Emad Masroor

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Education

Cornell University — Ithaca, NY
B.S. in Mechanical Engineering — 2013–2017

Virginia Tech — Blacksburg, VA
Ph.D. in Engineering Mechanics — 2018–present
Advisor: Mark A. Stremler
Thesis title: *Vortex Dynamics and forces in the laminar wakes of bluff bodies*

Publications

[4] Wenchao Yang, **Emad Masroor**, and Mark A. Stremler. "The wake of a transversely oscillating circular cylinder in a flowing soap film at low Reynolds number". In: *J. Fluids Struct.* 105 (Aug. 2021), p. 103343. ISSN: 08899746. DOI: 10.1016/j.jfluidstructs.2021.103343. arXiv: 2101.00108.

[6] Mark A. Stremler, Saikat Basu, and **Emad Masroor**. "Erratum: Streamline patterns in 2P vortex street equilibria". In: *Journal of Fluid Mechanics,* 901 (2020). ISSN: 14697645. DOI: 10.1017/jfm.2017.563.

Presentations

[1] **Emad Masroor** and Mark A. Stremler. "Vortex patterns in the wake of a transversely oscillating circular cylinder at low Reynolds number". In: *74th Annual Meeting of the APS Division of Fluid Dynamics*, Pheonix, AZ [file]. Nov. 2021.

[2] Mark A. Stremler and **Emad Masroor**. "A generalized Karman-like drag law for exotic vortex street equilibria". In: *74th Annual Meeting of the APS Division of Fluid Dynamics*, Pheonix, AZ. Nov. 2021.

[3] **Emad Masroor** and Mark A. Stremler. "Theoretical predictions for the drag force due to exotic wakes". In: *25th International Congress of Theoretical and Applied Mechanics*, Milan, Italy (virtual). Aug. 2021.

[5] Emadi Masroor and Mark A. Stremler. "Understanding the occurrence of the '2P mode' in the wake of an oscillating cylinder at low Re". In: *Inaugural Engineering Mechanics Symposium, Blacksburg VA*. Apr. 2021.

[7] **Emad Masroor** and Mark A. Stremler. "Drag forces on a bluff body shedding a 2P wake". In: *Fall Fluid Mechanics Symposium*, Blacksburg, VA. Nov. 2019.

[8] **Emad Masroor** and Mark A. Stremler. "Drag forces on a bluff body shedding a 2P wake". In: *72nd Annual Meeting of the APS Division of Fluid Dynamics*, Seattle, WA. Nov. 2019.

[9] **Emad Masroor**, Wenchao Yang, and Mark A. Stremler. "Vortex patterns in the two-dimensional wake of a transversely oscillating cylinder in uniform flow". In: *IUTAM Symposium on Vortex dynamics in science, nature and technology*, San Diego, CA. June 2019.

[10] **Emad Masroor**, Wenchao Yang, and Mark A. Stremler. "Wake Structure of an oscillating cylinder in a flowing soap film at low Reynolds number". In: *71st Annual Meeting of the APS Division of Fluid Dynamics*, Atlanta, GA. Nov. 2018.

[11] Wenchao Yang, **Emad Masroor**, and Mark A. Stremler. "Vortex patterns in the two-dimensional wake behind an oscillating cylinder". In: *Fall Fluid Mechanics Symposium*, Blacksburg, VA. Nov. 2018.

[12] Mark A. Stremler et al. "Classifying Relative Vortex Motions in 2P Mode Wakes". In: *7th Conference on Bluff Body Wakes and Vortex-Induced Vibrations*, Marsielle, France. July 2018.

Projects

SimpleNavierStokes.jl (2020)
A Julia package, blog post, and open-source notebook to serve as a beginner's tutorial for writing incompressible Navier-Stokes solvers using the $\omega - \psi$ formulation.

Experience

Virginia Tech — Blacksburg, VA
Member, *Theoretical & Applied Fluid Mechanics* research group — Spring 2018 –present

- Hydrodynamics experiments with flowing soap films
- 'Reduced order modeling' of exotic wakes using point vortex dynamics
- Dynamics of vortex rings
- Design & prototyping of a novel design for an atomizing nozzle for an industry partner.

Regeneron Pharmaceuticals — Tarrytown, NY
Ph.D. Intern — Summer 2021

- Conducted multiphase simulations of bioreactors using ANSYS Fluent.
- Helped identify thresholds for operating bioreactors at low-volume conditions
- Created a framework for reliably conducting in-house CFD simulations of bioreactors

Toyota Material Handling (Raymond Corp.) — Greene, NY
Intern Research Engineer — Summer 2016

- Spearheaded a project for testing the feasibility of switching forklift trucks from legacy lead-acid batteries to Lithium-Ion batteries.
- Designed and conducted preliminary experiments which would allow Raymond to monitor the on-field performance of the hydraulic systems in its lift trucks through telematics software already in use.
- Modeled the mast of a forklift truck under extreme loading conditions using Abaqus, in order to investigate the effect of changing the thickness of hydraulic cylinders.

Cornell **Mars Rover Project Team** — Ithaca, NY
Task Systems team member — Fall 2013 –Spring 2016

- Work with a team of 40 students from different engineering disciplines, who collaborate to design, build, and remotely operate a fully-functioning mock Mars Rover at an annual competition in Utah.
- Used SolidWorks to design assemblies and prepare shop drawings with tolerances. Fabricated aluminum parts in machine shop using mill and lathe.
- Built a different subsystem each academic year: wrist joint, elbow joint, and end effector (robotic hand).

Cornell University — Ithaca, NY
Various positions:

- *Writing tutor* Knight Institute for Writing in the Disciplines — Fall 2014 –Spring 2017
- *Student employee* Office of Institutional Research & Planning — Spring 2016
- *Member* Student Library Advisory Council — Spring 2016
- *Staff Design Editor* The Cornell Daily Sun — May 2014 –December 2014
- *Student worker* Cornell Dining — January 2014 –October 2014
- *Desk staff* Cornell University Library — Fall 2014 –Fall 2015

Teaching

– **Instructor** at Duke Talent Identification Program — Summer 2018 & 2019
Engineering Problem Solving

Graduate Teaching Assistant at Virginia Tech:

– *Computational Methods* at Sophomore level — Spring 2018
– *Introduction to Fluid Mechanics* at Junior level — Fall 2018
– *Dynamics* at Sophomore level — Spring 2019
– *Introduction to Solid Mechanics* at Graduate level — Spring 2019

Teaching Assistant at Cornell University:

– *Water & Wind Energy Module* — Fall 2016
– *Analysis of Mechanical and Aerospace Structures* — Fall 2016

Skills

- **Programming:** Julia, Python, Matlab, C/C++, Mathematica
- **Comp. Phys:** Basilisk, OpenFOAM, ANSYS, Abaqus
- **Engineering:** SolidWorks, AutoCAD, mill & lathe, 3-D printing, LabVIEW
- **Tools:** TensorFlow, Bash, Git, LaTeX, Nextjournal
- **Web:** Markdown, YAML, Jekyll

Coursework

– **CFD**: Computational Fluid Dynamics & Heat Transfer, Computational Methods for Viscous Flows, Reduced Order Models for Fluids
– **Math**: Perturbations, Advanced Dynamics, Chaos & Nonlinear Dynamics, Mathematical Fluid Dynamics, Complex Analysis, Partial Differential Equations
– **Fluids**: Ideal Flow, Turbulence, Applied Fluid Mechanics, Continuum Mechanics, Science Guided Machine Learning

Scholarships and Awards

- National Science Foundation Graduate Research Fellowship — 2019–2023
- Manuel Stein Scholarship, Engineering Mechanics Program, Virginia Tech — Spring 2019
- Liviu Librescu Memorial Fellowship, Engineering Mechanics Program, Virginia Tech — Spring 2020
- Daniel and Frances Frederick Fellowship, Engineering Mechanics Program, Virginia Tech — Spring 2022
- College of Engineering Fellowship, Virginia Tech, — Spring 2018
- International Student Tuition Scholarship, Cornell University, — 2013 –2017
- James E. Rice Jr. Award for exceptional writing in first-year writing seminars, Cornell University, — 2014