AJA M. CARTER, PH.D.

Postdoctoral Researcher
Mechanical Engineering
Carnegie Mellon University
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EDUCATION

University of Pennsylvania Philadelphia, PA
April 2020

Ph.D in Earth and Environmental Sciences
Dissertation: The Effects of Vertebral Morphology and Composition on Stem-Tetrapod Intervertebral Joint Functional Behavior
Fontaine Scholar: high achieving underrepresented doctoral students; Phillips Orville Fellow

Drexel University Philadelphia, PA
B.S in Biology; Minor: Spanish June 2014
Senior Thesis: Geometric morphometric analysis of stem tetrapod forelimbs
Mary K. Howett Memorial Scholar; Alliance for Minority Participation Scholar

HONORS AND AWARDS

Vice Provost Postdoctoral Fellowship ($197,000)	2020-2023
Outstanding Teaching Assistant Award	2018
Broadening Participation Award ($500)	2017
Greg and Susan J. Walker Endowment ($6,000)	2017
Paul Bond Scholarship ($2500)	2017
Fontaine Fellowship($50,000)	2014
Philip Orville Fellowship ($10,000)	2014
Mary K. Howett Memorial Scholarship in Biology ($5,000)	2013
Anthony J. Drexel Scholarship ($100,000)	2010-2014

RESEARCH EXPERIENCE

Postdoctoral Research (Advisor: Aaron Johnson)
Department of Mechanical Engineering, Carnegie Mellon University, 2023-Present

- Current Research Interests: Developing paleobiological design approaches for bio-inspired robotics, investigating spine-design for robots in unstructured terrain, quantify passive stability properties of extinct vertebral columns

Postdoctoral Research (Advisor: Daniel Koditschek)
Department of Electrical and Systems Engineering, General Robotics Automation Sensing and Perception lab, University of Pennsylvania, 2020-2023

- Characterized dynamic capabilities of spinal columns from earliest land animals to aid in

bio-inspired design of spines in legged robots
- Developed theoretical framework for using paleontology in bio-inspired robotic design
- Organized bi-weekly meetings for postdoctoral researchers, graduate students, and student researchers and across four universities for interdisciplinary works

Doctoral Research (Advisor: Peter Dodson)
Department of Earth and Environmental Sciences, University of Pennsylvania, 2014-2020
- Conducted kinematic studies on ancient vertebrae using AutoCad Inventor Fusion360
- Experimentally determined the Young's modulus of vertebrae in Permian (250 million years ago) using multi-material 3D printing
- Evaluated crushing resistance in ancient shelled mollusks

Undergraduate Research (Advisor: Kenneth Lacovara)
Department of Biology, Drexel University, 2010-2014
- Assembled database of 100+ journal articles concerning geology and fossils found in New Jersey, anatomy of crocodilians and dinosaurs
- Described cranium of sub-adult ancient crocodile from New Jersey
- Properly identified two halves of ancient crocodile skull mistakenly split between two departments of the Academy of Natural Sciences of Drexel University and developed a dichotomous key to prevent further

PUBLICATIONS

Peer Reviewed Articles

Caporale, J. D., Feng, Z., Rozen-Levy, S., **Carter, A. M.,** & Koditschek, D. E. (2023). Twisting Spine or Rigid Torso: Exploring Quadrupedal Morphology via Trajectory Optimization. (IEEE International Conference on Robotics and Automation (ICRA) pp. 1177-1184)

Johnson, E., Peterman, D., & **Carter, A.M.** (2022). Updating studies of past life and ancient ecologies using defossilized organismal proxies. *Frontiers in Earth Science*, 2029

Carter, A.M, and Roberts, S. (2022) The deep time perspective: How insights from millennia of evolving and extinct animals can inform robot design decision making. (*IOP Conference Series: Materials Science and Engineering*. Vol. 1261. No. 1)

Jasinski, S. E., Sullivan, R. M., **Carter, A. M**., Johnson, E. H., Dalman, S. G., Zariwala, J., & Currie, P. J. (2022). Osteology and reassessment of Dineobellator notohesperus, a southern eudromaeosaur (Theropoda: Dromaeosauridae: Eudromaeosauria) from the latest Cretaceous of New Mexico. (The Anatomical Record 306.7 1712-1756).

Carter, A.M., Johnson, E.H., Schroeter, E.A. (2022) Long-term Retention of diverse paleontologists requires increasing accessibility. (Frontiers in Ecology and Evolution: 595)

Carter, A.M., Hsieh, S-T., Dodson, P., Sallan, L. (2021) Early amphibians evolved distinct vertebrae for habitat invasions. (PLoS one 16 (6), e0251983);

DOI: 10.1371/journal.pone.0251983

Johnson, E.H., DiMarco, B., Peterman, D., **Carter, A.M**., Allmon, W. (2021) Did Shell-Crushing Predators Drive the Evolution of Ammonoid Septal Shape? (Paleobiology, 1-14); DOI: 10.1017/pab.2021.13

Johnson, E.H., **Carter, A.M.** (2019) Defossilization: A Review of 3D Printing in Experimental Paleontology. (Frontiers in Ecology and Evolution,7,430.)

Lacovara K.J., Lamanna, M.C., Ibiricu, L.M., Poole, J.C., Schroeter, E.R., Ullmann, P.V., Voegele, K.K., Boles, Z.M., **Carter, A.M.,** et.al., (2014) A gigantic exceptionally complete sauropod dinosaur from Southern Patagonia, Argentina (Nature: Scientific Reports 4, 6196); DOI: 10.1038/srep06196

Accepted

Carter, A.M., Chen, W-H., Misra, S., Sung, C.* A Task-to-Intelligence Mapping: When is Embodied Intelligence Worth Designing? Embodied Intelligence Conference Proceedings

Abstracts

Carter, A.M., Caporale, J.D., Musser, E., Koditschek, D. Investigating Spinal Column Dynamics in Crown Terrestrial Amniotes. (Society for Integrated and Comparative Biology Annual Meeting, Phoenix Austin 2023)

Carter, A.M., Johnson, E.H., Bissette, R., Hsieh, S.T., Dodson, P. Multimaterial 3D printing to explore vertebral stiffness in stem Tetrapods. (Society for Integrated and Comparative Biology Annual Meeting, Phoenix Arizona 2022)

Johnson, **Carter, A.M.,** Schroeter, E.R. Increasing accessibility to increase diversity in paleontology. (Society for Integrated and Comparative Biology Annual Meeting, Phoenix Arizona 2022)

Johnson, E., **Carter A.M.,** Schroeter, E.A. Increasing Diversity in Paleontology Requires Increasing Accessibility. 2021 Geological Society of America *Abstracts with Programs.* Vol 53, No. 6 doi: 10.1130/abs/2021AM-370949

Johnson, E.H. and **Carter A.M.**, "3D Printing for Biomechanical Studies of Shell Shape and Strength". (European Association of Vertebrate Paleontologists, July 2020)

Carter, A.M., Hsieh, S.T., Dodson, P. Method development in biomimetic models using 3D printed materials (Geological Society of America Annual Meeting, Indianapolis, IN, 2018)

DiMarco, B., Johnson E.H., **Carter, A.M.,** Sime, J., Sallan, L. Exploring the function of suture complexity with experimental compression of 3D printed ammonoids. (Geological Society of America Annual Meeting, Indianapolis, IN, 2018)

Sajdah-Bey, N., **Carter, A.M.,** Johnson, E.H., Sallan, L. 3D Printing pectoral fins attached to back of the skull in extinct cartilaginous fishes (Iniopterygians) to understand function. (Geological Society of America Annual Meeting, Indianapolis, IN, 2018)

Carter,A.M., Hsieh, S.T., Dodson, P., Sallan,L. Ecomorphology in Temnospondyli (Amphibia) vertebrae: a geometric morphometrics study (Society for Integrated and Comparative Biology Annual Meeting Programs and Abstracts Book, San Francisco, CA)

Carter, A.M., Hsieh, S.T., Dodson, P., Sallan, L. Ecomorphological implications of presacral morphology in temnospondyli (Evolution 2017, Portland, OR)

Carter, A.M.,Sallan, L., Hsieh S-T., Dodson, P. 2016 Just How Different? Quantifying Vertebral Diversity in Temnospondyls (Journal of Vertebrate Paleontology SVP Programs and Abstracts Book, 2016, p. 76,Dallas, TX)

Carter, A.M, K.J. Lacovara, 2011. Bringing Old Collections into New Focus. (Minority Access Inc Research Symposium, Washington, D.C. 2012)

Posters

DiMarco, B., Johnson, E.H., **Carter, A.M.,** Allmon, W.D. The Evolution of Ammonoid Septa Complexity: A Product of Predation? GSA Annual Meeting in Phoenix, Arizona, USA-2019

Carter, A.M, Standen, E., Sallan, L., Dodson, P., Hsieh, S-T. Obstacle crossing behaviors in the Senegalese bichir, Polypterus senegalus (Society for Integrated and Comparative Biology Annual Meeting Programs and Abstracts Book 2017, New Orleans, LA)

Carter, A.M.,Sallan, L., Hsieh S-T., Dodson, P. 2016 Quantifying Vertebral Diversity in Temnospondyls (Society for Integrated and Comparative Biology Annual Meeting Programs and Abstracts Book 2016, Portland, OR)

Carter, A.M, Boles, Z.M., Schroeter, E.R, and Lacovara, K.J. 2012. A juvenile Hyposaurus rogersii skull from the Hornerstown Formation of New Jersey. (Fifteenth Annual Philadelphia Alliance for Minority Participation Research Symposium and Mentoring Conference, 2013, Philadelphia, PA.)

Carter, A.M, Lacovara, K.J. Bringing Old Collections into New Focus. (Fourteenth Annual Philadelphia Alliance for Minority Participation Research Symposium and Mentoring Conference, 2011 Philadelphia PA)

INVITED LECTURES

Carter, A.M. "250 Million Year Old Connections" Georgia Tech Emerging Scholars Lecture Series. April 11th, 2023 (*Invited)*

Carter,A.M., Johnson, E.J., Bisette, R., Hsieh, S-T., Dodson, P. "Range of Motion in Vertebrae of Stem Tetrapods." European Association of Vertebrate Paleontologists. Virtual Meeting. July 6th, 2021 *(Invited)*

Carter, A.M., "Making Monsters Move: Osteological Range of Motion Studies." University of Birmingham. May 27th, 2020 (*Invited)*

Carter, A.M., "How many cheeseburgers could T-Rex Eat? Silly Questions that Inspire Science" Philadelphia Area Girls Enjoying Science. September 27th, 2014 (*Keynote Speaker)*

TEACHING EXPERIENCE

Department of Earth and Environmental Sciences, University of Pennsylvania 2016,2018

Teaching Assistant:

- *Earth and Life Through Time (ENVS 210)*
  - *Awarded: Outstanding Teaching Assistant Award*
- *Introduction to Environmental Earth (ENVS 100)*

Department of Geology, Rowan University 10/2019

Guest Lecturer:

- *Vertebrate Paleontology (GEO 311)*

Department of Biology, NCSU 09/2022,11/2022

Guest Lecturer:

- *The Science of Studying Dinosaurs (BIO 230)*
- *Evolution (BIO 270)*

OUTREACH AND SCIENCE COMMUNICATION

Museum Education

Museum Education Staff, Academy of Natural Sciences, Philadelphia PA 2011-2014
Inaugural Scientist Speaker, Academy of Natural Sciences, Philadelphia PA 12/2017

K-12 Outreach

Carter, A.C., "Paleontology, Robotics, and finding 'Good Ideas'", Upward Bound Rule Your Future STEAM Initiative, October 7th, 2022

Carter, A.C., "How to become a Paleontologist", Girl Scout Silver Award, Troop # 6260, Sandy Springs, GA. June 19th, 2021

Carter,A.C., "Where can we find a giant dinosaur?" Germantown Academy, Fort Washington PA, February annually 2015-2019 (2nd grd)

Stem Outreach for the Public

"Defossilization: A Review of 3D Printing in Experimental Paleontology" Delaware Valley Paleontological Society, Academy of Natural Sciences, Philadelphia, PA. June 9th, 2020
"Put your back into it!" Science on Tap, Philadelphia PA, May 20th, 2019
"A field guide to Vertebral Diversity" Delaware Valley Paleontological Society, Academy of Natural Sciences, Philadelphia, PA. May 21st, 2019

Outreach via Video

Digital Series Talent, "Drain the Jurassic" (Host: National Geographic),July 18-20th, 2022
Digital Series Talent, "Dinosaurs of Antartica" (Host: Giant Screen Studios LLC), July 16, 2022
Guest Speaker, "Robot Dinosaurs?" (Host: Franklin Outside, Franklin Institute – Science Museum, Philadelphia PA) March 17, 2021
Guest Speaker, "Scientist Spotlight" (Host:State Impact – NPR, Pennsylvania) September 22,2020

Mentorship

Brianna DiMarco (second author publication, first author poster presentation)

FIELD EXPERIENCE

New Jersey (*Drexel University, the New Jersey State Museum)* 2009-2014
Hornerstown Formation, Sewell County, New Jersey (Cretaceous Marine)
Montana (Museum of the Rockies) 2009
Hell Creek Formation, Jordan, Montana (Cretaceous Vertebrates)

DEPARTMENTAL SERVICE ACTIVITIES

Panels

Panelist and Activity Designer—Visit Students 08/2023

Panelist and Activity Designer—STEM GOES RED 02/2023
Red Cross, GRASP Outreach, Philadelphia, PA

Panelist, Candid Conversations - Standards of Professionalism: Breaking the Mold, **S**tudents **T**ackling **A**dvanced **R**esearch (STARs) of Drexel University 02/2022

Panelist, Black History in STEM Fields, Alliance for Minority Participation of Drexel University 09/2021

Panelist, Men of Honor and Women of Distinguish, STEM Journey, Alliance for Minority Participation of Drexel University 10/2017

Department Seminars

Carter,A.M,Ullman, P., and Lacovara, K.J. 2014. Morphometric Study of the Pectoral Girdle in Early Tetrapods. Senior Research Day. (Drexel University, Philadelphia, PA 2014)

Department Poster Presentations

Carter,A.M, Fowler,E., Schiff,N., and Lacovara, K.J. 2013. Restoration of a Cretaceous Crocodile through Digital and Traditional Paleontology Techniques. (University Research Day 2013, Drexel University, Philadelphia PA.)

Carter, A.M, Boles, Z.M., Schroeter, E.R, and Lacovara, K.J. 2012 A juvenile Hyposaurus rogersii skull from the Hornerstown Formation of New Jersey. (College of Arts and Sciences Research Day 2012, Drexel University, Philadelphia PA)

Carter, A.M, Boles, Z.M., Schroeter, E.R, and Lacovara, K.J. 2012, A juvenile Hyposaurus rogersii skull from the Hornerstown Formation of New Jersey. (University Research Day 2012, Drexel University, 2012 Philadelphia, PA)

Carter, A., Lacovara, K.J. Bringing Old Collections into New Focus. (STAR Scholars Symposium, Drexel University, 2011, Philadelphia PA)

Laboratory

Fossil Preparator, Academy of Natural Sciences 2009-2014

Professional Societies Memberships

Institute of Electrical and Electronics Engineers (IEEE)
Explorer's Club
Society for Integrative and Comparative Biology (SICB)
Society of Vertebrate Paleontology (SVP)
Geological Society of America (GSA)
Fontaine Society University of Pennsylvania
DuBois Postdoctoral Association

Peer Reviewer

Journal of Anatomy
Public Library of Science (PLOS)

Grants

Paleobiology Summer Stipend	2019
Paleobiology Summer Stipend	2017
Graduate Student and Professional Student Association Travel Grant	2017
Second Place in Biology, 15th Annual Alliance for Minority Participation Research Symposium	2012
Joan Summerfield Award for Excellence in Teaching (Nomination)	2012
Third Place in Biology, 14th Annual Alliance for Minority Participation Research Symposium	2011
Joan Summerfield Award for Excellence in Teaching (Nomination)	2011