

## 👤 Summary

Ph.D. candidate at MIT studying Hydrodynamics. Seeking to understand the creation and evolution of bubbles in turbulent free surface flow to enable better prediction of ship-wake signatures. Demonstrated skill in: fundamental hydrodynamics research, naval architecture and marine engineering, development of novel computational methods, teaching and communication.

## 🎓 Education

**Ph.D., Hydrodynamics | Minor, Acoustics** **Fall, 2025**

Massachusetts Institute of Technology – Cambridge, MA

Thesis: *Evolution of Turbulent Bubbly Flow Beneath an Entraining Free Surface*, supervised by Prof. Yue.

**S.M., Naval Architecture & Marine Engineering** **2021**

Massachusetts Institute of Technology – Cambridge, MA

**B.S., Naval Architecture & Marine Engineering** **2019**

Webb Institute – Glen Cove, NY

## 🔬 Research and Teaching

**Research Assistant** Massachusetts Institute of Technology – Cambridge, MA **2019 – Present**

- Formulated a new computational algorithm for tracking bubbles in two-phase DNS, which enabled the first direct measurement of bubble creation mechanisms in simulations of turbulent free surface flow (*J. Comput. Phys.*, 2022).
- To inform modeling and predicting of ship-wake signatures, used theory and simulations to show how the size distribution of bubbles created in the wake of a ship depends on the strength of turbulence, and that the distribution is distinct from that created by breaking waves (*J. Fluid Mech.*, 2024; *SNH*, 2024).
- Invented a new method to improve ship sonar performance by combining knowledge of bubble populations and acoustics.
- Wrote a white paper and subsequent proposal which led to a five year grant from ONR for our lab to continue working on bubbly ship wakes; presented quarterly research updates to ONR and other groups working on the problem.
- Mentored a first-year graduate student in the use of our lab's CFD tools; significantly improved the documentation of the code to make it easier for them and future graduate students to understand.
- Served as system administrator; responded to outages and updated the networking infrastructure and off-site file backup process to improve reliability.

**Teaching Assistant** Massachusetts Institute of Technology – Cambridge, MA **2020 – Present**

- Graduate courses: Marine Hydrodynamics (Fall 2020, 2021); Design Principles for Ocean Vehicles (Spring 2023, 2025); Stochastic Systems (Spring 2023, 2025).
- Developed and presented weekly recitations to teach students how to apply the theories learned in lecture to practice.
- Held office hours twice a week to work one-on-one with students to answer questions about assignments.
- Created and graded exams and weekly assignments.

## ✂ Skills

### High Performance Computing

Compiled languages (C++ and FORTRAN); Parallel programming (MPI and OpenMP); Build systems (Make, CMake); Version control (Git and Github); Job scheduling (Slurm and PBS); Parallel program debugging and profiling (ARM and Intel software); Linear matrix solver (HYPRE); Post-processing large data sets (ParaView, MATLAB, Python).

### Acoustics

Scattering and absorption by populations of air bubbles; Modeling ocean propagation (Bellhop, KRAKEN); Fourier analysis.

### Software

**Fluids:** Star-CCM+; AEGIR (potential flow); GHS; XFOIL; OpenProp (propeller design). **3D Modeling:** AutoCAD; Rhino; SolidWorks; Blender. **General:** LaTeX; Excel; Power Point; Word.

## Work Experience

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| <b>Student Intern</b>                                                                                                                                                                                                                                                                                                                                                | Navatek, Ltd. – Portland, ME                     | <b>Jan – Feb, 2019</b> |
| <ul style="list-style-type: none"><li>– Created a graphical user interface to enable faster calculation of static stability while exploring trimaran design spaces.</li><li>– Generated 3D models of advanced hull form concepts for CFD evaluation.</li><li>– Produced illustrative renderings of new undersea technology in support of an SBIR proposal.</li></ul> |                                                  |                        |
| <b>Student Intern</b>                                                                                                                                                                                                                                                                                                                                                | Donald L. Blount and Associates – Chesapeake, VA | <b>Jun – Aug, 2018</b> |
| <ul style="list-style-type: none"><li>– Analyzed dynamic stability of military and recreational high-speed planing craft for design reports.</li><li>– Developed GHS macros which made analysis of multiple static loading conditions much faster.</li><li>– Interpreted tow tank results for a report on the powering requirements of a vessel.</li></ul>           |                                                  |                        |
| <b>Student Intern</b>                                                                                                                                                                                                                                                                                                                                                | Gilbert Associates, Inc. – Braintree, MA         | <b>Jan – Feb, 2018</b> |
| <ul style="list-style-type: none"><li>– Developed structural arrangements and machinery selection for motor vehicle ferries, including designs for installing a new bow thruster and the addition of a crew berth designed to ABS rules.</li></ul>                                                                                                                   |                                                  |                        |
| <b>Student Intern</b>                                                                                                                                                                                                                                                                                                                                                | General Dynamics Electric Boat – New London, CT  | <b>Jun – Aug, 2017</b> |
| <ul style="list-style-type: none"><li>– Worked in the Internal Structures and Arrangements department developing finite element meshes for shock analysis.</li></ul>                                                                                                                                                                                                 |                                                  |                        |
| <b>Student Intern</b>                                                                                                                                                                                                                                                                                                                                                | General Dynamics NASSCO – San Diego, CA          | <b>Jan – Feb, 2016</b> |
| <ul style="list-style-type: none"><li>– Inspected spaces on naval vessels undergoing repair and produced daily reports documenting any outstanding work.</li></ul>                                                                                                                                                                                                   |                                                  |                        |

## Leadership Experience

Student President of Edgerton Graduate Dorm	2022 – 2024
Captain of MIT Curling Team	2020 – 2025
Captain of Webb Sailing Team	2016 – 2018

## Awards

**Clement F. Burnap Award** (2024). Awarded by the Mechanical Engineering Department at MIT for an outstanding Masters of Science in the marine field. **The William M. Kennedy Scholarship** (2019). Graduate scholarship awarded by the Society of Naval Architects & Marine Engineers. **Charles A. Ward, Jr. Memorial Prize** (2019). Commencement award from Webb Institute for excellence in Naval Architecture & Marine Engineering.

## Journal Papers

- D. Gaylo & D. K.P. Yue. “Size distribution of large air bubbles entrained by strong free-surface turbulence”. *in preparation*.
- D. Gaylo, K. Hendrickson & D. K.P. Yue (2024). “Effect of degassing on bubble populations in air-entraining free-surface turbulent flows”. *Journal of Fluid Mechanics* 995, A12.
- D. Gaylo, K. Hendrickson & D. K.P. Yue (2023). “Fundamental time scales of bubble fragmentation in homogeneous isotropic turbulence”. *Journal of Fluid Mechanics* 962, A25.
- D. Gaylo, K. Hendrickson & D. K.P. Yue (2022). “An Eulerian label advection method for conservative volume-based tracking of bubbles/droplets”. *Journal of Computational Physics* 479, 111560.
- D. Gaylo, K. Hendrickson & D. K.P. Yue (2021). “Effects of power-law entrainment on bubble fragmentation cascades”. *Journal of Fluid Mechanics* 917, R1.

## Conference Presentations

For a complete list, see [dgaylo.com/publications](https://dgaylo.com/publications)

- D. Gaylo, K. Hendrickson & D. K.P. Yue (2024). “Quantifying Entrainment and Degassing of Bubbles by Free-Surface Turbulence for Ship Wake Applications”. *35<sup>th</sup> Symposium on Naval Hydrodynamics*, Nantes, France.
- D. Gaylo, K. Hendrickson & D. K.P. Yue (2024). “Degassing-dominated bubble populations in air-entraining free-surface turbulence”. *77<sup>th</sup> Annual Meeting of the APS Division of Fluid Dynamics*, Salt Lake City, USA.
- D. Gaylo, K. Hendrickson & D. K.P. Yue (2022). “Quantifying Fragmentation Statistics in Two-Phase Turbulent Flows for Ship Wake Applications”. *34<sup>th</sup> Symposium on Naval Hydrodynamics*, Washington D.C., USA.