

AARON M OLSEN

Anatomy Teaching & Research Postdoctoral Fellow

E-mail: aaron_olsen@brown.eduWebsite: aaronolsen.github.io**Research Interests**

Evolution of musculoskeletal systems, skeletal biomechanics, motion analysis, shape analysis

Education**University of Chicago**

Ph.D. Integrative Biology, 2016, Dept of Organismal Biology & Anatomy

“Patterns of Morphological and Functional Evolution in the Feeding System of Waterfowl (Anseriformes): Insights from Diet, Beak Shape, and Cranial Mechanics”

Advisor: [Mark Westneat](#)

S.M. Integrative Biology, 2011, Dept of Organismal Biology & Anatomy

University of Kansas

B.S. Biochemistry with university honors, 2009

B.A. Languages for Humanitarian Aid (special major), 2009

University of Murcia, Spain

Study abroad, 2006-2007 academic year

Academic Appointments

2018-pres. Anatomy Teaching & Research Postdoc, Brown University ([Brainerd lab](#))
 2016-2018 NSF Postdoctoral Fellow, Brown University ([Brainerd lab](#))
 2009-2016 Ph.D. student, University of Chicago ([Westneat lab](#))
 2010-2016 Resident Graduate Student, Field Museum of Natural History
 2012-2013 NSF Moto-IGERT Fellow, University of Chicago
 2009 Research assistant, [Hauck lab](#), University of Konstanz, Germany
 2006-2008 Undergraduate research assistant, [Ward lab](#), University of Kansas

Grants, awards and fellowships

2017 Best Dissertation Award, Biological Sciences, University of Chicago
 2016-2018 [NSF Postdoctoral Research Fellowship in Biology](#) (\$138,000)
 2016 Smithsonian Predoctoral Fellowship (I declined this to accept the PRFB)
 2011-2015 NSF Graduate Research Fellowship
 2012-2013 NSF Moto-IGERT Research Award (\$2000)
 2011-2012 University of Chicago Hinds Research Award (\$1459)
 2009 DAAD Undergraduate Scholarship (4,485€)
 2007 K-INBRE Undergraduate Research Scholarship (\$5,700)

Peer-reviewed publications

13. Olsen AM (2019). A mobility-based classification of closed kinematic chains in biomechanics and implications for motor control. *Journal of Experimental Biology*. 222:jeb195735. DOI: [10.1242/jeb.195735](https://doi.org/10.1242/jeb.195735).

12. Coates MJ, Tietjen K, **Olsen AM** & Finarelli JA (2019). High-performance suction feeding in an early elasmobranch. *Science Advances*. 5(9). eaax2742. DOI: [10.1126/sciadv.aax2742](https://doi.org/10.1126/sciadv.aax2742).
11. **Olsen AM**, Hernandez LP, Camp AL & Brainerd EL (2019). Channel catfish use higher coordination to capture prey than to swallow. *Proceedings of the Royal Society B*. 286(1901). DOI: [10.1098/rspb.2019.0507](https://doi.org/10.1098/rspb.2019.0507).
10. Rico-Guevara A, Sustaita D, Gussekloo SWS, **Olsen AM**, Bright JA, Corbin CE, Dudley R (2019). Feeding in Birds: Thriving in Terrestrial, Aquatic, and Aerial Niches. In: Bels V., Whishaw I. (eds) *Feeding in Vertebrates. Fascinating Life Sciences*. Springer, Cham, Switzerland.
9. Aiello BR, Hardy AR, Cherian C, **Olsen AM**, Orsbon CP, Hale ME & Westneat MW (2018). A comparison of pectoral fin ray morphology and its impact on fin ray flexural stiffness in labriform swimmers. *Journal of Morphology*. 279(8):1031-1044. DOI: [10.1002/jmor.20830](https://doi.org/10.1002/jmor.20830).
8. Aiello BR, Hardy AR, Cherian C, **Olsen AM**, Ahn S, Hale ME & Westneat MW (2018). The relationship between pectoral fin stiffness and swimming behavior in Labridae: insights into design, performance, and ecology. *Journal of Experimental Biology*. 221(1). DOI: [10.1242/jeb.163360](https://doi.org/10.1242/jeb.163360).
7. **Olsen AM***, Camp AL* & Brainerd EL (2017). The opercular mouth-opening mechanism of largemouth bass functions as a 3D four-bar linkage with three degrees of freedom. *Journal of Experimental Biology*. 220:4612-4623. DOI: [10.1242/jeb.159079](https://doi.org/10.1242/jeb.159079). *Equal author contributions
6. Westneat MW, Aiello BR, **Olsen AM** & Hale ME (2017). Bioinspiration From Flexible Propulsors: Organismal Design, Mechanical Properties, Kinematics and Neurobiology of Pectoral Fins in Labrid Fishes. *Marine Technology Society Journal*. 51(5):23-34. DOI: [10.4031/MTSJ.51.5.3](https://doi.org/10.4031/MTSJ.51.5.3).
5. **Olsen AM** (2017). Feeding ecology is the primary driver of beak shape diversification in waterfowl. *Functional Ecology*. 31(10):1985-1995. DOI: [10.1111/1365-2435.12890](https://doi.org/10.1111/1365-2435.12890).
4. Delacy CR, **Olsen AM**, Chapman DD, Brooks EJ & Bond ME (2017). Affordable and accurate stereo-video system for measuring dimensions underwater- a case study using Oceanic Whitetip sharks (*Carcharhinus longimanus*). *Marine Ecology Progress Series*. 574:75-84. DOI: [10.3354/meps12190](https://doi.org/10.3354/meps12190).
3. **Olsen AM** & Westneat MW (2016). Linkage mechanisms in the vertebrate skull: Structure and function of three-dimensional, parallel transmission systems. *Journal of Morphology*. 277:1570-1583. DOI: [10.1002/jmor.20596](https://doi.org/10.1002/jmor.20596).
2. **Olsen AM** (2015). Exceptional avian herbivores: multiple transitions toward herbivory in the bird order Anseriformes and its correlation with body mass. *Ecology and Evolution*. 5(21):5016-5032. DOI: [10.1002/ece3.1787](https://doi.org/10.1002/ece3.1787).
1. **Olsen AM** & Westneat MW (2015). StereoMorph: an R package for the collection of 3D landmarks and curves using a stereo camera setup. *Methods in Ecology and Evolution*. 6:351-356. DOI: [10.1111/2041-210X.12326](https://doi.org/10.1111/2041-210X.12326).

Non peer-reviewed publications

Westneat, M. W., & Olsen, A. M. (2015). How fish power suction feeding, a commentary on [Swimming muscles power suction feeding in largemouth bass](#). *Proceedings of the National Academy of Sciences*. 112(28):8525-8526. DOI: [10.1073/pnas.1510522112](https://doi.org/10.1073/pnas.1510522112).

Published Software

Olsen AM & Romero, A (2019). [svgViewR](#): 3D Animated Interactive Visualizations using SVG. R package version 1.4. CRAN.R-project.org/package=svgViewR.

Olsen AM & Haber A (2018). [StereoMorph](#): Stereo Camera Calibration and Reconstruction. R package version 1.6.2. CRAN.R-project.org/package=StereoMorph.

Olsen AM (2016). [linkR](#): 3D Lever and Linkage Mechanism Modeling. R package version 1.1.1. CRAN.R-project.org/package=linkR.

Press coverage of research

Gorman, J (2017). 'How It Works: The Large Mouth of the Largemouth Bass'. [New York Times](#), [ScienceTake](#). 26 Dec, D6. (Coverage of [Olsen et al. 2017](#))

Teaching Experience

Total student contact hours: 588

Gross Anatomy (62.5 hrs), Warren Alpert Medical School, Brown University. Member of 9-person team teaching staff. Academic year 2019-20. [Student evaluations not yet collected]

Gross Anatomy (62.5 hrs), Warren Alpert Medical School, Brown University. Member of 10-person team teaching staff. Academic year 2018-19. [[Student evaluations](#)]

Gross Anatomy and histology (pelvis; 24 hrs), Pritzker School of Medicine, University of Chicago. Teaching assistant for Dr. Callum Ross. Fall 2015. [Student evaluations not collected]

Gross Anatomy and histology (human development, thorax, abdomen, pelvis; 86 hrs), Pritzker School of Medicine, University of Chicago. Teaching assistant for Dr. Callum Ross. Fall 2014. [Student evaluations not collected]

Gross Anatomy (thorax, abdomen, pelvis, head & neck; 107 hrs), Pritzker School of Medicine, University of Chicago. Teaching assistant for Dr. Callum Ross. Fall 2013. [[Student evaluations](#)]

Gross Anatomy (human development, abdomen, pelvis, limbs; 96 hrs), Pritzker School of Medicine, University of Chicago. Teaching assistant for Dr. Callum Ross. Fall 2012. [[Student evaluations](#)]

Comparative Vertebrate Anatomy (50 hrs), Organismal Biology and Anatomy, University of Chicago. Teaching assistant for Dr. Mark Westneat. Spring 2012. [Student evaluations not collected]

Computational Neuroscience II (50 hrs), Graduate Program in Computational Neuroscience, University of Chicago. Teaching assistant for Dr. Sliman Bensmaia. Winter 2011. [[Student evaluations](#)]

Chordate Evolutionary Biology (50 hrs), Organismal Biology and Anatomy, University of Chicago. Teaching assistant for Dr. Michael Coates. Spring 2011. [[Student evaluations](#)]

Invited Oral Presentations

5. **Olsen AM.** *What's going on (biomechanically) in a catfish head?* Departmental seminar at University of Massachusetts Lowell; 2018 Sep 12; Lowell, MA.
4. **Olsen AM.** *Animals with highly mobile heads and what they can tell us about the evolution of motor systems.* Departmental seminar at Stonehill College; 2017 Nov 10; North Easton, MA.
3. **Olsen AM.** *Animals with highly mobile heads and what they can tell us about the evolution of motor systems.* Departmental seminar at Clemson University; 2017 Sep 29; Clemson, SC.
2. **Olsen AM & Brainerd EL.** *Uncovering mechanisms of mouth expansion in catfish using X-Ray Reconstruction of Moving Morphology.* Paper presented in the Insights from Animal Biomechanics Symposium at the American Society of Biomechanics Annual Meeting; 2017 Aug 8-11; Boulder, CO.
1. **Olsen AM, Hernandez LP, Camp AL & Brainerd EL.** *Linking morphology and motion: Testing multibody simulations against in vivo cranial kinematics in suction feeding fishes using XROMM.* Paper presented in the Cranial Biomechanics and Evolution Symposium at the American Association of Anatomists Annual Meeting; 2017 Apr 22-26; Chicago, IL.

Oral Presentations (10 most recent)

- Olsen AM.** *Can Ecology Explain Patterns of Morphological Integration Between Functionally Coupled Structures?* Paper presented at: International Congress of Vertebrate Morphology; 2019 Jul 21-25; Prague, Czechia.
- Olsen AM, Hernandez LP, Camp AL & Brainerd EL.** *Channel catfish use higher coordination to capture prey than to swallow.* Paper presented at: Society for Integrative and Comparative Biology Annual Meeting; 2019 Jan 3-7; Tampa, Florida.
- Olsen AM & Brainerd EL.** *An Ancient Throat Expansion Mechanism Functions as an 11-Bar Linkage in Channel Catfish.* Paper presented at: Joint Meeting of Ichthyologists and Herpetologists; 2018 Jul 12-15; Rochester, New York.
- Olsen AM, Hernandez LP, Camp AL & Brainerd EL.** *Closed loops of joints, rather than the joints themselves, impose the primary motion constraint in the catfish mouth expansion mechanism.* Paper presented at: Society for Integrative and Comparative Biology Annual Meeting; 2018 Jan 3-7; San Francisco, California.
- Olsen AM, Camp AL & Brainerd EL.** *Balancing complexity and error in kinematic models: fitting 2D and 3D four-bar linkage models to the opercular mechanism of largemouth bass (*Micropterus salmoides*).* Paper presented at: Society for Integrative and Comparative Biology Annual Meeting; 2017 Jan 4-8; New Orleans, Louisiana.
- Olsen AM & Westneat MW.** *Two levers and a linkage: patterns of morphological and functional diversity in the upper beak, lower beak and cranial linkages of birds.* Paper presented at: Society for Integrative and Comparative Biology Annual Meeting; 2016 Jan 3-7; Portland, Oregon.

Olsen AM & Westneat MW. *Biological linkage mechanisms as networks*. Paper presented at: 6th International Meeting on Cranio-cervical Systems in Vertebrates; 2015 Jul 7-10; Ghent, Belgium.

Olsen AM & Westneat MW. *When linkages deviate from planarity: A new 3D computational linkage model applied to the cranial linkages of birds and fishes*. Paper presented at: Society for Integrative and Comparative Biology Annual Meeting; 2015 Jan 3-7; West Palm Beach, Florida.

Olsen AM. *Unlocking the diet data of the past: A new R package for compiling and querying diet datasets*. Paper presented at: 131st American Ornithologists' Union Meeting; 2014 Sept 23-28; Estes Park, Colorado.

Olsen AM. *Exceptional avian herbivores: Multiple origins of herbivory in the bird order Anseriformes and its correlation with beak shape and body mass*. Paper presented at: Society for the Study of Evolution Annual Meeting; 2014 Jun 20-24; Raleigh, North Carolina.

Mentoring

Undergraduates supervised

Alejandro Romero, Brown University, 2018-pres.

Chahat Rana, Brown University, 2018

Connor Johnson, Brown University, 2018

Shahn Thaliffdeen, Brown University, 2017-2019

Mariah Nuzzo, Brown University, 2017

Bianca Obiakor, Brown University, 2017

Tara Bozzini, Brown University, 2017

Jenna Hewitt-Kenda, Brown University, 2017

Trevor Thompson, University of Chicago, 2012

Travel Awards

2018 Brown University BioMed Postdoc travel award (\$650)

2017 Brown University BioMed Postdoc travel award (\$650)

2015 University of Chicago BSD travel award (\$500)

2015 University of Chicago GRAD travel award (\$750)

Refereed manuscripts (initial submissions, revised submissions)

American Naturalist (2,1)

Biology Letters (1,0)

Evolution (3,0)

Evolutionary Ecology (1,0)

Frontiers in Zoology (1,1)

Integrative and Comparative Biology (2,0)

Journal of Experimental Biology (1,0)

Journal of Morphology (2,2)

Journal of Zoology (1,1)

Methods in Ecology & Evolution (3,1)

North American Bird Bander (1,0)
 Paleobiology (1,0)
 PNAS (1,0)
 Proceedings of the Royal Society B (1,0)
 Royal Society Open Science (1,0)
 Systematic Biology (1,1)
 Zoology (1,0)
Total: 23,7

Invited Lectures

Biology design: Structural Architecture of Organisms, Ecology and Evolutionary Biology, Brown University. Course director: Dr. Sharon Swartz. 2017 Oct 20.
Biomechanics of Vertebrate Feeding Systems, Organismal Biology and Anatomy, University of Chicago. Course director: Dr. Callum Ross. 2013 Feb 8.
Development and Evolution of Neuromechanical Systems, Organismal Biology and Anatomy, University of Chicago. Course director: Drs. Melina Hale and Callum Ross. 2013 Apr 26.

Science Outreach

Marine Science Club. After-school club at the [Paul Cuffee School](#) (grades 9-12) in Providence, RI. Fall 2018.
Biomechanics Design. Summer camp for teens at the Field Museum of Natural History. July 14-25, 2014.
Vital Organs: Dissecting the Heart and Brain. Project Exploration after-school Program at Ariel Community Academy (Chicago, IL). March 7, 2012.

Societies and Committees

2011-pres. Society for Comparative and Integrative Biology (SICB), member
 2014-2016 Society for the Study of Evolution (SSE), member
 2013-2014 Field Museum Women in Science, Monthly seminar series committee
 2013-2014 Field Museum Women in Science, Summer internship committee

Volunteer Service

2010-2015 Bird Division Volunteer, Field Museum of Natural History, Chicago, IL
 2005-2008 Spanish-English Medical Interpreter, Kansas City, Kansas
 2005-2006 Director and founder of KU Campus Garden Project, University of Kansas
 2006-2007 Youth Mentor (*Refuerzo escolar*), Murcia city government, Murcia, Spain

Undergraduate academic awards and honors

2009 Graduation with university honors
 2009 Graduation Global Awareness Certification (GAP)
 2008 National IDeA Symposium Travel Stipend (\$600)
 2007 Member KU Alpha chapter of Phi Beta Kappa
 2006 Andrew P. Debicki ISEP Scholarship (\$2000)
 2005 CE Spahr Fund (\$480)
 2004 KU Summerfield Scholarship (\$12,000)
 2004 Thrivent College Scholarship (\$4,000)

Languages coded

R, HTML, JavaScript, C++, Matlab, PHP

Languages spoken

English (native), Spanish (non-native fluent), French (intermediate), German (intermediate)