# Emad Masroor

Website: emadmasroor.github.io
301-3 Turner St NE, Blacksburg VA 24060 ○ emad@vt.edu

## 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

[1] **Emad Masroor**, Wenchao Yang, and Mark A. Stremler. "Flow visualization data from experiments with an oscillatingcircular cylinder in a gravity-driven soap film". In: *Data in Brief* (2022). In press. ISSN: 2352-3409.

[2] **Emad Masroor** and Mark A. Stremler. "On the topology of the atmosphere advected by a periodic array of axisymmetric thin-cored vortex rings". In: 00.0 (Dec. 2021), pp. 1–15. DOI: 10.0000/S1560354700000012. arXiv: 2112.06105.

[3] 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.

[4] 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.

[4] 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.

[5] **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.

[6] **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.

[7] **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.

[8]  **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.

[9]  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.

[10]  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.

## 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

## 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.

## 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

## SERVICE

- Reviewer, *Progress in Computational Fluid Dynamics*
- Member, American Physical Society
- Member, Society for Industrial and Applied Mathematics
- Member, American Mathematical Society
- Member, Society for Integrative and Comparative Biology
- Reviewer, GSA Travel Fund Program          Spring 2018
- Judge for Blue Ridge Highlands Regional Science Fair          Spring 2020