

Shreyas Mandre

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Education

12/2006 Ph.D. Mathematics, The University of British Columbia
12/2002 M.S. Mechanical Engineering, Northwestern University
8/2000 B.Tech. Mechanical Engineering, Indian Institute of Technology, Mumbai

Professional Appointments

9/2006-8/2009 Lecturer in Applied Mathematics, School of Engineering and Applied Sciences, Harvard University
9/2009-8/2010 Research Associate, School of Engineering and Applied Sciences, Harvard University
9/2010- Assistant Professor, School of Engineering, Brown University

Positions and Awards

Sep 2013 - Aug 2016 Human Frontier Science Program Young Investigator Award.
Aug 2013 Simons visitor, National Centre for Biological Sciences,
Tata Institute of Fundamental Research, Bangalore.

Refereed Publications

- [1] A. Carlson, S. Mandre, and L. Mahadevan. Elastohydrodynamics of contact in adherent sheets. *Proc. Roy. Soc. A*, submitted.
- [2] R. Singh, M. M. Bandi, A. Mahadevan, and S. Mandre. Linear stability analysis for *monami* in a submerged sea grass bed. *J. Fluid Mech.*, submitted.
- [3] C. N. Kaplan, N. Wu, S. Mandre, J. Aizenberg, and L. Mahadevan. Dynamics of evaporative colloidal patterning. *Phys. Fluids*, in press.
- [4] A. He, K. Nguyen, and S. Mandre. Capillary interactions between nearby interfacial objects. *Europhys. Lett.*, 102(3):38001, 2013.
- [5] S. Mandre and M. P. Brenner. The mechanism of a splash on a dry solid surface. *Journal of Fluid Mechanics*, 690:148, 2012.
- [6] Z. Wei, S. Mandre, and L. Mahadevan. The branch with the furthest reach. *Europhys. Lett.*, 97:14005, 2012.
- [7] J. M. Kolinski, S. M. Rubinstein, S. Mandre, M. P. Brenner, D. A. Weitz, and L. Mahadevan. Skating on a film of air: drops impacting on a surface. *Physical Review Letters*, 108(7):074503, 2012.
- [8] S. Mandre and L. Mahadevan. A generalized theory of viscous and inviscid flutter. *Proceedings of the Royal Society A: Mathematical, Physical and Engineering Science*, 466(2113):141–156, 2010.
- [9] M. Mani, S. Mandre, and M. P. Brenner. Events before droplet splashing on a solid surface. *J. Fluid Mech.*, 647:163–185, 2010.
- [10] S. Mandre, M. Mani, and M. P. Brenner. Precursors to Splashing of Liquid Droplets on a Solid Surface. *Phys. Rev. Lett.*, 102(13):134502, 2009.

- [11] J. C. Bird, S. Mandre, and H. A. Stone. Short-Time Dynamics of Partial Wetting. *Phys. Rev. Lett.*, 100(23):234501, 2008.
- [12] A. C. Rust, S. Mandre, and N. J. Balmforth. The feasibility of generating low-frequency volcano seismicity by flow through a deformable channel. In S. J. Lane and J. S. Gilbert, editors, *Fluid motion in volcanic conduits: A source of seismic and acoustic signals*, pages 45–63, 2007.
- [13] N. J. Balmforth, S. A. Ghadge, A. Kettapun, and S. Mandre. Bounds on double-diffusive convection. *Journal of Fluid Mechanics*, 569(1):29–50, 2006.
- [14] X. P. Chen, S. Mandre, and J. J. Feng. Partial coalescence between a drop and a liquid-liquid interface. *Phys. Fluids*, 18(5):Art:051705, 2006.
- [15] X. P. Chen, S. Mandre, and J. J. Feng. An experimental study of the coalescence between a drop and an interface in Newtonian and polymeric liquids. *Phys. Fluids*, 18(9):Art:092103, 2006.
- [16] N. J. Balmforth and S. Mandre. Dynamics of roll waves. *J. Fluid Mech.*, 514:1–33, 2004.
- [17] S. Lichter, A. Roxin, and S. Mandre. Mechanisms for Liquid Slip at Solid Surfaces. *Physical Review Letters*, 93(8):86001, 2004.
- [18] S. Ghosal and S. Mandre. A simple model illustrating the role of turbulence on phytoplankton blooms. *Journal of Mathematical Biology*, 46(4):333–346, 2003.

Invited seminars

1. S. Mandre, Andong He, Khoi Nguyen, Michael Miller, *Capillary attraction between nearby objects floating on a liquid interface*, Department of Mechanical Engineering, Massachusetts Institute of Technology, Cambridge MA, 2014.
2. S. Mandre, Andong He, Khoi Nguyen, Michael Miller, *Capillary attraction between nearby objects floating on a liquid interface*, Department of Mechanical Engineering, University of Massachusetts, Dartmouth MA, 2014.
3. S. Mandre, Andong He, Khoi Nguyen, Michael Miller, *Capillary attraction between nearby objects floating on a liquid interface*, Department of Mechanical Engineering, Tufts University, Somerville MA, 2014.
4. S. Mandre, Anja Slim, Xinjun Guo, *Dissolution driven convection for carbon dioxide sequestration: the stability problem* Department of Mathematics, Princeton University, Princeton, 2013.
5. S. Mandre, Anja Slim, Xinjun Guo, *Dissolution driven convection for carbon dioxide sequestration: the stability problem* Department of Geology and Geophysics, Yale University, New Haven, 2013.
6. S. Mandre, Andong He, Khoi Nguyen, Michael Miller, *Capillary attraction between nearby objects floating on a liquid interface*, National Centre for Biological Sciences, Tata Institute of Fundamental Research, Bangalore, India, 2013.
7. S. Mandre, *Waving of marine grass due to tidal currents*, Okinawa Institute of Technology Graduate University, Okinawa, Japan, 2013.
8. S. Mandre, Anja Slim, Xinjun Guo, *Dissolution driven convection for carbon dioxide sequestration: the stability problem* Jawaharlal Nehru Centre for Advanced Scientific Research, Bangalore, India, 2013.
9. S. Mandre, Anja Slim, Xinjun Guo, *Linear stability of time-dependent flows: dissolution-driven convection*, Department of Mathematics, University of Wisconsin, Madison, 2013.
10. S. Mandre, Anja Slim, Xinjun Guo, *Hydrodynamic stability of time-dependent flows*, Geophysical Fluid Dynamics Program, Woods Hole Institute of Oceanography, Woods Hole, 2012.
11. S. Mandre, Anja Slim, Xinjun Guo, *Hydrodynamic stability of time-dependent flows*, Division of Applied Mathematics, Brown University, Providence 2010.
12. S. Mandre, *Mechanism of a splash*, i-Bio Seminar series, National Centre for Biological Sciences, Tata, Insitute of Fundamental Research, Bangalore, India, 2012.

13. S. Mandre, *Mechanism of a splash*, Department of Mathematics, New Jersey Institute of Technology Newark, 2010.
14. S. Mandre, *Mechanism of a splash*, Division of Engineering, Brown University Providence, 2010.
15. S. Mandre, *Mechanism of a splash*, Department of Mathematics, University of New Hampshire Durham, 2010.
16. S. Mandre, M. Mani and M. P. Brenner, *Air cushion on droplet impact: a mechanism for sheet ejection*, James Frank Institute, University of Chicago, Chicago, 2010.
17. S. Mandre, M. Mani and M. P. Brenner, *Events before droplet splashing on a solid surface*, Department of Mathematics, University of California Berkeley, Berkeley, 2009.
18. S. Mandre, M. Mani and M. P. Brenner, *Precursors to splashing of a liquid droplet on a solid surface*, Dynamics Days, Gottingen, 2009.
19. S. Mandre, *The physics and mathematics of singing bottles*, Department of Mathematics, University of Alberta, Edmonton, 2009.
20. S. Mandre, *Lectures on convective and absolute instabilities*, Department of Chemical Engineering, Indian Institute of Technology, Mumbai
21. S. Mandre, M. Mani and M. P. Brenner, *Droplet impact as a precursor to splashing*, Department of Chemical Engineering, Indian Institute of Technology Bombay, Mumbai, 2008.
22. S. Mandre, *The physics and mathematics of singing bottles*, Department of Mathematics, MIT, Cambridge, 2008.
23. S. Mandre, *Roll waves and relatives*, Division of Engineering and Applied Sciences, Harvard University, Cambridge, 2006.
24. S. Mandre, *A flow induced elastic instability*, Department of Mechanical Engineering, Indian Institute of Technology Bombay, Mumbai, 2005.
25. S. Mandre, *Energy stability and finite amplitude thresholds*, Center for Nonlinear Sciences, Georgia Institute of Technology, Atlanta, 2005.
26. S. Mandre, *Some flow instabilities and their mechanisms*, Simple Persons Applied Math Seminar Series, Department of Mathematics, MIT, Cambridge MA, 2004.

Invited conference presentations

1. S. Mandre, Andong He, Khoi Nguyen, Michael Miller, *The Effect of Size and Shape on the Capillary Attraction between Nearby Floating Objects*, New England Complex Fluids, University of Massachusetts, Amherst, 2013.
2. S. Mandre, Andong He, Khoi Nguyen, Michael Miller, *The Effect of Size and Shape on the Capillary Attraction between Nearby Floating Objects*, Frontiers in Applied and Computational Mathematics, New Jersey Institute of Technology, Newark, 2013.
3. S. Mandre, Anja Slim, Xinjun Guo, *Hydrodynamic stability of time-dependent flows*, Dynamical Systems Conference, Snowbird, Utah, 2013.
4. S. Mandre, *Mechanism of a splash*, Complex fluids and complex flows in industry and nature, Vancouver, BC, Canada, 2011.
5. S. Mandre, *Mechanism of a splash*, AMS Eastern Sectional Meeting, Worcester, MA, 2011.
6. S. Mandre and L. Mahadevan, *A generalized theory of viscous and inviscid flutter*, Dynamics Days, San Diego, 2009.

Most relevant contributed talks

1. S. Mandre, M. A. Dias, D. K. Singh, M. M. Bandi, and M. Venkadesan, How the arches of the feet influence stiffness, Dynamic Walking, Columbus OH, 2015
2. M. J. Miller, B. Strom, K. S. Breuer, and S. Mandre, Optimization of energy harvesting efficiency of an oscillating hydrofoil: Sinusoidal and Non-sinusoidal trajectories, 67th Annual Meeting of the APS Division of Fluid Dynamics, 2014.

3. B. Strom, D. Kim, S. Mandre, and K. S. Breuer, Parametric dependence of energy harvesting performance with an oscillating hydrofoil, 67th Annual Meeting of the APS Division of Fluid Dynamics, 2014.
4. D. Kim, B. Strom, Y. Su, S. Mandre, and K. S. Breuer, The effect of aspect ratio on the performance of an energy harvesting hydrofoil, 67th Annual Meeting of the APS Division of Fluid Dynamics, 2014.
5. P. Kartheeswaran, X. Guo, and S. Mandre, A reduced model for unsteady laminar flow past a solid body using matched asymptotics, 67th Annual Meeting of the APS Division of Fluid Dynamics, 2014.
6. L. Mahadevan, N. Kaplan, N. Wu, S. Mandre and J. Aizenberg, Dynamics of evaporative colloidal patterning, 67th Annual Meeting of the APS Division of Fluid Dynamics, 2014.
7. R. Singh, A. Mahadevan, S. Mandre, and L. Mahadevan, Stability theory for the synchronized waving of marine grass, 67th Annual Meeting of the APS Division of Fluid Dynamics, 2014.
8. J. Lee, R. Singh, and S. Mandre, An experimental study of flow around submerged grass vegetation, 67th Annual Meeting of the APS Division of Fluid Dynamics, 2014.

Most relevant contributed posters

1. S. Mandre, M. A. Dias, D. K. Singh, M. M. Bandi, and M. Venkadesan, How the arches of the feet influence stiffness, Dynamic Walking, Columbus OH, 2015
2. Venkadesan, M., Dias, M. A., Singh, D. K., Bandi, M. M. and Mandre, S., Stiffness of the human foot and evolution of the transversal arch, Human Frontier Science Program Annual Meeting, La Jolla CA, 2015.
3. S. Mandre, X. Guo, V. K. Ponnulakshmi, A reduced model for vortex shedding from a body using matched asymptotics, Conference on Computational Physics, Boston MA, 2014.
4. Shreyas Mandre, Xinjun Guo, and Ponnulakshmi Kartheeswaran, A reduced model for vortex shedding from a body using matched asymptotics, 67th Annual Meeting of the APS Division of Fluid Dynamics, 2014.
5. Xinjun Guo and Shreyas Mandre, Vortex shedding by matched asymptotic vortex method, 67th Annual Meeting of the APS Division of Fluid Dynamics, 2014.
6. M. Lugo-Bolanos, N. Dhavale, D. Singh, M. Bandi, M. Venkadesan, S. Mandre, Photoelasticity method to measure the traction forces exerted by the foot in motion, 2014 HFSP Awardees Annual Meeting, Lugano, Switzerland, 2014.
7. J. Lee, R. Singh, S. Mandre, An experimental analog for the study of waving marine grass in tidal currents, Workshop on *Dynamics at Interfaces*, Okinawa Institute of Technology, Japan, 2014.
8. M. Lugo-Bolanos, S. Mandre, M. Venkadesan, M. Bandi, Photoelasticity method to measure the traction forces exerted by the foot in motion, Workshop on *Dynamics at Interfaces*, Okinawa Institute of Technology, Japan, 2014.
9. K. Nguyen, S. Mandre, Evaporation rate profile near the contact line of a droplet, Workshop on *Dynamics at Interfaces*, Okinawa Institute of Technology, Japan, 2014.
10. M. J. Miller, K. Nguyen, Attractive behavior of the superficial: Cheerios effect for object with sharp corners, Workshop on *Dynamics at Interfaces*, Okinawa Institute of Technology, Japan, 2014.

External Grants

2016-2017	co-PI: National Institutes of Health (R21, pending) <i>Identifying the musculoskeletal origins of foot stiffness,</i> with PI:Madhusudhan Venkadesan, Yale University.	\$425,020
2013-2016	co-PI: Human Frontier Science Program Young Investigator Award <i>The mechanics of the foot,</i> with PI:Madhusudhan Venkadesan and co-PI:Mahesh Bandi.	\$1050k
2013-2016	PI: Advanced Research Projects Agency - Energy <i>Marine Hydro-Kinetic Energy Harvesting Using Cyber-Physical Systems,</i> with Kenny Breuer, Heather Leslie, Jennifer Franck and in collaboration with Wellesley College and Volpe, Department of Transportation.	\$3750k
2012-2015	co-PI: Air Force Office of Scientific Research <i>Cyber-physical systems to understand the dynamics of nonlinear aero-elastic systems for flexible MAVs and energy harvesting applications,</i> with PI:Kenny Breuer.	\$492877

Teaching

Term	Course	Title	Strength
F2010	ENGN 0030	Introduction to Engineering	206
S2011,12,13	ENGN 1710	Heat and Mass Transfer	20, 22, 13
F2011,2013	ENGN 2912H	Interfacial Phenomena	7
F2012	ENGN 2912J	Asymptotic and Perturbation Methods	12
S2014	ENGN 1860	Advanced Fluid Mechanics	21

Advising

1. Freshman and Sophomore advisor – AY 2011-onwards,
2. TEAM (Team enhanced advising and mentoring) Freshman advisor – AY 2011-2012,
3. Undergraduate senior thesis – **Karine Ip Kiun Chong '12, Pablo Santafeumeia-Sanchez '12, Khoi Nguyen '14, Patrick O'Neil, '14,**
4. Undergraduate research – **Rebecca Lorick '18, Kenneth Volkman '17, Eva Junquera '17, Sarah Cowles '17, Aryssa Medina '17, Filip Simeski '17,**
5. Foreign student intern – **Ning Yu, Tshinghua University, summer 2015**
6. Karine Ip and Khoi Nguyen presented posters at national conferences, and Khoi co-authored a journal article[4],
7. Current graduate advisees – **Ravi Singh** (Physics), **Xinjun Guo** (Physics), **Michael Miller** (FTS), **Maria-Fernanda Lugo-Bolanos** (FTS), **Julia Lee** (FTS),
8. Postdoctoral advisees – **Ildoo Kim** (current), **V. K. Ponnulakshmi** (now at Sankhya Sutra, a startup on high performance computation), **Julie Albagnac** (now faculty at U. Toulouse, France), **Andong He** (now faculty at U. Hawaii).

Administrative duties

1. Fluids Seminar Series organizer – AY 2010-2011,
2. Fluids and Thermal Sciences Graduate Representative – AY 2011-2012, 2012-2013. 2013-2014, and Spring 2015.

Conference and workshop organizer

1. Session chair for the session on Drops: Evaporation and Condensation at the 67th annual meeting of American Physical Society's Division of Fluid Dynamics, Nov 2014.
2. Session chair for the session on Drops: Levitation and Propulsion on Surfaces at the 66th annual meeting of American Physical Society's Division of Fluid Dynamics, Nov 2013.
3. Session chair for the session on Acoustics at the 65th annual meeting of American Physical Society's Division of Fluid Dynamics, Nov 2012.
4. New England Workshop on Mechanics of Structures and Materials, MIT, Oct 1 2011, and Brown University, Nov 2012.
5. Society of Engineering Sciences, 50th Annual Technical Meeting and ASME-AMD Annual Summer Meeting, July 2013.
6. Dynamics at Interfaces, Workshop organized at the Okinawa Institute of Science and Technology, June 9-13, 2014.

External reviewer

- Referee for
 - Proceedings of the National Academy of Sciences,
 - Journal of Fluid Mechanics,
 - Physics of Fluids,
 - Langmuir,
 - Ocean Engineering,
 - SIAM Journal of Applied Mathematics,
 - Journal of Fluids Engineering,
 - European Journal of Applied Mathematics,
 - Fluid Dynamics Research,
 - Journal of Engineering Mathematics.
- Grant reviewer for
 - The U.S. National Science Foundation,
 - The U.S. Department of Energy,
 - The Natural Science and Engineering Council of Canada.