

**Matthew N. George, Ph.D.**

[mngeorge@uw.edu](mailto:mngeorge@uw.edu) | ORCID: [0000-0003-1264-8667](https://orcid.org/0000-0003-1264-8667) | [mattgeorgephd.github.io](https://mattgeorgephd.github.io)

University of Washington  
School of Aquatic & Fishery Sciences  
1122 NE Boat St, Box 355020  
Seattle, WA 98195-5020

**PROFESSIONAL EXPERIENCE**

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- 2020–present    **Postdoctoral Scholar**  
Cooperative Institute for Climate, Ocean, & Ecosystem Studies  
University of Washington, School of Aquatic & Fishery Sciences, Seattle,  
Washington  
NOAA Northwest Fisheries Science Center, Seattle, Washington  
Mentor(s): Steven Roberts (UW), Mackenzie Gavery (NOAA)
- 2019–2020    **Postdoctoral Fellow**  
Children’s Hospital of Philadelphia, Center for Cellular and Molecular  
Therapeutics, Philadelphia, Pennsylvania  
Mentor(s): Paul Gadue
- 2018–2019    **Postdoctoral Research Fellow**  
Mayo Clinic, Department of Physiology and Biomedical Engineering,  
Rochester, Minnesota  
Mentor(s): Lichun Lu
- 2012–2018    **NSF Graduate Research Fellow**  
University of Washington, Department of Biology, Seattle, Washington  
Mentor(s): Emily Carrington
- 2011–2012    **Research Technologist**  
Friday Harbor Laboratories, Ocean Acidification Environmental Laboratory,  
San Juan Island, Washington

**EDUCATION**

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- 2018    **Ph.D., Biology**, University of Washington, Seattle, Washington  
Dissertation Title: “Mussel attachment in a dynamic ocean: an ecomechanical  
perspective”
- 2010    **B.Sc., Biology**, Gonzaga University, Spokane, Washington  
Concentration: Biological Research Methods

## TEACHING EXPERIENCE

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### *Pedagogical Training*

Teaching Biology Inclusively for Diverse Audiences      University of Washington  
Teaching Online      University of Washington

### *Lectures given within courses*

Coastal Oceanography      University of Washington  
Marine Benthic Ecology      University of Washington  
Invertebrate Zoology (x2)      Friday Harbor Laboratories

### *Teaching Experience*

2022      FISH 441/541: Integrative Environmental Physiology, instructor of record, University of Washington.

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

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

2015, 2017      BIOL 355: Foundations in Molecular Cell Biology, teaching assistant and laboratory instructor, University of Washington.

2014      BIOL 356: Foundations in Ecology, teaching assistant, University of Washington.

2013      BIOL 533: Ocean Acidification field course, Friday Harbor Laboratories, teaching assistant and laboratory instructor, University of Washington

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

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

2012      BIOL 533: Comparative Biomechanics field course at Friday Harbor Laboratories Marine Station, teaching assistant and laboratory instructor, University of Washington

### *Supervised Undergraduates (year supervised, name, current position - \*minority student)*

2020      Grace Crandall (M.S. Student, University of Washington)

2019      Eryn Zuiker (Ph.D. Student, Ohio State)

            Darrian Gamble\* (Undergraduate, California State University Long Beach)

2018      Benjamin Makhlof (Ph.D. Student, North Carolina State University)

- Benjamin Pedigo (Ph.D. Student, Johns Hopkins University Medical School)  
Molly Payne (Ph.D. Student, University of Alaska, Fairbanks)  
2017 Jessie Andino\* (M.D. Student, St. George's University)  
Jonathan Huie\* (M.D. Student, George Washington University)  
MacKenzie Edelsward (Undergraduate Student, University of Washington)  
2015 Chandana Kulkarni\* (M.D. Student, Texas Christian University)  
2014 Chloe Peterschmidt (STEM Teacher at Oak Harbor Public Schools)  
2012 Nicole Le Baron (Undergraduate Student, University of Victoria)

***Presentations by Supervised Undergraduates (\*)***

- 2019 Gamble D\*, Liu X, George MN, Gaihre B, Waletzki BE, and Lu L. Black phosphorus and carbon nanotube enhance the electric conductivity of bone tissue engineering scaffolds. Mayo Clinic Undergraduate Research Symposium, Rochester, MN, USA.  
2018 Payne M\*, George MN, Lowe A, Carrington E, and Ruesink J. Mussel aquaculture in future oceans: fatty acid analysis reveals how climate-driven changes in stratification alter food availability. The University of Washington Undergraduate Research Symposium, Seattle, WA, USA.  
2016 Pedigo B\*, Edelsward M, George MN, and Carrington E. Environmental conditions influence the formation and function of mussel byssus adhesive. The University of Washington Undergraduate Research Symposium, Seattle, WA, USA.

***Service to Mentorship and Outreach Programs***

- 2019 – 2020 Summer Undergraduate Internship Program (SUIP) Mentor, Children's Hospital of Philadelphia  
2018 – 2019 Summer Undergraduate Research Fellowship (SURF) Mentor, Center for Clinical and Translational Science program, Mayo Clinic  
2014 – 2018 Beach Naturalist and Outreach Coordinator, Seattle Aquarium  
2014 – 2016 STEM Out! Outreach Program Mentor, American Association for the Advancement of Science (AAAS)  
2011 – 2012 Science Outreach Mentor, Friday Harbor Laboratories (FHL)  
2008 – 2010 K-12 Science in Action Outreach Program Mentor, Gonzaga University

**PUBLICATIONS (\*undergraduate coauthors)**

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*In preparation*

1. **George MN**, Cattau O, Vadopalas B, Gavery M, and Roberts SB (in prep). Investigating the etiology of triploid mortality: differences in the physiological and genomic response of diploid and triploid Pacific Oysters to marine heatwaves.
2. **George MN**, Jain R\*, Trigg S, and Roberts SB (in prep). Diploid and triploid Pacific Oysters display different DNA methylation patterns after desiccation stress.
3. Payne M\*, **George MN**, Lowe A, Carrington E, and Ruesink J (in prep). Mussel aquaculture in future oceans: fatty acid analysis reveals how climate-driven changes in stratification alter food availability.
4. **George MN**, Hayford H, and Carrington E (in prep). Ocean acidification negatively impacts the growth and appetite of predatory snails (*N. ostrina*).

*Under review, accepted, in press*

5. Clements J and **George MN** (accepted). Ocean acidification and bivalve byssus: explaining variable responses using meta-analysis. Proceeding of the Royal Society B: Biological Sciences. Preprint available on [EcoEvoRxiv](#).
6. **George MN**, Liu X, Miller A, Zuiker E\*, Xu H, and Lu L. (in press) An injectable, pH-responsive, adhesive hydrogel for bone tissue engineering inspired by the underwater attachment strategy of marine mussels. Materials Science and Engineering C: Materials for Biological Applications. [10.1016/j.msec.2021.112606](https://doi.org/10.1016/j.msec.2021.112606)

*Peer-reviewed publications within Ecology*

1. **George MN**, O'Donnell MJ, Concodello M\*, Carrington E (2022). Mussels Repair Shell Damage despite Limitations Imposed by Ocean Acidification. Journal of Marine Science and Engineering 10(3):359. [10.3390/jmse10030359](https://doi.org/10.3390/jmse10030359).
2. **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).
3. 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).
4. **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).

5. **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).
6. **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).
7. 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). (+130 citations per Google Scholar)
8. 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).

*Peer-reviewed publications within Biomaterials*

9. Xu H, Liu X, **George MN**, Miller AL, Park S, Xu H, Terzic A., and Lu L. (2021). Black phosphorus incorporation modulates nanocomposite hydrogel properties and subsequent MC3T3 cell attachment, proliferation, and differentiation. *Journal of Biomedical Materials Research Part A* 109(9):1633-1645. [10.1002/jbm.a.37159](https://doi.org/10.1002/jbm.a.37159)
10. Sun Y, Liu X, **George MN**, Park S, Gaihre B, Terzic A, and Lu L. (2021). Enhanced nerve cell proliferation and differentiation on electrically conductive scaffolds embedded with graphene and carbon nanotubes. *Journal of Biomedical Materials Research Part A* 109(2):193-206. [10.1002/jbm.a.37016](https://doi.org/10.1002/jbm.a.37016)
11. 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).
12. 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* 109(1):6-17. [10.1002/jbm.a.37002](https://doi.org/10.1002/jbm.a.37002).
13. 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* 111:129-140. [10.1016/j.actbio.2020.04.047](https://doi.org/10.1016/j.actbio.2020.04.047).
14. **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).

15. 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).

### ***Review Articles***

16. **George MN**, Leavens KF, and Gadue P. (2021). Genome Editing Human Pluripotent Stem Cells to Model  $\beta$ -Cell Disease and Unmask Novel Genetic Modifiers. *Frontiers in Endocrinology*, 12, 643. [10.3389/fendo.2021.682625](https://doi.org/10.3389/fendo.2021.682625)
17. Liu X, Gaihre B, **George MN**, Yong L, Tilton M, Yaszemski MJ, and Lu L. (2021) 2D phosphorene nanosheets, quantum dots, nanoribbons: synthesis and biomedical applications. *Biomaterials Science*. [10.1039/D0BM01972K](https://doi.org/10.1039/D0BM01972K).

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

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### ***Fellowships and Grants (years funded, title, amount)***

- 2022 – 2023      “*Identifying genomic architecture features that contribute to critical phenotypes in shellfish.*” USDA NRSP-8: National Animal Genome Research Program (\$10,000, co-authored proposal, PI: SB Roberts).
- 2021 – 2022      “*Development of genomic markers for environmental resilience in mussels.*” Pacific States Marine Fisheries Commission (PSMFC; \$124,980, co-authored proposal, PI: E Carrington).
- 2020 – 2025      “*Leveraging transformative ‘omics technologies to alleviate barriers to American shellfish production.*” National Oceanic and Atmospheric Administration (NOAA; \$233,135, co-authored proposal, PI: SB Roberts).
- 2015 – 2017      *Mussel adhesion in a high CO<sub>2</sub> world: Uncovering the molecular basis of weak attachment (#65-7259)*, University of Washington Royalty Research Fund (RFF), (\$37,029, co-authored proposal, PI: E Carrington)
- 2015              Alan and Marian Kohn Fellowship, Friday Harbor Laboratories (\$800)
- 2014              WRF-Hall Fellowship, Washington Research Foundation (\$3900)
- 2014              Richard & Megumi Strathmann Fellowship, Friday Harbor Laboratories (\$2000)
- 2013, 2014      W.T & Yvette Edmondson Award, University of Washington (\$6500)
- 2013, 2016      Brooks and Suzanne Ragen Endowed Fellowship, Friday Harbor Laboratories (\$2,300)
- 2013 – 2016      NSF Graduate Research Fellowship (#DGE-1256082), National Science Foundation (\$138,000)

- 2010 Stephen and Ruth Wainwright Fellowship, Friday Harbor Laboratories (\$3000)
- 2008 – 2010 HHMI Undergraduate Research Fellowship, Howard Hughes Medical Institute (\$8,500)
- 2008 Robert and Claire McDonald Fellowship, Gonzaga University (\$2,000)
- 2006 – 2010 Dean’s Scholarship, Gonzaga University (\$58,000)

***Awards and Honors***

- 2020 BioOne Ambassador Award, BioOne Publishing  
<http://www.bioonepublishing.org/BioOneAmbassadorAward/2020/MG.html>
- 2008 – 2010 Dean’s List, Gonzaga University

**SCIENTIFIC PRESENTATIONS**

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- 2022 The contribution of summer heatwaves to ‘triploid mortality’ events observed during commercial pacific oyster production in Washington State. The Society for Integrated and Comparative Biology (SICB), Phoenix, AZ.
- 2022 The contribution of marine heatwaves to ‘triploid mortality’ during commercial pacific oyster production. World Aquaculture Society Triennial Meeting, San Diego, CA.
- 2020 Investigating the role of TBX2/TBX3 in human endoderm development using human pluripotent stem cells. International Conference for Stem Cell Research, Boston, MA.
- 2019 Mechanical testing setup design affects spine segment fracture outcomes. Mayo Clinic Postdoctoral Research Conference, Rochester, MN.
- 2017 Mussels use seawater pH as a molecular trigger in the formation of byssus adhesive. SICB, New Orleans, LA.
- 2017 Ocean acidification and mussel farming in the Puget Sound. Sound Waters University, Whidbey Island, WA.
- 2016 Hanging by a thread: The impact of ocean acidification on mussel farming in Salish Sea. 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.
- 2015 The impact of environment and physiological condition on the strength of a biological adhesive. SICB, West Palm Beach, FL.
- 2014 Short-term exposure to elevated temperature and low pH alters mussel attachment strength. SICB, Austin, TX.

- 2010 Claw force and cuticle strength: functional morphology of fiddler crab combat. SICB, Seattle, WA.
- 2009 Strong vs. Beautiful: evolving attractive weapons. Murdock Charitable Trust Undergraduate Research Conference, Spokane, WA.

## PROFESSIONAL MEMBERSHIPS

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- 2020 – present Pacific Coast Shellfish Growers Association (PCSGA)
- 2019 – 2020 International Society for Stem Cell Research (ISSCR)
- 2017 – present National Shellfisheries Association (NSA)
- 2015 – 2018 Western Society of Naturalists (WSN)
- 2009 – present Society for Integrative and Comparative Biology (SICB)

## PROFESSIONAL SERVICE

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I regularly serve as reviewer for prestigious journals such as *Scientific Reports*, *Environmental Science & Technology*, *BMC Genomics*, and *Global Change Biology*. A complete and up-to-date list of my credited reviews can be found on my [publons page](#).

## FEATURES & POPULAR ARTICLES

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- 2019 “What we can learn from how mussels attach to surfaces underwater.” Feature article in Friday Harbor Labs Tide Bites newsletter & San Juan Islander, March 2019, [link](#).
- 2018 “Hanging by a Thread - Mussels in a Changing Ocean” Animated video by Abby Lunstrum, Meg Chadsey, & Laura Newcomb, w/ WA Sea Grant, February 2018, [link](#).
- 2016 “Acid attack — can mussels hang on for much longer?” Feature article in UW News, July 6, 2016, [link](#).
- 2016 “Acid attack: Can mussels hang on for much longer?” Feature article in ScienceDaily, July 5, 2016, [link](#).
- 2016 “Ocean acidification is eating into mussels.” Feature article on Grist.org, July, 2016, [link](#).
- 2014 “Mussels lose footing in more acidic ocean.” Feature article in Scientific American, September 9, 2014, [link](#).
- 2013 “Blue mussels 'hang on' along rocky shores: For how long?” Feature article on phys.org, March 22, 2013, [link](#).
- 2013 “Mussels cramped by environmental factors.” Feature article in UW News, February 13, 2013, [link](#).