

BRYCE CAMPBELL

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EDUCATION

Ph.D., Mech. & Ocean Engineering, Massachusetts Institute of Technology (Feb.) 2015

Thesis: A mechanistic investigation of nonlinear interfacial instabilities leading to slug formation in multiphase flows

Minor: Applied Mathematics

Overall GPA: 4.8/5.0

S.M., Mechanical Engineering, Massachusetts Institute of Technology 2009

Thesis: Nonlinear effects on interfacial wave growth into slug flow

Overall GPA: 4.7/5.0

B.S., Mechanical Engineering, Drexel University 2007

Overall GPA: 3.92/4.0

RESEARCH AND ACADEMIC INTERESTS

Computational fluid dynamics

- two-phase fluid dynamics, multi-phase turbulence, subsea pipeline flow assurance, high energy breaking waves, coupled gas-liquid interface and boundary layer mechanics, sloshing, fluid-structure interaction

Nonlinear wave mechanics

- analytical methods for nonlinear equations (perturbation and asymptotic theory), hydrodynamic stability theory, resonant interaction theory, ocean wind-waves dynamics, wave-impact problems

High-performance computing

- massively parallel computing, high-resolution direct numerical simulations, numerical algorithms

Computational acoustics

- Large-scale(parallel) boundary element simulations of ocean acoustic scattering, structural-acoustic interactions, finite element modeling

WORK EXPERIENCE

Laboratory for Undersea Remote Sensing

Postdoctoral Associate, Research Assistant

April 2016 - Present

Cambridge, MA

- Carried out theoretical and numerical investigations of the impact of structural-acoustic coupling on the performance and efficiency of various stringed instruments. Developed fully coupled Abaqus finite element model for the direct simulation of instrument response. Used data collected from field studies with ocean acoustic waveguide remote sensing to quantify and model the behavior of massive fish shoals in the Nordic Seas. Advised by Professor Nicholas Makris.

Vortical Flow Research Lab

Postdoctoral Associate

January 2015 - Present

Cambridge, MA

- Developed a massively parallel boundary-element acoustic solver that was capable of direct simulation of complex scattering geometries within general ocean environments. Supervised the thesis work of a doctoral student.

Advanced Marine Technology

Engineering Consultant

January 2015 - Present

Cambridge, MA

- Utilized theoretical and computational methods to support an accident investigation involving the collision of two naval shipping vessels.

Vortical Flow Research Lab

Research Assistant

September 2007 - January 2015

Cambridge, MA

- Carried out research in the fields of nonlinear interfacial wave dynamics, analytical methods and computational fluid dynamics. Developed theoretical and numerical methods (finite volume, finite difference, spectral and interface tracking schemes) for the prediction of large nonlinear rogue waves and slugs in oil pipelines with emphasis on subsea pipeline flow assurance. Advised by Dr. Yuming Liu.

Hess Undergraduate Researcher

Research Assistant

January 2006-June 2007

Philadelphia, PA

- Performed research related to damage in curved aluminum fuselage panels of commercial aircraft. Examined subsurface fracture surface morphologies via the scanning-electron microscope. Developed software for data analysis. Advised by Professor Jonathan Awerbuch.

Sarnoff Engineer Co-op

Mechanical Engineer

April 2006-September 2006

Princeton, NJ

- High-voltage electrostatic anti-biological warfare laboratory technician. Developed air-to-liquid aerosol concentrator. Invented novel self-wetting post design for aerosol particle decomposition.
- Aided in engineering a novel type of eye glass using diffraction. Wrote software for micro-fabricating lenses. Clean room technician. Evaluated effectiveness of various lift-off techniques.
- Terahertz anti-biochemical warfare laboratory technician. Helped to design and construct ultra-high vacuum pressure chambers. Performed proof of concept tests for terahertz detection system.

Hess Undergraduate Researcher

Research Assistant

June 2005-April 2006

Philadelphia, PA

- Conducted numerical simulations of methane-air combustion in plug flow reactor and designed/developed corresponding experimental test facility. Advised by Professor Howard Pearlman.

TEACHING EXPERIENCE

Teaching Aide at MIT

Numerical Compaction for Mechanical Engineers (2.086)

Spring 2015

Cambridge, MA

- Responsible for designing homework and computer lab sessions.
- Instructing undergraduate students in programming techniques.

Guest Lecturer at MIT

Marine Hydrodynamics (2.20)

Fall 2013

Cambridge, MA

- Responsible for providing several 90-minute lectures to a class of 35 students.

MIT Teaching Assistant

Marine Hydrodynamics (2.20)

Fall 2009

Cambridge, MA

- Advised by Professor Dick Yue.

- Responsible for teaching 3 weekly class recitations and 1 3-hour office hour session
- Developed problem sets and exam questions
- Responsible for designing, constructing, and proctoring 3 large scale lab sessions in the MIT Tow Tank
- Mechanical engineering department student evaluation scores: 6.76/7.0
-Highest evaluation score out of all of the reported graduate (Mech. Eng.) classes that semester

Drexel University Teaching Assistant
Fluid Mechanics (MEM 220)

Summer 2006
Philadelphia, PA

- Advised by Professor Alisa Morss.
- Responsible for teaching 2 weekly class recitations and 1 2-hour office hour session
- Responsible for grading problem sets and exams
- Assisted in developing of problem sets and exam questions
- Nominated for Teaching Assistant of the Year Award.

Drexel University Teaching Assistant
Dynamics (MEM 238)

Fall 2006
Philadelphia, PA

- Advised by Professor Sorin Siegler.
- Responsible for teaching 2 weekly class recitations and 1 2-hour office hour session
- Responsible for grading problem sets and exams
- Assisted in developing of problem sets and exam questions
- Occasionally asked to give lecture
- Nominated for Teaching Assistant of the Year Award.

JOURNAL PUBLICATIONS

- Campbell, B. K., Liu, Y. Nonlinear coupling of interfacial instabilities with resonant wave interactions in horizontal two-fluid plane Poiseuille/Couette flows: numerical and experimental observation. *J. Fluid Mech.* (Under Review).
- Campbell, B. K., Liu, Y. A nonlinear transition criterion for the prediction of the onset of slugging in horizontal channels and pipes. *Physics of Fluids.* (Accepted).
- Campbell, B. K., Liu, Y. Sub-harmonic resonant interactions in the presence of a linear interfacial instability. *Physics of Fluids.* 26, 082107(2014).
- Campbell, B. K., Liu, Y. Nonlinear resonant interactions of interfacial waves in horizontal stratified channel flows. *J. Fluid Mech.* 717, 612-642 (2013).

CONFERENCE PAPERS AND PRESENTATIONS

- B. K. Campbell, K. Hendrickson, Y. Liu, H. Subramani. Direct numerical simulation of interfacial wave generation in turbulent gas-liquid flows in horizontal channels. American Physical Society: Division of Fluid Dynamics, 2014, San Francisco, CA.
- B. K. Campbell, A. Kiara, K. Hendrickson, Y. Liu, H. Subramani. Multi-dimensional modeling of two-phase flows in channels and pipelines. Offshore Technology Conference, 2013, Houston, TX.
- K. Hendrickson, B.K. Campbell, Y. Liu, and R. Roberts. Understanding and prediction of hydrodynamics of multiphase flow using CFD. 7th International Conference on Multiphase Flow, May 30-June 4, 2010, Tampa, FL.
- B.K. Campbell, Y. Liu, R. Roberts. Growth and nonlinear resonant interactions of interfacial waves in stratified channel flows. 2009 Annual Meeting of the American Institute of Chemical Engineering. November 9, 2009.

- B. K. Campbell, K. Hendrickson, Y. Liu, R. Roberts. Nonlinear effects on interfacial wave growth into slug flow. 28th Conference on Ocean, Offshore, and Arctic Engineering, May 31, 2009, Honolulu, Hawaii, USA.

DEVELOPED COURSE CURRICULUM

Experimental Mechanics Laboratory

Mechanical Engineering Department, Drexel University

Spring 2007

Philadelphia, PA

- Designed a new experimental mechanics laboratory for the undergraduate curriculum.
- Designed and developed experimental facility.
- Wrote laboratory manual "An Introduction to the Fundamental Theory of Vibrations".
- Advised by Professor Jonathan Awerbuch.

HONORS AND AWARDS

- MIT's Wunsch Foundation Silent Hoist and Crane Award for Outstanding Graduate Research(2013)
- Boeing Engineering Research Award (2007).
- Harry E. Muchnic Scholarship for academic performance, leadership, and industry performance (2007)
- Drexel University Mechanical Engineering and Mechanics Service and Outreach Award(2007)
- Drexel University Mechanical Engineering and Mechanics Award For Outstanding Academic Performance (2007)
- Nominated for Teaching Assistant of the Year(2006)
- Dean's List (2003-2007)
- Regional Finalist Siemens Westinghouse Math, Science and Technology Competition (2003)
-Rated among top 30 researchers in the United States
- Intel Science Talent Search Semi-finalist (2003)
-Rated among top 300 researchers in the United States
- Huntsman Special Award for Ingenious Research (2002 & 2003)
-The first time in the award's 23 year history that it has been awarded to the same person twice
-Awarded for research on vortex-induced vibrations

PATENTS

Self-wetting Aerosol Particulate Wet Collector Apparatus

Sarnoff Corporation

Status: Pending

- Developed a self-wetting apparatus for the collection and concentration of particulate matter (pathogen particles and aerosol particles) from the air. Co-inventors: Tim Pletcher, Christopher Poux.

LEADERSHIP EXPERIENCE

Vortical Flow Research Lab Co-Manager

Massachusetts Institute of Technology

2011-Present

Cambridge, MA

- Responsible for managing, maintaining, and upgrading two Microway Linux clusters (one with ~ 500 processors and one with ~ 150 processors). Helped to develop lab data backup system, and maintain four linux workstations.

Vortical Flow Research Lab Seminar Series

Massachusetts Institute of Technology

2009-Present

Cambridge, MA

- Responsible for arranging a weekly group/department seminar series. Required to find weekly speakers, arrange room, order food, and advertise the event.

Mountain Guide and Rock Climbing Instructor

June-August 2002-2004

Packard High Adventure Base

Salida, CO

- Responsible for leading groups of up to 15 people for extended mountain climbing trips for 1-5 days through the Rocky Mountains.
- Guide clients to the top of many of Colorado tallest 14,000-ft peaks.
- Top rope site manager for outdoor rock climbing trips
- Acting backcountry medic.
- Member of the Packard High Adventure Base rescue crew
- Lead mountain biking trips