

Kelsey N. Lucas

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Education

- 2019 **Ph.D., Harvard University, Cambridge, MA**
Organismic and Evolutionary Biology
- 2017 **M.A., Harvard University, Cambridge, MA**
Organismic and Evolutionary Biology
- 2012 **B.S., Roger Williams University, Bristol, RI**
Biology; Minor: Mathematics
Summa cum laude

Research Experience

- 2019-
Present **Postdoctoral Research Fellow, Karen Alofs Laboratory**
University of Michigan, Ann Arbor, MI
- Effects of warming climate on walleye metabolism
Links between fish habitats, distribution, and morphology in MI inland lakes
- 2013-2019 **PhD Candidate, Peter Girguis and Eric Tytell Laboratories**
Dissertation: Physical mechanisms of force production for swimming by fishes
Harvard University, Cambridge, MA
- Pressure fields & forces generated by:
-Swimming fishes
-Jellyfish, with Sean Colin and Jack Costello (Marine Biological Laboratory)
Deriving forces using empirical pressure fields
Role of body stiffness bodies in fish-like locomotion (George Lauder Laboratory)
- 2013 **Visiting Researcher, John Dabiri Laboratory**
California Institute of Technology, Pasadena, CA
- Understanding the neural control of locomotion in jellyfish
- 2010-2013 **Undergraduate Researcher, Sean Colin and John Costello Laboratory**
Roger Williams University, Bristol, RI
Marine Biological Laboratory, Woods Hole, MA

Convergent bending kinematics in swimming and flying animals
Effects of environmental conditions on the feeding of ctenophores
Mechanics of stealth predation in hydromedusae

2009-2012 **Laboratory Technician, Andrew Rhyne Laboratory**
Roger Williams University, Bristol, RI

Aquaculture of copepods and microalgae

2007-2008 **Marine Scholar**
University of Connecticut, Avery Point, Groton, CT

Poquonnock River hydrography

2007-2008 **Student Research Assistant**
Project Oceanology, Groton, CT

Routine field surveys in local water systems

Teaching Experience

2020 **Predator-Prey Interactions**, Ecology of Fishes, University of Michigan, Guest Lecturer

2019 **Water Quality Factors for Stream Fishes**, Stream Restoration, University of Michigan, Guest Lecturer

2013-2019 **Various Biology & Evolution lessons**, Harvard Museum of Natural History, informal educator/gallery guide

2016-2018 **Marine Biology**, Harvard Museum of Natural History, Instructor

2018 **Communicating Science**, Bok Center for Teaching & Learning, Co-instructor

2017 **Making a Concept Video**, Bok Center for Teaching & Learning, Co-instructor

2017 **Teaching with Objects**, Bok Center for Teaching & Learning, Instructor

2016 **Biology of Fishes**, Harvard University, Teaching Fellow

2015 **MCB80x: Fundamentals of Neuroscience**, HarvardX, Content Developer

2015 **Human Anatomy & Physiology**, Harvard Extension School, Lab Instructor

2015 **Methods in Aquatic Field Ecology**, Harvard Life Sciences Office, Co-instructor

2014 **Evolutionary Human Physiology & Anatomy**, Harvard University, Teaching Fellow

2014 **Marine Invertebrate Zoology**, Harvard Museum of Natural History, Instructor

Communications Experience

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- 2017-present **Contributing Writer & Consortium Member**
Massive Science
- Popular coverage of scientific research
Opinion pieces on diversity and academic climate
Articles available [here](#).
- 2017-present **BiteScis Lesson Plan Developer**
Partnering with Boston area high school teachers to develop inquiry-based STEM lesson plans themed around research in scientific literature. Lessons meet Next Generation Science Standards. Lessons available [here](#).
- 2016-2018 **Learning Lab Graduate Fellow**
Derek Bok Center for Teaching & Learning, Cambridge, MA
- Development & testing of multimedia content for Harvard University classrooms
Design of lesson plans for undergraduate classrooms
Leading seminars/trainings on making & teaching with multimedia
Managed 150 students from multiple classes fulfilling concept video (microteaching in a YouTube-style video) assignments
Collaboration with [Massive](#) to develop training methods in scientific writing
Organizing/running weeklong science communications workshop
Audio/visual support for professors
Support for student & EdPortal multimedia projects
- 2016 **Guest Writer**
Science in the News (SITN)
- Popular coverage of scientific research. Article is available [here](#).
- 2015 **Content Developer**
HarvardX, Harvard University, Cambridge, MA
Supervisor: Nadja Oertelt
- Development of visual content including graphics, explanatory drawing videos, and stop animation to supplement online lectures for [MCB80x: Fundamentals of Neuroscience](#)

Certifications & Additional Training

- 2019-present **Diversity, Equity, and Inclusion (DEI) Certification**
Center for Research in Learning and Teaching
University of Michigan, Ann Arbor, MI
- Training in DEI issues and interventions, including addressing microaggressions, unconscious biases, and bystander intervention

2015 **ComSciCon National Workshop Participant**
ComSciCon, Cambridge, MA

Training in science communication, social media, multimedia, and advocacy in a selective workshop. Worked with Boston area teachers to develop a K-12 lesson plan derived from current scientific research. Lesson available through BiteScis.

Publications

† Indicates mentored students

Costello JH, Colin SP, Dabiri JO, Gemmell BJ, **Lucas KN**, and Sutherland KR. (In press) Jellyfish as models for vehicle design. *Annu Rev Mar Sci*

Dabiri JO, Colin SP, Gemmell BJ, **Lucas KN**, Leftwich MC, and Costello JH. (Submitted) Jellyfish and fish solve the challenges of turning similarly to achieve high maneuverability. (Preprint: 2019 *bioRxiv* 706762) [\[Link\]](#)

Lucas KN, Lauder GV, and Tytell ED. (2020) Airfoil-like mechanics generate thrust on the anterior body of swimming fishes. *Proc Natl Acad Sci*. 117(19): 10585–10592 [\[Link\]](#)

Jaspers C, Costello JH, Sutherland K, Gemmell B, **Lucas KN**, Tackett J, Dodge K, and Colin SP. (2018) Resilience in moving water: Effects of turbulence on the predatory impact of the lobate ctenophore *Mnemiopsis leidyi*. *Limnol Oceanogr*. 63: 445–458 [\[Link\]](#)

Lucas KN, Dabiri JO, and Lauder GV. (2017) A pressure-based force and torque prediction technique for the study of fish-like swimming. *PLoS ONE*. 12(12): e0189225 [\[Link\]](#)

†Rosic MLN, Thornycroft PJM, Feilich KL, **Lucas KN**, and Lauder GV. (2017) Performance variation due to stiffness in a tuna-inspired flexible foil model. *Bioinspir Biomimetics*. 12: 016011 [\[Link\]](#)

Lucas KN, Thornycroft PJM, Gemmell BJ, Colin SP, Costello JH, and Lauder GV. (2015) Effects of non-uniform stiffness on swimming performance of a passively-flexing, fish-like foil model. *Bioinspir Biomimetics*. 10: 056019 [\[Link\]](#)

Lucas KN, Johnson N, Beaulieu WT, Cathcart E, Tirrell G, Colin SP, Gemmell BJ, Dabiri JO, and Costello JH. (2014) Bending rules for animal propulsion. *Nat Commun*. 5:3293 [\[Link\]](#)

Lucas K, Colin SP, Costello JH, Katija K, and Klos E. (2013) Fluid interactions that enable stealth predation by the upstream foraging hydromedusae *Craspedacusta sowerbyi*. *Biol Bull*. 225: 60-70 [\[Link\]](#)

Invited Presentations

Cross-disciplinary tools for understanding how forces are generated by swimming fishes. (2017) School of Biology Seminar, Georgia Tech, Atlanta, GA

Marine life in motion: How do animals employ the flow of water, and what can this tell us about their life history and evolution? (2017) Marine & Natural Sciences Departmental Seminar, Roger Williams University, Bristol, RI

Alumni Address. (2014) NSF ESPCoR RI SURF Conference, University of Rhode Island, Kingston, RI

Contributed Presentations

*Presenting author (if not KNL)

*Costello J, Dabiri J, Colin S, Gemmell B, **Lucas K**, and Leftwich M. (2020) Primitive and modern swimmers solve the challenges of turning similarly to achieve high maneuverability. Ocean Sciences Meeting, San Diego, CA

Lucas KN, Lauder GV, and Tytell ED. (2020) Revisiting Dubois: the roles of positive and negative pressure in force production during fish swimming. Society for Integrative and Comparative Biology (SICB), Austin, TX

Lucas KN, Keep S, Morey S. (2020) BiteScis: teacher-researcher partnerships to develop engaging research-based Lessons. SICB, Austin, TX

Lucas KN, Lauder GV, and Tytell ED. (2019) Low and high pressure both contribute to force production in fish body-caudal-fin locomotion. SICB, Tampa, FL

*Leftwich MC, Dabiri JO, Colin SP, Gemmell BJ, **Lucas KN**, and Costello JH. (2018) The relationship between torque and body shape of maneuvering swimmers. American Physical Society Division of Fluid Dynamics (APS DFD), Atlanta, GA

Lucas KN, Tytell ED, and Lauder GV. (2018) Quantifying the propulsive forces on steadily-swimming fishes. Ocean Sciences Meeting, Portland, OR

*Colin SP, Costello JH, **Lucas KN**, and Gemmell BJ. (2018) Turning on a dime: Kinematics and hydrodynamics of maneuvering in medusae. Ocean Sciences Meeting, Portland, OR

Lucas KN, Tytell ED, and Lauder GV. (2018) The distribution of thrust and drag on a bluegill sunfish during steady swimming. SICB, San Francisco, CA

Lucas KN, Tytell ED, and Lauder GV. (2017) Pressure-based measurement of instantaneous swimming forces produced by bluegill sunfish (*Lepomis macrochirus*). SICB, New Orleans, LA

Lucas KN, Dabiri JO, and Lauder GV. (2016) Pressure field measurements in the study of fish-like swimming. SICB, Portland, OR

Lucas K, Dabiri J, and Lauder G. (2015) Application of PIV-based pressure measurements to the study of aquatic propulsion. APS DFD, Boston, MA

Lucas KN, Thornycroft PJM, Gemmell BJ, Colin SP, Costello JH, and Lauder GV. (2015) Effects non-uniform stiffness on the swimming performance of a passively-flexing flapping foil model. SICB, West Palm Beach, FL

*Dabiri J, **Lucas K**, Thornycroft P, and Lauder G. (2014) PIV-based pressure, force, and torque measurements of a robotic model swimmer. APS DFD, San Francisco, CA

Lucas KN, Johnson N, Costello JH, and Colin SP. (2013) Convergent inflexion patterns of flexible margins of oscillating animal propulsors during swimming and flight. SICB, San Francisco, CA

Lucas K, Colin SP, Costello JH, Katija K, and Klos E. (2012) Fluid interactions that enable stealth predation by the upstream foraging hydromedusae *Craspedacusta sowerbyi*. Ocean Sciences Meeting, Salt Lake City, UT

*Johnson N, **Lucas K**, Costello JH, and Colin SP. (2012) Quantitative analysis of flexible margins in animal propulsions. Ocean Sciences Meeting, Salt Lake City, UT

Grants and Fellowships

- 2020-2022 **Postdoctoral Research Fellowship in Biology (PRFB, Collections)**, National Science Foundation (NSF)
Project title: Linking fish morphology, swimming ability, and habitat selection through an integrative approach
- 2020 **University of Michigan Postdoctoral Association Travel Award**
Award in support of travel to the SICB 2020 conference
- 2014-2019 **Graduate Research Fellowship (GRFP)**, NSF
- 2016-2018 **Learning Lab Graduate Fellowship**, Derek Bok Center for Teaching & Learning
Fellowship awarded to support graduate students in lieu of traditional classroom teaching. Fellows receive training in multimedia production, create and test content for Harvard University classrooms, and support educational multimedia projects.
- 2013, 2016 **Robert A. Chapman Memorial Scholarship**, Harvard University
Fellowship supporting student research in vertebrate locomotion
- 2013-2016 **James Mill Peirce Fellowship**, Harvard University
Merit fellowship awarded to support the research of top PhD applicants in the natural sciences, mathematics, and engineering
- 2012 **NSF EPSCoR RI Summer Undergraduate Research Fellowship**
- 2011, 2012 **Provost Fund for Student Research**, Roger Williams University
Grants supporting travel and presentation of undergraduate research. Awarded for Lucas et al. (2014) *Nat. Commun.* & Lucas et al. (2013) *Biol. Bull.* projects.

Honors and Awards

- 2015 **BiteScis Honorarium**

Awarded to five graduate students among over 150 ComSciCon National Workshop attendees for excellence in science communication for K-12 classrooms. See also Outreach section.

- 2013 **Outstanding Senior Award (Biology)**, Roger Williams University
Awarded to the top graduate in each discipline of the Department of Biology, Marine Biology, and Environmental Sciences
- 2009-2012 **Presidential Excellence Scholarship**, Roger Williams University
Merit-based scholarship
- 2011 **BioNES Poster Award**
Awarded to the top speakers at a public showcase of New England research. See also Outreach section.
- 2010 **Outstanding Freshman Chemist**, Roger Williams University
Awarded to the top freshman chemistry student

Outreach

- 2019-present **Science Communications Fellow**
Developing and presenting activities themed around my research at festival events at the University of Michigan Museum of Natural History
- 2016-present **Freelance science writing**
Popular science coverage and opinion pieces with Massive Science and Science in the News
- 2013-2019 **Harvard Museum of Natural History Gallery Guide**
Designing and presenting activities to enhance visitor experience. Informal educator in galleries and family events. Development of reference material for new volunteers. Taught new volunteer training in 2014, 2016-2018.
- 2015-2016 **GradWagon**
Expert & guest speaker for Boston area schools
- 2015 **BiteScis Pilot – Graduate Student Representative & Lesson Plan Developer**
Selected from over 150 ComSciCon National Workshop attendees to attend. Worked with a Boston area high school teacher to develop multiple research- and inquiry-based lessons meeting Next Generation Science Standards. Served as a graduate student representative to make recommendations for the future running of the program.
- 2015 **Engaging Teachers in Ecology-Based Investigations (Concord Field Station)**
Co-instructor for a professional development workshop for Boston area science teachers. Taught methods in aquatic field ecology. Co-authored a sample inquiry-based

lesson and reference guide for teachers to apply new skills in their classrooms.
Materials available upon request.

- 2015 **Lauder Lab Ambassador**, Harvard University
Hosted lab tours for and discussed the daily life of a scientist with Boston-area high school girls
- 2013 **TEACH program scientist**, Harvard University
Hosted classroom sessions for inner city middle school students to inspire enthusiasm about science and address misconceptions about who a scientist is
- 2013 **Dabiri Lab Ambassador**, Caltech
Hosted lab visits for inner city, female middle school students
- 2011 **Biology New England South (BioNES) speaker**
BioNES, along with parent organization New England Science Public, is a network of New England researchers performing science advocacy. The BioNES conference is a public showcase of local research. Won a Poster Award (see Honors & Awards)
- 2010-2012 **Wet Lab (Rhyne Lab) Ambassador**, Roger Williams University
Hosted lab tours and answered questions about research for school groups, prospective students, and families

Science Writing

[Meet Émilie du Châtelet, the French socialite who helped lay the foundations of modern physics](#) Oct 2019. *Massive*.

[Peer review is a rigorous process, but it should leave trainees feeling valued and not bullied](#) Sept 2019. *Massive*.

[The Graduate Research Fellowship Program favors elite schools – again](#) Apr 2018. *Massive*.

[What fish can teach us about how humans move](#) Feb 2018. *Massive*.

[How this beautiful, invasive jellyfish adapts to dominate foreign ecosystems](#) Oct 2017. *Massive*.

[How stressed-out fish are teaching us about human heart disease](#) Jun 2017. *Massive*.

[Scientists are gluing teeth to power saws to learn how sharks eat](#) Mar 2017. *Massive*.

[Enigmatic Tully monster finds a home on the tree of life](#) Jul 2016. *Science in the News*.

Memberships

Society for Integrative and Comparative Biology (SICB)
Association for the Sciences of Limnology and Oceanography (ASLO)