

Did you complete this program?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>85</td>
<td>35.7</td>
</tr>
<tr>
<td>No</td>
<td>19</td>
<td>8.0</td>
</tr>
<tr>
<td>In the process of finishing</td>
<td>134</td>
<td>56.3</td>
</tr>
</tbody>
</table>

Demographic Questions:

What is your gender?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male</td>
<td>307</td>
<td>39.9</td>
</tr>
<tr>
<td>Female</td>
<td>446</td>
<td>57.9</td>
</tr>
<tr>
<td>Prefer not to respond</td>
<td>17</td>
<td>2.2</td>
</tr>
</tbody>
</table>

What is your ethnicity?

<table>
<thead>
<tr>
<th></th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>American Indian or Alaskan Native</td>
<td>11</td>
<td>1.4</td>
</tr>
<tr>
<td>Asian</td>
<td>13</td>
<td>1.7</td>
</tr>
<tr>
<td>Black or African American</td>
<td>6</td>
<td>0.8</td>
</tr>
<tr>
<td>Hispanic of any race</td>
<td>50</td>
<td>6.5</td>
</tr>
<tr>
<td>Native Hawaiian or Pacific Islander</td>
<td>4</td>
<td>0.5</td>
</tr>
<tr>
<td>White</td>
<td>618</td>
<td>80.5</td>
</tr>
<tr>
<td>Two or more races</td>
<td>28</td>
<td>3.6</td>
</tr>
<tr>
<td>Race and ethnicity unknown</td>
<td>1</td>
<td>0.1</td>
</tr>
<tr>
<td>Prefer not to respond</td>
<td>30</td>
<td>3.9</td>
</tr>
<tr>
<td>Other</td>
<td>6</td>
<td>0.8</td>
</tr>
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</table>
Demographic Questions (continued):

What is your current age?

<table>
<thead>
<tr>
<th>Age</th>
<th>#</th>
<th>%</th>
</tr>
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<tbody>
<tr>
<td>Under 21</td>
<td>7</td>
<td>0.9</td>
</tr>
<tr>
<td>21-24</td>
<td>191</td>
<td>24.7</td>
</tr>
<tr>
<td>25-34</td>
<td>413</td>
<td>53.4</td>
</tr>
<tr>
<td>35-44</td>
<td>91</td>
<td>11.8</td>
</tr>
<tr>
<td>45-54</td>
<td>39</td>
<td>5.0</td>
</tr>
<tr>
<td>55 or older</td>
<td>18</td>
<td>2.3</td>
</tr>
<tr>
<td>Prefer not to respond</td>
<td>14</td>
<td>1.8</td>
</tr>
</tbody>
</table>

Do you live in the state of Colorado?

<table>
<thead>
<tr>
<th>Live in Colorado</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>574</td>
<td>74.3%</td>
</tr>
<tr>
<td>No</td>
<td>199</td>
<td>25.7%</td>
</tr>
</tbody>
</table>

If yes, do you live in Western Colorado?

<table>
<thead>
<tr>
<th>Live in Western Colorado</th>
<th>#</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yes</td>
<td>416</td>
<td>57.7%</td>
</tr>
<tr>
<td>No</td>
<td>305</td>
<td>42.3%</td>
</tr>
</tbody>
</table>
The report offers my assessment of the strengths and weaknesses of the program, along with recommendations, based on a thorough reading of the self-study and a one-day visit to campus on February 25, 2022. On that visit, I met with faculty, current students, and alumni; attended meetings of two different classes; received a tour of the facilities and campus; and met with administrators from across the university.

**Best practices employed by the program**

*The geosciences program is student-centered and invested in student success.* Faculty care about students, both their learning and their lives, and the students recognize that. Faculty mentor students in authentic research experiences, design and offer courses that are meaningful and relevant, work one-on-one with students outside of class, are mindful of the costs of textbooks and course fees, help students obtain funding, and connect them with opportunities for networking. Students feel supported and alumni value their experiences in the program. The ethic of attending to students’ success is deeply embedded in the program.

*The program takes full advantage of its surrounding natural geologic classroom to build students’ skills.* A wealth of Earth materials and processes are exposed and accessible within a short drive of campus, and bringing students out into the field regularly to explore these real-world settings and collect data is a significant strength of the program. Field experiences are frequent and scaffolded to build students’ skills to a culminating experience in which students take on more of the planning and decision-making that guides data collection, analysis, and interpretation.

*Research experiences are embedded in the program.* All students in the geosciences program engage in a mentored research project as seniors, beginning with a research proposal and continuing through to presenting their work on campus at a minimum and potentially at a regional or national meeting of the Geological Society of America. Faculty are active in research, collaborate with colleagues at other institutions, and involve students in their work. Research is a high-impact practice shown to be effective for learning. Authentic research experiences also make CMU students more competitive in both graduate school applications and to employers.

*GIS skills are embedded in the program.* The GIS program is a significant strength of the geosciences at CMU, helping students develop a skill that they will almost certainly use in their careers (all of the alumni who participated in the call said they use it). Students see and appreciate the career connections.
Evidence of student learning and quality found in students' work

Students in the geosciences program at CMU are producing high quality work, as evidenced by presentations at national meetings such as the Geological Society of America Annual Meeting and the regional Grand Junction Geological Society meeting. The research requirement that is part of the senior seminar in the curriculum undoubtedly lead to these successes. As a result, students receive internal and external awards for their work and gain entrance to competitive graduate schools, and local companies hire multiple graduates from the program.

Weaknesses/challenges identified in the program

The program functions well, but lacks a bigger vision and sense of value and goals. Both the university and the program have been in a period of rapid change for several years. It is not clear that there is a coherent vision in the current faculty for what the program can and should be doing, or that they have common goals that can guide decision-making. Faculty are dedicated to the program and to students, and the pieces of the program function well, but those pieces do not feel like they come together into a greater whole. This sense manifests itself in the current student learning outcomes, which are functional and assessable, but also rather specific and somewhat reductionist, outlining a set of skills without giving those skills purpose or meaning.

Key components of the program rely heavily on volunteer efforts and faculty near retirement. One heavily-used laboratory facility is run and maintained entirely by a retired geologist contributing as a volunteer. The courses in the critically important and popular GIS program are taught by a single faculty member who teaches a substantial load each term. These are single points of weakness, as the loss of either of these individuals through retirement will have a significant impact on two of the most successful components of the program.

Attracting students to the program through active outreach has not been a focus. The program has been successful in attracting students to the program through their introductory courses, and have relied on these as the primary opportunity for recruitment. The number of majors has fluctuated significantly over the past ten years, and the reduction in introductory sections due to COVID-related issues has undoubtedly had an impact. However, more active recruitment might help increase and stabilize the number of majors.

The size of the program limits the number of electives that can be offered and limits opportunities for faculty to innovate in research and teaching. Students and alumni expressed regret that many electives were not available to them because they were infrequently offered. Faculty would like to be able to teach more electives (and engage in more research), but have to make sure that each elective will have enough students enrolled and already carry a substantial teaching load with introductory courses and required courses. Without growth in the number of majors and in the number of faculty, it will be difficult to expand offerings in the program.

The lack of a lab coordinator creates inefficiencies in introductory courses. The high enrollment in courses and labs at the 100-level means results in several sections being offered. In most programs where this is the case, a lab coordinator keeps these multiple sections organized
(and often supports teaching assistants). Although student workers have helped, the lack of continuity and irregular support means that much of the work falls back on the faculty, creating inefficiencies and again limiting opportunities for innovation.

**Strategies the program faculty members might take to address these elements**

**Major recommendations**

**Develop a vision and goals for the program that can guide strategic planning.** There have been a lot of transitions in the faculty and instructors in the last several years, and of course the last two years of a pandemic have brought their own challenges. The institution also has a new president who is developing new initiatives. With several new faculty in the program, now is a good time to develop or refine the mission of the program, and develop or refine goals that can bring everyone together and allow faculty in the program to be strategic in where they invest their limited time and efforts. As other retirements near, a clear set of goals will allow the faculty to make a compelling case for new hires that can help make progress towards those goals.

**Revise program-level student learning outcomes to be more holistic and inspirational.** Moving to fewer, more holistic learning outcomes that give purpose and direction to the skills and inspire students (and faculty) to develop the qualities of a geoscientist. For example, I imagine that none of the faculty feel it is sufficient for a student who is graduating with a geoscience degree to simply demonstrate that they know things—they want students to be able to use that knowledge to address a problem, or put new data in context, or to develop a research question. A potential new learning outcome would be something like, “Apply an understanding of Earth processes to address a relevant research question.” In your current program, the senior seminar could be a place to assess this by looking at the background information for their research project. Assessment could then move beyond looking at the accuracy of geologic maps (which is a very specific skill) to ability to synthesize and evaluate data to answer questions.

**Build on the strengths of the relatively “closed” regional system to attract students to the geosciences program and support them through graduation and employment in the field.** Faculty have already responded to student interest in learning more about careers earlier in the program by inviting alumni who work in industry to speak in their classes and providing more opportunities for networking. The program currently has many connections that could be further developed to attract high school students and current CMU students to the program. Concurrent enrollment classes at regional high schools could be further developed and used more effectively as recruiting opportunities; the embedded community college provides an additional pathway. Exposing high school and early college students to careers in the geosciences that allow them to stay in the region can inspire students to pursue studies. An additional recommendation is to reinvigorate the discussion of developing a Master’s program in geology, which would fill a void in the region and thus be directly aligned with the university’s mission. Such a program would likely be appealing to regional employers as well, and could increase enrollment in upper-level courses to allow for more frequent course offerings. The president’s new Advance CMU initiative may be an avenue to explore funding opportunities to launch such a program. In addition, the current efforts of the faculty to establish an advisory board, presumably including
local employers of geoscientists, will help the program make progress towards this recommendation.

**Additional recommendations**

**Explore options for establish an equipment maintenance and replacement fund.** The program has been very successful in obtaining laboratory equipment to support research and teaching with research-grade tools. The recent acquisition of a magnetometer and refraction seismic equipment will enhance these capabilities in the field as well. However, several concerns were expressed about replacing this equipment when it breaks, particularly when support for writing large grants is limited. One possibility would be to establish a cross-departmental fund could be allowed to build up and used as needed by different programs.

**Explore options for establishing a staff-level lab coordinator position.** An investment in this staff position could allow for much more flexibility on the part of faculty in teaching and open other options for student workers in recruiting and otherwise supporting the program. There is potential for this position to be shared with other programs as well, and/or to support student research in the lab.

**Open discussions with other programs and departments to find opportunities for cross-pollination**

in courses, particularly in ways that could expand the electives in the major. Are there upper-level courses in geology that students in other programs could take? If geological engineering were open to both engineering students and geology students, would enrollment be high enough to offer it more frequently? Could a geophysics course be taught for both physics and geology students? At the 100-level, are there geoscience courses that might be valuable for other programs, such as agriculture or civil engineering? As the Watershed Science minor becomes more established, consider developing other interdisciplinary opportunities that bring students from other programs into the geosciences.

**Reviewer summary**

The geosciences program at Colorado Mesa University is providing an excellent education for students as a result of dedicated faculty who employ high-impact practices. The quality of the program is equal to or better than programs at other universities of a similar size, yet the teaching load is accommodated by fewer faculty and instructors, limiting their ability to innovate, attract students, and engage in scholarship. Despite these limitations, students who graduate from the program are successful in obtaining jobs in the geosciences and pursuing graduate studies. In the wake of a number of transitions in the faculty and the rapid growth of the university, the program would benefit from spending time to define programmatic goals and identifying strategies to meet those goals. They might consider applying for a Traveling Workshop offered by the National Association of Geoscience Teachers to bring in outside facilitators to lead this effort and help them develop an action plan. Within this small, cohesive program, such a process could be both enjoyable and invigorating, and help focus efforts that would grow the program.
### Executive Summary Template for External Reviewer’s Observations

<table>
<thead>
<tr>
<th>Program Review Element</th>
<th>Check the appropriate selection</th>
<th>Provide explanation if not agree with element and/or why unable to evaluate</th>
</tr>
</thead>
<tbody>
<tr>
<td>The program’s self-study is a realistic and accurate appraisal of the program.</td>
<td>Agree: X</td>
<td></td>
</tr>
<tr>
<td>The program’s mission and its contributions are consistent with the institution's role and mission and its strategic goals.</td>
<td>Agree: X, Not Agree</td>
<td>A programmatic mission is not present in the self-study, but the contributions are consistent with the institution’s mission</td>
</tr>
<tr>
<td>The program’s goals are being met.</td>
<td></td>
<td>No programmatic goals were provided in the self-study.</td>
</tr>
<tr>
<td>The curriculum is appropriate to the breadth, depth, and level of the discipline.</td>
<td>Agree: X</td>
<td></td>
</tr>
<tr>
<td>The curriculum is current, follows best practices, and/or adheres to the professional standards of the discipline.</td>
<td>Agree: X</td>
<td></td>
</tr>
<tr>
<td>Student demand/enrollment is at an expected level in the context of the institution and program’s role and mission.</td>
<td>Agree: X</td>
<td></td>
</tr>
<tr>
<td>The program's teaching-learning environment fosters success of the program's students.</td>
<td>Agree: X</td>
<td></td>
</tr>
<tr>
<td>Program faculty members are appropriately credentialed.</td>
<td>Agree: X</td>
<td></td>
</tr>
<tr>
<td>Program faculty members actively contribute to scholarship, service and advising.</td>
<td>Agree: X</td>
<td></td>
</tr>
<tr>
<td>Campus facilities meet the program’s needs.</td>
<td>Agree: X</td>
<td></td>
</tr>
<tr>
<td>Equipment meets the program’s needs.</td>
<td>Agree: X</td>
<td>See recommendations</td>
</tr>
<tr>
<td>Instructional technology meets the program’s needs.</td>
<td>Agree: X</td>
<td></td>
</tr>
<tr>
<td>Current library resources meet the program’s needs.</td>
<td>Agree: X</td>
<td></td>
</tr>
<tr>
<td>Student learning outcomes are appropriate to the discipline, clearly stated, measurable, and assessed.</td>
<td>Agree: X</td>
<td>See recommendations</td>
</tr>
<tr>
<td>Program faculty members are involved in on-going assessment efforts.</td>
<td>Agree: X</td>
<td></td>
</tr>
<tr>
<td>Program faculty members analyze student learning outcome data and program effectiveness to foster continuous improvement.</td>
<td>Agree: X</td>
<td></td>
</tr>
<tr>
<td>The program’s articulation of its strengths and challenges is accurate/appropriate and integral to its future planning.</td>
<td>Agree: X</td>
<td></td>
</tr>
</tbody>
</table>