

# Nicole G. Lunning

## Curriculum Vitae

### Research Interests

The goal of my research is to contribute to understanding how early rocky bodies—planetesimals—formed and evolved in the Solar System. As a petrologist, I investigate the geochemical evolution of extraterrestrial bodies by studying meteorites, many of which originated from the surviving portions of planetesimals in our asteroid belt, and by conducting petrological experiments.

### Education

Ph.D. Geology, University of Tennessee, Knoxville, GPA 4.0, August 2015. Dissertation Title: Insights into planetesimal evolution: Petrological investigations of regolithic howardites and carbonaceous chondrite impact melts. Advisor: H. Y. McSween, Jr.

M.S. Geology, University of California, Davis, GPA 3.78, June 2009. Thesis Title: Wind erosion in the Sacramento-San Joaquin Delta recorded by phytolith concentrations. Advisor: K. L. Verosub.

B.S. Geophysical Sciences, University of Chicago, GPA 3.45, June 2005. Honors in the College and Honors in the Geophysical Sciences, Deans' List 2002-2005.

### Grants and Fellowships

- Workshop on Catastrophic Disruption in the Solar System Travel Grant (2018)
- Peter Buck Smithsonian Institution Postdoctoral Fellowship (2015-2017)
- Meteoritical Society Early Career Scientist Travel Grant (2017)
- University of Tennessee Chancellor's Fellowship (2012-2015)
- Meteoritical Society Student Travel Grants (2013, 2014, and 2015)
- University of Tennessee Graduate Student Senate Travel Grants (2013 and two in 2014)
- University of California Davis Durrell Grant for Graduate Research (2006-2007)
- University of Chicago Richter Grant for Undergraduate Research (2004-2005)

### Experience

Peter Buck Postdoctoral Fellow, National Museum of Natural History, Smithsonian Institution, September 2015-Present

- Performed melting experiments using a 1-bar gas mixing furnace, a vertical furnace with a molybdenum-alloy pressure vessel at high temperatures and moderate pressures (e.g., 1100 °C and 500 bars), and a horizontal cold seal furnace at moderate temperatures and pressures (e.g., 700 °C and 400 bars)
- Characterized experimental charges and meteorites with petrographic microscope
- Analyzed experimental charges and meteorites with scanning electron microscope and electron microprobes (JEOL 8900, JEOL 8530F at the Smithsonian Institution)
- Outreach including meteorite vault tours and public programs
- Mentor to graduate and undergraduate students

Graduate Researcher, Lecturer, and Teaching Assistant, University of Tennessee, Knoxville, August 2012-August 2015

- Researched meteorite petrology and geochemistry to investigate the differentiation and evolution of asteroid 4 Vesta and impact melting on carbonaceous chondrite-like parent bodies
- Used the following instruments: electron microprobe, secondary ion mass spectrometer, laser ablation-inductively coupled-mass spectrometer, Raman microprobe, scanning electron microprobe, petrographic microscope
- Taught, as a lecturer, introductory physical geology
- Guest lectured in mineralogy and planetary geology
- Led and designed lab activities for mineralogy, petrology, and planetary geology

Meteorite Technician/Contractor, National Museum of Natural History, Smithsonian Institution, September 2010-August 2012

- Performed support and classification work for the Antarctic Meteorite Collection
- Prepared meteorite sections for scanning electron microscope, electron microprobe, and  $^{40}\text{Ar}$ - $^{39}\text{Ar}$  analyses
- Assisted curators and summer interns with research projects: surveyed potential research samples, cut/subsampled meteorites, documented meteorite subsampling, analyzed samples with the scanning electron microscope and electron microprobe, extracted/processed data, drafted figures, replied to reviewer comments regarding figures, and other support activities
- Evaluated and responded to potential meteorites from members of the public
- Photographed and scanned ~2,000 meteorite thin sections as part of a collection digitization project

Volunteer Math Teacher, Academy of Hope in Washington, D.C., January 2011-July 2012

- Taught basic arithmetic to adults preparing to take the GED

Adjunct Instructor, University of St. Thomas in St. Paul Minnesota, January 2010-July 2010

- Taught and prepared laboratory activities
- Guest lectured in introductory-level Physical Geology and Natural Disasters courses
- Led field trips for introductory students

Field Assistant, Villanova University, May 2009-August 2009

- Measured carbon dioxide gas emissions for a carbon sequestration study

Graduate Researcher and Teaching Assistant, University of California, Davis, September 2005-May 2009

- Set-up a laboratory space for pollen and phytolith extraction
- Implemented and modified a phytolith extraction procedure
- Taught geology discussion sessions and guest lectured to classes of up to 100 students
- Supervised and taught students at field camp mapping faults through Quaternary glacial moraines and alluvial fans

Research Assistant, USGS California Water Science Center, June 2006-September 2006

- Assisted with sediment core processing, digitally analyzing peat core photographs, bulk density measurements, and loss-on-ignition analyses

NSF-REU Intern, University of Minnesota, Twin Cities, June 2004-September 2004

- Assisted in the collection and analysis of sediment cores, modern ostracods and groundwater

## Invited Talks

- Ninth Catastrophic Disruption in the Solar System Workshop (CD9), Kobe, Japan, May 2018.  
Impact Melts in CV and CM chondrites  
Carnegie Institution for Science, Department of Terrestrial Magnetism, Washington DC, May 2018. Melting on Oxidized Asteroids and Planetesimals  
California Lutheran University, Department of Geology, Thousand Oaks CA, April 2018.  
Investigating Asteroids Using Meteorites  
University of Missouri, Department of Geological Sciences, Columbia MO, February 2018.  
From Crusts to Cores: Investigating Asteroids Using Meteorites  
Harvard University, Solid Earth Seminar, Cambridge MA, November 2017. From Crusts to Cores: Investigating Asteroids Using Meteorites  
Purdue University, Department of Earth, Atmospheric, and Planetary Sciences, West Lafayette IN, April 2017. A Petrologist's View of Asteroids  
Geological Society of Washington, Cosmos Club Washington DC, November 2016.  
Carbonaceous Chondrite Impact Melts  
Colby College, Geology Department, Waterville ME, October 2016. Melting Meteorites to Investigate the First Magmas Generated in Our Solar System  
National Museum of Natural History, Senate of Scientists, Washington DC, April 2016.  
Making Pocket-sized Planetesimals: Petrological Experiments on Meteorites  
University of Maryland, Geochemistry Group, College Park MD, February 2016.  
Investigating Asteroid 4 Vesta from Mantle to Regolith Using Meteorite Analogs  
University of West Georgia, Department of Geosciences, Carrollton GA, February 2016.  
Investigating Asteroid 4 Vesta from Mantle to Regolith Using Meteorite Analogs

## Synergistic Activities

- Thesis Committee Member/Adjunct Faculty Member at Texas Christian University (2017-8)
- Reviewer for *Geochimica et Cosmochimica Acta*, *Meteoritics & Planetary Science*, and *Nature Astronomy*
- Served on seven NASA proposal review panels (2015-2017)
- Led tours of the Smithsonian National Meteorite Collection (2015-2018)
- Mentor in the Geological Society of America's On To the Future (OTF) program aimed at increasing diversity in the geosciences (2015-2016)
- Organized seminar series for the UT Planetary Geosciences Institute (2014-2015)
- Meteorite-related public outreach (2010-2018)

## Awards

- University of Tennessee Chancellor's Citation for Professional Promise (2015)
- Wiley-Blackwell Award for an Outstanding Student Presentation at the 77<sup>th</sup> Annual Meteoritical Society Meeting (2014)
- Best Professional Presentation from the East Tennessee Geological Society (2014)
- McKay Award for Best Student Oral Presentation at the 76<sup>th</sup> Annual Meteoritical Society Meeting (2013)
- Excellence in Geology Award from the Knoxville Gem and Mineral Society (2013)
- Smithsonian National Museum of Natural History Peer Recognition Award (2011)

## Peer-Reviewed Publications

- Crossley S. D., **Lunning N. G.**, Mayne R. G., McCoy T. J., Yang S., Humayun M., Ash R. D., Sunshine J. M., Greenwood R. C., and Franchi I. A. (*in press*) Experimental insights into Stannern-trend eucrite petrogenesis. *Meteorites & Planetary Science*. Accepted April 16 2018.
- Hahn T. M., **Lunning N. G.**, McSween H. Y., Bodnar R. J., and Taylor L. A. (2018) Mg-rich harzburgites from Vesta: Mantle residua or cumulates from planetary differentiation? *Meteorites & Planetary Science* 53: 514-546
- Lunning N. G.**, Gardner-Vandy K. G., Sosa E. S., McCoy T. J., Bullock E. S., and Corrigan C. M. (2017) Partial melting of oxidized planetesimals: An experimental study to test the formation of oligoclase-rich achondrites Graves Nunataks 06128 and 06129. *Geochimica et Cosmochimica Acta* 214: 73-85.
- Hahn T. M., **Lunning N. G.**, McSween H. Y., Bodnar R. J., and Taylor L. A. (2017) Dacite formation on Vesta: Partial Melting of the Eucritic Crust. *Meteorites & Planetary Science*. 52: 1173-1196.
- Lunning N. G.**, Corrigan C. M., McSween H. Y., Tenner T. J., Kita N. T., and Bodnar R. J. (2016) CV and CM chondrite impact melts. *Geochimica et Cosmochimica Acta* 189: 338-358.
- Lunning N. G.**, Welten K. C., McSween H. Y., Caffee M. W., and Beck A. W. (2016) Regolithic howardites found in the Grosvenor Mountains, Antarctica. *Meteorites & Planetary Science* 51: 167-194.
- Lunning N. G.**, McSween H. Y., Tenner T. J., Kita N. T., and Bodnar R. J. (2015) Olivine and pyroxene from the mantle of asteroid 4 Vesta. *Earth and Planetary Science Letters* 418: 126-135.
- Udry A., **Lunning N. G.**, McSween H. Y., and Bodnar, R. J. (2014) Petrogenesis of a vitrophyre in the martian meteorite breccia NWA 7034. *Geochimica et Cosmochimica Acta* 141: 281-293.

## Non-Technical Publications

- Lunning N. G.** and Corrigan C. M. (2017) Carbonaceous Chondrite Impact Melts. *Elements* 13: 68-69.

## Abstracts for Recent and Upcoming Conference Presentations

- Lunning N. G.**, Bischoff A., McCoy T. J., Corrigan C. M. (2018) R chondrite melt clasts: indigenous and foreign. 49<sup>th</sup> Lunar and Planetary Science Conference #1552
- R. L. Funderburg, R. G. Mayne, **N. G. Lunning**, S. Singletary (2018) Metasomatic Features in Eucrites. 49<sup>th</sup> Lunar and Planetary Science Conference #2585
- Lunning N. G.**, Waters L. E., McCoy T. J. (2017) Amphibole and phlogopite formation on the R chondrite parent body: An experimental investigation. 80<sup>th</sup> Annual Meteoritical Society Meeting #6373
- Lunning N. G.**, Waters L. E., McCoy T. J., Corrigan C. M. (2017) Size Influences Core Composition of Oxidized Planetesimals. 80<sup>th</sup> Annual Meteoritical Society Meeting #6366