Daniel Floryan

Princeton University, D225 E Quad, Princeton, NJ, 08544
609.287.5370 | dfloryan@princeton.edu | dfloryan.mycpanel.princeton.edu

EDUCATION

Doctor of Philosophy, Mechanical and Aerospace Engineering — August 2014 – Present
Princeton University, Princeton, NJ

Master of Arts, Mechanical and Aerospace Engineering — May 2016
Princeton University, Princeton, NJ

Bachelor of Science *summa cum laude*, Mechanical Engineering — January 2014
Cornell University, Ithaca, NY

Bachelor of Arts *with distinction in all subjects*, Economics, minor in Mathematics — January 2014
Cornell University, Ithaca, NY

ACADEMIC EXPERIENCE

Graduate Research Assistant — February 2015 – Present
Princeton University — *Princeton, NJ*
Rowley Group, Prof. Clarence Rowley; Smits Group, Prof. Alexander Smits
- Dissertation work on elucidating the physics responsible for fast and efficient fish swimming.
- A combined experimental and numerical approach is used, incorporating a dynamical systems perspective.

Assistant in Instruction — February 2017 – May 2017
Princeton University — *Princeton, NJ*
MAE 222, Prof. Alexander Smits
- Taught introductory fluid mechanics to class.

Assistant in Instruction — February 2016 – May 2016
Princeton University — *Princeton, NJ*
MAE 433, Prof. Clarence Rowley
- Taught lab component of classical/modern controls class and presented lectures to class.

Research Assistant — December 2009 – August 2013
The University of Western Ontario — *London, Canada*
Complex Flow Systems Research Laboratory, Prof. J.M. Floryan
- Created numerical simulation to examine effects of heat, turbulence, and fluid type on convection patterns in channel flow.

Teaching Assistant — August 2012 – December 2012
Cornell University — *Ithaca, NY*
MAE 3230, Prof. Charles Williamson
- Teaching assistant for a third-year fluid mechanics course for mechanical engineers.
- Made and performed demonstrations, held office hours for course help, created unique problems for students.

Texas A&M USRG Scholar — May 2012 – August 2012
Texas A&M University — *College Station, TX*
National Aerothermochemistry Laboratory, Prof. William Saric
- Designed, made, and characterized a lens-and-grid type focusing schlieren system for use in the Mach 6 Quiet Tunnel.
- The system provided a non-intrusive diagnostic with high signal-to-noise ratio and a spectral range $\mathcal{O}$(MHz).

Undergraduate Research Assistant — January 2012 – January 2013
Cornell University — *Ithaca, NY*
Fluid Dynamics Research Laboratories, Prof. Charles Williamson
- Numerically investigated the evolution of a co-rotating vortex pair in ground effect.
- Project has applications to safety of airplane takeoff and landing.

NSERC USRA Scholar May 2011 – August 2011
The University of Western Ontario *London, Canada*
Wolf Orthopaedic and Biomechanics Laboratory, Prof. Thomas Jenkyn
· Created a GUI for radiostereometric analysis.
· Vastly improved upon former system, automating and streamlining several processes.

Academic Excellence Workshop Facilitator August 2010 – May 2011
Cornell University *Ithaca, NY*
MATH 1920, MATH 2930
· Led weekly workshops teaching students multivariable calculus and differential equations.
· Prepared lectures and problem sets catering to a disparate set of abilities.

Research Assistant May 2010 – August 2010
The University of Western Ontario *London, Canada*
Advanced Facility for Avian Research, Prof. Roi Gurka and Prof. Gregory Kopp
· Conducted an experimental investigation of starling aerodynamics.
· Performed particle image velocimetry (PIV) on live birds in a hypobaric wind tunnel.

OUTREACH

GSG MAE Representative 2016 – 2018
Princeton University *Princeton, NJ*
The Mechanical and Aerospace Engineering department's representative for the Graduate Student Government.

MAE Graduate Student Committee 2016 – 2018
Princeton University *Princeton, NJ*
Member of the Mechanical and Aerospace Engineering department's graduate student committee, serving as a liaison between graduate students and the department.

SEAS Orientation on Advising 2016
Princeton University *Princeton, NJ*
Guided new graduate students in the School of Applied and Engineering Science on navigating the advisor-advisee relationship.

MAE Committee on Climate and Inclusion 2015 – 2018
Princeton University *Princeton, NJ*
Founding member of a committee whose goal is to assess the Department's climate for underrepresented groups and make recommendations in the spirit of finding best practices that ensure all members of the department feel respected, included and supported by our community.

Harlem Prep to Princeton 2015 – 2018
Princeton University *Princeton, NJ*
Organize an annual trip for Harlem Prep 4th graders in which students participate in lab demos in the Mechanical & Aerospace Engineering Department.

Gas Dynamics Lab Demos 2015
Princeton University *Princeton, NJ*
Organize an annual trip for Chinese middle school- and high school-aged students in which students participate in fluid dynamics lab demos.

ACADEMIC ADVISING

Masters students
Rodrigo Lisazo (ISAE-SUPAERO), body effects in fish swimming, 2015

Undergraduate students
Nick Chen (Princeton '20), energy harvesting using fluid-structure interactions, Summer 2017
Nathan Wei (Princeton '17), cyber-physical fluids facility, 2016-2017
Devon Hartsough (Princeton '18), robotic swimmers, Summer 2015
Emile Oshima (Princeton '17), robotic swimmers, Summer 2015

ACADEMIC SERVICE

Member of: American Physical Society, American Institute of Aeronautics and Astronautics.
Referee for: AIAA Journal, Bioinspiration and Biomimetics, International Journal of Heat and Fluid Flow, Journal of Fluid Mechanics, Journal of Fluids and Structures, Physical Review Fluids, Physics of Fluids, Scientific Reports.
Chair for: American Physical Society DFD Meeting (2017).

PUBLICATIONS

1. D. Floryan and C.W. Rowley. Clarifying the relationship between efficiency and resonance for flexible inertial swimmers. Under review.
2. T. Van Buren, D. Floryan, and A.J. Smits. Scaling and performance of simultaneously heaving and pitching foils. AIAA Journal (invited). In press.
3. T. Van Buren, D. Floryan, N. Wei, and A.J. Smits. Flow speed has little impact on propulsive characteristics of oscillating foils. Physical Review Fluids, 3(1), 013103, 2018.
4. D. Floryan, T. Van Buren, and A.J. Smits. Forces and energetics of intermittent swimming. Acta Mechanica Sinica, 33(4), 725-732, 2017 (invited).
5. D. Floryan, T. Van Buren, C.W. Rowley, and A.J. Smits. Scaling the propulsive performance of heaving and pitching foils. Journal of Fluid Mechanics, 822, 386-397, 2017.
6. T. Van Buren, D. Floryan, D. Quinn, and A.J. Smits. Non-sinusoidal gaits for unsteady propulsion. Physical Review Fluids, 2(5), 053101, 2017.
7. T. Van Buren, D. Floryan, D. Brunner, U. Senturk, and A.J. Smits. Impact of trailing edge shape on the wake and propulsive performance of pitching panels. Physical Review Fluids, 2(1), 014702, 2017.
8. S.T.M. Dawson, M.S. Hemati, D. Floryan, and C.W. Rowley. Lift Enhancement of High Angle of Attack Airfoils Using Periodic Pitching. AIAA Paper 2016-2069.
9. D. Floryan and J.M. Floryan. Drag reduction in heated channels. Journal of Fluid Mechanics, 765, 353-395, 2015.
10. J.W. Hofferth, R.A. Humble, D. Floryan, and W.S. Saric. High-Bandwidth Optical Measurements of the Second-Mode Instability in a Mach 6 Quiet Tunnel. AIAA Paper 2013-0378.
11. M.Z. Hossain, D. Floryan, and J.M. Floryan. Drag reduction due to spatial thermal modulations. Journal of Fluid Mechanics, 713, 398-419, 2012.

Book chapters

1. T. Van Buren, D. Floryan, and A.J. Smits. "Bio-inspired underwater propulsors," in Bioinspired Design, editors L. Daniel and W. Soboyejo. Cambridge University Press, 2018.

In preparation

1. D. Floryan and C.W. Rowley. Adjoint optimization of fish swimming gaits.
2. D. Floryan, T. Van Buren, and A.J. Smits. Simple laws for aquatic locomotion.
3. D. Floryan and C.W. Rowley. Distributed flexibility in inertial swimmers.
4. D. Floryan, T. Van Buren, and A.J. Smits. Large-amplitude motions in fish-like swimming.

PRESENTATIONS

1. D. Floryan, C.W. Rowley, and A.J. Smits. Distributed flexibility in inertial swimmers. Proceedings of the 70th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Denver, USA, November 19-21, 2017.
2. C.W. Rowley and D. Floryan. A framework for distributed flexibility in swimmers. ONR MURI Review Meeting, Program Manager: Bob Brizzolara, Boston, USA, September 19-20, 2017.
3. A.J. Smits, T. Van Buren, and D. Floryan. Simplifying fish propulsion. ONR MURI Review Meeting, Program Manager: Bob Brizzolara, Boston, USA, September 19-20, 2017.
4. D. Floryan, T. Van Buren, C.W. Rowley, and A.J. Smits. Scaling laws for the performance of rigid propulsors intended for underwater locomotion. Proceedings of the 10th International Symposium for Turbulence and Shear Flow Phenomena, Chicago, USA, July 6-9, 2017.

5. D. Floryan, T. Van Buren, and A.J. Smits. Effects of combining heave, pitch and flexibility on swimming performance. 47th AIAA Fluid Dynamics Conference, Denver, USA, June 5-9, 2017 (invited).
6. C.W. Rowley, M. Fairchild, and D. Floryan. Nonsinusoidal gaits for improved thrust and efficiency of fishlike swimmers. 47th AIAA Fluid Dynamics Conference, Denver, USA, June 5-9, 2017 (invited).
7. D. Floryan, C.W. Rowley, and A.J. Smits. Adjoint-based optimization of fish swimming gaits. ONR MURI Review Meeting, Program Manager: Bob Brizzolara, Charlottesville, USA, March 9-10, 2017.
8. D. Floryan, T. Van Buren, C.W. Rowley, and A.J. Smits. Scaling propulsive performance. ONR MURI Review Meeting, Program Manager: Bob Brizzolara, Charlottesville, USA, March 9-10, 2017.
9. D. Floryan, T. Van Buren, C.W. Rowley, and A.J. Smits. Scaling the propulsive performance of fish-like swimming. Sixth Annual Winter Workshop on Neuromechanics and Dynamics of Locomotion, New Orleans, USA, January 19-20, 2017.
10. D. Floryan, C.W. Rowley, and A.J. Smits. Adjoint-based optimization of fish swimming gaits. Proceedings of the 69th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Portland, USA, November 20-22, 2016.
11. T. Van Buren, D. Floryan, D. Brunner, U. Senturk, and A.J. Smits. Effect of trailing edge shape on the wake and propulsive performance of pitching panels. Proceedings of the 69th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Portland, USA, November 20-22, 2016.
12. N. Wei, D. Floryan, T. Van Buren, and A.J. Smits. Cyber-physical experiments on the efficiency of swimming protocols. Proceedings of the 69th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Portland, USA, November 20-22, 2016.
13. D. Floryan, C.W. Rowley, and A.J. Smits. Towards adjoint-based optimization of fish swimming gaits. ONR MURI Review Meeting, Program Manager: Bob Brizzolara, Princeton, USA, September 29-30, 2016.
14. D. Floryan, T. Van Buren, C.W. Rowley, and A.J. Smits. Fundamental analysis for pitch and heave motions. ONR MURI Review Meeting, Program Manager: Bob Brizzolara, Princeton, USA, September 29-30, 2016.
15. T. Van Buren, D. Floryan, A.J. Smits. Trailing edge impact on wake and performance of pitching panels. ONR MURI Review Meeting, Program Manager: Bob Brizzolara, Princeton, USA, September 29-30, 2016.
16. N. Wei, D. Floryan, T. Van Buren, and A.J. Smits. Cyber-physical experiments with a bio-inspired propulsion system. ONR MURI Review Meeting, Program Manager: Bob Brizzolara, Princeton, USA, September 29-30, 2016.
17. D. Floryan, C.W. Rowley, and A.J. Smits. Thrust enhancement of oscillating foils. Complex Motion in Fluids Summer School, Zenderen, Netherlands, June 19-24, 2016.
18. D. Floryan, T. Van Buren, C.W. Rowley, and A.J. Smits. Thrust enhancement of an oscillating foil. Thousand Islands Fluid Dynamics Meeting, Gananoque, Canada, April 22-24, 2016.
19. D. Floryan, T. Van Buren, C.W. Rowley, and A.J. Smits. Propulsive performance of complex swimming gaits. ONR MURI Review Meeting, Program Manager: Bob Brizzolara, West Chester, USA, March 8-9, 2016.
20. D. Floryan, T. Van Buren, C.W. Rowley, and A.J. Smits. Effects of actuation waveform shape on the performance of pitching and heaving panels. Proceedings of the 68th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Boston, USA, November 22-24, 2015.
21. R. Lisazo, T. Van Buren, D. Floryan, D. Hartsough, E. Oshima, C.W. Rowley, and A.J. Smits. Performance of an unsteady plate with a two-dimensional body attached upstream. Proceedings of the 68th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Boston, USA, November 22-24, 2015.
22. W. Schleicher, D. Floryan, T. Van Buren, A.J. Smits, and K. Moored. Bio-inspired Propulsion with Functionally Graded Materials. Proceedings of the 68th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Boston, USA, November 22-24, 2015.
23. M. Saadat, T. Van Buren, D. Floryan, A.J. Smits, and H. Haj-Hariri. Strouhal number for free swimming. Proceedings of the 68th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Boston, USA, November 22-24, 2015.
24. D. Floryan, C.W. Rowley, and A.J. Smits. Optimizing gaits for fish swimming. ONR MURI Review Meeting, Program Manager: Bob Brizzolara, Bethlehem, USA, September 21-22, 2015.

25. D. Floryan, T. Van Buren, D.B. Quinn, C.W. Rowley, and A.J. Smits. Effects of actuation waveform shape on the performance of a pitching foil. Thousand Islands Fluid Dynamics Meeting, Gananoque, Canada, May 1-3, 2015.
26. T. Van Buren, D.B. Quinn, D. Floryan, K. Hartl, and A.J. Smits. Experiments on free swimming with drag, and the effects of actuation waveform. ONR MURI Review Meeting, Program Manager: Bob Brizzolara, Boston, USA, March 2-3, 2015.
27. D. Floryan and J.M. Floryan. Pressure Losses in Heated Channels. Proceedings of The Canadian Society for Mechanical Engineering International Congress 2014, Toronto, Canada, June 1-4, 2014.
28. D. Floryan and J.M. Floryan. Use of distributed heating for drag reduction. Thousand Islands Fluid Dynamics Meeting, Gananoque, Canada, May 30-June 1, 2014.
29. J.M. Floryan and D. Floryan. On the intensification of the Super-ThermoHydrophobic Effect. Proceedings of the 14th Pan-American Congress of Applied Mechanics, Santiago, Chile, March 24-28, 2014.
30. J.M. Floryan and D. Floryan. Drag reduction due to spatial thermal modulations. Proceedings of the 66th Annual Meeting of the American Physical Society, Division of Fluid Dynamics, Pittsburgh, USA, November 24-26, 2013.
31. M.Z. Hossain, J.M. Floryan, and D. Floryan. The Super-ThermoHydrophobic Effect. Proceedings of the 23rd International Congress of Theoretical and Applied Mechanics, Beijing, China, August 19-24, 2012.
32. A.J. Kirchhefer, D. Floryan, W. Bezner-Kerr, C.G. Guglielmo, G.A. Kopp, and R. Gurka. A Case Study of Unsteady Wings: The Wake of a Freely Flying European Starling (*Sturnus Vulgaris*). Proceedings of the 7th International Symposium on Turbulence and Shear Flow Phenomena, Ottawa, Canada, July 28-31, 2011.

HONOURS

Porter Ogden Jacobus Fellowship, 2018–2019 (Princeton University)
School of Engineering and Applied Science Award for Excellence, 2017 (Princeton University)
Brit and Eli Harari Post Generals Fellowship, 2017-2018 (Princeton University)
Sayre Award for Academic Excellence, 2015 (Princeton University)
Daniel and Florence Guggenheim Foundation Fellowship, 2015-2016 (Princeton University)
Charles W. Lummis Scholarship, 2014–2015 (Princeton University)
The Sibley Prize for highest standing in mechanical engineering program, 2014 (Cornell University)
Frank O. Ellenwood Prize for highest standing in heat and power courses, 2014 (Cornell University)
Dean's Honour List, all semesters (Cornell University)
Ontario Graduate Scholarship, 2014 (declined)
NSERC Canada Graduate Scholarship, 2014
Killam Canadian Scholarship, 2013 (Cornell University)
Omicron Delta Epsilon, 2013 (Cornell University)
Phi Beta Kappa, 2013 (Cornell University)
ELI Undergraduate Student Research Award, funded by Boeing, 2013 (Cornell University)
ELI Undergraduate Student Research Award, funded by Boeing, 2012 (Cornell University)
Undergraduate Student Research Grant, 2012 (Texas A&M University)
NSERC Undergraduate Student Research Award, 2011
S.T.A.R. Scholarship, 2009–2010 (Cornell University)
Governor General's Academic Medal, 2009 (Government of Canada)