

# ANNAKA M. CLEMENT, PhD

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## EDUCATION

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### North Dakota State University

Doctor of Philosophy, Environmental and Conservation Sciences

Fargo, North Dakota

May 2023

- Advisor: Dr. Lydia S. Tackett
- Dissertation: *Late Triassic sedimentary environments and their relationship to geochemical, paleobiological, and bivalve morphology change in Eastern and Southern Panthalassa*

### University of Georgia

Master of Science, Geology

Athens, Georgia

May 2015

- Advisor: Dr. Steven M. Holland
- Thesis: *Sequence stratigraphy of the Middle Jurassic Gypsum Spring and Piper formations in the eastern Bighorn Basin of Wyoming, U.S.A.*

### University of Wisconsin-Madison

Bachelor of Science, Geology & Geophysics, Environmental Studies

Madison, Wisconsin

August 2013

## PROFESSIONAL EXPERIENCE

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### Postdoctoral Scholar- Denver Museum of Nature & Science, Department of Earth Sciences

June 2023 – Present

- Develop innovative research projects that benefit the scientific community and further the goals of DMNS and Dept. of Earth Science including the integration of Environmental Niche Modeling techniques into the process of paleogeographic map reconstruction. Publish results in peer-reviewed journals.
- Support ongoing research projects within the Dept. of Earth Sciences.
- Gain experience in collections-based research, collections management, and curatorial duties at large accredited museum by shadowing an accomplished curator.
- Communicate science to the public through in-person outreach events at the museum, social media content generation, and the writing of public science articles.
- Co-mentored 7 museum interns. Guided interns on both independent and group research projects at DMNS resulting in three poster presentations, the inclusion of two interns on manuscripts in development, and the production of two suites of paleogeographic maps for the Proterozoic.

### Research Assistant- North Dakota State University

January 2018 – May 2023

- Conducted and published research related to Tackett Lab ongoing projects; global patterns of Late Triassic marine ecological turnover, morphometric trends in Late Triassic New Zealand bivalves, iron ooid formation in Early Jurassic carbonates.
- Monitored, trained, and assisted a total of 11 undergraduate students working in the lab, assisted undergraduate students in the development of projects and the presentation of research. Seven research projects resulted in poster and talk presentations at local and national symposia. Seven students assisted with field research in Oregon, Nevada, and Aotearoa New Zealand.

### Adjunct Instructor- Minnesota State University Moorhead

Summer 2021, 2022

- Served as instructor of record for GEOS 170: Earth Science Today (designed to provide K-12 education students an overview and background of topics in Earth Science).
- Converted the course to a hybrid format with asynchronous recorded lectures (with quizzes and readings), and weekly in-person lab activities. Lab activities were re-worked from spring and fall sessions for the hybrid format.

### Education Assistant- Cave of the Mounds National Natural Landmark

November 2016 – January 2018

- Led and developed educational programs above and below ground, assisted in reservation and day-of visit logistics, performed collections management activities for educational collections, functioned as a member of the Leadership Team, trained cave guides and Education Specialists.

**Paleontology Intern- Denver Museum of Nature & Science**

September – November 2016

- Prospected for and identified vertebrate fossils in the field, assisted in the development and mapping of fossil quarries, assisted in all day-to-day tasks of running a large field operation of over 20 people.

**Education Specialist- Cave of the Mounds National Natural Landmark**

2015 – 2016

- Led educational tours in a world-class cave, frequently led six different content-specific surface programs for school groups and scouts, and trained cave guides.

**Oil and Gas Technician/Geological Resources Intern- GeoCorps America**

June – September 2015

- Assisted in the administration and compliance of oil and gas and mineral development and operations within the Ashley National Forest, assisted with all other geological resource activities within the Ashley National Forest including geohazard and paleo monitoring, cave survey, and participation in interdisciplinary field assessments

**Teaching Assistant- University of Georgia**

2013 – 2015

- Sedimentary Geology, UGA (GEOL-4500); Spring 2014, 2015
- Life, Environments, and Ecologies of the Past, UGA (GEOL- 4010); Fall 2013, 2014
- Presented lab content, graded weekly labs and assignments, and held office hours for students.
- Assisted in the logistics and teaching for two field trips to Sapelo Island off the Georgia coast.

**Reader/Grader- University of Wisconsin-Madison**

Spring 2013

- Graded exams and weekly labs for Geoscience 204: Evolution of the Earth.

**Data Entry- University of Wisconsin-Madison, Dept. of Geoscience, Peters' Lab**

2011 – 2013

- Digitized COSUNA and Canadian Correlation charts into the Macrostrat Database.
- Corrected reference errors in the Paleobiology Database.

**Cave Tour Guide- Cave of the Mounds National Natural Landmark**

2011 – 2013

- Led educational tours in a world-class cave.

**Museum Guide- University of Wisconsin-Madison Geology Museum**

2011 – 2013

- Led educational tours of the UW-Madison Geology Museum.

**PUBLICATIONS**

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\*undergraduate student author, †co-first author

**Peer Reviewed Publications**

Petermann, H., **Clement, A. M.**, Sullivan, P., Bonner, H., Reynolds, R. G., Hagadorn, J. W., *in press*. Creating data-rich referenced paleogeographic maps. *Journal of Palaeogeography*.

**Clement, A. M.** †, Tackett, L. S. †, Marolt, S.\*, 2024. Biosediment assemblages reveal disrupted silica cycling and redox conditions throughout the Rhaetian Stage: evidence for a precursor event to the end-Triassic mass extinction. *Palaeogeography, Palaeoclimatology, Palaeoecology*. 112034.

Tackett, L. S., Zierer, D.\*, **Clement, A. M.**, 2022 Actinopterygian and chondrichthyan ichthyoliths reveal enhanced cosmopolitanism in Late Triassic marine ecosystems. *Historical Biology*, 2131405.

Monarrez, P. M., Zimmt, J. B., **Clement, A. M.**, Gearty, W., Jacisin, J. J., Jenkins, K. M., Kusnerik, K. M., Poust, A. W., Robson, S. V., Sclafani, J. A., Stilson, K. T., Tennakoon, S. D., Milagros Thompson, C. 2022. Our past creates our present: a brief overview of racism and colonialism in Western paleontology. *Paleobiology*. Vol. 48(2), p. 173–185.

**Clement, A. M.**, Tackett, L. S., 2021. Facies stacking and distribution in the Gabbs Formation (late Triassic, west-central Nevada, USA): An environmental baseline to the end-Triassic carbonate crisis. *Sedimentary Geology*. Vol. 425, 106021.

**Clement, A. M.**, Tackett, L. S., Ritterbush, K. A., & Ibarra, Y., 2020, Formation and stratigraphic facies distribution of early Jurassic iron oolite deposits from west-central Nevada, USA. *Sedimentary Geology*. Vol. 395, 105537.

**Clement, A. M.**, Holland, S. M., 2016, Sequence Stratigraphic Context of Extensive Basin-Margin Evaporites: Middle Jurassic Gypsum Spring Formation, Wyoming, U.S.A. *Journal of Sedimentary Research*. Vol. 86, No. 9, p. 965–981.

**Publications in Preparation (anticipated in 2024/2025)**

**Clement, A. M.**, Sclafani, J. A., Christie, M., Tackett, L. S., *in prep*. Rapid morphological changes in monotid bivalves during the late Triassic in Aotearoa New Zealand. (planned submission to *Paleobiology*)

- Clement, A. M.** †, Petermann, H. †, Kassaw, T. N., Hagadorn, J. W., *in prep.* Late Pleistocene to early Holocene paleoenvironments and early American occupation of the Rocky Mountain region. (planned submission to *Quaternary Research*)
- Gertenbach, D. D., Soar, L. K., Bullocks, J., Over, J., Schultze, H. P., Longman, M. W., Lahey, B. L., **Clement, A. M.**, King, G. E.\*, Hagadorn, J. W., *in prep.* Palaeontology across the Devonian-Carboniferous transition: biota of the Dyer Formation, Colorado, U.S.A. (planned submission to *Papers in Paleontology*)
- Tackett, L. S., Golding, M., Rigo, M, **Clement, A. M.**, Lei, J. Z. X., Caruthers, A. H., Them II, T., Gill, B., Marroquin, S. M., McCabe, K., *in prep.* The Norian–Rhaetian boundary in eastern Panthalassa: New biostratigraphic and chemostratigraphic data and global correlation. (abstract submitted to the special issue special issue "From rock to time" of *Palaeogeography, Palaeoclimatology, Palaeoecology*)
- Raynolds, R. G., **Clement, A. M.**, King, G. E.\*, Hagadorn, J. W., *in prep.* Multiple pulses of Laramide uplift and accommodation in the Paleocene Denver Basin: evidence from new age constraints. (planned submission to *Rocky Mountain Geology*)
- Birdwell, J. E., Gardner, R. D., Kinney, S. A., Hagadorn, J. W., Sullivan, P., Petermann, H., **Clement, A. M.**, Eaton, M. *in prep.* Geothermal resources of the Denver-Julesburg Basin evaluated using 3D basin modeling. (abstract submitted to the 2024 AAPG *Bulletin Special Issue on Geothermal*)

**Publications reviewed for:** *Sedimentology, Carbonates and Evaporites, PeerJ*

## GRANTS & AWARDS

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### Awarded Research Grants

- Paleontological Society Boucot Grant (\$4,000) 2024
- NDSU College of Graduate and Interdisciplinary Studies Doctoral Dissertation Fellowship (\$10,000) 2023
- Paleontological Society Ellis L. Yochelson Student Research Award (\$1,200) 2022
- Association of Applied Paleontological Sciences James R. Welch Scholarship (\$1,000) 2020
- Paleontological Society Student Research Grant (\$1,200) 2019
- SEPM Student Assistance Grant (\$1,250) 2019
- GSA Graduate Student Research Grant (\$500) 2018
- SEPM Student Assistance Grant (\$1,080) 2014
- GSA Graduate Student Research Grant (\$1,200) 2014
- Miriam Watts-Wheeler Fund, University of Georgia, Dept. of Geology (\$1,000) 2014

### Awarded Travel Grants

- SEPM Student Conference Travel Grant (\$350) 2022
- GSA Rocky Mountain Section Student Travel Grant (\$175) 2022
- NDSU College of Science and Math with matching ECS program funds (\$700) 2022
- NDSU College of Science and Math Travel Grant (\$250) 2019
- University of Georgia, Dept. of Geology Travel Grant (\$600) 2014

### Other Awards

- AWG Winnifred Goldring Award- Honorable Mention 2022
- GSA/ExxonMobil Bighorn Basin Field Award 2015
- Outstanding Teaching Award- University of Georgia 2015
- University of Georgia, Dept. of Geology Graduate Student of the Year 2015

## FIELD EXPERIENCE

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Experienced in planning and implementing research field work for groups up to 10 and facilitating larger groups up to 25.  
 Experienced in planning and leading educational field trips of larger class sizes.

- Ongoing field work with DMNS 2023 – Present
  - Cambrian Campito Fm, Nevada
  - Paleocene Calhan Paint Mines and Denver Basin, Colorado
  - Cretaceous Frontier Fm, Wyoming
  - Parting Fm, Colorado

- Ph.D. Research
  - Nevada: invertebrate fossil collection and stratigraphy, 4.5 weeks 2018 – 2022
  - Oregon: invertebrate fossil reconnaissance and stratigraphy, 3 weeks 2019
  - New Zealand: invertebrate fossil collection and stratigraphy 3 weeks 2018, 5 weeks 2022 2018 & 2022
- Paleontology Intern: Denver Museum of Nature & Science, Utah; 6 weeks 2016
- GeoCorps Intern: Ashley National Forest, Utah; 12 weeks 2015
- M.S. Research: Bighorn Basin, Wyoming; 5.5 weeks 2014
- Wasatch-Uinta Field Camp through Univ. of Wisconsin-Madison; 6 weeks 2013
- Univ. of Wisconsin-Madison Geology Museum: vertebrate fossil collection, Wyoming; 1.5 weeks 2013
- Univ. of Wisconsin-Madison: Whitelake Field Mapping Course, Ontario, Canada; 1 week 2012

## **ADDITIONAL SKILLS**

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### **Data Collection and Analysis**

- Field fossil and facies identification, measurement of stratigraphic columns, fossil quarry mapping, field fossil jacketing, geologic mapping, and cave survey, map production in ArcGIS Pro
- Processing and extraction for vertebrate microfossil from carbonate, siliciclastic, and loose sediment
- X-ray diffraction powder, smear, and oriented clay sample preparation, machine operation on a Bruker D8, pattern analysis in EVA and X'Pert HighScore, Rietveld refinement in TOPAS
- ICP-OES, thin-section and acetate peel creation, microfossil separation using LST heavy liquid, sequence stratigraphic analysis from measured section, core, well log, 2D and 3D seismic data
- Statistical analysis including multivariate and ordination techniques, biological modeling and model validation, 2D and 3D morphometric analysis (traditional and landmark-based)
- Imaging techniques using both photogrammetry and Artec Space Spider surface scanner

### **Programs**

- R, ArcGIS Pro, Agisoft Metashape, Artec Studio 17, Fiji, MorphoJ, PAST, EVA & TOPAS software by Bruker, X'Pert HighScore, Petrel, PastPerfect, KE EMu, Specify, S-GeMS, PHREEQC, Adobe Photoshop & Illustrator

### **Curation and Collections Management**

- Assisted in evaluation of incoming donations at DMNS and the Univ. of Wisconsin-Madison Geology Museum
- Assisted in accessioning, loan, and deaccessioning processes at DMNS.
- Experienced in specimen labeling, imaging, and storage, creation of cavity mounts, and specimen cataloging.
- Proficient in the use of relational databases for collections including KE EMu, PastPerfect, Specify, Microsoft Access and online databases including GBIF, Paleobiology Database (PBDB), and iDigBio. PBDB enterer status.
- Familiarity with rock, mineral, and meteorite collections and best practices for specimen housing and maintenance.
- Experienced in mechanical preparation of vertebrate and invertebrate fossil material with air abrasion and hand tools, consolidation of fossils using B-72 and epoxy, creation of field jackets and archival cradles.
- Familiarity with molding and casting process and replica painting.

## **PROFESSIONAL ORGANIZATIONS & POSITIONS**

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### **Positions**

- Paleontological Society Student Representative 2019 – 2021
- NDSU Student Representative to the Graduate Council 2022/23 academic year
- NDSU Environmental and Conservation Sciences Graduate Student Association 2018 – 2023
  - Environmental and Conservation Sciences Program Ambassador 2021 – 2023
  - Geosciences Liaison (officer) 2021 – 2023

### **Organization Memberships**

- Paleontological Society (PS), Palaeontological Association, Geological Society of America (GSA), Society for Sedimentary Geology (SEPM), Association for Women Geoscientists (AWG), International Association of Sedimentologists (IAS), The Society for the Preservation of Natural History Collections (SPNHC)

## PROFESSIONAL DEVELOPMENT

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- **Teaching:** Teaching College Science (NDSU STEM810), Earth Educators' Rendezvous 2022
- **Research & Software:** SPNHC-TDWG 2024, Introduction to Geostatistical Modeling of Geochemical Data (GSA short course), Ecological Niche Modeling (PS short course), Introduction to Structure from Motion (SfM) Photogrammetry (GSA short course), An Introduction to Stratigraphic Data Analysis in R (SDAR) (GSA short course), Integrated Basin Analysis (AAPG/SEG short course), Petrel© Fundamentals Seminar (AAPG/SEG short course), Sequence Stratigraphy (GSA short course)

## PRESENTATIONS AT PROFESSIONAL MEETINGS

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\*undergraduate student author, ‡ indicates poster presentation

### 2024 Presentations

- Clement, A. M.**, Petermann, H., Hagadorn, J. W., 2024. Leveraging large datasets and paleogeographic maps to evaluate sauropod ecology and ecosystem interactions. Geological Society of America *Abstracts with Programs* Vol. 56, No. 5.
- Bonner, H., Petermann, H., Sullivan, P., **Clement, A. M.**, Hagadorn, J. W., 2024. Do it yourself: making ancient earth accessible through data-rich paleogeographic images. Geological Society of America *Abstracts with Programs* Vol. 56, No. 5.
- Clement, A. M.**, Tackett, L. S., 2024. Origin and stratigraphic context of low-diversity shell beds: a case study from Late Triassic Aotearoa New Zealand: 12<sup>th</sup> North American Paleontological Convention.

### First Author Oral Presentations

- Clement, A. M.**, Tackett, L. S., Sclafani, J., Christie, M., 2023. Rapid morphological changes in the bivalve *Monotis* during the Late Triassic in Aotearoa New Zealand: environmental or biological drivers? Geological Society of America *Abstracts with Programs*. Vol. 55, No. 6.
- Clement, A. M.**, Ludewig, C.\*, Tackett, L. S., 2022. Fate of biogenic carbonates from common benthic phyla in immature sediments: An example from Late Triassic New Zealand. Geological Society of America *Abstracts with Programs*. Vol. 54, No. 5.
- Clement, A. M.**, Tackett, L. S., 2021. Norian-Rhaetian sponges of eastern Panthalassa: A harbinger of elevated dissolved silica in the Early Jurassic: Geological Society of America *Abstracts with Programs*. Vol. 53, No. 6.
- Clement, A. M.**, Tackett, L. S., 2020. An environmental baseline to the end-Triassic carbonate crisis: Late Triassic facies of the Gabbs Formation (Nevada, USA): Geological Society of America *Abstracts with Programs*. Vol. 52, No. 6.
- Clement, A. M.**, Tackett, L. S., 2019. Paleocological and morphological trends of the bivalve *Monotis* through the Warepan (Late Norian, Late Triassic) from South Island, New Zealand: Geological Society of America *Abstracts with Programs*. Vol. 51, No. 5.
- Clement, A. M.**, Tackett, L. S., 2019. Depositional environments and paleocological assemblages of a common Late Triassic shell bed-forming bivalve (*Monotis*) in New Zealand: 11<sup>th</sup> North American Paleontological Convention.
- Clement, A. M.**, Tackett, L. S., Ritterbush, K., Ibarra, Y., 2018. A new Panthalassan iron-oolite deposit from the Early Jurassic: implications for global shallow marine iron deposition in the aftermath of the End-Triassic mass extinction: Geological Society of America *Abstracts with Programs*. Vol. 50.
- Clement, A.M.**, Tackett, L.S., Ritterbush, K., Ibarra, Y., Marolt, S.\*, Schock, J.\*, 2018. Iron ooid forming environments in the aftermath of the End-Triassic mass extinction. 5<sup>th</sup> International Paleontological Congress.
- Clement, A.M.**, Holland, S.M., Graybeal, D.\*, 2015. The sequence stratigraphic architecture of the Middle Jurassic Gypsum Spring and Piper formations in the eastern Bighorn Basin of Wyoming. Geological Society of America *Abstracts with Programs*. Vol. 47, No. 6, p.37.

### Undergraduate Student Research Presentations (National Conferences)

- ‡Bunker, C. R.\*, Tackett, L. S., **Clement, A. M.**, 2022. Late Triassic Foraminifera from the South Island Aotearoa (New Zealand). Geological Society of America *Abstracts with Programs*. Vol. 54, No. 5.

- Jackson, E.\*, Tackett, L. S., **Clement, A. M.**, Bunker, C. R.\*, 2022. Diversity and ecology of foraminifera from the Gabbs Formation (Norian–Rhaetian, Nevada, USA). Geological Society of America *Abstracts with Programs*. Vol. 54, No. 5.
- ‡Zierer, D.\*, **Clement, A. M.**, Tackett, L. S., 2020. Chondrichthyan ichthyoliths suggest uneven global diversity during the late Triassic. Geological Society of America *Abstracts with Programs*. Vol. 52, No. 6.
- ‡Nelson, E.\*, Tackett, L. S., **Clement, A. M.**, Gibbs Schnucker, S.\*, 2019. Shallow marine paleoecology of *Halobia* of the Norian (Late Triassic) in Owaka, New Zealand. Geological Society of America *Abstracts with Programs*. Vol. 51, No. 5.
- ‡Zierer, D.\*, Tackett, L. S., **Clement, A. M.**, 2019. A new suite of late Triassic fish microfossils from the Norian stage (Late Triassic) in Southland, New Zealand and a morphometric analysis of dietary preference. Geological Society of America *Abstracts with Programs*. Vol. 51, No. 5.
- ‡Marston, H.\*, Tackett, L. S., **Clement, A. M.**, 2018. A paleoecological survey of vertebrate predators in the late Triassic using microfossil diversity. Geological Society of America *Abstracts with Programs*. Vol. 50, No. 6.

## **GEOSCIENCE OUTREACH & OTHER ACTIVITIES**

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### **Outreach with the Denver Museum of Nature & Science**

*June 2023 – Present*

- Participate in and conduct outreach activities on behalf of the museum.
- Assist with events and activities for the DMNS Skirts in Science group.
- Recent events: Science on the Spot- Where Ink Meets Rubber, Women in STEM Panel, 2024 Girls & Science, 2023 Members Night, Science on the Spot- Earth Sciences Interns (2023 & 2024).

### **Volunteer Scientist with Skype A Scientist**

*2020 – Present*

- Meet with approximately 3–5 classrooms virtually each semester to talk about research, what scientists do, becoming a scientist, and answer student questions.

### **Speed Mentor for STEM Goes Red Fall Conference**

*2023*

- Shared experiences with young women considering careers in STEM at the 2023 conference in Boulder, CO.

### **Research on changing student perspectives of geoscience**

*2021 – 2023*

- Conducted research regarding perceptions of geoscience and effectiveness of geoscience outreach in middle school, high school, and early college students with Drs. Day and Tackett at North Dakota State University.
- This research sought to test how alternate forms of outreach, such as co-operative gameplay, impacts perceptions of geoscience compared to existing outreach conducted by NDSU Dept. of Geosciences.

### **Volunteer Science Advisor for the Fargo-Moorhead Science Museum Project**

*2018 – 2023*

- Assisted in outreach activities for the Museum Project including educational events at the Red River Market, Hjemkomst Center Frostival, Party for the Planet Earth Day event, and an interview with Prairie Public Radio
- Assist in research for exhibit planning

### **North Dakota State University Geology Club member & Graduate Student Mentor**

*2018 – 2023*

- Participated in club activities that support sending undergraduate students to attend the annual GSA conference.
- Supported professional development opportunities for club members.

### **Outreach on behalf of the North Dakota State University Department of Geosciences**

*2018 – 2023*

- Gave presentations or host activities at events or schools when invited by community members.
- Events included the annual Earth Day Party for the Planet, Bell Museum Statewide Star Party, Share a Story (Prairie Public), several visits from local Girl Scout and Boy Scout groups, National Fossil Day events, visits to local elementary schools (Eastwood, Glyndon-Felton, & Cobber Kids), activities for events at the Red River Zoo

### **Avenues of Scientific Discovery Event at North Dakota State University**

*2018 – 2019, 2022*

- Hosted a booth and activity on geoscience for local high school students to explore as part of an event to expose Fargo-Moorhead area students to fields of science that they may not otherwise experience.

### **Student Representative to the Paleontological Society**

*2019-2021*

- Served as one of two Student Representatives to council, attended council meetings, submitted annual reports to the society, coordinated events at the Annual Geological Society of America meetings (Schuchert Talk and Student Social, Women in Paleontology/PaleoX Social).
- Assisted with logistics and coordination for a student-run networking initiative PaleoConnect and Paleontological

Society Webinars (Work Life Balance, Mental Health in Academia).

**NATURE program at North Dakota State University**

*2018 – 2019*

- Helped mentor students working in the Tackett Lab as part of the Native American Tribal Undergraduate Research and Education (NATURE) program.
- Assisted students in collecting and analyzing data for a short-term project.

**Darwin Day Event at North Dakota State University**

*2018 – 2019*

- Assisted in the coordination of a pop-up museum about evolution on NDSU's campus.
- Acted as a docent/interpreter at various exhibits during the two days of the pop-up museum.

**Volunteer Caver- Mammoth Cave Restoration Camp**

*March 2016*

- Worked as part of a team to develop and/or restore areas within the cave at Mammoth Cave National Park.

**Volunteer Cave Mapper- Big Brush Creek Cave Mapping Project**

*2015*

- Worked as part of a volunteer team to re-map the second longest cave in Utah to support cave research and promote safe access and exploration of the cave by the general public.

**University of Georgia Geology Club member and Speaker**

*2013 – 2015*

**University of Wisconsin- Madison Undergraduate GeoClub Secretary**

*2010 – 2013*