

Gary K. Nave, Jr.

*Ph.D. Candidate in Engineering Mechanics
Virginia Tech*

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Research Interests

My research focuses on problems involving motion through fluids such as air and water, viewed through the lens of dynamical systems to understand global features. Through the use of simplified models, we can gain clear insights into the complexity of these problems. In my graduate work, I have focused on flow induced vibration of tandem cylinders and the dynamics of simple gliders. I have also developed methods to detect regions of attraction and repulsion in dynamical systems. I have conducted this research through an interdisciplinary research program, which has exposed me to natural examples and collaboration with biologists working in similar areas.

Teaching Interests

I am interested in teaching a broad range of classes, particularly in the areas of dynamics and fluid mechanics. I would be excited to incorporate current research into higher level classes, in addition to helping students early in their careers build a strong foundation. I am very passionate about the fundamentals of mechanics, and my teaching interests reflect this as well. I want the courses I teach to be welcoming and engaging environments where students are excited to try new ideas and aren't afraid of failure. I like to teach through examples and involve students in trying techniques for themselves.

Education

2018 **Ph.D. Engineering Mechanics**, *Virginia Tech*, Blacksburg, VA.

Dissertation: Models of fluid-structure interaction and related phase space structures

Advisors: Shane Ross and Mark Stremler

Graduate Certificate: Preparing the Future Professoriate

2012 **B.S. Engineering Science and Mechanics**, *Virginia Tech*, Blacksburg, VA.

Senior Design: Dispersed sensing through chaotic motion

Minor: Mathematics

Work Experience

2016- **Graduate Research Assistant**, *BioTrans Program*, Virginia Tech.

Pres Virginia Tech Graduate School funded interdisciplinary research assistantship. Under this funding, I have worked to understand the underlying mechanics of falling and gliding objects, such as animal gliders.

2014- **Graduate Research Assistant**, *MultiSTEPS Program*, Virginia Tech.

2016 NSF-funded interdisciplinary research assistantship focused on material transport at the boundary between biologists and engineers. In the first year of the program, students conduct research projects with 3 different advisors in different fields to grow as interdisciplinary researchers, in addition to taking coursework in engineering, biology, and interdisciplinary grant writing. My research rotations were with Tess Thompson (Biological Systems Engineering), Shane Ross (Engineering Mechanics), and Jake Socha (Engineering Mechanics)

- 2012- **Director of Undergraduate Recruiting**, *College of Engineering*, Virginia Tech.
- 2014 Responsibilities: Coordinated all recruiting activities for the College of Engineering. Led the Dean's Team, a group of 38 undergraduate students who aid in recruiting activities. Planned and coordinated annual Engineering Open House.
- 2011 **Project Manager**, *Project SPY*, Christiansburg, VA.
Responsibilities: Coordinated volunteer construction projects with middle/high school students. Inspected homes. Prepared Documentation for projects. Oversaw/trained students and adult leaders. Total of 43 projects in 7 weeks.

Publications and Presentations

Journal Articles

- Chang, Brian, **Gary Nave**, and Sunghwan Jung (2012). "Drop formation from a wettable nozzle". In: *Communications in Nonlinear Science and Numerical Simulation* 17.5, pp. 2045–2051.
- Nave Jr., Gary K.** and Shane D. Ross. "Phase space structures for gliding and falling bodies". In preparation.
- "Trajectory-free calculation of attracting and repelling manifolds". In preparation. Pre-print on arXiv:1705.07949.
- Nave Jr., Gary K.** and Mark A. Stremler. "Wake stiffness as a nonlinear spring". In preparation.

Conference Papers

- Nave Jr., Gary K.**, Amy L. Hermundstad, Chelsea Corkins, Emily Garner, Jeena R. Jayamon, Mohammed Seyam, Michael Stewart, Michele Waters, and Karen P. DePauw (2017). "Global perspectives: graduate students' experiences with global higher education". In: The American Society of Engineering Education annual conference. Columbus, Ohio.
- Nave, Gary**, Mark Stremler, and Shane D. Ross (2016). "Wake stiffness and its application: oscillating cylinders and flying snakes". In: *Proceedings of the 24th International Congress on Theoretical and Applied Mechanics (ICTAM)*. Montreal, Canada.

Conference Presentations

- Nave Jr., Gary K.** and Shane D. Ross (2018). *Slow manifolds in the aerodynamic descent of animals and plants*. Denver, Colorado: Poster and short talk to be presented at Dynamics Days 2018.
- Nave, Gary K.** (2017). *Understanding gliding flight with the terminal velocity manifold*. Blacksburg, Virginia: Presented at the southeast regional Society of Integrative and Comparative Biology meeting.
- Nave, Gary K.** and Shane D. Ross (2017). *Phase space structures in velocity space for gliding and falling bodies*. Mini-symposium: Recent advances in characterization of nonautonomous dynamical transport. Snowbird, Utah: Presented at the Society of Industrial and Applied Mathematics Dynamical Systems Meeting.
- Yeaton, Isaac J., Grant A. Baumgardner, Talia M. Weiss, **Gary Nave**, Shane D. Ross, and John J. Socha (2016). *Snakes in a Cube: high-resolution kinematics of gliding in flying snakes*. Presented at the Society for Integrative and Comparative Biology. Portland, OR.
- Nave, Gary** and Mark Stremler (2015). *Regimes of flow induced vibration for tandem, tethered cylinders*. Presented at the 68th Annual American Physical Society Division of Fluid Dynamics Meeting. Boston, MA.

Yeaton, Isaac J., Grant A. Baumgardner, Talia M. Weiss, **Gary Nave**, Shane D. Ross, and John J. Socha (2015). *What's its wave? A 3D analysis of flying snake locomotion*. Presented at the 68th Annual American Physical Society Division of Fluid Dynamics Meeting. Boston, MA.

Nave, Gary, Tyler Michael, Pavlos Vlachos, and Mark Stremmer (2014). *Flow-induced oscillations of tandem tethered cylinders in a channel flow*. Presented at the 67th Annual American Physical Society Division of Fluid Dynamics Meeting. San Francisco, CA.

Teaching Experience

I have not yet had the opportunity to teach a full course. However, I have taught guest lectures in the following courses, including preparing the lecture myself.

Advanced Dynamics, ESM 6314

In this PhD-level survey of advanced research in dynamical systems, I was asked to give a series of 2 lectures as an introduction to the theory of smooth manifolds, including the tangent bundle, Lie groups, Lie algebras, and

Dynamics, ESM 2304

I taught 2 substitute lectures on behalf of my advisor for a sophomore-level dynamics course. The first lecture was an introduction to the impulse-momentum equations and the dynamics of collisions. The second lecture was an introduction to rigid body rotation about a fixed axis and the parallel axis theorem.

Foundations of Engineering II, ENGE 1216

I was able to guest lecture on two occasions in the freshman-level foundations of engineering course at Virginia Tech. On both occasions, the instructors asked me to come and discuss the Engineering Science and Mechanics major at Virginia Tech and highlight my current work, so students could have a better idea of what an engineer might do.

Professional Development

June **Global Perspectives Program**, *Switzerland, France, and Italy*.

2016 The global perspectives program is a selective program run by Dean DePauw of the graduate school at Virginia Tech. The program consists of two weeks of visiting higher education institutions primarily in Switzerland. Our group visited a total of 8 universities of varying size and emphasis and had a number of conversations with students, staff, and faculty about the future of higher education in Europe and around the world.

2014 **VTKnowledgeWorks Tech Transfer Challenge**, Finalist.

In 2014, I led a team that was a finalist in the Tech Transfer Challenge, an entrepreneurial pitch competition for technology transfer from the research lab to the market. Our team name was "Hydrokinetic Energy Systems"

2014 **ACC Clean Energy Challenge**, *University of Maryland*, Semi-finalist.

The ACC Clean Energy Challenge was a competition for 12 schools in the Southeast United States. One team from each school with a technology based on clean energy was chosen as a semi-finalist. Our project was entitled "enVIV: Energy from Vortex Induced Vibration"

2013 **Ambassador Leadership Forum**, *Eastman Chemical Company*.

Eastman Chemical Company paid to host the Virginia Tech College of Engineering Dean's Team, which I directed, for a two day leadership training event.

Awards & Recognition

2018 Dynamics Days 2018 Student Travel Award

2017 SIAM Student Travel Award
2017 Virginia Tech Outstanding Graduate Student Leader
2014 NSF IGERT traineeship, MultiSTEPS
2014 Virginia Tech College of Engineering Outstanding M.S. Student
2014 Manuel Stein Scholarship
2010 Ken and Loretta Reifsneider Scholarship

Service

2017 **Director of Programs**, Graduate Student Assembly (GSA)
2016- **Mentor**, Virginia Tech Early Engineering Mentoring Program
Pres
2016- **Funding Programs Chair**, Graduate Student Assembly (GSA)
Pres
2016- **Founder and President**, Graduate Engineering Mechanics Society
Pres
2015- **Member**, GSA Committee on Graduate Inclusion and Diversity Policies
Pres
2015- **Mentor**, Graduate Undergraduate Mentoring Program
Pres
2014- **Delegate**, Graduate Student Assembly
2017
2015 **Member**, Virginia Tech Graduate Student of the Year Selection Committee
2014- **Advisor**, undergraduate Senior Design team
2015
2012- **Mentor**, Student Transition to Engineering Program
2016