

Mohammadhossein Firouznia

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Research Interests

Fluid dynamics, active matter, physics of soft interfaces, numerical simulations, electrohydrodynamics, complex fluids.

Employment

Flatiron Research Fellow

2023-present

CENTER FOR COMPUTATIONAL BIOLOGY, FLATIRON INSTITUTE, NEW YORK, NY

Education

PhD. in Mechanical Engineering

Fall 2018- Summer 2023

UNIVERSITY OF CALIFORNIA SAN DIEGO, JACOBS SCHOOL OF ENGINEERING, LA JOLLA, CA

- Thesis: *Interfacially driven flows: from electrohydrodynamics to active interfaces*
- Advisor: Professor David Saintillan

MS. in Mechanical Engineering

Fall 2014- Summer 2017

OHIO UNIVERSITY, RUSS COLLEGE OF ENGINEERING AND TECHNOLOGY, ATHENS, OH

- Thesis: *The Hydrodynamic Interaction of Two Small Freely-moving Particles in a Couette Flow of a Yield Stress Fluid*
- Advisor: Professor Sarah Hormozi

BS. in Mechanical Engineering

Fall 2008-Summer 2012

AMIRKABIR UNIVERSITY OF TECHNOLOGY (TEHRAN POLYTECHNIC), TEHRAN, IRAN

Publications

1. **M. Firouznia**, J. Koch, D. Saintillan & P. Vlahovska, (2024). *Electrohydrodynamic lift of a viscous drop near an insulating wall*, in preparation.
2. **M. Firouznia** & D. Saintillan, (2024). *Self-organized dynamics of viscous drops with interfacial nematic activity*, arXiv:2404.11729.
3. **M. Firouznia**, S. H. Bryngelson, & D. Saintillan, (2023). *A spectral boundary integral method for simulating electrohydrodynamic flows in viscous drops*, Journal of Computational Physics, 489, 112248.
4. **M. Firouznia**, M. Miksis, P. Vlahovska & D. Saintillan, (2022). *Instability of a planar fluid interface under a tangential electric field in a stagnation point flow*, Journal of Fluid Mechanics, 931, A25.
5. **M. Firouznia** & D. Saintillan, (2021). *Electrohydrodynamic instabilities in freely suspended viscous films under normal electric fields*, Physical Review Fluids 6 (10), 103703.
6. A. Rashedi, M. Sarabian, **M. Firouznia**, D. Roberts, G. Ovarlez & S. Hormozi, (2020). *Shear-induced migration and axial development of particles in channel flows of non-Brownian suspensions*, AIChE Journal, 66(12), e17100.
7. M. Sarabian, **M. Firouznia**, B. Metzger & S. Hormozi, (2019). *Fully developed and transient concentration profiles of particulate suspensions sheared in a cylindrical Couette cell*, Journal of Fluid Mechanics, 862, 659-671.
8. **M. Firouznia**, B. Metzger, G. Ovarlez & S. Hormozi, (2018). *The interaction of two spherical particles in simple-shear flows of yield stress fluids*, Journal of Non-Newtonian Fluid Mechanics, 255, 19-38.

Conferences & Talks (presenter underlined)

M. Firouznia, & D. Saintillan, *Self-organized dynamics of viscous drops with surface nematic activity*, APS March Meeting, March 2024, Minneapolis, USA.

M. Firouznia, & D. Saintillan, *Self-organized dynamics of a viscous drop with interfacial nematic activity*, Southern California (SoCal) Fluids XIV, April 2023, San Diego, USA.

M. Firouznia, S. H. Bryngelson, & D. Saintillan, *A spectral boundary integral method for simulating electrohydrodynamic flows in liquid droplets*, Annual Meeting of the APS Division of Fluid Dynamics, November 2022, Indianapolis, USA.

M. Firouznia, M. Miksis, P. Vlahovska, & D. Saintillan, *Electrohydrodynamic Interfacial Instability at the Stagnation Point of a Converging Flow*, 19th U.S. National Congress on Theoretical and Applied Mechanics, June 2022, Austin, USA.

M. Firouznia, & D. Saintillan, *Electrohydrodynamic instabilities in viscous films under perpendicular electric fields*, Southern California (SoCal) Fluids XV, April 2021, UC Los Angeles, USA.

M. Firouznia, M. Miksis, P. Vlahovska, & D. Saintillan, *Electrohydrodynamic interfacial instability at a stagnation point*, Annual Meeting of the APS Division of Fluid Dynamics, November 2021, Pheonix, USA.

M. Firouznia, M. Miksis, P. Vlahovska, & D. Saintillan, *Instability of a planar interface under a tangential electric field in a stagnation point flow*, Southern California (SoCal) Fluids XIV, April 2021 (online).

M. Firouznia & D. Saintillan, *Interfacial instabilities in electrified liquid films*, Annual Meeting of the APS Division of Fluid Dynamics, November 2020 (online).

M. Firouznia & D. Saintillan, *Electrohydrodynamic instability of a suspended liquid film*, Annual Meeting of the APS Division of Fluid Dynamics, November 2019, Seattle, USA.

A. Rashedi, M. Sarabian, **M. Firouznia**, G. Ovarlez, & S. Hormozi, *An experimental study on fracturing flows of Newtonian fluids*, Annual Meeting of the APS Division of Fluid Dynamics, November 2018, Atlanta, USA.

M. Firouznia, R. Mehrani, B. Metzger, G. Ovarlez, & S. Hormozi, *Experiments of a sphere settling in simple shear flows of yield stress fluids*, Annual Meeting of the APS Division of Fluid Dynamics, November 2018, Atlanta, USA.

M. Firouznia, B. Metzger, G. Ovarlez, & S. Hormozi, *The interaction of two spheres in a simple-shear flow of complex fluids*, Annual Meeting of the APS Division of Fluid Dynamics, November 2017, Denver, USA.

M. Sarabian, **M. Firouznia**, B. Metzger & S. Hormozi. *Dispersion and layering of solid particles in cylindrical Couette flows*, Annual Meeting of the APS Division of Fluid Dynamics, November 2017, Denver, USA.

M. Firouznia, B. Metzger, G. Ovarlez, & S. Hormozi, *The hydrodynamic interaction of two small freely-moving particles in a Couette flow of a yield stress fluid*, Annual Meeting of the APS Division of Fluid Dynamics, November 2016, Portland, USA.

Honors & Awards

- **Fellowship**: Jacobs School of Engineering Powell/Kunzel Fellowship 2018
- **Scholarship**: Department of Mechanical Engineering of Ohio University 2014-2017
- **Outstanding Student Award**: Awarded merit-based admission to MS. program in mechanical engineering as the top senior, Amirkabir University of Technology. 2012
- **Honor Scholar and Double Major Award**: Recognized by the office of Brilliant Talents and Olympiads and offered choice of two desired bachelor programs as a distinguished sophomore, Amirkabir University of Technology. 2010

Teaching

At UCSD

- Fluid Mechanics I (MAE 210A, Grad.), Teaching Assistant, Fall 2022.
- Fluid Mechanics II (MAE 210B, Grad.), Teaching Assistant, Winter 2021.
- Introduction to Mathematical Physics (MAE 105), Teaching Assistant, Spring 2020 & 2021.
- Mechanics of Fluids (MAE 201, Grad.), Teaching Assistant, Fall 2020.

At AUT

- Heat Transfer I, Teaching Assistant, Fall 2012.

Service & Outreach

- MAE Mentorship Program: Provided career and professional guidance for undergraduate students, UCSD, Spring 2023.
- ENLACE: Mentored two engineering students in a summer research program, UCSD, Summer 2022.
- Supervised two engineering students in the research group, Ohio University, 2015-2018.
- Tech Savvy: Co-organized a STEM career workshop for girls grade 6-9, Ohio University, Summer 2017.
- Technology Camp for High School Girls: Co-organized a workshop for female high school students about career opportunities in engineering and technology, Ohio University, Summer 2016.

Reviewer of Archived Journals

- Journal of Fluid Mechanics
- European Journal of Mechanics - B/Fluids
- Journal of Applied Mechanics

References

Prof. Michael Shelley

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COURANT INSTITUTE OF MATHEMATICAL SCIENCES, NEW YORK UNIVERSITY, NEW YORK

- Email: mshelley@flatironinstitute.org
- Website: <https://math.nyu.edu/~shelley/>

Prof. David Saintillan

PROFESSOR, DEPARTMENT OF MECHANICAL AND AEROSPACE ENGINEERING, UNIVERSITY OF CALIFORNIA SAN DIEGO

- Email: dstn@ucsd.edu
- Website: <http://stokeslet.ucsd.edu>

Prof. Petia Vlahovska

PROFESSOR, MCCORMICK SCHOOL OF ENGINEERING, NORTHWESTERN UNIVERSITY

- Email: petia.vlahovska@northwestern.edu
- Website: <https://sites.northwestern.edu/petiavlahovska>

Prof. Spencer H. Bryngelson

ASSISTANT PROFESSOR, COLLEGE OF COMPUTING, GEORGIA TECH

- Email: shb@gatech.edu
- Website: <https://comp-physics.group>