

# AJA M. CARTER

240 South 33rd St. #251, Philadelphia PA, 19143 | (267)-325-2336 | caja@sas.upenn.edu

## EDUCATION

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### University of Pennsylvania

Philadelphia, PA

PhD in Earth and Environmental Sciences

April 2020

*Dissertation: The Effects of Vertebral Morphology and Composition on Stem-Tetrapod Intervertebral Joint Functional Behavior*

Fontaine Scholar: high achieving underrepresented doctoral students; GPA: 3.5/4.0; Phillip Orville Fellow

### Drexel University

Philadelphia, PA

Bachelor of Science in Biology; Minor: Spanish

June 2014

Mary K. Howett Memorial Scholar; Alliance for Minority Participation Scholar

## SKILLS

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**Software:** R-Cran; MATLAB; Solidworks; AutoCad Inventor; Autodesk Fusion360, ImageJ

**Hardware:** Next Engine 3D Laser Scanner, Photron FastCam, Formlabs 2 Printer

**Lab:** Animal Husbandry, High Speed Kinematics Testing, Grant Writing

## RESEARCH EXPERIENCE

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**Vice Provost of Research Postdoctoral Fellow**, Electrical and Systems Engineering,  
University of Pennsylvania

2020-2023

- Organized team of researchers, graduate students, and postdoctoral fellows in weekly meetings to discuss interdisciplinary research across three institutions

**Ph.D. Candidate**, Earth and Environmental Sciences Department, University of  
Pennsylvania

2014- 2020

- Correlated 40 different spinal column shapes across 220 million years and terrestrial locomotion
- Created MATLAB code to extract peak head clearances in obstacle crossing trials in primitive fish study
- Designed and 3D printed preliminary models of ancient vertebrae using AutoCad Inventor and Fusion360
- Presented 4 oral presentations and 2 poster presentations of thesis work at 6 different conferences
- Designed and manufactured tubes for crushing tests on ancient shelled mollusks
- Designed experiment to test multimaterials (smooth-on silicone and various 3D printed resins)
- Lead a team of four researchers to identify function of suture morphologies resistance to compression
- Directed three other researchers in testing fin placement and orientation in 4 groups of extinct fishes

**Research Assistant**, Biology Department, Drexel University

2013-2014

- Assembled database of 100+ journal articles concerning geology and fossils found in New Jersey, anatomy of crocodylians and dinosaurs
- Collected location of fossil layers in each of the five boroughs of New York for episode of *Born To Explore, New York: The Great Fossil Hunt*

**S.T.A.R Scholar**, Biology Department, Drexel University

2011

- Properly identified two halves of ancient crocodile skull mistakenly split between two departments of the Academy of Natural Sciences of Drexel University
- Devised a dichotomous key to combine the crocodile skull and other fossils between the two departments

## TEACHING AND SCIENCE COMMUNICATION EXPERIENCE

- Invited Speaker**, Franklin Outside, Franklin Institute – Science Museum, Philadelphia PA 03/2021
- Delivered an informal talk on the physical modelling and robotics in paleontology
  - Discussed the importance of open access and equity in STEM fields
- Guest Lecturer**, Rowan University 10/2020
- Lectured to vertebrate paleontology course on evolution of vertebral morphology
- Invited Speaker**, State Impact – NPR, Pennsylvania 09/2020
- *Title*: Scientist Spotlight
  - Delivered informal talk on changes in vertebral morphology through deep time
  - Discussed accessibility to science and careers in STEM fields
- Invited Speaker**, Delaware Valley Paleontological Society 06/2020
- *Title*: Defossilization: A Review of 3D Printing in Experimental Paleontology
  - Informal talk on the use of 3D printing in addressing paleontological hypotheses surrounding form and function
- Invited Speaker**, University of Birmingham 05/2020
- *Title*: Making Monsters Move: Osteological Range of Motion Studies
  - Delivered a review of range of motion studies, presented a new technique, and demonstrated range of motion in vertebral joints of Permian tetrapods
- Guest Lecturer**, Rowan University 10/2019
- Lectured to vertebrate paleontology course on evolution of vertebral morphology
  - Discussed current 3D printing technologies for experimental paleontology
- Invited Speaker**, Science on Tap, 07/2019
- *Title*: Water-to-land: Put your back into it
  - Informal talk on vertebral evolution and experimental paleontology
- Invited Speaker**, Delaware Valley Paleontological Society 05/2019
- Created slides that demonstrated the use of linear measurements to interpret vertebral function from fossils in the field for ~30 local amateur paleontologists
- Teaching Assistant**, University of Pennsylvania, Philadelphia PA 01/ 2018-05/2018
- Created two-chapter lectures, and designed specific labs for 200 students
  - Delivered lab instructions twice a week to 40 underclassmen
  - *Awarded*: Outstanding Teaching Assistant Award, Earth and Environmental Sciences Dept Spring 2018.
  - *Classes assisted*: Earth and Life Through Time, Introduction to Environmental Earth Science
- Invited Panelist**, Alliance for Minority Participation (AMP), Philadelphia PA 10/2017
- Answered questions surrounding application and thesis development for 100 undergraduates from local universities
  - Spoke on careers and pathways surrounding scientists and specifically doctoral candidacy candidate at 19<sup>th</sup> Annual AMP Research Symposium and Mentor Conference
- Inaugural Scientist Speaker**, Academy of Natural Sciences, Philadelphia PA 12/2017
- Guided museum visitors through the process of biomimetic modelling from fossils to moveable models using Arduino Uno and 3D printed materials

- Visiting Teacher**, Germantown Academy, Fort Washington PA 01/2015
- Designed custom talk concerning dinosaur discovery, from grant writing, to excavation, to scientific publishing 02/2016
  - Lectured 45 second grade students of Germantown Academy 02/2018
  - 02/2019
- Keynote Speaker**, Philadelphia Area Girls Enjoying Science 09/2014
- Gave keynote speech to ~150 six-grade girls on science accessibility and careers
- Museum Educator**, Academy of Natural Sciences, Philadelphia PA 06/2011-
- Managed public museum spaces such as the Fossil Preparatory Laboratory 06/2014
  - Guided ~100 students in fossil preparation across ~50 different fossils
  - Enhanced visitors' knowledge and experience by informational presentations such as "Introduction to fossil preparation," and "A Basic Field Work Guide"
- Drexel University Community Outreach Volunteer** Gloucester County, New Jersey 2010-2014
- Aided visitors in excavating fossils in marl pits of New Jersey
  - Guided ~200 visitors per public days on fossil excavation technique and preservation
  - Informed visitors of the previous environment of the marl pit, the types of animals of the time, and how fossils are preserved over seventy-million years

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**PUBLICATIONS**


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**Peer Reviewed Articles**

- *Accepted*: Johnson, E.H., DiMarco, B., Peterman, D., **Carter, A.M.**, Allmon, W. Did Shell-Crushing Predators Drive the Evolution of Ammonoid Septal Shape? *Paleobiology*.
- *Under Review*: **Carter, A.M.**, Hsieh, S-T., Dodson, P., Sallan, L. Vertebral diversity in stem-amphibians shed light on requirements for terrestrial locomotion. *PLoSOne*
- *In Prep*: **Carter, A.M.**, Hsieh, S-T., Jerolmack, D., Dodson, P. Osteological Range of Motion in Vertebrae of Stem Tetrapods. *Journal of Experimental Biology*
- 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., Voegelé, 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)

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**GRANTS, FELLOWSHIPS, AND HONORS**


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Paleobiology Summer Stipend, University of Pennsylvania	2019
Outstanding Teaching Assistant Award, Earth and Environmental Sciences Dept. University of Pennsylvania	2018
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Greg and Susan J Walker Endowment, University of Pennsylvania	2017
Paleobiology Summer Stipend, University of Pennsylvania	2017
Graduate Student and Professional Student Association Travel Grant	2017
Broadening Participation Award, Society for Integrative and Comparative Biology	2017
Paul Bond Scholarship, Delaware Valley Paleontological Society	2016
Fontaine Society Summer Research Award Phillip Orville Fellowship, University of Pennsylvania	2014
Benjamin Franklin Fellowship, University of Pennsylvania	2014- 2018
Mary K. Howett Memorial Scholarship in Biology, Drexel University	2013
Anthony J. Drexel Scholarship, Drexel University	2010- 2014
Performing Arts Scholarship, Drexel University	2010- 2014
Third Place in Biology, 14th Annual Alliance for Minority Participation Research Symposium	2011
	2013
Second Place in Biology 15th Annual Alliance for Minority Participation Research Symposium	2011

Joan Summerfield Award for Excellence in Teaching Nominee  
 Joan Summerfield Award for Excellence in Teaching Nominee

2012

### **PRESENTATIONS**

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Session Co-chair “Applications of 3D Printing and Other 3D Methods to Experimental Paleontology” (Geological Society of America Annual Meeting, Indianapolis, IN, 2018)

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

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

### **POSTERS**

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**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.**, 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. (Fifteenth Annual Philadelphia Alliance for Minority Participation Research Symposium and Mentoring Conference, 2013, 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. (Fourteenth Annual Philadelphia Alliance for Minority Participation Research Symposium and Mentoring Conference, 2011 Philadelphia PA)

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

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

## LANGUAGES

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English; *native speaker*

Spanish; *high proficiency in verbal and written*

## MEMBERSHIPS

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Society of Vertebrate Paleontology (SVP)

Society of Integrative and Comparative Biology (SICB)

Geological Society of America (GSA)

Fontaine Society University of Pennsylvania

Graduate Women In Science (GWIS)