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University of Miami
Department of Physics
Knight Physics Building
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Coral Gables, FL 33146

EDUCATION AND TRAINING

Postdoctoral Researcher

University of Miami
Department of Physics
Advisor: Dr. Vivek N. Prakash

September 2022-Present

Georgia Institute of Technology
Civil and Environmental Engineering
Advisor: Dr. Donald R. Webster

May 2022-August 2022

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

August 2017-May 2022

B.S. Allegheny College
Biology and Music
Dr. Milton Ostrofsky & Dr. Lowell Hepler

September 2013-June 2017

RESEARCH INTERESTS

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

HONORS AND AWARDS

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"

PUBLICATIONS

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.

Ruszczyk, M., Webster, D. R., Yen, J. (2021). Dual phase-shifted ipsilateral metachrony in *Americamysis bahia*. *Integrative and Comparative Biology*. 61(5), 1644-1657.

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.

CONFERENCE PRESENTATIONS

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.

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

TEACHING EXPERIENCE

Georgia Institute of Technology

- Ecology Lab (BIOL 2336) 2017, 2021
- Experimental Design and Statistical Methods (BIOL 4401) 2018
- Organismal Biology Lab (BIOL 1521) 2018

Allegheny College

- Chemical Concepts II 2015
- Chemical Concepts I 2014

RESEARCH EXPERIENCE

Kinematic Analysis of Phytoplankton Trajectories in Burgers Vortex

Georgia Institute of Technology 2022

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

- 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 *Hesperodiptomus 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 *Hesperodiptomus shoshone*

2016

Georgia Institute of Technology

REU Position

Advisor: J. Yen

- Where do copepods determine the sex of the copepod they are tracking; 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?

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 Oceanography and Limnology 2019-Present

SCIENTIFIC OUTREACH

Ocean Visions Planning Committee 2019

Building Manager and Tech Supervisor

Last Updated: December 14, 2022