Matthew N. George, Ph.D.

mngeorge@uw.edu | ORCID: 0000-0003-1264-8667 | mattgeorgephd.github.io

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

PROFESSIONAL EXPERIENCE

2020–present **CICOES 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, Mackenzie Gavery

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

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

PUBLICATIONS (*undergraduate coauthors)

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 impacts the growth and appetite of predatory snails (*N. ostrina*).

Under review

5. **George MN**, O'Donnell MJ, Concodello M*, Carrington E (under review). Ocean acidification weakens, but does not prevent, shell repair in marine mussels. Journal of Marine Biology and Engineering.
6. Clements J and **George MN** (under review). Ocean acidification and bivalve byssus: explaining variable responses using meta-analysis. Marine Ecological Progress Series. Preprint available on EcoEvoRxiv.
7. **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. Materials Science and Engineering C: Materials for Biological Applications.

Peer-reviewed Publications within Marine Science

8. **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.
9. 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 pCO2 on mussel attachment. Conservation Physiology 7(1):coz068. 10.1093/conphys/coz068.
10. **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.

11. **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.
12. **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.
13. 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. (+100 citations per Google Scholar)
14. 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.

Peer-Reviewed Publications within Biomedicine

15. 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
16. 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
17. 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.
18. 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.
19. 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 Biomaterilia 111:129-140. 10.1016/j.actbio.2020.04.047.
20. **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.

21. 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.

Review Articles

22. **George MN**, Leavens KF, and Gadue P. (2021). Genome Editing Human Pluripotent Stem Cells to Model β-Cell Disease and Unmask Novel Genetic Modifiers. Frontiers in Endocrinology, 12, 643. 10.3389/fendo.2021.682625.
23. 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 9:2768-2803. 10.1039/D0BM01972K.

TEACHING EXPERIENCE

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
Bioinformatics for Environmental Sciences	University of Washington
Integrative Environmental Physiology	University of Washington
Marine Benthic Ecology	University of Washington
Invertebrate Zoology (x2)	Friday Harbor Laboratories

Teaching Experience

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, University of Washington
2013	BIOL 533: Ocean Acidification field course at Friday Harbor Laboratories Marine Station, co-instructor, University of Washington
2013	BIOL 300: Introduction to Neuroscience, 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, co-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 Makhlouf (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

FELLOWSHIPS, GRANTS, AND AWARDS

Fellowships and Grants (years funded, title, amount)

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 CO2 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

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

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

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

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.