Benjamin Davidson

PhD Candidate

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Education

September 2020 – Present
University of Wisconsin - Madison, Madison, WI
PhD Candidate: Civil and Environmental Engineering
Minor: Mechanical Engineering
DELTA Teaching Certificate - Completed August 2024
Cumulative GPA: 3.988 of 4.0

September 2016 – May 2020
Luther College, Decorah, IA
BA: Physics – Summa Cum Laude
Minors: Mathematics and Environmental Studies
Cumulative GPA: 3.920 of 4.0

Research Experience

August 2020 - Present
Graduate Research Assistant
Project: Marine Debris in Coastal Environments: Transport and Fate in the Swash Zone
Location: University of Wisconsin - Madison
Advisor: Nimish Pujara, PhD

- Investigated the transport and fate of buoyant marine debris in coastal environments through fieldwork, wave flume and wave basin experiments, and computational modeling.
- Retrieved and isolated microplastics from beach sediments on Western Lake Superior to investigate trends in microplastic beach deposition.
- Developed a simple beaching model (1D) for buoyant marine debris with wave flume experimental validation and expanded it to a 2D model to account for oblique waves.
- Demonstrated a novel dispersion regime for buoyant debris in the swash zone and explored implications for particle transport and fate.

January 2024
Transatlantic Research Partnership
Project: Casimir Study in Surface Wave Turbulence
Location: IRPHE - CNRS, Marseille, France
Advisors: Gautier Verhille, PhD and Nimish Pujara, PhD

- Initiated preliminary experiments to study the Casimir effect on buoyant marine debris in surface wave turbulence.

May 2019 - May 2020
NSF Research Experience for Undergraduates
Project: Rayleigh Wave Attenuation Tomography
Location: Incorporated Research Institutions for Seismology & Brown University, Providence, RI
Advisor: Colleen Dalton, PhD

- Developed structural model of the crust and upper mantle beneath Alaska using Rayleigh wave attenuation.

September 2018 - May 2019
Undergraduate Student Research Assistant
Project: Nano-scale Friction and Wear
Location: Luther College, Decorah, IA
Advisor: Erin Flater, PhD

- Researched in nanotribology lab investigating nano-scale wear through atomic force microscopy experiments.

Leadership and Teaching Experience

Spring 2024 | **Delta Internship**
Location: University of Wisconsin - Madison
- Developed an enrichment activity for local high school students to explore the mathematical modeling of beach plastics through simple coding exercises.

August 2023 - Present | **Grainger Engineering Design Innovation Lab Fabrication Fellowship**
Location: University of Wisconsin - Madison
- Managed 3D printing operations at the UW - Madison Engineering Design Innovation Lab (makerspace).
- Supervised team of undergraduate student staff to maintain and assist users with equipment.
- Mentored first year teams through the process from design to fabrication of a product to benefit a real-world client.

Fall 2021 & Fall 2022 | **Introductory Fluid Mechanics Teaching Assistant**
Location: University of Wisconsin - Madison
- Led discussion sections and facilitated hands-on laboratory exploration of fluid mechanics principles for undergraduate introductory fluid mechanics course.

Fall 2017 | **Physics Lab Assistant**
Location: Luther College, Decorah, IA
- Assisted students through hands on laboratory discovery and understanding of material for General Physics I.

Fall 2018 - Spring 2020 | **Physics Tutor**
Location: Luther College, Decorah, IA
- Drop in and individual tutoring for students in physics classes at Luther College.

Outreach and Service

August 2023 | **Young Coastal Scientist and Engineers Conference - Americas (YCSEC-A)**
Location: University of Wisconsin - Madison
- Served as a member of the local organizing committee: assisting in the organization and facilitation of the YCSEC-A conference hosted in Madison, WI.

Spring 2022 - 2023 | **Engineering Expo**
Location: University of Wisconsin - Madison
- Assisted in presenting engineering topics of waves and beaching to high school students.

February 2023 | **Wisconsin Sea Grant Ask a Scientist**
Location: Rhinelander High School - Rhinelander, WI (virtual)
- Presented a virtual lesson to high school students about microplastics in the Great Lakes.

Summer 2022 & 2023 | **UW - Madison Grandparents University**
Location: University of Wisconsin - Madison
- Led outreach event for elementary and middle school aged youth and their grandparents to explore water waves in the UW-Madison wave flume. We also explored the issue of microplastics and connection to the Great Lakes.

April 2022 | **UW - Madison Day at the Capitol**
Location: Wisconsin State Capitol
- Presented work regarding microplastic pollution and issues to legislators and staff at the Wisconsin state capitol.

Undergraduate Mentoring

Summer 2024	**Ethan Steichen -** Marine Debris Beaching Experiments at Queen's University
Fall 2022 - Summer 2023	**Jamie Brenner -** Marine Debris Beaching Models and Experiments at Queen's University
Fall 2021 - Summer 2022	**Sabeel Samrah -** Microplastics on Lake Superior Beaches
Spring/Summer 2021	**Kallyn Batista -** Microplastics on Lake Superior Beaches

Publications

2025 Shatara, F. J., **Davidson, B.**, Pujara, N. & Majumder, E. L.-W. Amplicon sequences from enriched communities obtained at the mouth of tributaries along Lake Superior's southern shore. *Microbiology Resources Announcements* (in press).

2023 **Davidson, B.**, Brenner, J. & Pujara, N. Beaching model for buoyant marine debris in bore-driven swash. *Flow* **3,** E35 (2023).

2022 **Davidson, B.**, Batista, K., Samrah, S., Rios Mendoza, L. M. & Pujara, N. Microplastic contamination of sediments across and within three beaches in western Lake Superior. *Journal of Great Lakes Research* **48,** 1563–1572 (2022).

Presentations

2024 **Davidson, B.** *Modeling buoyant debris transportation and deposition in the swash zone with experimental validation.* Invited Lecture. WHOI COFDL Seminar, Woods Hole Oceanographic Institution - Woods Hole, MA, 2024.

Davidson, B. *Plastics on Beaches.* Invited Lecture. Weston Lecture Series, University of Wisconsin - Madison, 2024.

Davidson, B., Brenner, J., Mulligan, R., Chardon-Maldonado, P., Puleo, J. & Pujara, N. *Debris transport and deposition in the swash zone from oblique surface waves.* Oral Presentation. American Geophysical Union - Ocean Sciences Meeting, 2024.

Davidson, B., Brenner, J., Mulligan, R., Chardon-Maldonado, P., Puleo, J. & Pujara, N. *The impact of marine debris geometry on alongshore swash zone particle transport.* Oral Presentation. Young Coastal Scientists and Engineering Conference - Americas, 2024.

2023 **Davidson, B.**, Batista, K., Samrah, S., Rio Mendoza, L. & Pujara, N. *Microplastic contamination of beach sediments: unpacking trends across three sites in Western Lake Superior.* Oral Presentation. International Association of Great Lakes Research Annual Conference, 2023.

Davidson, B., Brenner, J. & Pujara, N. *Simple beaching model for buoyant marine debris with experimental validation.* Oral Presentation. Young Coastal Scientist and Engingeering Conference - Americas, 2023.

2022 **Davidson, B.**, Batista, K., Samrah, S. & Pujara, N. *Microplastics in Lake Superior Beach Sediments.* Oral Presentation. Wisconsin Section of the American Water Resources Association Annual Meeting, 2022.

Davidson, B., Batista, K., Samrah, S., Tran, J., Kubenik, T., Rios Mendoza, L., Denison, A., Rylander, Z., Wellnitz, T., Haines, D. & Pujara, N. *Lake Superior Microplastic Pollution.* Poster Presentation. UW - Madison Graduate Research Symposium at the Capitol, 2022.

Davidson, B. & Pujara, N. *Modeling the Physical Beaching Process of Microplastic Particles.* Oral Presentation. American Physical Society - Division of Fluid Dynamics Annual Meeting, 2022.

2021 **Davidson, B.**, Batista, K. & Pujara, N. *Lake Superior Microplastic Density in Beach Sediments.* Oral Presentation. Young Coastal Scientist and Engingeering Conference - Americas, 2021.

Davidson, B. & Pujara, N. *Physical Beaching Process of Microplastic Particles.* Poster Presentation. American Geophysical Union Annual Meeting, 2021.

Honors & Awards

2025 **Becker Travel Award (YCSECA)**
- Research presentation scholarship of $200 to travel to and present at the CoPartCoFlow summer school in France, in June 2025.

2024 **Becker Travel Award (YCSECA)**
- Research presentation scholarship of $100 to travel to the YCSECA Conference in Quebec City, Quebec Canada, in June 2024.

2024 **Student Research Grants Competition**
- Research presentation scholarship of $1,500 to travel to the AGU Ocean Sciences Meeting, in February 2024.

2023 **Student Research Grants Competition**
- Research funding scholarship of $1,500 to conduct debris beaching experiments in the Queen's University wave basin (Kingston, ON).

2023 **Becker Travel Award (IAGLR)**
- Travel award to attend and present at the International Association of Great Lakes Research annual meeting.

2023 **IAGLR Student Travel Award**
- Student travel award for International Association of Great Lakes Research annual meeting.

2022 **Becker Travel Award (APS)**
- Travel award to attend and present at the American Physical Society - Division of Fluid Dynamics annual meeting.

2021 **Anna Grant Birge Scholarship**
- Research funding scholarship of $1,500 for microplastic analysis and laboratory microplastic beaching experiments.

2021 **YCSECA - Student Presentation Award**
- Outstanding oral presentation award at the Young Coastal Scientists and Engineers Conference - Americas 2021.

2020 **Phi Beta Kappa**
- Inducted into Phi Beta Kappa, academic honor society.

2019 **Herman E. Ellingson Prize in Physics**

2018 **Sigma Pi Sigma**
- Inducted into Sigma Pi Sigma, physics honor society.

2018 **Pi Mu Epsilon**
- Inducted into Pi Mu Epsilon, mathematics honor society.

Skills

Research and Analysis	Design and Fabrication	Communication Skills
Experimental Research	3D Printing (FDM, SLA, SLS)	Written and Oral Communication
Image Processing	3D Modeling (Onshape)	Science Communication and Outreach
MATLAB	Engineering Design	Teaching and Mentoring
Data Acquisition Systems	Micro-controllers	
Particle Image Velocimetry	T-slot Framing Systems (8020)	