GREGORY JAMES SMITH

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# RESEARCH INTERESTS

The *core question* my research seeks to answer is **“How can we use the fossil record to reconstruct interspecific interactions in the past, interpret biotic patterns in the present, and build predictive models for the future?”** Past ecosystems and their response to disturbance offer us a case study in predicting how modern ecosystems might respond to similar disturbances arising from anthropogenic impacts. Under this framework, my current research projects focus on the following specific areas: (1) megafauna morphology, paleoecology, and biogeography; and, (2) the impact of biotic crises on ecosystem structure and function.

# EDUCATION AND OUTREACH MISSION STATEMENT

# My *main goal* as a scientist interested in education and outreach is to serve the public by promoting scientific literacy and interest in the earth sciences among students, educators, and my local community. I am currently accomplishing this goal by (1) serving as the chair of the Fossil Programming Committee for the Friends of Fort Negley, where I develop educational programs and exhibits for the public at a local Civil War fort; and, (2) developing cross-disciplinary curricula for the Interdisciplinary Science and Research program at John Overton High School, which includes a service-learning component and opportunities for the students to lead authentic paleontological research projects.

# EDUCATION

Ph.D. (2019) Vanderbilt University (VU): Earth and Environmental Sciences

*Dissertation*: Coupling paleoecological proxies to infer competition, niche partitioning, and ecosystem structure in extinct mammalian communities

M.S. (2015) Penn State University (PSU): Geosciences

*Thesis*: Evolutionary, phylogenetic, and functional implications of mammoth molar morphology as measured by computational tomographic (CT) scans

B.S. (2012) Penn State University (PSU): Geobiology, minors in Biology and Astrobiology

*Thesis*: Dental wear and lamellar frequency analysis to constrain the identity of the North American mammoth species

# ACADEMIC APPOINTMENTS

Aug 2019 ­ Postdoctoral Fellow: Center for Science Outreach, Vanderbilt University; Resident Scientist: Interdisciplinary Science and Research Program, John Overton High School

2018 – 2019 Graduate Teaching Fellow: Center for Teaching, Vanderbilt University

# PEER­REVIEWED PUBLICATIONS

1. **Smith, G.J.** and DeSantis, L.R.G. 2020. Extinction of North American *Cuvieronius* (Mammalia, Proboscidea, Gomphotheriidae) driven by dietary resource competition with sympatric mammoths and mastodons. *Accepted to* *Paleobiology.*
2. Lundelius, E.L., Thies, K.J., Graham, R.W., Bell, C.J., **Smith, G.J.**, DeSantis, L.R.G. 2019. Proboscidea from the Big Cypress Creek Fauna from the Deweyville Formation, Harris County, Texas. *Quaternary International.* **530-531**:59-68*.* <https://doi.org/10.1016/j.quaint.2019.11.018>
3. Dooley, A.C., Scott, E., Green, J.L., Springer, K., Dooley, B.S., **Smith, G.J.**, 2019. *Mammut pacificus* sp. nov., a newly recognized species of mastodon from the Pleistocene of western North America. *PeerJ*:e6614. <https://doi.org/10.7717/peerj.6614>
4. **Smith, G.J.** and DeSantis, L.R.G., 2018. Dietary ecology of Pleistocene mammoths and mastodons as inferred from dental microwear textures. *Palaeogeography, Palaeoclimatology, Palaeoecology.* **492**:10 – 12. <https://doi.org/10.1016/j.palaeo.2017.11.024>
5. Green, J.L., DeSantis, L.R.G., and **Smith, G.J.,** 2017. Regional variation in the browsing diet of Pleistocene *Mammut americanum* (Mammalia, Proboscidea) as recorded by dental microwear textures. *Palaeogeography, Palaeoclimatology, Palaeoecology* **487**:59 – 70. <https://doi.org/10.1016/j.palaeo.2017.08.019>
6. **Smith, G.J.** and Graham, R.W., 2017. The effects of dental wear on impairing mammoth taxonomy: a reappraisal of the Newton Mammoth, Bradford County, Northeastern Pennsylvania. *Quaternary International* **443A:**40 – 51. <https://doi.org/10.1016/j.quaint.2017.01.030>
7. Bralower, T.J., Kelly, D.C., Gibbs, S., Farley, K., Eccles, L., Lindemann, T.L., **Smith, G.J.**, 2014. Impact of dissolution on the sedimentary record of the Paleocene-Eocene thermal maximum. *Earth and Planetary Science Letters* **401**:70-82. <https://doi.org/10.1016/j.epsl.2014.05.055>

*In Review*

* **Smith, G.J.**, DeSantis, L.R.G., Green, J.L., Dooley, A.C. Paleoecology of the Late Pleistocene Diamond Valley Lake Local Fauna in southern California as evidenced by dental mesowear analysis and dental microwear texture analysis. *Submitted to* *Palaeogeography, Palaeoclimatology, Palaeoecology.*

*In Preparation (in order of expected submission date; drafts available upon request)*

* **Smith, G.J.** and Darroch, S.A.F. Phylogenetic conservatism of Biotic Crises in North American mammals. *In preparation*
* **Smith, G.J.**, Gibson, B.M., Gibson, M.A. Diet and environment of three *Mammut americanum* (Proboscidea, Mammutidae) from West Tennessee, United States. *In preparation*
* **Smith, G.J.,** Graham, R.W. Taxonomic implications of mammoth molar morphology as measured by computed tomography (CT). *In preparation*

# FUNDING/AWARDS

*Research and Travel Grants*

2019 VU Alberstadt-Reesman-Stears Field Studies Fund ($1,400)

2018 VU Graduate School Travel Grant ($500)

 Western Science Center Travel Grant and Research Funding ($500)

 NSF Travel Funding for the ELC-ePANDDA-Earthrates Demo Derby Workshop ($1000)

2017 Larry D. Agenbroad Legacy Fund for Research ($500)

Theodore Roosevelt Memorial Grant ($1869)

Paleontological Society Stephen Jay Gould Award ($800)

Western Science Center Travel Grant for the “Valley of the Mastodons” Exhibit and Symposium ($1200)

2016 Geological Society of America Student Research Grant ($2,500)

2014 PSU GEOSC Paul D. Krynine Scholarship ($500)

 NSF Travel Funding for the iDigBio CT Data Acquisition, Visualization, and Analysis Workshop

2012 PSU EMS Ellen Steidle Achievement Award for Seniors ($1200)

2011 PSU GEOSC Joseph Berg Award for Undergraduate Research ($500)

 Sherwood and Janet Roberts Blue Memorial Scholarship ($1000)

*Outreach and Education Grants*

2020 Battelle Education TSIN/STEMx STEM Classroom Grant to install a community garden and outdoor classroom at John Overton High School ($5,000)

2019 STEAM Passport Partnership with Metropolitan Nashville Public Schools (MNPS) and the Nashville Zoo – funding to provide 900 4th grade students from 13 MNPS elementary schools with a visit to Fort Negley Park for fossil programs ($5,000)

2019 Predators Foundation Grant in support of fossil programs and exhibits at Fort Negley Park ($3,500) Paleontological Society Grant in support of K-12 Earth Science field trips and technology ($2,500)

*Accolades*

2015 PSU GEOSC Best Oral Presentation by an M.S. Student, Graduate Colloquium

2012 PSU EMSAGE Laureate, Class of 2012

# PUBLIC SPEAKING

2019 “Conservation Paleobiology: Putting the Dead to Work,” an invited talk given for the Women’s Breakfast Club at Maggiano’s Little Italy, Nashville, TN

 “Fort Negley Park and Nashville’s Prehistoric Past;” an invited talk at Page Duke Landscape Architects, Nashville, TN

 “Of Mollusks and Mastodons: Tennessee’s Prehistoric Past;” an invited talk given for the Breakfast Club of Nashville at Germantown Café, Nashville, TN

2018 “The Paleoecology of the Diamond Valley Lake Local Fauna;” a presentation for museum attendees and members at the Western Science Center, Hemet, CA

 “Time Traveling with a Tooth: How Extinct Animals and What They Ate Will Save the World;” VSA Talks, Vanderbilt University, Nashville, TN

2016 “The Proboscidea: Evolution, Diversity, and Ecology of Elephants and their Relatives;” given for World Elephant Day, The Elephant Sanctuary, Hohenwald, TN.

# SCIENTIFIC PRESENTATIONS

*Invited presentations*

2018 “Gomphothere paleoecology in North America as inferred from stable isotope analysis” Department of Earth and Environmental Sciences Research Gala, Vanderbilt University

2017 “Coupling multiple proxy methods to reconstruct the paleoecology of sympatric proboscideans” Valley of the Mastodons Workshop, Western Science Center, Hemet, CA

2015 “Taxonomic implications of mammoth molar morphology as inferred from computed tomography” Department of Geosciences Graduate Colloquium, Penn State University

*Contributed presentations*

2019 “Nashville Discovers Paleozoic Fossils: Programs and Field Trips at an Urban Historical Park” (talk) North American Paleontological Convention, Riverside, CA

 “Fossil Finding at Fort Negley in Nashville: Linking Deep-Time and Civil War History” (talk) Earth Educators’ Rendezvous, Nashville, TN

“Phylogenetic Conservatism of Biotic Crises in North American Mammals” (talk) North American Paleontological Convention, Riverside, CA

2018 “Coupling paleoecological proxies to infer the dietary ecology of extinct megaherbivores” (talk) Society of Vertebrate Paleontology Meeting, Albuquerque, NM

“Spatial and temporal variability in North American gomphothere diet as inferred from dental microwear textures” (talk) Southeastern Section of the Geological Society of America Meeting, Knoxville, TN

2017 “Gomphothere paleoecology in North America as inferred from stable isotope analysis” (talk) Geological Society of America Meeting, Seattle, WA

“Seasonality and dental development of *Mammut americanum* from the Late Pleistocene of West Tennessee” (poster) Southeastern Association of Vertebrate Paleontology Meeting, Grey, TN

2016 “Proboscidean dietary variability in North America and the Competitive Exclusion Principle” (poster) Society of Vertebrate Paleontology Meeting, Salt Lake City, UT

“Variation in the browsing diet of Pleistocene *Mammut americanum* (Mammalia, Proboscidean) as recorded by dental microwear texture analysis” (poster) Society of Vertebrate Paleontology Meeting, Salt Lake City, UT

2015 “Taxonomic implications of mammoth molar morphology as measured by computed tomography (CT)” (talk) Geological Society of America Meeting, Baltimore, MD

“Bergmann’s response and dietary variability in North American black bears (*Ursus americanus*)” (talk) Society of Vertebrate Paleontology, Dallas, TX

2014 “Bergmann’s response, morphological variability, and paleoenvironmental implications for North American black bears (*Ursus americanus*) throughout the Quaternary” (talk) American Quaternary Association Meeting, Seattle, WA

2012 “Dental wear and lamellar frequency analysis to constrain the identity of the North American mammoth species” (poster) Society of Vertebrate Paleontology Meeting, Raleigh, NC

# MEDIA COVERAGE AND PRESS RELEASES

* Gizmodo: “[This newly discovered mastodon species roamed California for millions of years](https://gizmodo.com/this-newly-discovered-mastodon-species-roamed-californi-1833607214)”
* Science News: “[How mammoths competed with other animals and lost](https://www.sciencenews.org/article/how-mammoths-competed-other-animals-and-lost)”
* PLOS Blogs: “[Exploring the Valley of the Mastodon](https://blogs.plos.org/paleocomm/2017/07/30/exploring-the-valley-of-the-mastodon/)”
* Scientific American: “[Valley of the Mastodons](https://blogs.scientificamerican.com/laelaps/valley-of-the-mastodons/?redirect=1)”
* [Press Release](https://www.elephants.com/news/world-news/posts/world-elephant-day-events-at-the-elephant-sanctuary) for World Elephant Day at the Elephant Sanctuary in Hohenwald, TN

# UNIVERSITY TEACHING

*Lead Instructor*

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| 2018 / 2019 | Seminar in College Teaching (VU Center for Teaching) |

*Teaching Assistant*

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| 2018 | Senior Seminar (VU: EES 4961) |
| 2017 | Dynamic Earth (VU: EES 1510) |
|  | Life Through Time Lab (VU: EES 3221) |
| 2016 | Life Through Time Lab (VU: EES 3221) |
| 2015 | Vertebrate Paleontology (PSU: GEOSC 422) |
| 2014 | The Geology of Natural Disasters (PSU: GEOSC 402Y) |
|  | The Geology of Oil and Gas (PSU: GEOSC 454) |
|  | Introductory Physical Geology (PSU: GEOSC 001) |
| 2013 | Introductory Physical Geology (PSU: GEOSC 001) |
| 2012 | Natural Disasters: Hollywood vs. Reality (PSU: EARTH 110) |
| 2011 | Dinosaur Extinctions and Other Controversies (PSU: EARTH 150) |
| 2010 | Calculus II for the Geosciences (PSU: MATH 141G) |
| 2009 | Calculus I for the Geosciences (PSU: MATH 140G) |

*Guest Lecturer*

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| 2017 | Proboscideans (VU: EES 4961) |
|  | Oxygen and Strontium Isotopes; Dental Microwear Textures (VSA III: Biological anthropology) |
| 2015 | Saurischians (PSU: GEOSC 422) |

*Certifications*

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| 2017 | Certificate in College Teaching from the Center for Teaching at VU |

# K­12 TEACHING

2019 - 2020 Scientist in the classroom and co-teacher for the Interdisciplinary Science and Research program at John Overton High School (Grades 9-12)

July 2019 Vanderbilt Summer Academy (VSA) Session III. 3-week intensive course for rising 11th and 12th graders – “Geology in the Modern Age”

Fall 2018 Developed and co-taught field trips covering the Paleozoic fossil resources at a nearby Civil War Fort for 19 Metropolitan Nashville Public Schools (G5 Science)

July 2018 VSA Session II. 2-week intensive course for rising 9th and 10th graders – “Ecological Statistics”

June 2018 VSA Session I. 1-week intensive course for rising 7th and 8th graders – “Conservation Paleobiology”

Fall 2016 Guest Lecturer for Vanderbilt School for Science and Math ISR 1 – “How did we get here?”

July 2016 VSA Session III. 3-week intensive course for rising 11th and 12th graders – “Ecological Paleontology”

Spring 2014 Co-taught “Shake, Rattle, and Rocks,” a day of discovery covering fossils and local geology for elementary school students (G1-5 Science) in State College, PA

# SERVICE

*Professional Service*

Member of: American Association for the Advancement of Science, American Quaternary Association, Geological Society of America, Paleontological Society, Society of Vertebrate Paleontology

Reviewer for: Palaeogeography, Palaeoclimatology, Palaeoecology (1); PLoS ONE (1); Quaternary International (1)

*Community Service*

2016 – Guide and Paleontologist, Monthly “Fossil Finders” events at Fort Negley Park

2017 – 2020 Board of Directors, Friends of Fort Negley

June 2017 Central Baptist Church Mission Trip to Pacaya, Guatemala

2014 – 2015 Volunteer Coordinator, “Shake, Rattle, and Rocks” Penn State Day of Outreach

2010 – 2015 Facilitator, Penn State Earth and Mineral Science Exposition (EMEX) Open House

2013 – 2014 Team Director, The Hope Express

2011 – 2012 Dancer and Committee Member, Penn State Panhellenic Dance MaraTHON

*Institutional Service*

2018 – 2019 Secretary, Vanderbilt EES Graduate Student Council

2017 – 2019 EES Department Representative, Vanderbilt Graduate Student Council

2011 – 2012 Service Chair, PSU College of Earth and Mineral Sciences Undergraduate Student Council

2011 Vice President, Theta Chi Fraternity, Omega Chapter

# LAB AND FIELD EXPERIENCE

*Lab Appointments*

2016 – 2017 Graduate Research Assistant (VU). Stable isotope preparation and analysis, dental microwear texture analysis, database querying and ArcGIS spatial modeling

2013 – 2015 Graduate Research Assistant (PSU). Computed tomographic analysis, taxonomic description of proboscidean taxa via dental morphological attributes

2011 – 2012 Undergraduate Research Assistant (PSU). Tilia database management and SQL querying.

2009 – 2010 Undergraduate Research Assistant (PSU). Grain size analysis (Malvern™ particle analyzer) and sedimentary core log analysis.

*Field Work*

June 2017 Late Pleistocene Field Excavations (Saltville, VA)

May 2015 Clastic Sequence Stratigraphy Course (Helper, UT)

May 2014 Stratigraphic Paleobiology Field Course (Guadalupe National Park, NM)

Aug. 2013 Late Pleistocene Field Excavations and Paleobotanical Work (St. Paul Island, AK)

July 2013 Trap Cave Fossil Excavations (Black Hills, SD)

Nov. 2012 Geophysical Logging and Consulting with Earth Data Northeast, Inc. (Mayaguez, PR)

Summer 2012 Penn State University Field Geology Camp (American Southwest and Great Plains)

Summer 2010 International Field Geology Camp (Central Apennine Mountains, Italy)

*Museum Collections Visits*

Aug. 2018 Raymond Alf Museum (Claremont, CA); equid and proboscidean morphology and mesowear

July 2018 Western Science Center (Hemet, CA); *Mammut* and *Mammuthus* mesowear

Aug. 2017 Western Science Center (Hemet, CA); ungulate and proboscidean microwear

May 2017 Florida Museum of Natural History (Gainesville, FL); proboscidean stable isotopes and microwear

Dec. 2016 Penn State Earth and Mineral Sciences Museum (University Park, PA); *Mammuthus* microwear

Aug. 2016 Texas Memorial Museum (Austin, TX); ungulate and proboscidean stable isotopes and microwear

Nov. 2014 American Museum of Natural History (New York, NY); *Mammuthus* dental wear and CT scanning

May 2014 National Museum of Natural History (Washington, DC); *Mammuthus* dental wear and CT scanning

# MENTORSHIP

Field and Lab Assistants Trained:

Allana Anderson‡, Autumn Sanders‡; Elinor Scholtz (2017, VU); Eva Biedron, Anna Reside‡ (2016, VU); T. Logan Lindemann (2014, PSU)

# Total: 6 trained, 3 mentored (denoted by ‡)

 **LANGUAGE SKILLS**

English (native), Spanish (conversationally proficient)

**COMPUTATIONAL PROFICIENCY**

ArcGIS, Python, R, NetLogo, MATLAB, Git, ImageJ, LateX, Avizo 3D Studio, SSFA software (Toothfrax and Sfrax), Adobe Creative Suite, Microsoft Office

# COLLABORATORS WITHIN LAST 48 MONTHS

Brame, Cynthia Center for Teaching, Vanderbilt University, Nashville, TN

Darroch, Simon Department of Earth and Environmental Sciences, Vanderbilt University, Nashville, TN

DeSantis, Larisa Department of Biology, Vanderbilt University, Nashville, TN

Dooley, Alton Western Science Center, Hemet, CA

Dooley, Brett Western Science Center, Hemet, CA

Fedesco, Heather Center for Teaching, Vanderbilt University, Nashville, TN

Gibson, Michael Department of Agriculture, Geosciences and Natural Resources, UT Martin, Martin, TN

Gibson, Brandt Department of Earth and Environmental Sciences, Vanderbilt University, Nashville, TN

Graham, Russell Earth and Mineral Sciences Museum, Penn State University, State College, PA

Green, Jeremy Department of Geology, Kent State University at Tuscarawas, New Philadelphia, OH

Lundelius, Ernest Texas Memorial Museum, Austin, TX

Miller, Molly Department of Earth and Environmental Sciences, Vanderbilt University, Nashville, TN

Scott, Eric Department of Biology, California State University at San Bernardino, San Bernardino, CA

Springer, Kathleen U.S. Geological Survey, Denver, CO

Ufnar, David Interdisciplinary Science and Research Program, John Overton High School, Nashville, TN

Ufnar, Jennifer Center for Science and Outreach, Vanderbilt University, Nashville, TN

Widga, Chris East Tennessee Museum of Natural History, Johnson City, TN