# *CURRICULUM VITAE*


## Clara O'Farrell

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## EDUCATION

**2013 PhD in Control and Dynamical Systems**
California Institute of Technology, Pasadena CA
Minor in Aeronautics
Thesis: *A Dynamical Systems Analysis of Vortex Pinch-Off*
Adviser: John O. Dabiri

**2008 B.S.E.** *summa cum laude* **in Mechanical and Aerospace Engineering**
Princeton University, Princeton NJ
Certificate in Applications of Computing
Thesis: *Chasing Hairpin Packets and their Wall Signature in Turbulent Boundary Layers*
Adviser: M. Pino Martín

## RESEARCH EXPERIENCE

- **Guidance and Control Engineer**, Jet Propulsion Laboratory, Pasadena CA (2013-*present*)
  - Dynamics and trajectory modeling and simulation for entry, descent, and landing
  - Modeling parachute aerodynamics and parachute system flight dynamics for planetary exploration missions
  - Research engineer: test of model parachutes at the NASA Langley Transonic Dynamics Tunnel
  - Reconstruction Lead, Data Manager, and GNC operations chair: *Low-Density Supersonic Decelerators* project

- **Research Assistant**, California Institute of Technology, Pasadena CA (2009-2013)
  - Vortex dynamics and vortex formation in biological propulsion
  - Applications of Lagrangian Coherent Structures (LCS) to problems in biological flows
  - Adviser: John O. Dabiri

- **Research Assistant**, Princeton University, Princeton NJ (2007-2008)
  - Algorithms and tools for identifying and tracking structures in hypersonic turbulent boundary layers
  - Adviser: Pino Martín

- **Research Assistant**, Instituto Tecnológico de Buenos Aires, Argentina (Summer 2008)
  - Federal Aviation Administration certification for an affordable light aircraft design

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## TEACHING EXPERIENCE

- **Teaching Assistant**, ME 19ab Fluid Mechanics, Caltech, Pasadena, CA (Fall 2011/Winter 2012)
- **Project Advisor**, Ae 104c Experimental Methods, Caltech, Pasadena, CA (Spring 2014)
- **Guest Lecturer**, AEE 427 Aircraft Performance and Dynamics, Syracuse University, Syracuse, NY (Fall 2015)
- **Guest Lecturer**, ME 19ab Fluid Mechanics, Caltech, Pasadena, CA (Spring 2014, Winter 2012, Fall 2011)
- **Guest Lecturer**, CDS 140b Introduction to Dynamical Systems, Caltech, Pasadena, CA (Spring 2012)
- **Guest Lecturer**, Ae/BE 242 Biological Flows: Propulsion, Caltech, Pasadena, CA (Winter 2011)
- **High School Biology Teacher**, Saint Andrew's Scots School, Buenos Aires, Argentina (Summer 2006)

## INVITED TALKS

1. "Subscale Wind Tunnel Test of Two Parachute Designs for Mars Missions", *Fluid Mechanics Seminar Series*, Stanford University, Stanford, CA (January 26, 2016)

## JOURNAL ARTICLES

5. **O'Farrell, C.** and Dabiri, J.O., "Nested contour-dynamic models for axisymmetric vortex rings and vortex wakes," *Journal of Fluid Mechanics* **748**: 521-548 (2014) [PDF]

4. **O'Farrell, C.** and Dabiri, J.O., "Pinch-off of non-axisymmetric vortex rings," *Journal of Fluid Mechanics* **740**: 61-96 (2014) [PDF]

3. **O'Farrell, C.** and Dabiri, J.O., "Perturbation response and pinch-off of vortex rings and dipoles," *Journal of Fluid Mechanics* **740**:280-300 (2012) [PDF]

2. **O'Farrell, C.** and Dabiri, J.O., "A Lagrangian approach to identifying vortex pinch-off," *Chaos* **20**:017513 (2010) [PDF]

1. **O'Farrell, C.** and Martín M.P., "Chasing eddies and their wall signature in DNS data of Turbulent Boundary Layers," *Journal of Turbulence* **10**:15 (2009) [HTML]

## CONFERENCE PAPERS

9. **O'Farrell, C.**, Brandeau, E. J., Tanner, C. L., Gallon, J. C., Muppidi, S., and Clark, I. G., "Reconstructed Parachute System Performance During the Second LDSD Supersonic Flight Dynamics Test", *AIAA Atmospheric Flight Mechanics Conference* , Washington DC (13-17 June 2016)

8. Zumwalt, C. H., Cruz, J. R., Keller, D. F., and **O'Farrell, C.**, "Subscale Wind Tunnel Test of Ringsail and Disk-Gap-Band Parachutes", *AIAA Applied Aerodynamics Conference* , Washington DC (13-17 June 2016)

7. Karlgaard C., **O'Farrell, C.** , Ginn J., and Van Norman, J., "Supersonic Flight Dynamics Test 2: Trajectory, Atmosphere, and Aerodynamics Reconstruction," *26th AAS/AIAA Space Flight Mechanics Meeting* , Napa, CA (14-18 February 2016)

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6. Dutta, S., Bowes, A. L., Striepe, S. A., Queen, E. M, **O'Farrell, C.** , and Ivanov, M. C., "Post-Flight Assessment of the Low Density Supersonic Decelerator Flight Dynamics Test 2 Simulation," *26th AAS/AIAA Space Flight Mechanics Meeting* , Napa, CA (14-18 February 2016)

5. Machalick, W., Witkowski, A., and **O'Farrell, C.**, "Design of Subscale Parachute Models for LDSD Transonic Dynamics Wind Tunnel Testing", *23rd AIAA Aerodynamic Decelerator Systems Technology Conference* Daytona Beach FL (30 March -2 April 2015)

4. Tanner, C. L., **O'Farrell, C.**, Gallon, J. C., Clark, I. G., Witkowski, A., and Woodruff, P. J. , "Pilot deployment of the LDSD Parachute via a Supersonic Ballute," *23rd AIAA Aerodynamic Decelerator Systems Technology Conference* Daytona Beach FL (30 March -2 April 2015)

3. Muppidi, S., Van Norman, J. W., **O'Farrell, C.**, Bose, D., and Clark, I. G., " Computational Analysis and Post-Flight Validation of Ballute Aerodynamics," *23rd AIAA Aerodynamic Decelerator Systems Technology Conference* Daytona Beach FL (30 March -2 April 2015)

2. Kutty P., Karlgaard C., Blood E.M., **O'Farrell, C.** , Ginn J., Schoenenberger M. and Dutta S., "Supersonic Flight Dynamics Test One: Trajectory, Atmosphere, and Aerodynamics Reconstruction," *25th AAS/AIAA Space Flight Mechanics Meeting* , Williamsburg VA (January 11-15, 2015)

1. Blood, E., Ivanov, M., **O'Farrell, C.**, Ginn, J., Kutty, P., Karlgaard, C., and Dutta, S., "LDSD Supersonic Flight Dynamics Test 1: Post-flight Reconstruction", *IEEE Aerospace Conference*, Big Sky MT (7-14 March 2015)

## TECHNICAL REPORTS

2. **O'Farrell, C.**, Clark, I. G., and Basch, P. (Eds.), *Low-Density Supersonic Decelerators (LDSD) Supersonic Flight Dynamics Test-2 (SFDT-2) Post-Test Report*, JPL Technical Report D-81939 (April 2016)

1. Clark, I. G. and Blood, E. (Eds.), *Low-Density Supersonic Decelerators (LDSD) Supersonic Flight Dynamics Test-1 (SFDT-1) Post-Test Report*, JPL Technical Report D-81940 (August 2015)

## CONFERENCE PROCEEDINGS, ABSTRACTS

14. McMullen, R., McKeon, B.J., and **O'Farrell C.**., "Starting Process for a Hemispherical Shell with a Central Circular Vent" 67th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Francisco CA (November 2014) [HTML]

13. **O'Farrell C.** and Dabiri J.O., "Nested contour-dynamic models for axisymmetric vortex rings and vortex wakes" 66th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Pittsburgh PA (November 2013) [HTML]

12. **O'Farrell C.** and Dabiri J.O., "Pinch-off and optimal vortex formation in biological propulsion" SIAM Conference on Applications of Dynamical Systems, Snowbird UT (May 2013) [HTML]

11. **O'Farrell C.** and Dabiri J.O., "Perturbation response of model vortex rings and dipoles" 65th Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Diego CA (November 2012) [HTML]

10. **O'Farrell C.** and Dabiri J.O., "The formation of non-axisymmetric vortex rings" 23rd International Congress on Theoretical and Applied Mechanics, Beijing, China (August 2012) [PDF]

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9. **O'Farrell C.**, Whittlesey R.W. and Dabiri J.O., "The formation of vortex rings from elliptical nozzles" 64th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Baltimore MD (November 2011) [HTML]

8. **O'Farrell C.** and Dabiri J.O., "Optimal vortex formation in biological propulsion." Workshop on Resonance, Flexibility and Biopropulsion, Princeton University, Princeton NJ (July 2011)

7. **O'Farrell C.** and Dabiri J.O., "Vortex 'pinch-off' in the Norbury and Pierrehumbert families of vortices." Workshop on Coherent Structures in Dynamical Systems, Lorentz Center, Universiteit Leiden, The Netherlands (May 2011) [HTML]

6. **O'Farrell C.** and Dabiri J.O., "Vortex 'pinch-off' in the Norbury family of vortices." Southern California Symposium on Flow Physics, University of Southern California, Los Angeles CA (April 2011)

5. **O'Farrell C.** and Dabiri J.O., "The stability of a family of vortex rings." 63rd Annual Meeting of the American Physical Society Division of Fluid Dynamics, Long Beach CA (November 2010) [HTML]

4. **O'Farrell C.** and Dabiri J.O., "Lagrangian Coherent Structures in the wake of an anguilliform swimmer." Workshop on Natural Locomotion in Fluids and on Surfaces, Institute for Mathematics and its Applications, University of Minnesota, Minneapolis MN (June 2010) [HTML]

3. **O'Farrell C.** and Dabiri J.O., "A Lagrangian analysis of the wake of an anguilliform swimmer." Southern California Symposium on Flow Physics, University of California, Irvine CA (April 2010)

2. **O'Farrell C.** and Dabiri J.O., "A Lagrangian approach to identifying vortex pinch-off." 62nd Annual Meeting of the American Physical Society Division of Fluid Dynamics, Minneapolis MN (November 2009) [HTML]

1. **O'Farrell C.**, Priebe S., and Martín M.P. , "The wall signature of hairpin packets in turbulent boundary layers" 60th Annual Meeting of the American Physical Society Division of Fluid Dynamics, Salt Lake City UT (November 2007) [HTML]

## FELLOWSHIPS AND AWARDS

- **Research Achievement**
  - Acknowledgment of Outstanding Technical Contribution (NASA Engineering and Safety Center, January 2016)
  - Voyager Award (JPL, August 2015)
  - NASA Team Award (Supersonic Flight Dynamics Test 1 Team, December 2014)
  - U.S. National Committee for Theoretical and Applied Mechanics Travel Grant (2012)
  - NSF Travel Grant for the Lorentz Center Workshop on Coherent Structures in Fluid Flows (2011)
  - Honorable Mention, Donald Janssen Dike Award for Undergraduate Research (Princeton University, June 2008)
  - Sigma Xi National Research Honor Society Book Award (Princeton University, June 2008)
- **Graduate Fellowships**
  - National Science Foundation Graduate Research Fellowship (2008-2012)
  - Betty and Gordon Moore Fellowship (California Institute of Technology, 2008-2009)

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- **Academic Achievement**
  - Sau-Hai Lam *58 Prize in Mechanical and Aerospace Engineering (Princeton University, 2008)
  - Harold T. Shapiro Prize for Academic Excellence (Princeton University, October 2006)

## ADDITIONAL TRAINING

- **H. G. Heinrich Parachute Technology Short Course** National Institute of Aerospace, Portsmouth, VA (June 2-6, 2014)
- **Scientific SCUBA Diving**, American Academy of Underwater Sciences, University of California - Los Angeles (September 2009 -June 2010)
- **Open Water SCUBA Certification**, National Association of Underwater Instructors (NAUI, December 2009)
- **Competent Communicator**, Caltech Chapter, Toastmasters International (June 2012)

## ART OF SCIENCE

- **Ring of Fire**, Princeton University Art of Science Exhibition (2014)[HTML]
- **Vortex Evolution**, Caltech Art of Science Exhibition (2013)[HTML]
- **Luchador**, Caltech Art of Science Exhibition (2013)[HTML]
- **An Eel's Wake**, Caltech *Engineering and Science* Magazine (Summer 2010 Issue)[PDF]
- **Attracting Lagrangian Coherent Structures in a Circular Jet** , *Honorable Mention*, Caltech Art of Science Exhibition (2010)[HTML]

## OTHER ACTIVITIES

- **Referee**, *AIAA Journal* (2016-present), *Bioinspiration and Biomimetics* (2014-present)
- **Organizing Committee**, Conference for Undergraduate Women in Physics - West, Pasadena, CA (January 18-20, 2013)
- **Fundraiser / Half-Marathon Runner**, Leukemia and Lymphoma Society Team in Training, San Gabriel Valley, CA (Winter 2016)
- **Secretary**, Caltech Chapter, Toastmasters International (2012)
- **Vice-President and Social Chair**, International Students Association at Princeton (2005-2007)