Johnathon **Barbish, Ph.D.**

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Education

Ph.D. in Mechanical Engineering   *Blacksburg, Virginia*

VIRGINIA TECH   *Aug. 2018 - Aug. 2023*

- Dissertation: *The Effect of Tension and Nonlinearity on the Dynamics of Small Elastic Systems in Fluid*
- Future Professoriate Graduate Certificate

B.S. in Mechanical Engineering   *Blacksburg, Virginia*
B.S. in Physics

VIRGINIA TECH   *Aug. 2014 - May 2018*

- Honor Scholar

Research Experiences

Graduate Research Assistant   *Virginia Tech, Blacksburg, VA*

DEPARTMENT OF MECHANICAL ENGINEERING   *Aug. 2018 - Aug. 2023*

- Developed theoretical models of the dynamics of nanoscale devices due to thermal and driven dynamics
- Characterized the role of tension in the dynamics of a doubly clamped nanobeam immersed in fluid
- Connecting discrete and continuous models of stochastically driven systems using numerical methods
- Investigating the statistical properties of nanoscale systems driven by fluctuations into the nonlinear regime

Summer Research Intern   *Los Alamos, NM*

LOS ALAMOS NATIONAL LABORATORY   *Summer 2018*

- Developed parallel algorithms for estimating macroalgae growth across ocean models
- Learned computational modelling techniques for shock-hydro code applications

Undergraduate Research Assistant   *Virginia Tech, Blacksburg, VA*

DEPARTMENT OF MECHANICAL ENGINEERING   *Nov. 2016 - May 2018*

- Analyzed chaotic behavior of coupled map lattice systems with covariant Lyapunov vectors
- Characterized the statistical properties of coupled map lattices.

Undergraduate Research Assistant   *Virginia Tech, Blacksburg, VA*

VIRGINIA BIOINFORMATICS INSTITUTE   *Nov. 2014 - Dec. 2015*

- Connected and characterized the publication practices of scientists suspected of duplicate grant funding
- Searched for additional grants by the scientists suspected of grant fraud

Publications

J. Barbish, and M. R. Paul, "Using Covariant Lyapunov Vectors to Quantify High Dimensional Chaos with a Conservation Law," *Phys. Rev. E*, vol. 108, no. 5, p. 054202, Nov. 2023. doi: 10.1103/PhysRevE.108.054202

H. Gress, J. Barbish, C. Yanik, I. I. Kaya, R. T. Erdogan, M. S. Hanay, M. González, O. Svitelskiy, M. R. Paul, and K. L. Ekinci, "Multi-mode Brownian Dynamics of a Nanomechanical Resonator in a Viscous Fluid," *Phys. Rev. Appl.*, vol. 20, no. 4, p. 044061, Oct. 2023. doi: 10.1103/PhysRevApplied.20.044061

J. Barbish, C. Ti, K. L. Ekinci, and M. R. Paul, "The dynamics of an externally driven nanoscale beam that is under high tension and immersed in a viscous fluid," *Journal of Applied Physics*, vol. 132, no. 3, p. 034501, Jul. 2022, doi: 10.1063/5.0100462

Presentations

H. Gress, J. Barbish, M. R. Paul, and K. Ekinci, "Thermal Fluctuations of a Nanomechanical Beam Resonator in a Viscous Fluid," presented at the Frontiers of Nanomechanical Systems, Jun. 2023.

J. Barbish*, H. Gress, K. Ekinci, and M. R. Paul, "How Shrinking a Beam to the Nanoscale Yields Nonlinear Dynamics when Driven by Brownian Motion," presented at the Walter O'Brien Research Symposium, Apr. 2023.

J. Barbish*, H. Gress, K. Ekinci, and M. R. Paul, "Exploring the Role of Nonlinearity in the Brownian Driven Motion of Micro and Nanoscale Elastic Objects in Fluid," presented at the SIAM Southeastern Atlantic Section Meeting, Mar. 2023.

J. Barbish*, H. Gress, K. Ekinci, and M. R. Paul, "The Fluctuations of Small Elastic Objects in Fluid with Linear and Nonlinear Restoring Forces," presented at the APS March Meeting, Mar. 2023.

J. Barbish*, C. Ti, K. Ekinci, and M. R. Paul, "Multimodal Analysis of Driven Nanobeams with Arbitrary Tension in a Viscous Fluid," presented at the APS DFD, Nov. 2022.

H. Gress, J. Barbish, M. R. Paul, and K. Ekinci, "Brownian Fluctuations of a Nanomechanical String Resonator Immersed in a Viscous Fluid," presented at the APS DFD, Nov. 2022.

C. Taylor, J. Barbish, and M. R. Paul, "Molecular Fluctuations of Nanoscale Objects Immersed in Fluid," presented at the Mechanical Engineering Undergraduate Research Showcase, Virginia Tech, Sep. 2022.

J. Barbish* and M. R. Paul, "Spatially Varying Force on a Doubly Clamped Beam in Tension Immersed in Fluid," presented at the Walter O'Brien Research Symposium, Apr. 2022.

J. Barbish* and M. R. Paul, "Quantifying High Dimensional Chaos with Covariant Lyapunov Vectors," presented at the Fall Fluids Symposium, Oct. 2018.

J. Barbish*, M. Xu, and M. R. Paul, "Probing the Chaotic Dynamics of Fluids using Insights from Coupled Map Lattices," presented at the APS DFD, Nov. 2017.

M. R. Paul, M. Xu, J. Barbish, and S. Mukherjee, "Using Covariant Lyapunov Vectors to Understand Spatiotemporal Chaos in Fluids," presented at the APS DFD, Nov. 2017.

* denotes presentations given by me.

Teaching Experiences

Adjunct Instructor (ME 2134) *Virginia Tech, Blacksburg, VA*
DEPARTMENT OF MECHANICAL ENGINEERING *Fall 2023 (Current)*
- Teaching a class size of 70 sophomore students on classical thermodynamics
- Writing course lectures, homework, and exams to enhance student understanding

Graduate Student Instructor (ME 3124) *Virginia Tech, Blacksburg, VA*
DEPARTMENT OF MECHANICAL ENGINEERING *Fall 2019 & Spring 2020*
- Teaching an average class size of 50 students on classical thermodynamics (a junior level course)
- Writing course lectures, homework, and exams to enhance student understanding
- Rapidly adapted class structure from traditional to online setting during Coronavirus outbreak

Graduate Teaching Assistant for Fluid Mechanics *Virginia Tech, Blacksburg, VA*
DEPARTMENT OF MECHANICAL ENGINEERING *Fall 2018*
- Generated grading rubric and graded weekly homework assignments for 140 students
- Answered student questions to improve their understanding of fluid mechanics during weekly office hours

Extracurricular Activities

Director of Finance
GRADUATE AND PROFESSIONAL STUDENT SENATE
Virginia Tech, Blacksburg, VA
Oct. 2022 - May 2023
- Developed policies and appropriations strategies for $1.7 million to student organizations
- Managed $91,000 of funding for 100+ graduate student organizations
- Chaired bi-weekly meetings, hearing over 200 funding requests

Founding President
GRADUATE ENGINEERING ALLIANCE (GEA)
Virginia Tech, Blacksburg, VA
Aug. 2022 - May 2023
- Founded GEA to build community amongst all engineering graduate students
- Organized student leaders across 8+ departments
- Developed action plans for analyzing the operations of student organizations

President
MECHANICAL ENGINEERING GRADUATE STUDENT COUNCIL (MEGSC)
Virginia Tech, Blacksburg, VA
Feb. 2020 - May 2022
- Founded peer mentoring program for incoming grad students
- Used $4000 budget to maximize community building amongst 300 ME grad students
- Organized outreach and technical events for prospective and current grad students

Associate
GRADUATE ACADEMY FOR TEACHING EXCELLENCE
Virginia Tech, Blacksburg, VA
Oct. 2019 - May 2023
- Cross-disciplinary graduate students dedicated to improving our teaching abilities

Wheel Part Holder
FORMULA SAE
Virginia Tech, Blacksburg, VA
Sept. 2016 - May 2018
- Refined the manufacturing procedure of carbon fiber wheels for fornula style race car
- Developed classical laminate models of composite undergoing various loading cases

Honors & Awards

2023	**Group on Statistical and Nonlinear Physics (GSNP) Student Speaker Finalist**, APS March Meeting	*Las Vegas, NV*
2022	**Pratt Fellowship**, Virginia Tech	*Blacksburg, VA*
2014-2018	**Dean's List: 8 semesters**, Virginia Tech	*Blacksburg, VA*
2016	**Tau Beta Pi (Engineering Honor Society)**, Virginia Tech	*Blacksburg, VA*
2016	**Sigma Pi Sigma (Physics Honor Society)**, Virginia Tech	*Blacksburg, VA*
2016	**Robert C. Richardson Memorial Scholarship**, Virginia Tech	*Blacksburg, VA*
2016	**Harry B. Gilbert Merit Scholarship**, Virginia Tech	*Blacksburg, VA*
2016	**Bayport Beard/Bennett Memorial Scholarship**, Virginia Tech	*Blacksburg, VA*
2012	**Eagle Scout**, Boy Scouts of America	*Chesapeake, VA*

Skills

Programming	Julia, MATLAB, Python, LaTeX, Git, JAVA, Django, HTML, C++
CAD/CAE	COMSOL, NX for part modeling, assembly, and manufacturing, Inventor
Manufacturing	Manual and CNC Mill and Lathe, Carbon fiber layups, curing, and post-processing