

Lei Fang Ph.D.

Department of Civil and Environmental Engineering, University of Pittsburgh
3700 O'Hara Street, Benedum Hall of Engineering, Room 706, Pittsburgh, PA 15213
Tel: 412-624-8618; Email: lei.fang@pitt.edu
Last updated: June 3, 2022

EDUCATION

- 2017 - 2020 **Stanford University, Stanford, California**
Ph.D., Civil and Environmental Engineering
Ph.D. minor, Computational and Mathematical Engineering
- 2015 - 2017 **Stanford University, Stanford, California**
M.S., Civil and Environmental Engineering
- 2012 - 2015 **Colorado State University, Fort Collins, Colorado**
B.S., *First Place in the Department*, Environmental Engineering

PEER-REVIEWED JOURNAL PUBLICATIONS (students are underlined)

- 2022 Xinyu Si and **Lei Fang**. “Toward the enhanced turbulent production by the swimmers’ perturbations,” In preparation.
- 2022 **Lei Fang** and Ze-Xu Li. “High fidelity human trajectory tracking based on surveillance camera data,” In preparation.
- 2022 Xinyu Si and **Lei Fang**. “Preferential flux of swimmers in heterogeneous two-dimensional turbulent flow,” Submitted
- 2021 Xinyu Si and **Lei Fang**. “Preferential alignment and heterogeneous distribution of active non-spherical swimmers near Lagrangian coherent structures,” *Physics of Fluids* 33, no. 7 (2021): 073303. **Chosen as Editor’s Picks.**
- 2021 Xinyu Si and **Lei Fang**. “A novel social distance model reveals the sidewall effect at bottlenecks,” *Scientific Reports* 11, 20982 (2021).
- 2021 **Lei Fang** and Nicholas T. Ouellette. “Spectral condensation in laboratory two-dimensional turbulence,” *Physical Review Fluids* 6, 104605 (2021).
- 2021 **Lei Fang** and Nicholas T. Ouellette. “Assessing the information content of complex flows,” *Physical Review E* 103, 023301 (2021).
- 2020 **Lei Fang**, Sanjeeva Balasuriya, and Nicholas T. Ouellette. “Disentangling resolution, precision, and inherent stochasticity in nonlinear systems,” *Physical Review Research* 2, 023343 (2020).
- 2020 Zeyou Zhou, **Lei Fang**, Nicholas T. Ouellette, and Haitao Xu. “Vorticity gradient stretching in the direct enstrophy transfer process of two-dimensional turbulence,” *Physical Review Fluids* 5, 054602 (2020).

- 2019 **Lei Fang**, Sanjeeva Balasuriya, and Nicholas T. Ouellette. “Local linearity, coherent structures, and scale-to-scale coupling in turbulent flow,” *Physical Review Fluids* 4, 014501 (2019).
- 2019 **Lei Fang** and Nicholas T. Ouellette. “Transport across a bathymetric interface in quasi-two-dimensional flow,” *Physical Review Fluids* 4, 064501 (2019).
- 2018 **Lei Fang** and Nicholas T. Ouellette. “Influence of lateral boundaries on transport in quasi-two-dimensional flow,” *Chaos* 28, 023113 (2018). **Chosen as a Featured paper in Chaos**, and summarized in an **AIP Scilight**.
- 2017 **Lei Fang** and Nicholas T. Ouellette. “Multiple stages of decay in two-dimensional turbulence,” *Physics of Fluids* 29, 111105 (2017).
- 2016 **Lei Fang** and Nicholas T. Ouellette. “Advection and the efficiency of spectral energy transfer in two-dimensional turbulence,” *Physical Review Letters*. 117, 104501 (2016).

CONFERENCE PROCEEDING (students are underlined)

- 2021 Xinyu Si and **Lei Fang**. “Preferential alignment and heterogeneous distribution of active non-spherical swimmers near Lagrangian coherent structures,” American Geophysical Union Fall Meeting, December 13-17, New Orleans, Louisiana, USA
- 2021 **Lei Fang** and Xinyu Si. “Preferential alignment and heterogeneous distribution of active non-spherical swimmers near Lagrangian coherent structures,” The 74nd Annual Meeting of the APS Division of Fluid Dynamics, November 21-23, Phoenix, Arizona, USA
- 2019 **Lei Fang** and Nicholas T. Ouellette. “Enhanced Spectral Transfer in Weakly Mixing Regions of a Turbulent Flow,” The 72nd Annual Meeting of the APS Division of Fluid Dynamics, November 23-26, Seattle, Washington, USA
- 2019 Nicholas T. Ouellette, **Lei Fang** and Sanjeeva Balasuriya. “Disentangling Resolution, Precision, and Inherent Stochasticity in Fluid Mixing,” The 72nd Annual Meeting of the APS Division of Fluid Dynamics, November 23-26, Seattle, Washington, USA
- 2018 **Lei Fang**, Nicholas T. Ouellette and Sanjeeva Balasuriya. “Local linearity, coherent structures, and scale-to-scale coupling in turbulent flow,” The 71st Annual Meeting of the APS Division of Fluid Dynamics, November 18-20, Atlanta, Georgia, USA
- 2017 **Lei Fang** and Nicholas T. Ouellette. “Multiple stages of decay in two-dimensional turbulence,” The 70th Annual Meeting of the APS Division of Fluid Dynamics, November 19-21, Denver, Colorado, USA
- 2016 Nicholas T. Ouellette and **Lei Fang**. “Advection and the efficiency of spectral energy transfer in two-dimensional turbulence,” The 69th Annual Meeting

of the APS Division of Fluid Dynamics, November 20-22, Portland, Oregon, USA

INVITED TALKS

- 2022 **Lei Fang.** “Preferential alignment and heterogeneous distribution of active non-spherical swimmers near Lagrangian coherent structures,” School of Civil Engineering and Transportation, South China University of Technology, January 6, Guangdong, China
- 2021 **Lei Fang.** “Preferential alignment and heterogeneous distribution of active non-spherical swimmers near Lagrangian coherent structures,” Department of Civil and Environmental Engineering, Carnegie Mellon University, October 10, Pennsylvania, USA
- 2021 **Lei Fang.** “Preferential alignment and heterogeneous distribution of active non-spherical swimmers near Lagrangian coherent structures,” Department of Mechanical Engineering, University of Massachusetts, Dartmouth, March 26, Massachusetts, USA
- 2020 **Lei Fang.** “Preferential alignment and heterogeneous distribution of active non-spherical swimmers near Lagrangian coherent structures,” Department of Mechanical Engineering, University of New Hampshire, December 11, Durham, New Hampshire, USA
- 2020 **Lei Fang.** “Coherent Dynamics in Model Geophysical Flows,” Rowland Institute at Harvard, January 30, Cambridge, Massachusetts, USA
- 2020 **Lei Fang.** “Coherent Dynamics in Model Geophysical Flows,” Department of Civil and Environmental Engineering, University of Pittsburgh, January 9, Pittsburgh, Pennsylvania, USA
- 2019 **Lei Fang.** “Coherent Dynamics in Model Geophysical Flows,” Department of Mechanical Engineering, University of California, Berkeley, October 25, Berkeley, California, USA

ACADEMIC POSITIONS

- 2020 - present **Assistant Professor (tenure track)**
Department of Civil and Environmental Engineering, University of Pittsburgh
- 2016 - 2020 **Graduate Research Assistant**
Department of Civil and Environmental Engineering, Stanford University
Advisor: Prof. Nicholas T. Ouellette
supported by the U.S. NSF under Grant No. CMMI-1563489
- 2014 Summer **Research Assistant**
Colorado State University, Engineering Research Center

RESEARCH FUNDING

- 2022 - 2026 **Department of Defense: W911NF2220001**
Testing & Evaluation for Soldier-device Teaming Compatibility, Vulnerability, and Durability in Emergent Situations (**\$1,175,000**, equally shared with Prof. Amin Rahimian)
- 2022 - 2024 **National Science Foundation: CMMI-2143807**
Toward the Two-way Coupling between Active Matter and Transport Barriers (**\$360,828**)
- 2022 - 2023 **University of Pittsburgh Momentum Fund**
Toward the Two-way Coupling between Active Matter and Transport Barriers (**\$16,000**)
- 2021 - 2022 **University of Pittsburgh Momentum Fund**
Data Mining Approaches to Understand Tensor Properties in Turbulent Cascade (**\$16,000**)

RESEARCH EXPERIENCES AND INTERESTS

Coherent transport in geophysical flows

Turbulence dynamics

Active matter in complex flows

Microplastics at air-sea interface

Crowd dynamics

Developing physical tools for flow structure probing (Linear Neighborhood and Dynamical Linear Neighborhood)

COURSES TAUGHT

Introduction to Water Resources Engineering
Fluid Mechanics

MENTORSHIPS AND LAB ALUMS

Postdoctoral Researchers

2022 - now Ayan Banerjee, University of Pittsburgh

Research Focus: The micro-plastic flux at the air-sea interface

2022 - now Mingming Ge, University of Pittsburgh

Research Focus: Three-dimensional turbulent-resolved measurement of expiration plumes

Ph.D. Students

2022 - now Ze-Xu Li, University of Pittsburgh
Research Focus: On the individual-level perceptual coupling in social-distanced crowds: the measurement, mathematical characterization, and modeling

2020 - now Xinyu Si, University of Pittsburgh
Research Focus: Toward the two-way coupling between active matter and transport barriers

Master Student

2022 Xinyue Yuan, University of Pittsburgh
Mentoring Content: Bubble tank design

Undergraduate Students

2022 Wenhe Ma, University of Pittsburgh
Mentoring Content: Human crowd measurement

2022 Tianyi Bi, University of Pittsburgh
Mentoring Content: Human crowd simulation

2022 Brandon Chai, University of Pittsburgh
Mentoring Content: Brandon Chai is a undergraduate student who received Mascaro Center for Sustainable Innovation (MCSI) summer research grant. I mentor they to study the locomotion of bacteria.

2022 Melina Hudson, Ammie Faunce, Jack Richards Logan Dyer and Jessica Scheler, University of Pittsburgh
Mentoring Content: Bubble curtain technology for plastic recycling

2021 Jamison Beveridge, University of Pittsburgh
Mentoring Content: Jamison Beveridge (they) is a undergraduate student who received Mascaro Center for Sustainable Innovation (MCSI) summer research grant. I mentor they to study the transport of non-spherical swimmers in the ocean flows.

PROFESSIONAL MEMBERSHIPS

2016 - present **Member**, American Physical Society

2021 - present **Member**, American Geophysical Union

PROFESSIONAL SERVICE

2021 **Primary convener** and **chair** for American Geophysical Union Fall Meeting Session OS013-I-I. Non-spherical Swimmers in the Ocean

- 2019 - present **Peer Reviewer:**
Journal of Fluid Mechanics
Physics of Fluids
International Journal of Multiphase Flow
Experimental Thermal and Fluid Science
Journal of Fluid Engineering
Journal of Hydraulic Research
Journal of Geophysical Research - Oceans
- 2017 - 2018 **Seminar Coordinator**, The Bob and Norma Street Environmental Fluid Mechanics Laboratory, Stanford University

AWARDS AND HONORS

- 2015 **Environmental Engineering Achievement Award**, Colorado State University
- 2015 **Graduate with Distinction, 1st place in the department**, Colorado State University
- 2013 - 2015 **Dean's Lists (five times)**, Colorado State University
- 2012 - 2015 **Colorado State University International Excellence Scholarship (total amount: \$24,000)**, Colorado State University
- 2012 - 2014 **Coca-Cola Water Scholars Program, Coca-Cola full scholarship (total amount: \$50,000)**, Colorado State University

COMPUTER SKILLS

- Advanced C++ (with CUDA, OpenMP, MPI project experiences), MATLAB, Python, R
- Intermediate JAVA, ArcGIS, HEC-RAS, ANSYS Fluent, AutoCAD, Julia

SOCIAL SERVICES

- 2018 - 2019 **Co-President**, Stanford Christian Students Club, Stanford University
- 2017 - 2019 **Coordinator and Volunteer**, Stanford New International Student Airport Pick up Program, Stanford University and The Church in Mountain View
- 2012 - 2013 **Officer**, Association of Chinese Students and Scholars, Colorado State University