

# Matthew N. George, Ph.D.

(425) 328-5141 | [mattgeorgephd@gmail.com](mailto:mattgeorgephd@gmail.com) | ORCID ID: [0000-0003-1264-8667](https://orcid.org/0000-0003-1264-8667) | [mattgeorgephd.github.io](https://mattgeorgephd.github.io)  
University of Washington School of Aquatic and Fisheries Science  
NOAA Northwest Fisheries Science Center

## RESEARCH INTERESTS

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As a marine ecologist, my research focuses on the interaction between organisms and their environment, with a particular emphasis on using ecophysiology to better understand how to manage and conserve wildlife and aquaculture species. I'm a big believer in approaching questions in an interdisciplinary manner, using a combination of techniques and concepts inspired by other disciplines such as genetics, biomedicine, engineering, and computer science to address ecological questions. As a result, my work includes fieldwork, laboratory experiments, and genomics to achieve a mechanistic understanding of the biological processes that underly climate-driven changes in marine organisms.

## POSITIONS HELD

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### **Post-Doctoral Scholar**, 2020 to present

University of Washington, School of Aquatic and Fisheries Sciences, Seattle, Washington  
NOAA Northwest Fisheries Science Center, Seattle, Washington

### **Post-Doctoral Research Fellow**, 2019 to 2020

Children's Hospital of Philadelphia, Center for Cellular and Molecular Therapeutics, Philadelphia, Pennsylvania

### **Post-Doctoral Research Fellow**, 2018 to 2019

Mayo Clinic, Department of Physiology and Biomedical Engineering, Rochester, Minnesota

### **NSF Graduate Research Fellow**, 2012 to 2018

University of Washington, Department of Biology, Seattle, Washington

### **Research Technologist**, 2011 to 2012

Friday Harbor Laboratories, Ocean Acidification Environmental Laboratory, San Juan Island, Washington

### **Research Assistant**, 2009

Smithsonian Tropical Research Institute, Panama City, Panama

### **Research Assistant**, 2008 to 2010

Gonzaga University, Biology Department, Spokane, Washington

## EDUCATION

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### **Ph.D. in Biology**, 2018, University of Washington, Seattle, Washington

Dissertation Title: "Mussel attachment in a dynamic ocean: an ecomechanical perspective"

### **B.S. in Biology**, 2010, Gonzaga University, Spokane, Washington

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## **PUBLICATIONS (\*undergraduate coauthors)**

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### ***Publications within Marine Science***

Payne M\*, **George MN**, Lowe A, Carrington E, and Ruesink J (under review). Mussel aquaculture in future oceans: fatty acid analysis reveals how climate-driven changes in stratification alter food availability. *Marine Ecological Progress Series*.

**George MN**, Hayford H, and Carrington E (under review). Ocean acidification negatively impacts the growth and appetite of predatory snails (*N. ostrina*). *Ecology Letters*.

**George MN**, O'Donnell MJ, Concodello M\*, Carrington E (under review). Ocean acidification weakens, but does not prevent, shell repair after simulated predation in marine mussels. *Global Change Biology*.

**George MN**, Andino J\*, Huie J\*, and Carrington E (2019). Microscale pH and dissolved oxygen fluctuations within mussel aggregations and their implications for mussel attachment and raft aquaculture. *Journal of Shellfish Research* 38:795-809. [10.2983/035.038.0329](https://doi.org/10.2983/035.038.0329).

Newcomb LA, **George MN**, O'Donnell MJ, and Carrington E (2019). Only as strong as the weakest link: structural analysis of the combined effects of elevated temperature and pCO<sub>2</sub> on mussel attachment. *Conservation Physiology* 7(1):coz068. [10.1093/conphys/coz068](https://doi.org/10.1093/conphys/coz068).

**George MN**, Pedigo B\*, and Carrington E (2018). Hypoxia weakens mussel attachment by interrupting DOPA cross-linking during adhesive plaque curing. *Journal of the Royal Society Interface* 15(147):20180489. [10.1098/rsif.2018.0489](https://doi.org/10.1098/rsif.2018.0489).

**George MN** and Carrington E (2018). Environmental post-processing increases the adhesion strength of mussel byssus adhesive. *Biofouling* 34(4):388-397. [10.1080/08927014.2018.1453927](https://doi.org/10.1080/08927014.2018.1453927).

**George MN** and Carrington E (2014). Spine reorientation influences drift particle capture efficiency in sea urchins. *Journal of Experimental Marine Biology and Ecology* 461:102-106. [10.1016/j.jembe.2014.08.001](https://doi.org/10.1016/j.jembe.2014.08.001).

O'Donnell MJ, **George MN**, and Carrington E (2013). Mussel byssus attachment weakened by ocean acidification. *Nature Climate Change* 3(6):587-590. [10.1038/nclimate1846](https://doi.org/10.1038/nclimate1846). (+100 citations per Google Scholar)

Swanson BO, **George MN**, Anderson SJ\*, and Christy J (2013). Evolutionary variation in the mechanics of fiddler crab claws. *BMC Evolutionary Biology* 13(1):137. [10.1186/1471-2148-13-137](https://doi.org/10.1186/1471-2148-13-137).

### ***Publications within Biomedicine***

Xifeng Liu X, Gaihre B, **George MN**, Yaszemski MJ, and Lu L. (under review) Black phosphorus for tissue engineering and regenerative medicine. *Materials Horizons*.

**George MN**, Liu X, Miller A, Zuiker E\*, Xu H, and Lu L. (under review) An injectable, pH-responsive, adhesive hydrogel for bone tissue engineering inspired by the underwater attachment strategy of marine mussels. *Acta Biomaterialia*.

Liu X, **George MN**, Li L, Gamble D\*, Miller II AL, Gaihre B, Waletzki BE, and Lu L (2020). Injectable two-dimensional black phosphorus and carbon nanotube hydrogel with enhanced electric conductivity and phosphate release for bone tissue engineering. *ACS Biomaterials Science and Engineering* 6(8):4653-4665. [10.1021/acsbiomaterials.0c00612](https://doi.org/10.1021/acsbiomaterials.0c00612).

Sun Y., Liu X, **George MN**, Park S, Gaihre B, Terzic A, and Lu L (2020). Enhanced nerve cell proliferation and differentiation on electrically conductive scaffolds embedded with graphene and carbon nanotubes. *Journal of Biomedical Materials Research Part A*. [10.1002/jbm.a.37016](https://doi.org/10.1002/jbm.a.37016).

Liu X, Gaihre B, **George MN**, Miller II AL, Xu H, Waletzki BE, and Lu L (2020). 3D bioprinting of Oligo(Poly(Ethylene Glycol) Fumarate) for bone and nerve tissue engineering. Journal of Biomedical Materials Research Part A. [10.1002/jbm.a.37002](https://doi.org/10.1002/jbm.a.37002).

Liu X, **George MN**, Park S, Miller II AL, Gaihre B, Li L, Waletzki BE, Terzic A, Yaszemski MJ, and Lu L (2020). 3D-printed scaffolds with carbon nanotubes for bone tissue engineering: one-step fast and homogeneous functionalization. Acta Biomaterialia. [10.1016/j.actbio.2020.04.047](https://doi.org/10.1016/j.actbio.2020.04.047).

**George MN**, Liu X, Miller II AL, Xu H, and Lu L (2019). Phosphate functionalization and enzymatic mineralization synergistically enhance oligo[poly(ethylene glycol) fumarate] hydrogel osteoconductivity for bone tissue engineering. Journal of Biomedical Materials Research Part A 108(3):515-527. [10.1002/jbm.a.36832](https://doi.org/10.1002/jbm.a.36832).

Liu X, Miller II AL, Park S, **George MN**, Waletzki BE, Xu H, Terzic A, and Lu L (2019). Two-dimensional black phosphorous and graphene oxide nanosheets synergistically enhance cell proliferation and osteogenesis on 3D-printed scaffolds. ACS Applied Materials and Interfaces 11(26):23558-23572. [10.1021/acsami.9b04121](https://doi.org/10.1021/acsami.9b04121).

## **PRESENTATIONS**

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Investigating the role of TBX2 and TBX3 in human endoderm development using human pluripotent stem cells. International Conference for Stem Cell Research, Boston, MA (2020).

Mechanical testing setups affect spine segment fracture outcomes. Mayo Clinic Postdoctoral Research Conference, Rochester, MN (2019).

Mussels use seawater pH as a molecular trigger in the formation of byssus adhesive. The Society for Integrated and Comparative Biology (SICB), New Orleans, LA (2017).

Ocean acidification and mussel farming in the Puget Sound. Sound Waters University, Whidbey Island, WA (2017).

Hanging by a thread. The Sunshine Rotary, Seattle, WA (2016).

Environmental conditions influence the formation and function of mussel byssus adhesive. University of Washington Graduate Student Symposium, Seattle, WA (2016).

The ecomechanics of mussel attachment. The Salish Sea Ecosystem Conference, Vancouver, B.C. (2016).

The impact of environment and physiological condition on the strength of a biological adhesive. SICB, West Palm Beach, FL (2015).

Short-term exposure to elevated temperature and low pH alters mussel attachment strength. SICB, Austin, TX (2014).

Claw force and cuticle strength: functional morphology of fiddler crab combat. SICB, Seattle, WA (2010).

Strong vs. Beautiful: evolving attractive weapons. Murdock Charitable Trust Undergraduate Research Conference, Spokane, WA (2009).

## **FELLOWSHIPS, GRANTS, AND AWARDS**

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### ***Fellowship and Grants***

Mussel adhesion in a high CO<sub>2</sub> world: Uncovering the molecular basis of weak attachment (#65-7259), Royalty Research Fund, 2015 – 2017 (\$37,029)

Alan and Marian Kohn Fellowship, Friday Harbor Laboratories, 2015 (\$800)

WRF-Hall Fellowship, Washington Research Foundation, 2014 (\$3900)

Richard and Megumi Strathmann Fellowship, Friday Harbor Laboratories, 2014 (\$2000)

W.T & Yvette Edmondson Award, University of Washington, 2013, 2014 (\$6500)

Brooks and Suzanne Ragen Endowed Fellowship, Friday Harbor Laboratories, 2013, 2016 (\$2,300)

NSF Graduate Research Fellowship (#DGE-1256082), National Science Foundation, 2013 – 2016 (\$138,000)

Stephen and Ruth Wainwright Fellowship, Friday Harbor Laboratories, 2010 (\$3000)

HIMI Undergraduate Research Fellowship, Howard Hughes Medical Institute, 2008 – 2010 (\$8,500)

Robert and Claire McDonald Fellowship, Gonzaga University, 2008 (\$2,000)

Dean's Scholarship in Recognition of Academic Excellence, Gonzaga University, 2006 – 2010 (\$58,000)

### ***Awards and Honors***

BioOne Ambassador Award, BioOne Publishing, 2020

<http://www.bioonepublishing.org/BioOneAmbassadorAward/2020/MG.html>

Dean's List, Gonzaga University, 2008 – 2010

### **TEACHING EXPERIENCE**

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BIOL 200: Introductory Biology II (genetics, cell biology, development), teaching assistant and laboratory instructor, University of Washington, Winter 2017 and Spring 2018

BIOL 180: Introductory Biology I (evolution, biodiversity, and ecology), teaching assistant and laboratory instructor, University of Washington, Autumn 2016 and Autumn 2017

BIOL 355: Foundations in Molecular Cell Biology, teaching assistant, University of Washington, Spring 2017

Biology 533: Ocean Acidification field course at Friday Harbor Laboratories Marine Station, co-instructor, University of Washington, Summer 2013

BIOL 300: Introduction to Neuroscience, teaching assistant, University of Washington, Winter 2013

BIOL 427: Biomechanics, teaching assistant and lab instructor, University of Washington, Autumn 2012

BIOL 533: Comparative Biomechanics field course at Friday Harbor Laboratories Marine Station, co-instructor, University of Washington, Summer 2012

### **PROFESSIONAL MEMBERSHIPS**

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International Society for Stem Cell Research, 2019 – 2020

National Postdoctoral Association, 2018 – present)

National Shellfisheries Association, 2017 – present

Western Society of Naturalists, 2015 – 2018

Society for Integrative and Comparative Biology, 2009 – 2017

## **MENTORSHIP AND COMMUNITY OUTREACH**

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Summer Undergraduate Internship Program (SUIP) Mentor, Children's Hospital of Philadelphia, 2019 – 2020

Summer Undergraduate Research Fellowship (SURF) Mentor, Mayo Clinic, 2018 – 2019

Outreach Program Beach Naturalist, Seattle Aquarium, 2014 – 2018

STEM Out! Outreach Program Mentor, American Association for the Advancement of Science, 2014 – 2016

Science Outreach Mentor, Friday Harbor Laboratories, 2011 – 2012

K-12 Science in Action Outreach Program Mentor, Gonzaga University, 2008 – 2010