

Suzanne (Mulligan) Autrey

SUMMARY

- Specializes in mineralogy, metamorphic petrology, and mineral physics
 - Uses Raman spectroscopy, laser ablation inductively coupled mass spectrometry, high-pressure and high-temperature experimentation, and synchrotron X-ray diffraction to explore questions in petrology, mineralogy, and tectonics
 - Research interests include identification and development of geothermobarometry methods, the application of spectroscopic techniques in geology, and mid-crustal deformation in metamorphic core complexes
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EDUCATION

Doctoral Degree in Geological Sciences, awarded August 2022

University of Nevada, Las Vegas

- Dissertation: The application of detrital zircon geochronology, pressure-temperature modeling, monazite petrochronology, and quartz-in-garnet geobarometry to the tectonic evolution of the Funeral Mountains and related metamorphic core complexes

Bachelor of Science in Geological Science, awarded May 2016

Indiana University, Bloomington, Indiana

- Executive Dean's List: Spring 2013, Summer 2013, Summer 2014, Spring 2015
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PROFESSIONAL AND WORK EXPERIENCE

Assistant Professor

08/18/2023-present

Northern Illinois University, DeKalb

- Developing a research laboratory focused on experimental petrology/mineralogy, geothermobarometry, and Raman spectroscopy.
- Teaching core mineralogy and petrology courses

Postdoctoral Research Fellow

08/13/2022-08/14/2023

University of Wisconsin, Madison

- Hired to run the Raman laboratory and improve the capabilities of the instrument
- Collected Raman data at the UW spectroscopy lab and SXD data at the micro-Laue diffraction beamline 12.3.2 at the Advanced Light Source of the Berkeley National Laboratory
- Obtained pressures of metamorphism for Precambrian rock samples from the Grand Canyon, which led to a reevaluation of the pressure-temperature path and deformational history
- Supervised by Dr. Chloe Bonamici

Lawrence Berkeley National Laboratory Research Fellow

12/13/2021-5/13/2022

DOE Office of Science Graduate Student Research Program

- Collected data at the micro-Laue diffraction beamline 12.3.2 over several months on-site at the Advanced Light Source of the Berkeley National Laboratory
- Collected X-ray fluorescence and SXD (monochromatic and micro-Laue diffraction) data on minerals under stress

- Assisted in data collection for studies focused on characterizing new minerals, investigating nanowires, and probing the crystal structures of new materials
- Supervised by Dr. Oliver Tschauner and Dr. Nobu Tamura

Materials and Chemistry Institute Intern

05/17/2021-08/17/2021

Lawrence Livermore National Laboratory, Materials Science Division

- Carried out high-pressure diamond anvil cell (DAC) compression experiments for data collection at the Advanced Photon Source of the Argonne National Laboratory
- Synthesized high-pressure garnet polymorphs to understand deep mantle phase transitions
- Supervised by Dr. Jason Lee Baker

Materials and Chemistry Institute Intern

05/26/2020-08/15/2020

Lawrence Livermore National Laboratory, Materials Science Division

- Carried out high-pressure DAC compression experiments for data collection at the Advanced Photon Source of the Argonne National Laboratory and the Advanced Light Source of the Berkeley National Laboratory
- Focused on SXD on materials under pressure, DAC experimentation, equation of state determination for garnet, and Raman spectroscopy on quartz inclusions
- Published a first author paper on a subset of the data collected during this internship
- Supervised by Dr. Elissaios Stavrou and Dr. Oliver Tschauner

Assistant at Nevada Extreme Conditions Laboratory

Summer 2019

University of Nevada, Las Vegas

- Assisted with and carried out successful high-pressure DAC experiments while collecting in-situ Raman spectroscopy
- Participated in several projects using Raman spectroscopy to characterize materials, identify unknown minerals, and utilize Raman-based thermobarometers
- Supervised by Dr. Ashkan Salamat

Hourly Employee- Rewriting Mineralogy Laboratory Exercises

Summer 2019

University of Nevada Las Vegas, Dept. of Geoscience

- Updated the lab section to incorporate optical mineralogy into the course by rewriting labs, preparing thin sections for students, and creating lectures on physical and optical properties of minerals
- Supervised by Dr. Rodney Metcalf

Graduate Research Assistant

Fall 2018

University of Nevada Las Vegas, Dept. of Geoscience

- Participated in structural data collection, geochemistry, petrography, thermodynamic modeling (theriak-domino), titanite petrochronology, monazite petrochronology, and zircon geochronology in the Funeral Mountains metamorphic core complex
- Evaluated the extent of Jurassic, Cretaceous, and Miocene deformation in mid-crustal rocks from Monarch Canyon to reconstruct the polyphase deformational history
- Supervised by Dr. Michael Wells

Geology Lab Analysis, Research Staff

9/13/2014-7/1/2016

Indiana Geological Survey, Bloomington, Indiana.

- Employed as a researcher at the Geological Survey before entering graduate school
- Assisted with laboratory and fieldwork on various projects in collaboration with the Geological Survey and National Parks Service

- Sampled drill cores, collected samples in the field, ran grain-size analysis using laser diffraction, carried out optically stimulated luminescence dating, carried out heavy mineral separation, and collected X-ray powder diffraction
- Worked on a variety of projects that ranged from characterizing glacial tills across Indiana to studying ancient archaeological sites

National Park Service Mt. Baldy Project, Research Staff

9/13/2014-7/1/2016

Indiana Geological Survey, Bloomington, Indiana.

- Investigated the cause for dune collapse at the Indiana Dunes after a child fell into a dune and was trapped for several hours
- Carried out heavy mineral separation, grain mount preparation, X-ray powder diffraction, and heavy mineral point counting to evaluate the cause of dune collapse at Mount Baldy of the Indiana Dunes State Park
- Successfully aided the group in discovering the cause for collapse and allowed the park to reopen safely
- Supervised by Dr. William Monaghan

Senior Thesis Research in the Rye Complex

10/10/2014-7/1/2016

Indiana University, Bloomington, Indiana

- Conducted detailed petrography, textural analysis, and microstructural analysis on highly deformed metamorphic rocks
- Supervised by Dr. Robert Wintsch

Internship with the Indiana Hoosier National Forest

12/17/2012-06/31/2014

Bloomington, Indiana

- Wrote, recorded, and edited podcasts about the German Ridge Heritage Geoarchaeology project that were broadcast by the Indiana Hoosier National Forest Service
- Participated in geoarchaeology outreach

Assisted in Paleontology Laboratory

Fall 2013-Spring 2014

Indiana University, Bloomington, Indiana

- Studied taphonomy, paleontology, and hominid evolution
- Supervised by Dr. Jackson Njau

Geology and Paleoanthropology at Olduvai Gorge Field School

June-August 2014

Camp Leaky in Olduvai Gorge, Tanzania.

- Measured stratigraphic section, assisted with trenching, produced detailed cross-sections, investigated metamorphic core complexes, and studied rift related magmatism during Indiana University's six-week field course, in addition to field camp
- Lived closely with the local Massai people and attended a multitude of traditional cultural ceremonies

Field Geology in the Rocky Mountains

June-August 2015

Indiana University Field Camp, Judson Mead Geologic Field Station

- Gained experience with intensive geologic mapping, measuring stratigraphic section, interpreting well logs, analyzing geochemical data, sequencing stratigraphy, and completing detailed cross-sections during Indiana University's six-week field camp

DISSERTATION PROJECTS

Synchrotron X-ray Diffraction Projects

Spring 2020-Summer 2022

National Laboratories

- Gained experience with various diamond anvil cell (DAC) loadings including single crystal and powder in liquid, gas, and salt pressure-transmitting mediums in a variety of DAC types, and participated in data collection at multiple synchrotron beamlines
- Obtained synchrotron X-ray diffraction (SXD) data on single crystals at the Advanced Light Source of Berkeley National Lab beamline 12.3.2 over several months on-site
- Obtained SXD data on powder pellets while compressing and laser heating samples at the Advanced Light Source of the Berkeley National Lab beamline 12.2.2
- Obtained SXD data on single crystals at the Argonne National Lab beamline HPCAT 16-IDD while compressing samples in DACs
- Obtained SXD on single crystals at the Argonne National Lab beamline GSECARS 13-IDD while compressing samples in DACs
- Supervised by Dr. Oliver Tschauner, Dr. Jason Baker, Dr. Elissaios Stavrou, and Dr. Nobumichi Tamura

Raman Spectroscopy Projects

Fall 2018-Summer 2022

University of Nevada, Las Vegas

- Tested the developing method of quartz-in-garnet elastic geobarometry by collecting spectra on thousands of quartz inclusions on a variety of Raman systems
- Used Raman spectroscopy to identify unknown minerals, characterize newly discovered minerals, analyze fluid inclusions in mantle olivine, perform thermometry on carbonaceous material, and evaluate strain in crystals using Raman active vibrational mode shifts in minerals under pressure
- Supervised several outside users and UNLV students applying Raman spectroscopy to geologic projects

Petrochronology Projects

Fall 2018-Summer 2022

University of Nevada, Las Vegas

- Collected and analyzed LA-ICP-MS U-Pb age data on zircon cores for detrital zircon geochronology at the Arizona Laser Chron Center
- Collected and analyzed LA-ICP-MS U-Pb age data and trace element geochemistry on zircon rims to produce depth profiles at the UCSB petrochronology lab
- Collected and analyzed LA-ICP-MS U-Pb age data and trace element geochemistry on monazite and titanite for petrochronology at the UCSB petrochronology lab
- Supervised by Dr. Michael Wells

Structure & Metamorphic Petrology Projects

Fall 2018-Summer 2022

University of Nevada, Las Vegas

- Researched metamorphic core complexes in Death Valley to reconstruct protolith stratigraphy, constrain the timing of deformation, identify structures, map regions, and reconstruct P-T-t histories
- Used detailed microscopy (optical, scanning electron, and cathode luminescence) to characterize metamorphic textures and shear fabric characteristics
- Applied petrographic analysis to interpret structures and microstructures
- Modeled metamorphic pressures and temperatures using the thermodynamic modeling programs Theriak-Domino and Perplex from XRF data
- Supervised by Dr. Michael Wells

TEACHING EXPERIENCE

Course Instructor: Geography 103 Lecture

Spring 2020

University of Nevada Las Vegas, Dept. of Geoscience

- Was the instructor of record for a section of the undergraduate course Physical Geography of Earth's Environment
- Created lesson plans, prepared biweekly 90-minute lectures, wrote exams, graded, and interacted with students

Guest Lecturer: Structural Geology Lecture

Fall 2021

University of Nevada Las Vegas, Dept. of Geoscience

- Taught several lectures on structural geology topics for the course Structural Geology
- LECTURED on microstructures, microstrain, and deformation mechanisms

Guest Lecturer: Mineralogy Lecture

Fall 2019

University of Nevada Las Vegas, Dept. of Geoscience

- Gave lectures on crystal symmetry and framework silicates for Introduction to Mineralogy

Teaching Assistant: Field II

Spring 2022

University of Nevada Las Vegas, Dept. of Geoscience

- Was the teaching assistant for the UNLV Advanced Field Mapping course, which involved three weeks of geologic mapping in the Poleta Fold-belt field site in the White Inyo Mountains and the Papoose Flats field sites
- Worked hands-on with students in a field setting and taught geologic mapping
- Worked with students on creating geologic cross-sections, plotting stereonet, and writing geologic reports

Teaching Assistant: Structural Geology Lab

Fall 2021

University of Nevada Las Vegas, Dept. of Geoscience

- Taught two lab sections of Structural Geology
- Gained experience teaching in classroom and field settings

Teaching Assistant: Geology 101 Lab

Fall 2020 & Spring 2021

University of Nevada Las Vegas, Dept. of Geoscience

- Taught a lab section of the GEOL 101 Introduction to Geology undergraduate course online using Webcampus
- Learned how to use useful online tools and gained experience in remote teaching

Teaching Assistant: Mineralogy Lab

Spring & Fall 2019

University of Nevada Las Vegas, Dept. of Geoscience

- Aided the instructor in restructuring the layout of the course while teaching the laboratory section of Introduction to Mineralogy
- Independently developed and carried out weekly mineral identification quizzes and prepared weekly practice tests to incentivize students to apply themselves

MENTORING EXPERIENCE

Undergraduate Supervisor

Spring 2020

University of Nevada Las Vegas, Dept. of Geoscience

- Supervised undergraduate student Alex Holmberg in an hourly position with lab work for detrital zircon geochronology
- Carried out bulk rock crushing, zircon mineral separation, and LA-ICP-MS data collection and analysis at UNLV

Undergraduate Supervisor

Spring 2019

University of Nevada Las Vegas, Dept. of Geoscience

- Supervised undergraduate student Alison Corrales in an hourly position with lab work for detrital zircon geochronology
- Carried out bulk rock crushing, zircon mineral separation, data collection at the Arizona Laserchron Laboratory, and LA-ICP-MS data collection and analysis

Undergraduate Supervisor

Fall 2018-Spring 2019

University of Nevada Las Vegas, Dept. of Geoscience

- Supervised undergraduate student Sarah Grove in an hourly position with lab work for geochemistry
- Carried out bulk rock crushing, fusing, and powdering samples in preparation for wet chemistry ICP-MS geochemistry

Undergraduate Supervisor

Fall 2017-Spring 2017

University of Nevada Las Vegas, Dept. of Geoscience

- Supervised undergraduate students Ariel Wolfman and Arron Tarnowski during their senior thesis research
- Carried out detrital zircon data collection at the Arizona Laserchron Laboratory, stratigraphic reconstruction, and provenance analysis

Raman Lab Supervisor

Fall 2021-Spring 2022

University of Nevada Las Vegas, Dept. of Physics and Astronomy

- Supervised several users in the Raman lab including visiting faculty and students, UNLV graduate students, and UNLV undergraduate students
- Tuned the instrument to fit the needs of the users, assisted users with data collection, and trained users in data collection and processing

COMMUNITY OUTREACH & SERVICE

Guest Editor for ‘Tectonic evolution of the cratonic blocks and orogenic belts in Asia and associated metallogeny’

Fall 2023

Journal of Asian Earth Sciences

- Invited authors to submit papers
- Edited and reviewed submissions

Session convener and chair of ‘The Metamorphic Kitchen Sink’

December 2022

American Geophysical Union National Conference

- Organized oral and poster sessions for the session that involved projects that applied several techniques to study metamorphic rocks
- Reviewed applications, chaired two oral sessions, and judged presentations

Volunteer with University of Wisconsin Geology Museum

Fall 2021

Science Festival & Gem and Mineral Show

- Science Festival: welcomed visitors of all ages to the museum where we exhibited several engaging mineral and fossil demonstrations
- Gem and Mineral Show: showcased mineral specimens from the museum collection and taught visitors about the samples
- Increased community engagement with the museum

Classroom Volunteer

March 2021-current

Skype a Scientist

- Volunteered in K-12 classrooms speaking with students and members of the public about geology and answering questions about geology topics and life as a scientist

- Learned crucial skills in communicating science to the public and fielding questions from a diverse audience
- Participated in 6 classes and counting

Inclusion Rocks Program

Spring 2019, 2020, & 2021

University of Nevada, Las Vegas

- Exhibited science demonstrations for local middle schools
- Gave lectures and participated in hands-on demonstrations involving geomorphology, planetary geology, and igneous petrology

Classroom Volunteer

Fall 2015-Spring 2016

Boys and Girls Club, Bloomington Indiana

- Exhibited science demonstrations for the local Boys and Girls Club
- Independently developed and presented games and demonstrations for children that involved geology and mineralogy to inspire kids to learn about science

CONTINUING EDUCATION

Strabospot Short Course

Geological Society of America Joint Rocky Mountain/Cordillera Meeting, 2022

- Short course that focused on using digital geologic mapping software

National School on Neutron and X-ray Scattering

Oakridge and Argonne National Laboratories, 2021

- Intensive three-week school featuring lectures, seminars, trainings, and hands-on remote-controlled experiments with various neutron and X-ray scattering techniques

Light Sources 101 Workshop

Advanced Light Source User Meeting, 2020

- Workshop on synchrotron X-ray diffraction (SXD)

Using Laser Ablation Split Stream Geochronology and Petrochronology to Address Tectonic and Petrologic Questions Short Course

Geological Society of America National Conference, 2016

- Short course on LA-ICP-MS and its applications

GRANTS AND AWARDS

Jack and Fay Ross Family Fellowship [\$27,000+]

Fall 2016- Fall 2018

University of Nevada Las Vegas, Dept. of Geoscience

- Awarded fellowship based on graduate school application, statement of purpose, C.V., and letters of recommendation
- Funded two years of living expenses, travel, some research, health insurance, and tuition

Lipman Research Grant [\$2500]

12 June 2019

Geological Society of America

- Awarded for proposal on: Testing Raman-inclusion barometry across a contact aureole

Jacobs Research Grant [\$1000]

26 April 2019

Geosymposium Conference, University of Nevada Las Vegas, Dept. of Geoscience

- Awarded for proposal: Testing the applications and limitations of Raman-inclusion barometry

Geological Society of Nevada Scholarship [\$2750]

26 April 2019

Geological Society of Nevada

- Awarded based on C.V. and questions about academic achievement, personal challenges, and future goals

UNLV Open Article Fund Grant [\$1500]

20March 2019

University of Nevada Las Vegas, Library Fund

- Awarded grant to cover the cost of publishing the manuscript *Equation of state for natural almandine, spessartine, pyrope garnet: Implications for quartz-in-garnet elastic geobarometry*. *Minerals* 11(5), 458. <https://doi.org/10.3390/min1010001>

Bernada French Scholarship [\$600+]

Fall 2019, 2020 and Spring 2019, 2021, 2022

University of Nevada, Las Vegas

- Awarded several Department of Geosciences scholarship for my degree progress

Geosymposium Best Oral Presentation Award [\$600]

26April 2019

Geosymposium Conference, University of Nevada Las Vegas, Dept. of Geoscience

- Awarded best oral presentation for: Comparing Raman Quartz-in-garnet barometry with thermodynamic modeling across a Barrovian metamorphic terrane: The Funeral Mountains metamorphic core complex

Outstanding Dissertation Award College of Sciences Nominee

November 2022

College of Sciences, University of Nevada, Las Vegas

- Nominated as the College of Sciences best dissertation award
- Chosen based on dissertation, letters of recommendation, and C.V.
- Results are pending for the university-wide award

Best Graduate Teaching Assistant Nominee

January 2022

College of Sciences, University of Nevada, Las Vegas

- Nominated as the College of Sciences best graduate teaching assistant
- Chosen based on teaching packet, letters of recommendation by students and faculty supervisors, and course evaluations

GSA Travel Grant [\$500]

12June 2019

Geological Society of America Cordilleran Section

- Awarded grant to offset travel costs to present two talks at the regional conference

M.G.P.V. Travel Grant [\$500]

12June 2019

Mineralogy, Geochemistry, Petrology, and Volcanology Division GSA

- Awarded travel support for Geological Society of American National Meeting

Judson Mead Scholarship [\$500]

April 2015

Indiana University Field Camp

- Awarded grant to offset travel and tuition costs for field camp

Graduate and Professional Student Association Travel Grant [\$350]

December 2019

University of Nevada, Las Vegas

- Awarded grant to conduct SXD at the Lawrence Berkeley National Laboratory

A.E.G. Oral Presentation Award [\$100]

15May 2019

Association of Environmental and Engineering Geologists

- Awarded best oral presentation for: Comparing Raman Quartz-in-garnet barometry with thermodynamic modeling across a Barrovian metamorphic terrane: The Funeral Mountains metamorphic core complex

MANUSCRIPTS PUBLISHED & IN PREP

Mulligan S. R., Wells M. L., Hoisch T. D., Salamat A., Childs C., Tschauer O., Craddock Affinati S., Willis M. A., Smith A. G. (2022). Deviation between quartz-in-garnet elastic

- geobarometry and thermodynamic P-T modeling in Barrovian metamorphic rocks. *Journal of Metamorphic Geology*. <https://doi.org/10.1111/jmg.12658>
- Mulligan S. R., Stavrou E., Chariton S., Tschauner O., Salamat A., Wells M. L., Smith A.G., Hoisch T.D., Prakapenka V. (2021). Equation of state for natural almandine, spessartine, pyrope garnet: Implications for quartz-in-garnet elastic geobarometry. *Minerals* 11(5), 458. <https://doi.org/10.3390/min1010001>
- Haxel, G.B., Epstein, G.S., Jacobson, C.E., Wittke, J.H., Standlee, K.G., and Mulligan, S.R., (2022). Mantle peridotite and associated metasomatic rocks in the Orocochia Schist subduction channel (latest Cretaceous) at Cemetery Ridge, southwest Arizona: Geologic map, petrology, and structural setting: Arizona Geological Survey Contributed Report CR-22-A, 85 p., map scale 1:2000. rt
- Zuza A. V., Levy D.A., Mulligan, S. R. (2020). Geologic field evidence for non-lithostatic overpressure recorded in the North American Cordillera hinterland, northeast Nevada. *Geoscience Frontiers* <https://doi.org/10.1016/j.gsf.2020.10.006>

IN REVIEW & IN PREP

- Autrey-Mulligan S. R., Bonamici C., Williams M. L., Karlstrom K., Condit C. (2023-in internal review). Resolving pressure differences across the Grand Canyon: Implications for Proterozoic tectonics. For *Geology*.
- Autrey-Mulligan S. R., Wells, M. L., Wright, S., Kylander-clark, A. (2023-in prep). A 100-million-year pressure-temperature-time path for Monarch Canyon: Implications for monazite petrogenesis. For *Contributions to Mineralogy and Petrology*.
- Mulligan S. R., Wells M. L., Wolfman A. (2023 – in internal review). Elucidating the protolith stratigraphy and northern extent of Pahrump Group basins in amphibolite facies metamorphic rocks and migmatites in the Funeral Mountains and the Bullfrog Hills metamorphic core complexes
- Qiu L., Yan D., Wells M. L., Cao W., Hoisch T.D., Li X., Mulligan S. R. (*in review*, *Geology*) Staurolite schists in Accretionary Complex Record Paleo-Tethys Arc-Arc Collision in Eastern Tibetan Plateau

PRESENTATIONS

- Autrey-Mulligan S. and Wells M. L. (2023). Cretaceous metamorphism in the Sevier hinterland, Geological Society of America *Penrose Conference Poster Session*.
- Mulligan S. R. (2023). How Studies of Ancient Rocks and Minerals Can Reveal Information About Tools and Techniques of the Future, American Museum of Natural History, *invited seminar talk*.
- Mulligan S. R. (2023). How Studies of Ancient Rocks and Minerals Can Reveal Information About Tools and Techniques of the Future, American Museum of Natural History, *invited seminar talk*.
- Mulligan S. R., Wells M. L., Wright S., Hoisch T. D. (2022). Polymetamorphism in the Funeral Mountains metamorphic core complex recorded in monazite, titanite, and zircon, Geological Society of America, *Abstracts with Programs*.
- Mulligan S. R., Wells M. L., Wright S., Hoisch T. D. (2022). Estimates of geologic pressures in the Funeral Mountains and the Wood Hills metamorphic core complexes: QuiG verses thermodynamic modeling, Geological Society of America, *Abstracts with Programs*, 54(2)
- Mulligan S. R., Baker J. L., Tschauner O., Wells M. L., Salamat A., Prakapenka V. (2021).

- Insights into the deep mantle from high-pressure garnet compression. Lawrence Livermore National Laboratory, *Summer Slam*
- Mulligan S. R., Stavrou E., Tschauner O., Wells M. L., Salamat A., Prakapenka V., Park C., Kuntz M. (2020). Garnet compression: From the crust to the deep mantle. *Lawrence Livermore National Laboratory, Summer Slam*
- Mulligan S. R., Wells M. L., Salamat A. (2020). Quartz-in-Garnet barometry in Barrovian metamorphic rocks: overstepping or overestimation. *University of Nevada, Las Vegas Geosymposium, Abstracts with Programs*
- Mulligan S. R. (2019). How petrochronology can provide tectonic context to age data: a case study in the Funeral Mountains metamorphic core complex. University of Nevada, Las Vegas, *invited seminar*
- Mulligan S. R., Wells M. L., Hoisch T. D., Craddock Affinati S., Childs C., Salamat A. (2019). Comparing Raman-inclusion barometry and thermodynamic PT modeling in Barrovian metamorphic environments, Geological Society of America, *Abstracts with Programs, 40(3)*
- Mulligan S. R., Craddock Affinati S., Wells M. L., Hoisch T. D., Childs C., Wright S., and Salamat A. (2018). Comparing Raman quartz-in-garnet barometry with thermodynamic modeling across a Barrovian metamorphic terrane: The Funeral Mountains metamorphic core complex, *Abstract 369023 Fall Meeting, AGU, Washington D.C., 10-14 Dec*
- Mulligan S. R., Wolfman A., Wells M. L., Hoisch T. D. (2018). Using zircon and titanite geochronology to evaluate protolith stratigraphy and the timing of metamorphism and migmatization in Monarch Canyon, Geological Society of America, *Abstracts with Programs, 50(5)*
- Wolfman A., Mulligan S. R., Wells M. L. (2017). Resolving stratigraphic complexities of the Pahrump group and migmatite protolith in the Funeral Mountains metamorphic core complex using U-Pb DZ geochronology, Geological Society of America, *Abstracts with Programs, 49(6)*
- Mulligan S. R., Kane P., Kunk M. J., Stoesz E., and Witsch R. (2016). Multiple generations of Al₂SiO₅ polymorphs in a low-pressure metamorphic setting: The Rye complex, New Hampshire, Geological Society of America, *Abstracts with Programs, 48(7)*
- Mulligan S. R., Kane P., Stoesz E., and Witsch R. (2015). Three stages of andalusite growth in the Rye complex, New Hampshire, Geological Society of America, *Abstracts with Programs, 47(7)*

PROFESSIONAL SKILLS

Raman Spectroscopy	Elastic Geobarometry
Diamond Anvil Cell Compression	Synchrotron X-ray Diffraction
Powder XRD (Powdercell)	Thermobarometry
Optical Mineralogy	Grainsize Analysis
Microstructural Analysis	Geologic Mapping
Zircon Geochronology	Heavy Mineral Separation
Thermodynamic Modeling (Theriak-Domino, Thermocalc)	Electron Microprobe
EoS Determination	Geochemical Modeling
Scanning Electron Microscopy	LA-ICP-MS
Elastic Modeling (EoSFit, EntraPT)	Mineral Identification
Provenance Analysis	X-ray Fluorescence

Drafting (Inkscape, Adobe)
Spectral Fitting (Fityk, Origin)
XRD Indexing (Unit Cell, CrysAlis)
Monazite Petrochronology
QGIS
Sediment Core Analysis

Mineral Point Counting
Structure Analysis (Jana)
Micro-Laue Analysis (XMAS)
Titanite Petrochronology
Strabospot Field Mapping
Structural Data Analysis

ACTIVITIES

AGU session convener and chair: The Metamorphic Kitchen Sink	<i>December 2022</i>
Member, National Postdoctoral Association	<i>November 2022-present</i>
Volunteer, Gem and Mineral Show	<i>November 2022</i>
Volunteer, Madison Science Festival	<i>October 2022</i>
Geosymposium Silent Auction Coordinator	<i>Spring 2019 & 2020</i>
Volunteer Pet Foster, The Animal Foundation	<i>March 2021-August 2022</i>
Founding Member, UNLV chapter of Association for Women Geoscientists	<i>Fall 2019-present</i>
Vice President, American Association of Petroleum Geologists	<i>Spring 2018-Fall 2018</i>
Logistics Coordinator, American Association of Petroleum Geologists	<i>Fall 2016-Spring 2017</i>
Member, American Association of Petroleum Geologists	<i>Fall 2016-Present</i>
Volunteer, Las Vegas Science Festival	<i>6 May 2017</i>
Member, Sigma Gamma Epsilon	<i>10/24/2014-Present</i>
Member, Society of Economic geologists	<i>2/15/2018-Present</i>
Member, Geology Club Indiana University	<i>2013-2016</i>
Member, Geological Society of America	<i>2014-Present</i>
Student Coach, Little 500 Women's Bike Race	<i>December 2013</i>
Member, American Geophysical Union	<i>Fall 2018-Present</i>
Member, Mineralogical Society of America	<i>Spring 2018-Present</i>