

# Jesse T. Ault, Ph.D.

Alvin M. Weinberg Distinguished Fellow  
Oak Ridge National Laboratory (ORNL)

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## Experience

- **Alvin M. Weinberg Distinguished Fellow, Oak Ridge National Laboratory (7/17–Present)**  
Biomedical Sciences and Engineering Group, Computational Sciences and Engineering Division

## Education

- **Ph.D., Mechanical and Aerospace Engineering**  
*Princeton University, June 2017*
  - Thesis: Vortex Dynamics in Swirling Flows with Applications to Energy and Biology
  - Advisor: Howard A. Stone
  - Graduate Certificate in Computational and Information Science
- **M.A., Mechanical and Aerospace Engineering**  
*Princeton University, September 2014*
- **B.S.M.E., Mechanical Engineering with Math and Physics minors, University Honors Program**  
*Purdue University, June 2012*

## Awards

- **Alvin M. Weinberg Distinguished Fellowship** - Awarded to early career scientists who have demonstrated both “outstanding scientific ability” as well as “potential for technical and scientific leadership at the highest levels”, Oak Ridge National Laboratory (2017-2020).
- **Harold W. Dodds Honoric Fellowship** - Awarded to senior graduate students “displaying the highest scholarly excellence in graduate work” at Princeton University (2016).
- **Best Presentation Award** - MAE Research Day Competition, Princeton University (2016).
- **Mary and Randall Hack ‘69 Graduate Award** - Awarded by the Princeton Environmental Institute to support innovative research on water-related research with implications for the environment (2015).
- **Excellence in Teaching Award** - Awarded by the Princeton Engineering Council and Graduate Engineering Council on behalf of the students in MAE 335 (2014).
- **Crocco Award for Teaching Excellence** - Awarded by the Faculty of the MAE Department in recognition of outstanding performance as an Assistant in Instruction for MAE 222 (2014).
- **Gordon Y. S. Wu Fellowship** - “Princeton’s most prestigious award for graduate study in engineering” for incoming graduate students (2012).
- **Larry L. & Mary Alice McDonald Scholarship** - Purdue University (2011).
- **Arcelor Mittal Industrial Roundtable Scholarship** - Purdue University (2010).

- **Stephen D., Yvonne D., and Robert D. Miles Memorial Mechanical Engineering Scholarship** - Purdue University (2009).
- **John McClean Memorial Fund Scholarship** - Purdue University (2008).
- **Purdue Trustees Scholarship** - Purdue University (2008 - 2012).

## Publications

1. **J. T. Ault**, S. Shin, and H. A. Stone. [Diffusiophoresis in narrow channel flows](#). *J. Fluid Mech.*, 854:420–448, Sept. 2018
2. \*D. Oettinger, **J. T. Ault**, H. A. Stone, and G. Haller. [Invisible anchors trap particles in branching junctions](#). *Phys. Rev. Lett.*, 121(5):054502, Aug. 2018. \*Featured as Editor’s Suggestion.
3. **J. T. Ault**, P. B. Warren, S. Shin, and H. A. Stone. [Diffusiophoresis in one-dimensional solute gradients](#). *Soft Matter*, 13(47):9015–9023, Nov. 2017
4. S. Shin, **J. T. Ault**, P. B. Warren, and H. A. Stone. [Accumulation of colloidal particles in flow junctions induced by fluid flow and diffusiophoresis](#). *Phys. Rev. X*, 7(4), Nov. 2017
5. S. Shin, **J. T. Ault**, J. Feng, P. B. Warren, and H. A. Stone. [Low-cost zeta potentiometry using solute gradients](#). *Adv. Mater.*, 29(30):1701516, June 2017
6. T.-H. Chen, **J. T. Ault**, H. A. Stone, and C. B. Arnold. [High-speed axial-scanning wide-field microscopy for volumetric particle tracking velocimetry](#). *Exp. Fluids*, 58(5), Apr. 2017
7. **J. T. Ault**, B. Rallabandi, O. Shardt, K. K. Chen, and H. A. Stone. [Entry and exit flows in curved pipes](#). *J. Fluid Mech.*, 815:570–591, Feb. 2017
8. J. Feng, M. Muradoglu, H. Kim, **J. T. Ault**, and H. A. Stone. [Dynamics of a bubble bouncing at a liquid/liquid/gas interface](#). *J. Fluid Mech.*, 807:324–352, Oct. 2016
9. **J. T. Ault**, A. Fani, K. K. Chen, S. Shin, F. Gallaire, and H. A. Stone. [Vortex-breakdown-induced particle capture in branching junctions](#). *Phys. Rev. Lett.*, 117(8), Aug. 2016
10. R. Mensire, **J. T. Ault**, E. Lorenceau, and H. A. Stone. [Point-source imbibition into dry aqueous foams](#). *EPL (Europhys. Lett.)*, 113(4):44002, Feb. 2016
11. S. Shin, E. Um, B. Sabass, **J. T. Ault**, M. Rahimi, P. B. Warren, and H. A. Stone. [Size-dependent control of colloid transport via solute gradients in dead-end channels](#). *P. Natl. Acad. Sci. USA*, 113(2):257–261, Dec. 2015
12. **J. T. Ault**, K. K. Chen, and H. A. Stone. [Downstream decay of fully developed Dean flow](#). *J. Fluid Mech.*, 777:219–244, July 2015
13. S. Shin\*, **J. T. Ault\***, and H. A. Stone. [Flow-driven rapid vesicle fusion via vortex trapping](#). *Langmuir*, 31(26):7178–7182, June 2015. \*The authors contributed equally to this work
14. N. A. Marine, P. M. Wheat, **J. T. Ault**, and J. D. Posner. [Diffusive behaviors of circle-swimming motors](#). *Phys. Rev. E*, 87(5), May 2013

## Publications (Under Review/In Revision)

1. **J. T. Ault**, S. Shin, and H. A. Stone. **Characterization of surface–solute interactions by diffusioosmosis**. *Under review for publication in Soft Matter*.

## Publications (In Preparation)

1. S. T. Chan\*, J. T. Ault\*, S. J. Haward, and A. Q. Shen. **Unsteady-steady transition and tri-stability in a microfluidic swirling flow.** *In preparation.* \*The authors contributed equally to this work.
2. J. T. Ault, H. Ma, D. Bhowmik, and S. Shin. **Diffusiophoretic mobility measurements of proteins by non-equilibrium molecular dynamics simulations.** *In preparation.*
3. J. T. Ault, A. Perazzo, S. Shin, and H. A. Stone. **Misalignment effects in parallel-plate rheometers.** *In preparation.*
4. J. T. Ault, A. Perazzo, A. Garcia, S. Shin, and H. A. Stone. **Influence of water absorption on the viscosity measurement of glycerol.** *In preparation.*
5. S. Battat, J. T. Ault, S. Shin, S. Khodaparast, and H. A. Stone. **Particle entrainment in dead-end pores by diffusiophoresis.** *In preparation.*
6. J. T. Ault, B. Rallabandi, and H. A. Stone. **Finite length effects of sliding rods near solid boundaries.** *In preparation.*

## Funded Grant Proposals (Total Value: \$584,800 + 2,000,000 core hours)

1. "High-fidelity cardiovascular simulation for personalized medicine," Oak Ridge National Laboratory LDRD, PI: J. T. Ault, \$550,800, 2017–2020.
2. "Using parallel computation to improve blood cell simulations in cardiovascular flows," Oak Ridge National Laboratory Titan supercomputer allocation, PI: J. T. Ault, 2,000,000 core hours, 2018–2019.
3. "The Blockchain Initiative at ORNL," Oak Ridge National Laboratory Program Development Funds, PI: Sean Oesch, Co-PI: J. T. Ault, \$30,000, 2018.
4. "Large-surface-area continuous-flow evaporative water purification," Princeton Environmental Institute, PI: J. T. Ault, Co-PI: H. A. Stone, \$4000, 2015.

## Teaching Experience

- **Teagle Teaching Seminar:** Year-long collaboration between graduate students and faculty to engage current research in teaching and learning in higher education, Princeton University, McGraw Center for Teaching and Learning (2014-2015)
- **Mechanics of Fluids: MAE 222,** Assistant in instruction (Spring 2014, Spring 2016)
  - Received Crocco Award for Teaching Excellence
- **Simulation and Modeling of Fluid Flows: MAE 557,** Assistant in instruction (Fall 2015)
- **Aircraft Design: MAE 332,** Assistant in instruction (Spring 2015)
- **Fluid Dynamics: MAE 335,** Assistant in instruction (Fall 2014)
  - Received Excellence in Teaching Award
- **Average Student Rating: 4.7/5.0**
- **Select Student Comments:**
  - "He is one of the best preceptors I've ever had. He goes out of his way to help students and brings clarity where there might be confusion."
  - "He is always willing to meet and help, even outside of office hours."

- “He cares a lot about the class and the students.”
- “He is an extremely dedicated preceptor, always going above and beyond for his students.”
- **Undergraduate student advising:**
  - **Dawn Wang:** Vortex-breakdown in Y-, T-, and arrow-shaped junctions.
  - **John Davis:** Growth and decay of fully developed Dean flow.
  - **Kevin Lee:** Enhancement of solar still productivity using thin-film, continuous flows.
  - **Sarah Battat:** Diffusiophoretic particle motions in dead-end pores.
  - **Andre Douglas:** Particle capture in swirling flows.

## Invention Disclosures

1. **Measuring the zeta potential of surfaces using pressure measurements in flow.** Invention disclosure at Oak Ridge National Laboratory with S. Shin and H. A. Stone (2018).
2. **Measurement and manipulation of particles and biomaterials using solute gradients.** Invention disclosure at Oak Ridge National Laboratory with S. Shin and H. A. Stone (2018).
3. **Rapid preconcentrator using flow-driven diffusiophoretic accumulation.** Invention disclosure at Princeton University with H. A. Stone, S. Shin, and P. B. Warren (2017).
4. **Zeta potentiometer using diffusiophoresis and diffusioosmosis.** Invention disclosure at Princeton University with H. A. Stone, S. Shin, J. Feng, and P. B. Warren (2017).
5. **A method for producing large lipid vesicles.** Invention disclosure at Princeton University with H. A. Stone and S. Shin (2015).

## Invited Talks

1. Okinawa Institute of Science and Technology, Micro/Bio/Nanofluidics Unit, (Dec. 2018).
2. **J. T. Ault**, S. Shin, and H. A. Stone. **Bioseparation in microflows by diffusiophoresis.** In *IEEE 12th International Conference on Nano/Molecular Medicine and Engineering*, Honolulu, HI, USA, December 2018.
3. Oak Ridge Institute for Continued Learning, Roane State, (Oct. 2018).
4. Oak Ridge National Laboratory, Computational Sciences and Engineering Division, (Mar. 2017).
5. Harvard University, Department of Applied Mathematics (Jan. 2017).
6. University of North Texas, Department of Mechanical and Energy Engineering (Jan. 2017).
7. Princeton University, Department of Mechanical and Aerospace Engineering and the Princeton Institute for Computational Science and Engineering, (Sept. 2016).

## Conference Presentations

1. S. Shin, **J. T. Ault**, P. B. Warren, and H. A. Stone. **Colloidal accumulation in flow junctions induced by fluid flow and dissolved solutes.** In *American Physical Society 71st Annual Meeting of the Division of Fluid Dynamics*, Atlanta, GA, USA, November 2018.
2. S. Shin, **J. T. Ault**, P. B. Warren, and H. A. Stone. **Accumulation of colloidal particles in flow junctions induced by fluid flow and diffusiophoresis.** In *ACS Colloid & Surface Science Symposium*, State College, PA, USA, June 2018.

3. **J. T. Ault**, S. Shin, and H. A. Stone. **Diffusiophoresis in confined geometries**. In *American Physical Society March Meeting*, Los Angeles, CA, USA, March 2018.
4. **J. T. Ault**, S. Shin, P. B. Warren, and H. A. Stone. **Diffusiophoresis in one-dimensional solute gradients**. In *American Physical Society 70th Annual Meeting of the Division of Fluid Dynamics*, Denver, CO, USA, November 2017.
5. **J. T. Ault**, S. Shin, and H. A. Stone. **Vortex breakdown in simple pipe bends**. In *American Physical Society 69th Annual Meeting of the Division of Fluid Dynamics*, Portland, OR, USA, November 2016.
6. D. Vigolo, M. Riccomi, F. Alberini, E. Brunazzi, **J. T. Ault**, and H. A. Stone. **Flow visualization of the trapping induced by vortex breakdown at a junction**. In *American Physical Society 69th Annual Meeting of the Division of Fluid Dynamics*, Portland, OR, USA, November 2016.
7. R. Mensire, **J. T. Ault**, K. Piroird, H. A. Stone, and E. Lorenceau. **Imbibition of dry aqueous foams by oil**. In *24th International Congress of Theoretical and Applied Mechanics*, Montreal, Canada, August 2016.
8. T.-H. Chen, **J. T. Ault**, and C. B. Arnold. **Volumetric real-time wide-field microscopy with tunable acoustic gradient lens**. In *SPIE Photonics West*, San Francisco, CA, USA, February 2016.
9. **J. T. Ault**, K. K. Chen, and H. A. Stone. **Asymptotic scalings of developing curved pipe flow**. In *American Physical Society 68th Annual Meeting of the Division of Fluid Dynamics*, Boston, MA, USA, November 2015.
10. T.-H. Chen, **J. T. Ault**, and C. B. Arnold. **Volumetric real-time wide field microscopy with tunable acoustic lens: a new tool for micro PIV**. In *American Physical Society 68th Annual Meeting of the Division of Fluid Dynamics*, Boston, MA, USA, November 2015.
11. **J. T. Ault**, D. Vigolo, S. Radl, and H. A. Stone. **Critical Reynolds Numbers for Particle Capture in Y-, T-, and Arrow-Shaped Junctions**. In *American Physical Society 67th Annual Meeting of the Division of Fluid Dynamics*, San Francisco, CA, USA, November 2014.
12. **J. T. Ault**, J. Davis, and H. A. Stone. **Development and Decay Lengths of Fully-Developed Curved Pipe Flow**. In *American Physical Society 66th Annual Meeting of the Division of Fluid Dynamics*, Pittsburgh, PA, USA, November 2013.

## Professional Development

1. Advanced Scientific Computing Research (ASCR) Early Career Proposal Workshop, Oak Ridge National Laboratory (Nov. 2018).
2. Deep Learning Fundamentals, NVIDIA's Deep Learning Institute, Oak Ridge National Laboratory (Feb. 2018).
3. Introduction to Machine Learning in Python, *The Data Incubator*, Oak Ridge National Laboratory (Sept. 2017).
4. Graduate certificate in Computational and Information Science, Princeton University (2017).
5. Prospective Faculty Seminar, Purdue University, College of Engineering (Feb. 2017).
6. Teagle Teaching Seminar, McGraw Center for Teaching and Learning, Princeton University (2014–2015).

## Responsibilities and Professional Service

1. **Professional Society Memberships:** American Physical Society, American Society of Mechanical Engineers, Institute of Electrical and Electronics Engineers
2. **Peer reviewer:** Soft Matter
3. **Webmaster:** I am the webmaster for the Biomedical Sciences, Engineering, and Computing Group at Oak Ridge National Laboratory (2017–present), and I am one of the two webmasters for the Complex Fluids Group at Princeton University (2013–present).
4. **tnAchieves mentor:** I am a volunteer mentor for the tnAchieves program dedicated to increasing higher education opportunities for Tennessee high school students through scholarships and mentor guidance.