

Marie E. Hoerner

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GES Department

1420 Austin Bluffs Pkwy

Colorado Springs, CO 80918

Education

Ph.D. University of Chicago (Chicago, IL): Geophysical Sciences, March 2017.

Dissertation: "The ecological and evolutionary dynamics of species introductions and environmental change: From East African cichlids to the Great American Biotic Interchange."

Advisor: Albert Colman

Committee Members: David Jablonski, Susan Kidwell, Richard Madden, Michael Foote

M.S. University of Chicago (Chicago, IL): Geophysical Sciences, August 2014.

Topic: "Testing for differences in rates of speciation, extinction, and morphological evolution in four tribes of cichlids endemic to Lake Tanganyika, East Africa"

B.A. Colorado College (Colorado Springs, CO): Geology, May 2009.

Thesis: "A study of Jurassic camarasaur migration using stable and radiogenic isotopes."

Teaching Experience

Instructor, University of Colorado at Colorado Springs

01/2018 - Present

GEOL 1010: Physical Geology

GEOL 1020: Historical Geology

GEOL 3410: Introduction to Paleontology

GEOL 4310: Sedimentology and Stratigraphy

GEOL 4660: Field Studies in Geology

GES 1010: Environmental Systems: Landforms and Soils

Adjunct Instructor, Red Rocks Community College

08/2015 – 12/2017

ENV 110: Natural Disasters

PHYS 111: Physics I Algebra-based w/ Lab

SCI 156: Integrated Science II

SCI 105: Science and Society

Teaching Assistant, University of Chicago

09/2009 – 05/2014

PHSC 11000: Environmental History of the Earth

PHSC 13600: Natural Hazards

PHSC 13140: Global Warming

GEOS 13100: Physical Geology

Appointments

2018-2021	Instructor	University of Colorado Colorado Springs
2017	Adjunct Instructor	Red Rocks Community College Science Dept.
2016	Ph.D. Student	University of Chicago Geophysical Sci. Dept.
2015	Adjunct Instructor	Red Rocks Community College Science Dept.
2014	Research Assistant	University of Chicago Geophysical Sci. Dept.
2013-2014	Teaching Assistant	University of Chicago Geophysical Sci. Dept.
2010-2013	NSF Fellow	University of Chicago Geophysical Sci. Dept.
2009-2010	Teaching Assistant	University of Chicago Geophysical Sci. Dept.
2006-2009	Research Assistant	Colorado College Dept. Geology
2005-2008	Database Manager	Colorado College Service & Learning Ctr.

Educational Training and Mentorship Experience

<i>UCCS Teaching Online Program: Online Course Design Badge</i>	<i>In Progress</i>
<i>UCCS Teaching Online Program: Online Facilitation Badge</i>	<i>1/21</i>
<i>Teaching and Learning Conference Participant</i>	<i>1/20, 1/21</i>
<i>V.E.T.S Training I</i>	<i>02/20</i>
<i>STEM Initiative Participant</i>	<i>01/17 – 12/17</i>
<i>Student Mentor</i>	<i>04/13 – 10/13</i>
<i>Biogeochemistry Lab Instructor</i>	<i>01/10 – 12/13</i>

Public Outreach and Service Activities

<i>Palmer Lewis High School: Guest lectures in all Earth Science classes, 4/21</i>
<i>UCCS Faculty Pride Committee: Member, 5/20 – Present</i>
<i>University of Colorado Faculty Assembly LGBTQ+ Committee: UCCS Rep. 1/18 – Present</i>
<i>UCCS Sustainability Committee: Member, 8/19 – Present</i>
<i>UCCS Sustainability Committee Teaching and Research Subcommittee: Member, 11/19 – Present</i>
<i>Paleontological Society Student Grant Review Board: Member, 3/20</i>
<i>GES Sustainability Subcommittee: Member, 1/20 – Present</i>
<i>UCCS Geology Club: Faculty Sponsor, 1/18 – 12/19</i>
<i>Red Rocks Community College Students, Engage! Speaker Series: Speaker, 9/16</i>
<i>Spark Apprenticeship: Teacher/Mentor, 9/11 – 12/11</i>
<i>Sisters4Science: Session leader/designer, 10/09 – 11/11</i>
<i>Perspectives Middle School: Guest lecturer, 9/10 – 2/11</i>
<i>Grove Avenue Elementary School, Ask-a-Paleontologist: Organizer and participant, 2/10 – 4/10</i>
<i>St. Charles Borromeo School, Ask-a-Paleontologist: Participant, 2/10 – 3/10</i>
<i>McKinley Park School, Science Fair: Judge, 11/09</i>

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Colorado College Committee on Instruction: Natural Sciences Student Representative, 8/08 – 5/09

Literacy Corps, East Middle School: Tutor, 8/06 – 12/06

Morrison Natural History Museum: Volunteer, 7/03 – 1/05

Research Experience

Doctoral Student University of Chicago, Dept. of Geophysical Sciences 8/09-12/16

Supervisor: Dr. Albert Colman.

- Modelled ecological interactions between North American immigrant and South American native mammals in the Great American Biotic Interchange.
- Employed light stable isotope geochemistry to deduce climate and mammalian ecology using fossils from the Miocene of South America.
- Simulated morphological evolution of East African cichlids.

Research Assistant Colorado College, Dept. of Geology 1/07-5/09

Supervisor: Dr. Henry Fricke.

- Used stable isotope ($\delta^{13}\text{C}$, $\delta^{18}\text{O}$) composition of dinosaur tooth enamel to infer Jurassic camarasaur migration patterns.

Research Assistant University of Illinois at Urbana-Champaign, Dept. of Geology 7/08

Supervisor: Dr. Craig Lundstrom.

- Measured $^{87}\text{Sr}/^{86}\text{Sr}$ values of dinosaur tooth enamel to infer differences in geological environments for Jurassic dinosaurs.

Research Assistant Colorado College, Dept. of Geology 3/08

Supervisors: Dr. Christine Siddoway and Dr. Michael Petronis.

- Measured the paleomagnetic signatures of clastic dikes in the Pikes Peak Granite.

Field Research

Field Assistant Smithsonian Tropical Research Institute, Panama 7/11

Supervisor: Dr. Carlos Jaramillo.

- Recorded White-faced Capuchin (*Cebus capucinus*) behavior on Barro Colorado Island.
- Collected and logged vertebrate fossils from Panama Canal localities, including using plaster jackets and excavation.

Field Assistant University of Chicago, Nevada and Utah 9/10

Supervisor: Dr. Mark Webster.

- Measured stratigraphic sections.
- Collected trilobite specimens.

Student Researcher University of Chicago, Field Course: Carbonate Ecosystems 3/10

Supervisors: Dr. Susan Kidwell, Dr. Michael LaBarbera, and Dr. Albert Colman.

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- Designed and conducted independent research on environmental ecology of tide pools outside of Gerace Research Center, Bahamas.
- Completed course activities with sedimentary geology, including measuring stratigraphic sections and analyzing fossil reef outcrops.

Field Assistant *Smithsonian Institution, Bighorn Basin, WY* 6/08-7/08

Supervisor: Dr. Scott Wing.

- Participated in site prospecting and collected paleosol (soil) samples, fossil leaves and fossil vertebrates.

Student Researcher *ACM Tanzania: Ecology and Human Evolution Series* 7/07-12/07

Supervisor: Dr. Susan Swanson.

- Designed and conducted independent research on zebra and wildebeest niche partitioning in Tarangire National Park, Tanzania.
- Completed course fieldwork in both modern ecology and in study of fossil sites using paleontological and geological methods.

Student Researcher *Colorado College, Geology Coursework* 10/05-5/09

Supervisors: Colorado College geology faculty.

- Conducted independent and group research projects during the course of over 100 days of course-related field work in various fields of geology.

Languages

English: Native/Fluent

Spanish: Working proficiency

Honors and Awards

- 8/17 Romer Prize Finalist Session Participant, Society of Vertebrate Paleontology 2017
- 6/11 Hinds Fund Award: Grant for student research in evolution
- 4/11 Paleontological Society MidAmerica Paleontology Society Outstanding Student Research Award, First Place
- 10-12 NSF Graduate Research Fellow, University of Chicago
- 09-11 McCormick Fellow, University of Chicago
- 5/09 Phi Beta Kappa, Colorado College
- 5/09 Association of Women Geologists Outstanding Student Award
- 5/09 Distinction in Geology, Colorado College
- 5/09 Graduated *Summa cum laude*, Colorado College
- 3/09 Meritorious placement in national Mathematical Contest in Modeling (MCM)
- 08-09 Donald B. Gould Scholarship in Geology, Colorado College
- 4/08 Patricia Buster Research Scholarship, Colorado College

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4/08 Colorado College Venture Grant, Colorado College

07-08 Donald B. Gould Scholarship in Geology, Colorado College

05 National AP Scholar

Professional Affiliations

Geological Society of America

Paleontological Society

Society of Vertebrate Paleontology

Association for Women in Science

Computer Skills

Programming

R: Advanced.

Mathematica: Intermediate

Relational Databases

MS Access: Advanced

Visual and Audiovisual presentation

Camtasia: Intermediate – Advanced

Adobe Photoshop and Illustrator: Intermediate

Spatial Analysis

ArcGIS: Beginner – Intermediate

Office Applications

Adobe Acrobat Pro, MS Word, PowerPoint, Excel, Publisher: Advanced

Publications

Mine, A.H., Waldeck, A., Olack, G., **Hoerner, M.E.**, Alex, S., Colman, A.S. 2017. Microprecipitation and $\delta^{18}\text{O}$ analysis of phosphate for paleoclimate and biogeochemistry research. *Chemical Geology* 460:1-14.

Hoerner, M.E. 2011. Testing for differences in rates of speciation, extinction, and morphological evolution in four tribes of cichlids endemic to Lake Tanganyika, East Africa. *Evolution* 65(12): 3398-3412.

Fricke, H.C., Henceroth, J., **Hoerner, M.E.** 2011. Seasonal upland-lowland migrations of sauropod dinosaurs during the late Jurassic. *Nature* 480: 513-515.

Publications in Preparation

Hoerner, M.E. Usurpers and insinulators: The role of competition in the dynamics of the Great American Biotic Interchange.

Hoerner, M.E. Body mass in South American mammals over the last 15 million years.

Hoerner, M.E., Madden, R.H., Jaramillo, C. Ecology and biology of the pivotal La Venta fauna of the Honda Group, Colombia.

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Hoerner, M.E., Waldeck, A., Fricke, H.C., Jaramillo, C., Olack, G., Colman, A.S. Middle Miocene Neotropical terrestrial temperatures were higher than in any modern humid climates.

Hoerner, M.E., Waldeck, A., Fricke, H.C., Jaramillo, C., Olack, G., Colman, A.S. Reconstruction of Neotropical environment and ecology from prior to the Great American Biotic Interchange.

Hoerner, M.E., Fricke, H.C., Henceroth, J. Late Jurassic camarasaur migration as inferred from stable isotopes.

Conference Presentations and Abstracts

Bronzo, K., Fricke, H., **Hoerner, M.E.**, Lundstrom, C. 2017. Using oxygen, carbon, and strontium isotope ratios of tooth enamel from dinosaurs to infer patterns of movement over the late Jurassic landscape of CO, UT, and WY. Annual GSA Mtg. (Seattle, WA).

Hoerner, M.E. August 2017. Usurpers and insinulators: The role of competition in the dynamics of the Great American Biotic Interchange. Annual SVP Mtg (Calgary, AB). Oral Presentation.

Hoerner, M.E., Jaramillo, C., Fricke, H.C., Waldeck, A., Olack, G., Colman, A. October 2014. Neotropical climate and environment from stable isotopes in mammalian and fish tooth enamel from the early Miocene through the Pliocene. Annual GSA Mtg (Vancouver, BC). Oral Presentation.

Hoerner, M.E., Jaramillo, C., Fricke, H.C., Waldeck, A., Olack, G., Colman, A. October 2013. Paleoenvironmental reconstruction of the Middle Miocene Honda Group (La Venta Fauna) of Colombia using stable isotope proxies. Annual GSA Mtg (Denver, CO). Oral Presentation.

Mine, A.H., **Hoerner, M.E.**, Olack, G., Alex, S., Colman, A. October 2013. Avoiding artifacts in the measurement of $\delta^{18}\text{O}$ on phosphate derived from biogenic apatite. Annual GSA Mtg (Denver, CO). Oral Presentation.

Hoerner, M.E. October 2010. Differences in rates of morphological evolution in East African cichlids from stochastic branching models. Annual GSA Mtg (Denver, CO). Poster.

Hoerner, M.E., Fricke, H.C. October 2009. A study of Jurassic camarasaur migration using stable and radiogenic isotopes. Annual GSA Mtg (Portland, OR). Poster.

University Presentations

Hoerner, M.E. December 2016. The ecological and evolutionary dynamics of species introductions and environmental change: From East African cichlids to the Great American Biotic Interchange. Public dissertation defense, Geophysical Sciences Dept., University of Chicago (Chicago, IL). Oral Presentation.

Hoerner, M.E. September 2016. Messages on climate change: Science, media, and politics. Students, Engage!, Red Rocks Community College (Lakewood, CO). Oral Presentation.

Hoerner, M.E. May 2012. Morphological evolution in East African cichlids. EXPO Forum, Geophysical Science Dept., University of Chicago (Chicago, IL). Oral Presentation.

Hoerner, M.E. January 2012. Modeling evolutionary rates in Lake Tanganyika cichlids. Fish Group Seminar Series, University of Chicago (Chicago, IL). Oral Presentation.

Hoerner, M.E. May 2011. Dynamics of the Great American Biotic Interchange: Stable isotopes, microwear, and hypsodonty in mammalian teeth. EXPO Forum, Geophysical Science Dept., University of Chicago (Chicago, IL). Oral Presentation.

Hoerner, M.E. April 2011. Dynamics of the Great American Biotic Interchange: Stable isotopes, microwear, and hypsodonty in mammalian teeth. Dissertation proposal, Geophysical Science Dept., University of Chicago (Chicago, IL). Oral Presentation.

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Hoerner, M.E., Fricke, H.C. May 2009. A study of Jurassic camarasaur migration using stable and radiogenic isotopes. Venture Grant Forum, Colorado College (Colorado Springs, CO). Poster.

Hoerner, M.E., Fricke, H.C. April 2009. A study of Jurassic camarasaur migration using stable and radiogenic isotopes. Geology Forum, Colorado College (Colorado Springs, CO). Poster.

Hoerner, M.E., Fricke, H.C. April 2008. A stable isotope approach to studying diet and niche partitioning among Jurassic dinosaurs. Geology Forum, Colorado College (Colorado Springs, CO). Oral Presentation.

References

Albert Colman

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Susan Kidwell

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Appendix: Dissertation Abstract

My research illuminates new aspects of the ecological and evolutionary controls on species invasions of new ecosystems and of the consequences of species invasions for their new ecosystems. First, I develop a new modeling framework for analysis of morphological evolution in cases without extensive phylogenetic or fossil information, and I apply that framework to a study of East African cichlids in Lake Tanganyika. Such work provides critical new insight into the evolutionary and ecological processes underlying their fantastic adaptive radiations that have followed their introductions to East African Great Lakes.

Second, I lay the foundations for a fresh analysis of the Great American Biotic Interchange (GABI), in which the formation of the Panamanian Isthmus allowed exchange between the long isolated faunas of North and South America. The middle Miocene fauna of La Venta, Colombia, provides an ideal opportunity for such analysis. I synthesize studies on this fauna with paleoecological and paleobiological studies for closely related taxa from other times and/or locations. Stable isotope analysis of fossil and authigenic minerals indicates mean annual temperature of 30-35°C, with high relative humidity (60-70%) and limited seasonality. Further analysis supports a wet and likely forested ecosystem, but not under a closed canopy. Implications for vegetation composition and mammalian behavior and physiology are also explored.

Finally, I apply metadata analysis of mammalian autecology to the dynamics of the GABI. Today, over half of South American species are of North American descent, but only three terrestrial genera in temperate North America have South American origins. The reasons for this imbalance are unknown, but hypotheses include competitive exclusion, ecological replacement, or intense predation of South American native taxa, as well as insinuation, in which North American immigrants filled adaptive zones that were previously unoccupied by South American native taxa. Data on diet, locomotion, and body mass from literature sources and new calculations define adaptive zones for all known native and immigrant South American taxa, which allows the testing of these hypotheses. Insinuation is by far the dominant mode for immigrant taxa ($\geq 74\%$), whereas potential cases of competitive replacement are the least common and quite rare ($\leq 5.9\%$).