

# CURRICULUM VITAE

## GABRIEL D. WEYMOUTH

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### EDUCATION

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| <b>Sc.D., Ocean Engineering</b> , Massachusetts Institute of Technology<br><b>Thesis:</b> "Physics and Learning Based Computational Models for Breaking Bow Waves Based on New Boundary Immersion Methods" | <b>2008</b> |
| <b>M.S., Mechanical Engineering</b> , University of Iowa<br><b>Thesis:</b> "RANS CFD Predictions of Pitch and Heave Ship Motions"  | <b>2002</b> |
| <b>B.S., Naval Architecture and Marine Engineering</b> , Webb Institute<br><b>Thesis:</b> "An Engineering Method for the Inclusion of Viscous-Inviscid Interaction in Computational Ship Hydrodynamics"    | <b>2001</b> |

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### RESEARCH AND ACADEMIC INTERESTS

- **Free-interface fluid dynamics** - high energy breaking waves, mixed two-phase fluid dynamics, air entrainment and bubble dynamics
- **Hydrodynamic sensing** - environmental mapping and flow optimization from pressure information
- **Computational fluid dynamics** - Cartesian-grid methods, BDIM: boundary data immersion method, cVOF: conservative volume of fluid method
- **Computational learning and optimization** - PBLM: physics based learning models, machine learning, evolutionary algorithms
- **High-performance computing** - massively parallel systems, 100M+ point simulations, Object Oriented Programming

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### RESEARCH AND PROFESSIONAL EXPERIENCE

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| <b>Vortical Flow Research Laboratory, MIT - Cambridge, MA</b><br><i>Post Doctoral Research Associate</i> | <b>2008</b><br><b>- present</b> |
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Post-doctoral research funded by Dick K.P. Yue and Michael Triantafyllou investigating the fields of mixed two-phase fluid dynamics and hydrodynamic sensing. Research travel and collaboration with the Singapore MIT Alliance for Research and Technology (SMART ). Co-authored several research grant proposals for funding through the Office of Naval Research, the SMART Innovation Centre, and the Center for Clean Water and Clean Energy at MIT and KFUPM.

**Deep Sea Systems International - Falmouth, MA** **2008**  
*Hydrodynamics and CFD consultant*

Aided in computational analysis for the design phase of a highly maneuverable Remote Operated Vehicle (ROV) for inspection of offshore industry equipment. Project director was Chris Nicholson.

**Vortical Flow Research Laboratory, MIT - Cambridge, MA** **2003**  
*Graduate Research Assistant* **-2008**

Research and investigation in the fields of free-interface fluid dynamics, computational fluid dynamics, and computational learning and optimization. Developed a Cartesian-grid solver for general solid-fluid simulations, as well as libraries of numerical solvers (Multi-Grid, Conjugate-Gradient, etc) and optimizers (Interior Point, Genetic Evolution, Unscented Kalman Filter, etc). Advised by Dick K.P. Yue.

**IIHR (Iowa Institute of Hydraulic Research) - Iowa City, IA** **2001**  
*Graduate Research Assistant* **-2002**

Standardization of verification and validation techniques for CFD, 3D unsteady RANS analysis of ship motions in forced and free response numerical environments. Supervised by Fred Stern and Bob Wilson.

**Northrop Grumman Marine Industries – San Jose, CA** **2000**  
*Undergraduate Intern*

Two-month college internship creating machinery arrangements for engine auxiliary systems of the ACX noncombatant naval vessel. Supervised by Chief Systems Engineer Rob Notman and contract consultant Lincoln B. Evans.

**Band, Lavis and Associates – Annapolis, MD** **2000**  
*Undergraduate Intern*

Two-month college internship working primarily on time domain maneuvering (TDMan) programs for hovercraft preliminary design. Given an extreme amount of flexibility and trusted to work on complicated problems with minimal supervision by senior Naval Architect Brian LaRue.

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## HONORS AND AWARDS

- Recipient of fellowship and research grants at the Massachusetts Institute of Technology **2003**
- Recipient of presidential fellowship at the University of Iowa **2001**
- American Bureau of Shipping Award for Outstanding Thesis **2001**
- Recipient of full academic scholarship at the Webb Institute **1997**

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## JOURNAL PUBLICATIONS

“Physics-based Machine Learning Prediction Models for Computational Ship Hydrodynamics”, Weymouth, G.D. and Yue, D.-K.P., Journal of Ship Research, *in progress*

“Hydrodynamic object recognition using pressure sensing”, Bouffanais, R. Weymouth, G.D. and Yue, D.- K.P., Proceedings of the Royal Society A, *in review*

"Boundary Data Immersion Method for Multi-Phase Flow Simulations on Cartesian grids ", Weymouth, G.D and Yue, D.-K.P., Journal of Computational Physics, *in review*

"Conservative Volume of Fluid Methods for Free-Interface Simulations on Cartesian grids ", Weymouth, G.D and Yue, D.-K.P., Journal of Computational Physics, January 2010

"RANS CFD Prediction of Pitch and Heave Ship Motions in Head Seas", Weymouth, G.D. et al, Journal of Ship Research, June 2005

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## CONFERENCE PAPERS AND PRESENTATIONS

“Bubble Source Modeling Using Macro-Scale Two-Phase Flow Simulations”, Weymouth, G.D. et al, 28th Symposium on Naval Hydrodynamics, *to appear*

“Bubble Entrainment and Evolution Modeling for the Design and Analysis of Naval Vessels”, Weymouth, G.D. et al, IEEE – Proceeding of the DoD HPCMD USC, *to appear*

“Obtaining/Modeling Bubble Source Information from Macro-Scale Two-Phase Flow Simulations”, Dick K.P. Yue, Gabriel Weymouth, Kelli Hendrickson, Sankha Banerjee, Athena & Bubbly Wake Workshop, 2009

“Models and Analysis for Ship Breaking Waves”, Dick K.P. Yue, K. Hendrickson, G. Weymouth, S. Banerjee , ONR Ship Wave-Breaking and Bubbly Wave Review, 2009

“Computational Naval Ship Hydrodynamics”, Douglas G. Dommermuth, Dick K.P. Yue, Kelli Hendrickson, Gabriel Weymouth, Thomas O’Shea, Kyle A. Brucker, and Kristine L. Chevalier, IEEE – Proceeding of the DoD HPCMD USC, 2009

“Models and Analysis for Ship Breaking Waves”, Dick K.P. Yue, Kelli Hendrickson Gabriel Weymouth, Areti Kiara, Bryce Campbell, Sankha Banerjee, ONR Ship Wave-breaking and Bubble Wake Review, 2008

“Cartesian-grid methods for Computational Fluid Dynamics”, Gabriel Weymouth, Guest Lecture at Old Dominion University, 2008

"Modeling Breaking Ship Waves for Design and Analysis of Naval Vessels", Weymouth, G.D. et al, IEEE – Proceeding of the DoD HPCMD USC, 2007

“Models and Analyses for Ship Breaking Waves”, D. K.P. Yue, K. Hendrickson, G. Weymouth, ONR Ship Wave-breaking and Bubble Wake Review, 2007

“An Application of Cartesian-Grid and Volume-of-Fluid Methods to Numerical Ship Hydrodynamics”, Douglas G. Dommermuth, Thomas T. O'Shea, Donald C. Wyatt, Toby Ratcliffe, Gabriel D. Weymouth, Kelli L. Hendrikson, Dick K.P. Yue, Mark Sussman, Paul Adams, and Miguel Valenciano, 9th International Conference on Numerical Ship Hydrodynamics, August 2007

"Advances in Cartesian-grid methods for computational ship hydrodynamics", Weymouth, G.D. et al, 26th Symposium on Naval Hydrodynamics, September 2006

“The numerical simulation of ship waves using cartesian-grid and volume-of-fluid methods”, Douglas G. Dommermuth, Thomas T. O'Shea, Donald C. Wyatt, Mark Sussman, Gabriel D. Weymouth, Dick K.P. Yue, Paul Adams, and Randall Hand, 26th Symposium on Naval Hydrodynamics, September 2006

"Modeling Breaking Ship Waves for Design and Analysis of Naval Vessels", Weymouth, G.D. et al, IEEE – Proceeding of the DoD HPCMD USC 2006

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## ACHIEVEMENTS

- Honored with an official instructor's position in the MIT Tae Kwon Do Club and the American Tae Kwon Do Association (ATA)
- Served two years as the President of the Ocean Engineering Student's Association (13Seas) at MIT helping students link with professionals in the marine science and technology fields
- Elected by the student body to the position of Honor Council Chairman of the Student Organization of Webb Institute

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## INTERESTS

- Participate in collegiate level soccer, tennis, and volleyball, as well as recreational boxing, rugby, flag-football, Tae Kwon Do, and other Martial Arts.
- Active hiker, backpacker, and mountain biker.
- New father of a beautiful baby girl, Arabella Lorelei Weymouth.