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University of Miami
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EMPLOYMENT HISTORY

Postdoctoral Researcher *September 2022-Present*
University of Miami
Department of Physics
Advisor: Dr. Vivek N. Prakash

Postdoctoral Researcher *May 2022-August 2022*
Georgia Institute of Technology
School of Civil and Environmental Engineering
Advisor: Dr. Donald. R. Webster

EDUCATION

Ph.D. Georgia Institute of Technology *August 2017-May 2022*
Ocean Science and Engineering
Minor in Applied Mathematics
Advisors: Dr. Jeannette Yen & Dr. Donald R. Webster

B.S. Allegheny College *September 2013-June 2017*
Biology, Music
Dr. Milton Ostrofsky & Dr. Lowell Hepler

PROFESSIONAL DEVELOPMENT

University of Miami Teaching Academy *Fall 2024*
A selective program where postdoctoral fellows and graduate student participants build teaching competencies, apply skills in a teaching session, and prepare components of a teaching portfolio to prepare for teaching positions in academia.

RESEARCH INTERESTS

Small-scale biomechanics, marine invertebrates, invertebrate morphology, bio-fluid interactions, marine ecology, life in low and intermediate Reynolds number environments

PUBLICATIONS

Peer-Reviewed

1. **Ruszczyk, M.**, Webster, D. R., Yen, J. (in press). The response of a freshwater copepod to small-scale, dissipative eddies in turbulence. *Limnology and Oceanography.* Early view: https://aslopubs.onlinelibrary.wiley.com/doi/full/10.1002/lno.12402
2. Gooshvar, S., Madhu, G., **Ruszczyk, M.**, Prakash, V. N. (2023). Non-bilaterians as model systems for tissue mechanics. *Integrative and Comparative Biology.* 63(6), 1442-1454.

https://doi.org/10.1093/icb/icad074

3. **Ruszczyk, M.**, Webster, D. R., Yen, J. (2022). Trends in stroke kinematics, Reynolds number, and swimming mode in shrimp-like organisms. *Integrative and Comparative Biology,* 62(3), 791-804. https://doi.org/10.1093/icb/icac067
4. **Ruszczyk, M.**, Webster, D. R., Yen, J. (2021). Dual phase-shifted ipsilateral metachrony in *Americamysis bahia. Integrative and Comparative Biology.* 61(5), 1644-1657. https://doi.org/10.1093/icb/icab119
5. Byron, M. L., Murphy, D. W., Katija, K., Hoover, A. P., Daniels, J., Garayev, K., Takagi, D., Kanso, E., Gemmell, B. J., **Ruszczyk, M.**, Santhanakrishnan, A. (2021). Metachronal motion across scales: Current challenges and future directions. *Integrative and Comparative Biology,* 61(5), 1674-1688. https://doi.org/10.1093/icb/icab105

In Prep

1. **Ruszczyk, M.**, Rodriguez, S., Alimi, W., Tuen, M., Rux, K., Chandragiri, C., Brown, O., Xia, J., Kiel, P. M., Stickley, M., Haus, B. K., Baker, A. C., Miller, M. W., Suraneni, P., Langdon, C., Prakash, V. N. (in prep) Local alkalinity enhancement using artificial substrates to increase growth and survivorship in early-stage coral recruits. (2024)
2. Shrestha, B. D., Chandragiri, S., Gibson, C. D., Couture, N. R., **Ruszczyk, M.**, Prakash, V. N. (in prep). Confinement induced vortex generation in marine larvae. (2024).

TEACHING EXPERIENCE

Graduate Teaching Assistant: Georgia Institute of Technology

Course	Responsibilities	Semester(s)
Ecology Lab (BIOL 2336)	• Prepare 30-60min lectures on lab topic • Assist students on weekly lab projects • Grade quizzes, lab handouts, and lab reports	*Fall 2021, Fall 2017*
Experimental Design and Statistical Methods (BIOL 4401)	• Grade homework • Provide office hours outside of class to review topics	*Summer 2018*
Organismal Biology Lab (BIOL 1521)	• Prepare 30-60min lectures on lab topic • Assist students on weekly lab projects • Grade quizzes, lab handouts, and lab reports	*Spring 2018*

Undergraduate Teaching Assistant: Allegheny College

Course	Responsibilities	Semester(s)
Chemical Concepts II (CHEM 122)	• Prepare and monitor lab projects for introductory chemistry class	*Spring 2015*
Chemical Concepts I (CHEM 120)	• Prepare and monitor lab projects for introductory chemistry class	*Fall 2014*

INVITED SEMINARS

University of Miami: Modern Physics Honors Seminar *2022*
Trends in stroke kinematics, Reynolds number, and swimming mode in shrimp-like organisms

University of Miami: Invertebrate Neuroscience Meeting *2022*
Trends in stroke kinematics, Reynolds number, and swimming mode in shrimp-like organisms

Georgia Institute of Technology: Ocean Science and Engineering Seminar *2022*
Dual phase-shifted ipsilateral metachrony in *Americamysis bahia*

RESEARCH MENTORING EXPERIENCE

Undergraduate Students

- Senior Thesis Committee Member
    - Owen Brown: Synthesizing artificial replicates of rising coral gamete bundles (Fall 2023 – Spring 2024)
- Independent Research Mentor
    - Owen Brown: Concrete effects on local alkalinity (Summer 2023), Flow field analysis of coral larvae (Spring 2023)
    - Johnnie Xia: Coral gamete rising rates (Spring 2023 – Summer 2023)
    - Maria Cardelino: Kinematic analysis of phytoplankton in a Burgers vortex (Summer 2022)
    - Gianna Perretta: Kinematic analysis of phytoplankton in a Burgers vortex (Summer 2022)
    - Anikait Dhond: Digitization of copepod motion in a Burgers vortex (Summer 2021, Spring 2022)
    - Ashley Jhun: Digitization of copepod motion in a Burgers vortex (Summer 2021)
    - Ngoc Thuy An (Keira) Tran: Digitization of copepod motion in a Burgers vortex (Summer 2021)
    - Juliette Goff: Digitization of copepod motion in a Burgers vortex (Spring 2021)
    - Agam Singh: Digitization of copepod motion in a Burgers vortex (Spring 2019), Digitization of krill biomechanics (Fall 2019-Fall 2020)
    - Anugraha Babuji: Digitization of krill biomechanics (Summer 2020)
    - Emma Slater: Digitization of krill biomechanics (Summer 2020)
    - Enye Lee: Digitization of krill biomechanics (Fall 2019)
    - Kevin Joseph: Digitization of krill biomechanics (Fall 2019)
    - Uma Patel: Digitization of krill biomechanics (Summer 2019)
    - Tianyi Zuo: Digitization of copepod motion in a Burgers vortex (Fall 2018)

FUNDING

Designing optimal artificial substrate for enhanced coral growth
L'Oréal USA for Women in Science [pending]
$60,000 (November 11, 2024 – October 31, 2025)
PI: M. Ruszczyk

Identifying coral larvae's searching strategies for settlement location
National Science Foundation: Postdoctoral Fellowship: OCE-PRF [declined]
$167,800 (July 1, 2024 – June 30, 2026)
PI: M. Ruszczyk

HONORS AND AWARDS

1st Prize Poster Presentation for Physical Sciences & Engineering *2024*
Received for "Physicochemical dynamics of substrates for enhanced coral growth in laminar flow conditions" at the University of Miami's Graduate Student and Postdoc Research Symposium

Excellence in Teaching: Student Choice Award *2018*
Received for teaching Ecology (2017) at Georgia Institute of Technology

Interdisciplinary Studies Faculty Prize *2017*
Received for undergraduate research thesis, "Serial Sonification of *Chaoborus* Behavior in Response to *Daphnia* Size: The Intricacies of the Predator-Prey Relationship"

Aquatic Chemical Ecology Research Experience for Undergraduates *2016*
Summer position in J. Yen's laboratory at Georgia Institute of Technology funded by the National Science Foundation working on the research project, "Mate tracking behavior of *Hesperodiaptomus shoshone.*"

PROFESSIONAL SERVICE

Scientific Journal Reviews
- Proceedings of the Royal Society B (1)
- Integrative and Comparative Biology (2)

Conference Organization
- Ocean Visions 2019 (Atlanta, GA): Building Manager and Tech Supervisor
- APS DFD 2018 (Atlanta, GA): Student AV Volunteer

Judge
- 2024 Undergraduate Research, Creativity, and Innovation Forum (University of Miami; Miami, FL)

SCIENTIFIC OUTREACH

Connecting Science and Art: "Coral" Music *2023-Present*
Collaboration with Doctor of Musical Arts candidate and two undergraduate students in the Frost School of Music at the University of Miami to compose sonifications based on coral larvae swimming trajectories.

PROFESSIONAL AFFILIATIONS

The Society for Integrative and Comparative Biology *2020-Present*
American Physics Society, Division of Fluid Dynamics *2019-Present*
Association for the Sciences of Limnology and Oceanography *2019-Present*

CONFERENCE PRESENTATIONS

Ruszczyk, M., Chandragiri, S., Alimi, W., Brown, O., Kiel, P. M., Xia, J., Haughey-Gramazio, C., Baker, A., Stickley, M., Miller, M. W., Langdon, C., Suraneni, P., Prakash, V. N. Physiochemical dynamics of substrates for enhanced coral growth in laminar flow conditions [eLightning]. In: Ocean Sciences Meeting; February 18-23, 2024; New Orleans, Louisiana.

Ruszczyk, M., Webster, D. R., Yen, J. Copepod from alpine ponds responds different than marine copepods to dissipation-scale turbulent flow structure [poster]. In: ASLO 2023 Aquatic Sciences Meeting; June 4-9, 2023; Palma de Mallorca, Spain. Poster ID: 749.

Ruszczyk, M., Webster, D. R., Yen, J. A freshwater copepod's response to dissipation-scale turbulent flow structure [abstract]. In: The Society for Integrative and Comparative Biology Annual Meeting 2023; January 3-7, 2023; Austin, Texas.

Ruszczyk, M., Cardelino, M., Perretta, G., Elmi, D., Webster, D. R. Phytoplankton morphology affects susceptibility to aggregation via microscale turbulence [abstract]. In: 75th Meeting of the APS Division of Fluid Dynamics; November 20-22, 2022; Indianapolis, Indiana. Abstract ID: J05.00007.

Ruszczyk, M., Webster, D. R., Yen, J. Metachrony across swimming modes and Reynolds number in free-swimming crustaceans [abstract]. In: Ocean Sciences Meeting; February 27-March 4, 2022; Honolulu, Hawaii.

Ruszczyk, M., Webster, D. R., Yen, J. Trends in Reynolds number, swimming behavior, and metachronal stroke kinematics in free-swimming crustaceans [abstract]. In: The Society for Integrative and Comparative Biology Annual Meeting 2022; January 3-7, 2022; Phoenix, Arizona.

Ruszczyk, M., Webster, D. R., Yen, J. Benefits of concurrent metachronal cycles as observed in *Americamysis bahia* [abstract]. In: 74th Meeting of the APS Division of Fluid Dynamics; November 21-23, 2021; Phoenix, Arizona.

Ruszczyk, M., Webster, D. R., Yen, J. Metachronal Stroke Kinematics in *Euphausia pacifica* [abstract]. In: Southeast Regional Society for Integrative and Comparative Biology; November 6, 2021; Atlanta, Georgia.

Ruszczyk, M., Webster, D. R., Yen, J. Dual phase-shifted ipsilateral metachrony in *Americamysis bahia* [invited speaker]. In: The Society for Integrative and Comparative Biology Annual Meeting 2021; January 3-February 28, 2021; Washington D. C.

Ruszczyk, M.., Webster, D. R., Yen, J. Metachronal Swimming in Pacific Krill, *Euphausia pacifica* [poster]. In: Ocean Sciences Meeting; February 16-21, 2020; San Diego, California. Poster ID: PI44A-2527.

Ruszczyk, M., Webster, D. R., Yen, J. Freshwater Copepod Behavior in Turbulent Eddies [abstract]. In: 72nd Meeting of the APS Division of Fluid Dynamics; November 23-26, 2019; Seattle, Washington. Abstract ID: P32.008.

Ruszczyk, M., Webster, D. R., Yen, J. Underwater propulsion at intermediate *Re*: Multi-oar biomechanics of mysids [abstract]. In: 71st Meeting of the APS Division of Fluid Dynamics; November 18-20, 2018; Atlanta, Georgia. Abstract ID: BAPS.2018.DFD.G22.2.

RESEARCH EXPERIENCE

Alkalinity Effects on Coral Growth in Flow *2022-present*
University of Miami
Advisor: V. N. Prakash
Collaborators: DARPA X-REEFS Team (Project Website) including B. K. Haus[1], A. C. Baker[2], M. W. Miller[3], P. Suraneni[4], C. Langdon[2]
Additional Affiliations: [1]Ocean Sciences, Rosenstiel School of Marine, Atmospheric, and Earth Science, University of Miami; [2]Marine Biology and Ecology, Rosenstiel School of Marine, Atmospheric, and Earth Science, University of Miami; [3]SECORE International; [4]Civil and Architectural Engineering, College of Engineering, University of Miami

- Does increasing local alkalinity for settled coral larvae using different cement compounds increase coral growth under flow conditions in a laboratory setting?

Rising Rates of Coral Gamete Bundles *2022-present*
University of Miami
Advisor: V. N. Prakash
Collaborators: M. W. Miller[2], K. O'Neil[5], M. McGonigle[2]
Additional Affiliations: [2]SECORE International; [5]The Florida Aquarium

- Estimate density of coral gamete bundles from the rising rates during spawning

Kinematic Analysis of Phytoplankton Trajectories in Burgers Vortex *2022*
Georgia Institute of Technology
Advisor: D. R. Webster

- How does phytoplankton morphology affect interactions with microscale turbulence?

Crustacean Behavior and Morphology in Low and Intermediate Reynolds Number Environments *2017-2022*
Georgia Institute of Technology
Doctoral Thesis
Advisors: D. R. Webster, J. Yen
Committee Members: E. Di Lorenzo[6], M. J. Weissburg[7], D. W. Murphy[8]
Additional Affiliations: [6]Earth, Environmental, and Planetary Sciences, Brown University; [7]Biological Sciences, Georgia Institute of Technology; [8]Mechanical Engineering, University of South Florida.

- How does the physics of living in a fluidic environment impact the ecology and morphology of plankton?
- Quantify and characterize swim modes and gait parameters of *Euphausia pacifica* and *Americamysis bahia*
- Quantify the freshwater *Hesperodiaptomus shoshone*'s behavioral response to vortices of various orientations and intensities and compare to marine species

Serial Sonification of *Chaoborus* Behavior in Response to *Daphnia* Size: Intricacies of the Predator-Prey Relationship *2016-2017*
Allegheny College
Undergraduate Thesis
Advisors: M. Ostrofsky, L. Hepler, S. Wissinger

- Can *Chaoborus* detect differences in the size of their prey, resulting in a preference before physical contact?
- Relate data across disciplines and compose a piece of music based on results

Mate Tracking Behavior of *Hesperodiaptomus shoshone* *2016*
Georgia Institute of Technology
REU Position
Advisor: J. Yen

- Where do copepods determine the sex of the copepod they track, before or upon physical contact?

Ultraviolet Light is not the Sole Trigger of Diel Vertical Migration in *Daphnia* *2015*
Allegheny College
Advisor: M. Ostrofsky

- How does a 12:12 UV-only photoperiod affect the migration habits of *Daphnia*?

The Impact of Environmental Stress on the Immune System of *Plethodon cinereus* *2014*
Allegheny College
Advisor: M. Venesky

- Does susceptibility to fungal pathogens increase in red-backed salamanders under increased corticosterone levels?

Photoreactivation Efficiency in *Serratia marcescens* at Various Wavelengths *2014*
Allegheny College
Advisor: T. Humphreys

- Does photolyase in *Serratia* have an ideal wavelength at which it functions to correct mutations from ultraviolet light?

REFERENCES

Dr. Vivek N. Prakash (Postdoctoral advisor) *vprakash@miami.edu*
Assistant Professor
Department of Physics
Secondary Faculty in Biology and Marine Biology & Ecology
University of Miami
Miami, FL 33146-1155

Dr. Donald R. Webster (Postdoctoral advisor, Ph.D. advisor) *dwebster@ce.gatech.edu*
Karen & John Huff School Chair and Professor
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