**Petia M. Vlahovska**

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**Research Interests:** *soft matter, interfacial flows, fluid-structure interaction in Stokes flow, active fluids, mechanics of biomembranes*

electromechanics of biomembranes, microhydrodynamics of soft particles (drops, red blood cells), electrohydrodynamics, membrane biophysics, self-organization in active suspensions

# Education

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| --- | --- |
| 8/03 | **Ph.D. Chemical Engineering**, Yale University.Thesis: “Dynamics of a surfactant-covered drop and the non-Newtonian rheology of emulsions” Advisors: Prof. Michael Loewenberg and Prof. Jerzy Blawzdziewicz2001 M.Phil. Mechanical Engineering, Yale University1999 M.S. Chemical Engineering, Yale University |
| 6/96 | M.Sc. Post-graduate program in “Separation processes in the industry and environmental protection” Laboratory of Chemical Physics and Engineering (renamed to Department of Chemical Engineering), University of Sofia “St. Kliment Ohridski”, BulgariaThesis: “Modeling the drying of solvent coatings on continuous webs”Advisors: Dr. Richard Aust and Prof. Franz Durst (LSTM, University of Erlangen, Germany), Prof. Krassimir Danov (University of Sofia, Bulgaria) |
| 6/94 | **M.Sc. Chemistry**, University of Sofia “St. Kliment Ohridski” (Bulgaria)Concentration: **chemical physics and theoretical chemistry**Thesis: “Diffusion-controlled adsorption kinetics in micellar surfactant solutions” Advisor: Prof. Krassimir Danov |

# Professional appointments

|  |  |
| --- | --- |
| 07/17-present | Associate Professor (with tenure), Engineering Science and Applied Math, Northwestern University |
| 07/13-06/17 | Associate Professor (with tenure), School of Engineering, Brown University |
| 09/14-08/15 | Visiting Scholar, ESAM, Northwestern University |
| 08/10-06/13 | Assistant Professor, School of Engineering, Brown University |
| 08/10-08/11 | Adjunct Assistant Professor, Thayer School of Engineering, Dartmouth College |
| 08/10-08/12 | Adjunct Assistant Professor, Physics Department, Dartmouth College |
| 08/06-08/10 | Assistant Professor, Thayer School of Engineering, Dartmouth College |
| 09/05-08/06 | Visiting Scientist, Membrane Biophysics Group, Theory and Bio-systems Department, Max-Planck Institute of Colloids and Interfaces, Germany |
| 08/03-06/05 | Visiting Assistant Professor, Division of Engineering, Brown University |
| 06/96-06/97 | Research Associate, Laboratory of Chemical Physics and Engineering, University of Sofia, Bulgaria |

**3 Honors and awards**

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| --- | --- |
| 2016 | Humboldt Research Fellowship, Alexander von Humboldt Foundation (Germany) |
| 2015 | Invitation to the National Academy of Engineering German-American Frontiers of Engineering Symposium |
| 2012 | Richard. B. Salomon research award, Brown University |
| 2010 | Dartmouth College nominee for the Camille-Dreyfus Teacher-Scholar Award |
| 2009 | Faculty Early Career Development (CAREER) Award, NSF |
| 2004 | David Crighton Fellow, DAMTP, Cambridge, UK |
| 2002 | Prize Teaching Fellowship, Yale University, for outstanding performance and promise as a teacher |

**4. Publications**

**4.1 Chapters in books**

1. P. M. Vlahovska “Non-equilibrium lipid membranes: stability and deformation in electric fields" in Advances in Planar Lipid Bilayers and Liposomes, Eds. Iglic and Tien, Vol 12, pp. 101-146, Elsevier 2010 <http://dx.doi.org/10.1016/B978-0-12-381266-7.00005-5>
2. P. M. Vlahovska “Dynamics of membrane bound particles: capsules and vesicles” Chapter in “Low-Reynolds-Number Flows: Fluid-Structure Interactions” Eds. C. Duprat and H.A. Stone, Royal Society of Chemistry’s Series RSC Soft Matter, 2015 <http://dx.doi.org/10.1039/9781782628491-00313>

**4.2 Refereed journal articles**

1. K. Danov, P. M. Vlahovska, T. Horozov, P. Kralchevsky, C. Dushkin, A. Mehreteab and G. Broze, “Adsorption in micellar surfactant solutions: nonlinear theory and experiment”, *J. Coll. Int. Sci*. 183, pp.223-235 (1996) <http://dx.doi.org/10.1006/jcis.1996.0537>
2. P. M. Vlahovska, K. Danov, A. Mehreteab and G. Broze, “Adsorption kinetics of ionic surfactants with detailed account for the electrostatic interactions:1. No added electrolyte”, *J. Coll. Int. Sci*. 192, pp. 194-206 (1997) <http://dx.doi.org/10.1006/jcis.1997.4919>
3. K. Danov, P. M. Vlahovska, P. Kralchevsky, A. Mehreteab and G. Broze, “Adsorption kinetics of ionic surfactants with detailed account for the electrostatic interactions: 2. Effect of the presence of electrolyte”, *Colloids Surfaces A* 156, pp. 389-411 (1999) [http://dx.doi.org/10.1016/S0927-7757(99)00099-0](http://dx.doi.org/10.1016/S0927-7757%2899%2900099-0)
4. J. Blawzdziewicz, P. Vlahovska and M. Loewenberg, “Rheology of a dilute emulsion of surfactant covered spherical drops” *Physica A* 276, pp. 50-85 (2000) <http://www.sciencedirect.com/science/article/pii/S0378437199003660>
5. P. Vlahovska, J. Blawzdziewicz and M. Loewenberg “Nonlinear rheology of a dilute emulsion of surfactant-covered spherical drops in time-dependent flows”, *J Fluid Mech*. 463, pp. 1-24 (2002) <http://dx.doi.org/10.1017/S0022112002008571>
6. P. M. Vlahovska, J. Blawzdziewicz and M. Loewenberg “Deformation of a surfactant-covered drop in a linear flow”, *Physics of Fluids* 17, 103103, (2005) <http://dx.doi.org/10.1063/1.2112727>
7. P.M.Vlahovska and R.S.Gracia “Dynamics of a viscous vesicle in linear flows”, *Physical Review E* 75 016313 (2007) <http://dx.doi.org/10.1103/PhysRevE.75.016313>
8. P. M. Vlahovska, J. Blawzdziewicz and M. Loewenberg “Small-deformation theory for a surfactant-covered drop in linear flows”, *J. Fluid Mech.* 624 pp. 293-337 (2009) <http://dx.doi.org/10.1017/S0022112008005417>
9. R. Dimova, N. Bezlyepkina, M. D. Jordö, R. L. Knorr, K. A. Riske, M. Staykova, P.M.Vlahovska, T. Yamamoto, P. Yang, and R. Lipowsky “Vesicles in electric fields: some novel aspects of membrane response” *Soft Matter* 5 pp. 3201-3212 (2009) (review) <http://dx.doi.org/10.1039/b901963d>
10. G. Danker, P. M. Vlahovska and C. Misbah, “Vesicles in Poiseuille flow” *Physical Review Letters*, 102 148102 (2009) <http://dx.doi.org/10.1103/PhysRevLett.102.148102>
11. P. M. Vlahovska, R. S. Gracia, S. Aranda and R. Dimova, “Electrohydrodynamic model of vesicle deformation in alternating electric fields “, *Biophysical Journal*, 96 pp. 4789-4803 (2009) <http://dx.doi.org/10.1016/j.bpj.2009.03.054>
12. P. M. Vlahovska, T. Podgorski and C. Misbah “Vesicles and red blood cells: from individual dynamics to rheology” *Comptes Rendus Physique* 10 pp.775–789 (2009) (invited review) <http://dx.doi.org/10.1016/j.crhy.2009.10.001>
13. J. Hanna and P. M. Vlahovska “Surfactant-induced migration of a spherical drop in Stokes flow” Physics of Fluids 22, 013102 (2010) <http://dx.doi.org/10.1063/1.3277665>
14. J. T. Schwalbe, P. M. Vlahovska and M. Miksis “Monolayer slip effects on the dynamics of a lipid bilayer vesicle in a viscous flow*”, J. Fluid Mech*. 647 pp. 403-419 (2010) <http://dx.doi.org/10.1017/S002211200999320X>
15. P. F. Salipante and P. M. Vlahovska "Electrohydrodynamics of drops in strong uniform DC electric fields" *Physics of Fluids* 22, 112110 (2010) <http://dx.doi.org/10.1063/1.3507919>
16. J. T. Schwalbe, F. R. Phelan Jr., P. M. Vlahovska, and S. D. Hudson “Interfacial effects on droplet dynamics in Poiseuille flow” *Soft Matter* 7, 7797-7804 (2011) <http://dx.doi.org/10.1039/c1sm05144j>
17. P. M. Vlahovska “On the rheology of a dilute emulsion in an uniform electric field”, *J. Fluid Mech.* 670:481-503 (2011) <http://dx.doi.org/10.1017/S0022112010005379>
18. J. T. Schwalbe, P. M. Vlahovska and M. J. Miksis “Lipid membrane instability and poration driven by capacitive charging” *Physics of Fluids* 23: 041701 (2011) <http://dx.doi.org/10.1063/1.3567276>
19. S. Veerapaneni, Yuan-nan Young, P. M. Vlahovska, and J. Blawzdziewicz “Dynamics of a compound vesicle” *Physical Review Letters* 105: 158103 (2011) <http://dx.doi.org/10.1103/PhysRevLett.106.158103>
20. J.T. Schwalbe, P. M. Vlahovska and M. J. Miksis “Vesicle electrohydrodynamics” *Physical Review E* 83:046309 (2011) <http://dx.doi.org/10.1103/PhysRevE.83.046309>
21. P. M. Vlahovska, Y.-n.Young, G. Danker and C. Misbah, “Dynamics of a non-spherical microcapsule with incompressible interface in a shear flow” *J. Fluid Mech*. 678:221-247 (2011) <http://dx.doi.org/10.1017/jfm.2011.108>
22. P. F. Salipante, R. Knorr, R. Dimova, P. M. Vlahovska “Electrodeformation method for measuring the capacitance of bilayer membranes”, *Soft Matter*, 8, 3810 - 3816 (2012) <http://dx.doi.org/10.1039/c2sm07105c>
23. J. Seiwert, M.J. Miksis, and P. M. Vlahovska “Stability of biomimetic membranes in DC electric fields”, *J. Fluid Mechanics*, 706, 58-70 (2012) <http://dx.doi.org/10.1017/jfm.2012.211>
24. X. Li, P.M. Vlahovska, G. Em Karniadakis “Continuum- and particle-based modeling of shapes and dynamics of red blood cell in health and disease “, *Soft Matter*, 9, 28 - 37 (2013) <http://dx.doi.org/10.1039/c2sm26891d>
25. J. Seiwert and P. M. Vlahovska “Instability of a fluctuating membrane driven by an AC electric field”, *Physical Review E*, 87, 022713 (2013) <http://dx.doi.org/10.1103/PhysRevE.87.022713>
26. H. He, P. F. Salipante, and P. M. Vlahovska “Electrorotation of a droplet in a uniform DC electric field”, *Physics of Fluids*, 25, 032106 (2013) <http://dx.doi.org/10.1063/1.4795021>
27. L. C. McConnell, P. M. Vlahovska, M. J. Miksis “Vesicle electrohydrodynamics in DC electric fields” *IMA Journal of Applied Mathematics*, 78, 797-817 (2013) <http://dx.doi.org/10.1093/imamat/hxt023>
28. P. M. Vlahovska, D. Barthès-Biesel, C. Misbah “Individual and Collective Behavior of Red Blood Cells and their Biomimetic Counterparts”, *Comptes Rendus Physique*, 14, 451-458 (2013) <http://dx.doi.org/10.1016/j.crhy.2013.05.001>
29. P. F. Salipante and P. M. Vlahovska “Electrohydrodynamic rotations of a viscous drop”, *Physical Review E* 88, 043003 (2013) <http://dx.doi.org/10.1103/PhysRevE.88.043003>
30. H. Nganguia, Y.-n. Young, P.M. Vlahovska, J. Bławzdziewcz J. Zhang, and H. Lin “Electro-deformation of a surfactant-laden viscous drop”, *Physics of Fluids*, 25, 092106 (2013) <http://dx.doi.org/10.1063/1.4821205>
31. P. F. Salipante and P. M. Vlahovska “Vesicle deformation in DC electric pulses”, *Soft Matter* 10:3386-3393 (2014) <http://dx.doi.org/10.1039/c3sm52870g>
32. M. Ouriemi and P. M. Vlahovska “Electrohydrodynamics of particle-covered drops”, *J. Fluid Mech.* 751:106-120 (2014) <http://dx.doi.org/10.1017/jfm.2014.289>
33. P. F. Salipante, M. L. Shapiro, and P. M. Vlahovska “Electric field induced deformations of biomimetic fluid membranes”, *Procedia IUTAM* 16:60-69 (2015) [doi:10.1016/j.piutam.2015.03.008](http://dx.doi.org/10.1016/j.piutam.2015.03.008%22%20%5Ct%20%22doilink)
34. L. C. McConnell, P. M. Vlahovska, M. J. Miksis “Vesicle dynamics in electric fields: squaring and breathing”, *Soft Matter* 11: 4840-4846 (2015) <http://dx.doi.org/10.1039/c5sm00585j>
35. P. M. Vlahovska “Voltage-morphology coupling in biomimetic membranes: dynamics of giant vesicles in applied electric fields”, highlight article for *Soft Matter*, 11:7232 -7236 (2015) <http://dx.doi.org/10.1039/C5SM01050K>
36. K. Yeo, E. Lushi and P. M. Vlahovska “Collective dynamics in a binary mixture of hydrodynamically coupled microrotors”, *Physical Review Letters* 114, 188301 (2015) <http://journals.aps.org/prl/abstract/10.1103/PhysRevLett.114.188301>
37. M. Ouriemi and P. M. Vlahovska “Electrodeformation and rotation of a particle-covered drop”, *Langmuir* 32: 6298-6305 (2015) <http://dx.doi.org/10.1021/acs.langmuir.5b00774>
38. E. Lushi and P. M. Vlahovska “Periodic and chaotic orbits of micro-rotors in creeping flows”, *J Nonlinear Sci*. 25:1111-1123 (2015) <http://dx.doi.org/10.1007/s00332-015-9254-9>
39. L. C. McConnell, P. M. Vlahovska, M. J. Miksis “Continuum modeling of the electric-field-induced tension in deforming lipid vesicles”, *J. Chem. Physics*, 143: 243132 (2015) <http://dx.doi.org/10.1063/1.4935826>
40. W. Kim, N. Fricke, A. L. Conery, B. B. Fuchs, R. Rajamuthiah, E. Jayamani, P. M. Vlahovska, F. M. Ausubel, E. Mylonakis, “NH125 kills methicillin-resistant Staphylococcus aureus persisters by lipid bilayer disruption”, *Future Medicinal Chemistry*, 8: 257-269  (2016) <http://dx.doi.org/10.4155/fmc.15.189>
41. K. Yeo, E. Lushi and P. M. Vlahovska “Dynamics of inert spheres in active suspensions of micro-rotors”, *Soft Matter* 12: 5645-5652(2016) <http://dx.doi.org/10.1039/C6SM00360E>
42. A. Darvish, G. Goyal, R. V. K. Sundaram, R. N. Arora, K. D. Lee, C. W. Ahn, Ki-B. Kim, I. Chaiken, P. M. Vlahovska and M. J. Kim “Nanoparticle mechanics: deformation detection via nanopore resistive pulse sensing”, *Nanoscale* 8: 14420-14431 (2016) <http://dx.doi.org/10.1039/c6nr03371g>
43. P. M. Vlahovska “Electrohydrodynamic instabilities of viscous drops” *Physical Review fluids* 1: 060504 (2016) http://dx.doi.org/10.1103/PhysRevFluids.1.060504
44. Q. Brosseau, G. Hickey, P. M. Vlahovska, “Electrohydrodynamic instabilities of viscous drops” *Physical Review fluids* 2: 014101 (2017) <http://dx.doi.org/10.1103/PhysRevFluids.2.014101>
45. Q. Brosseau and P. M. Vlahovska, “Equatorial streaming of a drop in an electric field”, *Physical Review Letters* 119: 034501 (2017) <http://dx.doi.org/10.1103/PhysRevLett.119.034501>
46. Y. Hu, P. M. Vlahovska, M. J. Miksis “Colloidal particle electrorotation in a non-uniform electric field”, Phys. Rev. E 97: 013111 (2018) <http://dx.doi.org/10.1103/PhysRevE.97.013111>
47. W. Kim, W. Zhu, G. L. Hendricks, D. Van Tyne, A. D. Steele, C. E. Keohane, N. Fricke, A. L. Conery, S. Shen, W. Pan, K. Lee, R. Rajamuthiah, B. B. Fuchs, P. M. Vlahovska, W. M. Wuerst, M. Gilmore, H. Gao, F. M. Ausubel, E. Mylonakis “A new class of synthetic retinoid antibiotics effective against bacterial persisters”, Nature (2018) <https://www.nature.com/articles/nature26157>

**4.3 Non-refereed journal articles**

1. P. M. Vlahovska “Dynamics of surfactant-covered drops in linear flows”, *PAMM* 7 1101601–1101602 (2007) <http://dx.doi.org/10.1002/pamm.200700247>
2. P. M. Vlahovska “Asymmetric shapes and pearling of a stretched vesicle” Focus on Fluids article, *J. Fluid Mech*. 754:1-4(2014) <http://dx.doi.org/10.1017/jfm.2014.373>

**4.4 Articles in preparation or review**

1. P. M. Vlahovska and C. Misbah “Theory of vesicle dynamics in flow and electric fields” Chapter 7 in “The giant vesicle book”, Eds. R. Dimova and C. Marques, submitted
2. Z. Shen, A. Farutin , T. M. Fischer , P. M. Vlahovska, J. Harting , C. Misbah “Blood crystal: emergent order of red blood cells under shear flow”, submitted
3. P. M. Vlahovska “Electrohydrodynamics of drops and vesicles”, Annual Review of Fluid Mechanics, submitted

**4.5 In the news**

Active matter <https://news.brown.edu/articles/2015/06/colloids>

Equatorial streaming:

[Saturn-shaped drops](https://physics.aps.org/synopsis-for/10.1103/PhysRevLett.119.034501) Physics synopsis

[A new twist on electrosprays](http://www.mccormick.northwestern.edu/news/articles/2017/07/a-new-twist-on-electrosprays.html) Northwestern engineering news

[Electrified Droplets Create Mini Saturn Planets](https://www.livescience.com/59722-electrified-droplets-create-mini-saturn-planets.html) Livescience

[Like little rings of Saturn: How electricity pulls a drop of | Cosmos](https://cosmosmagazine.com/physics/how-electricity-pulls-a-drop-of-liquid-apart)

[Saturn ring-like ‘streaming’ takes liquids into a new world](https://www.chemistryworld.com/news/saturn-ring-like-streaming-takes-liquids-into-a-new-world/3007755.article) Chemistry World

[Party slugs, pseudo-Saturn and a dancing Moon rover](http://www.nature.com/news/party-slugs-pseudo-saturn-and-a-dancing-moon-rover-1.22236) Nature news

**4.6 Videos**

4.6.1 Lectures:

Complex Creeping Fluids: Numerical Methods and Theory, Oct 1-6, 2017

*Complex dynamics of soft microparticles in flow and electric fields*

https://www.birs.ca/events/2017/5-day-workshops/17w5155/videos/watch/201710020900-Vlahovska.html

Electrohydrodynamics and Electrodiffusion in Material Sciences and Biology, March 12-16, 2018

*Electrohydrodynamic instabilities of viscous drops in strong electric fields*

https://www.ima.umn.edu/2017-2018.3/W3.12-16.18/26717

4.6.2 Gallery of Fluid Motion:

[The Saturn-ring instability of a drop in an electric field](https://gfm.aps.org/meetings/dfd-2016/57bef9d6b8ac311791000359)

[Electrohydrodynamics of a particle-coated drop](https://gfm.aps.org/meetings/dfd-2014/541602a569702d585c190100)

**5 Research Grants**

**5.1 Current Grants**

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| 07/01/2017-06/30/2020 | NSF-DMS “Collective Dynamics of Particles at Fluid Interfaces”Co-PI with Michael Miksis (PI) and David Chopp (Co-PI) | $480,000 |
| 09/01/2017-08/31/2020 | NSF-CBET “Collaborative Research: Electrorotational fluid instabilities ”PI with Co-PIs Michael Miksis (NU) and David Saintillan (UCSD) | $253,850 (NU portion) |
| 09/01/2016-08/31/2019 | NSF-CMMI “Collaborative Research: Quantitative Analysis of Liposome Deformation at Nanoscale Using Resistive Pulse Sensing in Solid State Nanopores “(co-PI, lead PI Prof. Minjun Kim, Drexel University) | $200,000 (my portion) |
| 09/01/2015-08/31/2019 | NSF-CMMI “Electromechanical properties and deformation of biomembranes”(Principal Investigator) | $428,095 |
| 01/01/2015-12/31/2017 | NSF-CBET “Electrohydrodynamics of particle-covered drops”(Principal Investigator) | $321,425 |

**5.2 Completed Grants**

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| 2008-2010 | ACS-PRF “Effect of surfactant on drop electrohydrodynamics”  | $50,000 |
| 2009 | NSFTravel support for students and young researchers to attend the Summer School on “Complex- and Bio- Fluids”, June, 2009, Corsica, France | $13,500 |
| 2010 | NSF ADVANCE Travel Award | $1000 |
| 2010- 2012 | NSF-OISE “US-Germany Dissertation Enhancement: Dynamics of biomembranes in electric fields (Principal Investigator) | $15,000 |
| 2012 | NSF-Travel support for students and young researchers to attend the Summer School on "Biological Complex Fluids", June, 2012, Corsica, France(Principal Investigator) | $10,000 |
| 2012 | Richard B. Salomon Faculty Research Award “Tension regulated phase separation in biomimetic multicomponent membranes”(Principal Investigator) | $15,000  |
| 2012- 2014 | NSF-CBET“Nonlinear droplet electrohydrodynamics in Stokes flow regime”(Principal Investigator) | $261,223+ REU $9,992 |
| 2012 | NSF Career-Life Supplement | $24,405 |
| 2009- 2014 | NSF-CBET CAREER “Dynamics of cells and cellular mimetics in flow and electric fields: An integrated biophysical and engineering approach” (Principal Investigator) | $405,351 |
| 2013-2015 | NSF-CMMI “Tension effects on phase transitions in biomimetic bilayer membranes”(Principal Investigator) | $295,467 |
| 09/01/2015-08/31/2016 | NSF-CBET “EAGER: Emergent order of hydrodynamically coupled microrotors”PI with Co-PI E. Lushi | $100,001 |

**6. Keynote presentations and major lectures**

2011 Gordon Research Conference “Soft Condensed Matter Physics: Soft Matter Far from Equilibrium” *Non-equilibrium dynamics of vesicles and lipid bilayer membranes: deformation and stability in electric fields*

2015 APS-DFD annual meeting invited lecture *Microhydrodynamics of deformable particles: surprising responses of drops and vesicles to uniform electric field or shear flow*

2016 22th CISM-IUTAM International Summer School on “Biological and Bio-inspired Fluid Mechanics”, Udine, Italy. 6 lectures on  *Microhydrodynamics of red blood cells and their mimetics (vesicles and capsules)*

2016 Summer School “Soft solids and complex fluids”, UMass Amherst. 4 lectures on *Microhydrodynamics of soft particles*

2017 Plenary talk, BIRS workshop "Complex Creeping Fluids: Numerical Methods and Theory”, Oaxaca, Mexico, October 1-6, 2017 *Complex dynamics of soft microparticles in flow and electric fields*

**7. Invited seminars and talks**

(since 2006)

2006

* IPAM-UCLA: Membrane Protein Science and Engineering workshop, March : *Vesicle microhydrodynamics*
* Max-Planck Institute for Polymer Research, Mainz, Germany, July: *Microhydrodynamics of soft particles and the non-Newtonian rheology of dispersions*

2007

* Department of Physics, Dartmouth College, February: *Structure and flow of dispersions of soft particles*
* Department of Mathematical Sciences, NJIT, March: *Microhydrodynamics of soft particles*
* Institute Curie, Physical Chemistry Unit, France, May: *Dynamics of vesicles in flow and electric fields*
* 6th International Congress on Industrial and Applied Mathematics, ICIAM, Zurich, Switzerland, July: *Dynamics of surfactant-covered drops in linear flows*
* Engineering Sciences and Applied Math, Northwestern University, October: *Dynamics of vesicles in hydrodynamic and electric fields*
* Condensed Matter Seminar, Physics Department, Brown University, October: *Shape Transitions of Vesicles in Hydrodynamic and Electric Fields*

2008

* School of Engineering, University of Vermont, February: *The role of membranes in cell mechanosensing*
* Condensed Matter Theory Seminar, Harvard University, April: *Micro-hydrodynamics of vesicles*
* SIAM Annual Meeting, Minisymposium: Mathematical modeling and simulation of biological membranes, July*: Non-Equilibrium Dynamics of Biomembranes*
* NJIT, Fluid Dynamics seminar, October*: Electrohydrodynamic deformation of lipid bilayer membranes*
* Computations in Science Seminar, MRSEC, University of Chicago, October: *Electrohydrodynamic Deformation of Lipid Bilayer Membranes*
* Department of Chemistry, Dartmouth College, November: *Lipid vesicles as a tool to study cellular biomechanics*
* IPAM-UCLA: Cells and Materials: At the Interface between Mathematics, Biology and Engineering - Reunion Conference II, December: *Lipid vesicles as a tool to study cellular biomechanics*

2009

* Engineering Sciences and Applied Math, Northwestern University, February: *Complex dynamics of red blood cells and vesicles in viscous flows*
* Center for Fluid Mechanics, Brown University, April: *Red Blood Cell Dynamics in Microcirculatory Flows*
* Max-Planck Institute for Colloids and Interfaces, Theory and Biosystems, Germany, July: *Electrohydrodynamic model of vesicle deformation in alternating electric fields*
* Mechanical Engineering and Applied Mechanics, University of Pennsylvania, September: *Lipid membranes in electric fields*
* Mechanical Engineering, University of Maryland Baltimore County, October: *Red blood cell dynamics in microcirculatory flows*

2010

* Special Session on Mathematics and Computations of Fluid Dynamics, AMS Spring Eastern Sectional Meeting, Newark, May: *Microhydrodynamics of soft particles*
* ESPCI, Paris , France, July: *Electrohydrodynamics of drops and vesicles*
* Chemical Engineering, Yale University, September: *Electrohydrodynamics of drops and vesicles*
* 467th Wilhelm and Else Heraeus Seminar “Biophysics of membrane transformations”, Germany, October: *Deformation and stability of biomembranes in electric fields*
* Electrokinetic Phenomena in Nano-colloids and Nano-fluidics, Technion, Israel: *Electrohydrodynamics of drops and vesicles*

2011

* Courant Institute, NYU, April: *Electrohydrodynamics of Droplets and Vesicles*
* Gordon Research Conference “Soft Condensed Matter Physics: Soft Matter Far from Equilibrium”, August: *Non-equilibrium dynamics of vesicles and lipid bilayer membranes: deformation and stability in electric fields*
* Physics Department, UMass-Amherst, September: *Deformation and stability of biomembranes in electric fields*
* Mechanical Engineering, Tufts, October: *Dynamics of red blood cells and vesicles in flow*

2012

* URI, Mechanical Engineering, March 2: *Dynamics of Red Blood Cells in Flow*
* NJIT, Mathematical Sciences, March 19: *Nonlinear electrohydrodynamics of a viscous droplet*
* IUIC, Mechanical Engineering, March 30: *Nonlinear electrohydrodynamics of a viscous droplet*
* MIT, Mechanical Engineering, May 1: *Nonlinear electrohydrodynamics of a viscous droplet*
* AmeriMech 2012: Mechanics in Biology, December 10-11 (invited speaker): *Flow dynamics of red blood cells*

2013

* Harvard University, Applied Mechanics Seminar, February 27: *Electromechanics of biomembranes*
* NJIT, Applied Math Colloquium, April 26: *Electromechanics of biomembranes*

2014

* University of Illinois, Chicago, Biomedical Engineering, March 14: *Electromechanics of biomimetic bilayer membranes*
* Polymer Program in the Institute of Materials Science at the University of Connecticut, April 18: *Electromechanics of biomimetic bilayer membranes*
* NYU, Soft Matter seminar, September 24: *Complex fluid interfaces in electric fields: belted drops, patchy membranes, and vesicle drums*
* URI, Chemical Engineering, September 25: *Living on the edge: voltage-driven extreme deformation of bilayer membranes*
* Clemson University, Material Science and Engineering Colloquium, November 6: *Complex fluid interfaces in electric fields: belted drops, patchy membranes, and vesicle drums*
* UIUC, Chemical Engineering, December 16, *Voltage driven morphology changes in biomimetic bilayer membranes*

2015

* University of Illinois, Chicago, Chemical Engineering, January 22, *Voltage driven morphology changes in biomimetic bilayer membranes*
* Northwestern University, Mechanical Engineering, Feb 9, *Electromechanics of biomimetic bilayer membranes*
* Tennessee Tech University, Chemical Engineering, March 3, *Electrodeformation of biomimetic bilayer membranes*
* University of Minnesota, Chemical Engineering, March 24, *Deformation and Stability of Biomembranes in Electric Fields*
* Northwestern University, ESAM, April 6, *Complex fluid interfaces in electric fields: belted drops, patchy membranes and vesicle drums*
* National Academy of Engineering German-American Frontiers of Engineering Symposium, April 15-18 (canceled)
* Biofrontier Symposium, JSME (Fukuoka, Japan), October 2: *Red blood cells dynamics in microcirculatory flows*
* Biological Flow Studies Laboratory, Tohoku University (Japan), October 5: *Red blood cells dynamics in microcirculatory flows*
* APS-DFD Focus Session on “Electrohydrodynamics of Drops, Vesicles and Membranes”, Nov 22-24, *Electric Field Effects of the Thermal Undulations of Lipid Bilayer Membranes*

2016

* Carnegie-Mellon University, Center for Complex Fluids Engineering, April 1st, *Complex fluid interfaces in electric fields: interfacial instabilities and patterns of particle-coated drop*s
* CECAM workshop on Emergent dynamics of out-of-equilibrium colloidal systems at nano- to microscales, EPFL (Switzerland), April 18-20, *Hydrodynamic Self-Organization and Mixing in Active Suspensions of Micro-Rotors*
* Levich Institute, CCNY, November 1st, *Electrohydrodynamic instabilities of viscous drops*
* **Invited speaker**, workshop “Surface activity driven by material geometry and elasticity", UMass Amherst Sep 8-10 Electrohydrodynamic particle assembly on a drop interface

2017

* **Invited speaker**, “Physics of Microfluidics” workshop, Sde Boker (Israel) January 3-8
* **Invited speaker,** ICERM workshop “Making a Splash - Droplets, Jets and Other Singularities”, Brown University, March 20-24
* Rochester Institute of Technology, Computational and Applied Mathematics Seminar*Electrohydrodynamic Instabilities of Viscous Drops*, March 28
* Invited speaker (keynote), ACS Colloids and Surfaces Symposium, July
* **Plenary talk**, BIRS workshop "Complex Creeping Fluids: Numerical Methods and Theory”, Oaxaca (Mexico) October 1-6
* University of Michigan, Condensed Matter Physics seminar, October 10, *The “Saturn-Rings” Drop and Other Electrohydrodynamic Instabilities*
* ETH (Switzerland), December 5

2018

* Invited speaker, IMA Workshop Electrohydrodynamics and Electrodiffusion in Material Sciences and Biology March 12 – 16, *Electrohydrodynamic instabilities of viscous drops in strong electric fields*
* Invited speaker, IMA Workshop Dynamic Contact Lines: Progress and Opportunities, March 26 – 28, *Electrokinetics of particles at interfaces*
* Yale University, Mechanical Engineering Seminar, April 18, *Electrohydrodynamic Instabilities of Viscous Drops*
* AIChE Annual meeting, invited talk at the Novel Flows session, November

**8. Conference presentations (contributed)**

(Complete since 2006)

2006

* “Dynamics of Vesicles in Linear Flows”, AIChE Annual Meeting in San Francisco, Nov 12-17, 2006.
* “Vesicle dynamics in linear viscous flows” (with Ruben Serral-Gracia), APS-DFD meeting in Tampa, Nov 19-21, 2006.

2007

* “Dynamics of drops and cells in hydrodynamic and electric fields", Pan-American Advanced Studies Institute on Interfacial Fluid Dynamics: From Theory to Applications, Mar de Plata (Argentina) , 6-17 August., 2007.
* “Effect Of Surfactant On Drop Dynamics In Electric Fields”, AIChE Annual Meeting in Salt Lake City, Nov 4-9, 2007.
* “Dynamics Of Artificial Cells In Electric Fields”, AIChE Annual Meeting in Salt Lake City, Nov 4-9, 2007.
* “Dynamics of vesicles in electric fields”, APS-DFD meeting in Salt Lake City, Nov 18-20, 2007.

2008

* “Electro- hydrodynamic deformation of vesicles and cells” with R. Gracia, S. Aranda and R. Dimova IACM/ECCOMAS Congress 2008, June 30 – July 5, 2008
* “Complex Dynamics of Vesicles and Red Blood Cells in Viscous Flows” with G. Danker and C. Misbah, APS –DFD Annual Meeting, Nov 23-25, 2008
* “Dynamics of Lipid Bilayer Vesicles in Viscous Flows” with J. Schwalbe and M. Miksis, APS –DFD Annual Meeting, Nov 23-25 2008
* “Nonlinear effects in the dynamics of viscous vesicles in linear flows” with Yuan-nan Young (poster), APS –DFD Annual Meeting, Nov 23-25 2008
* “Electrohydrodynamics of Soft Particles: Role of the Interface” (poster), AIChE Annual Meeting November 17 2008

2009

* “Complex Dynamics of Vesicles and Red Blood Cells in Viscous Flows” with Y.Young and C. Misbah, AIChE Annual meeting November 8-13, 2009
* “Deformation and Rotation of a Drop in a Uniform Electric Field” with P. Salipante, AIChE Annual meeting November 8-13, 2009
* “Complex motions of vesicles and capsules in flow” with Y.Young and C. Misbah, APS-DFD meeting November 21-24, 2009
* “Surfactant-induced migration of a drop in Stokes flow” with J. Hanna, APS-DFD meeting November 21-24, 2009
* “Deformation and Rotation of a Drop in a Uniform Electric Field” with P. Salipante, APS-DFD meeting November 21-24, 2009
* “Stability of a Lipid Bilayer Membrane Subjected to a DC Electric Pulse” with J. Schwalbe and M. Miksis, APS-DFD meeting November 21-24, 2009
* Gordon research conference Soft Condensed Matter Physics “Soft meets biology” August 9-14, 2009: poster and talk by P. Salipante , poster by J. Hanna.
* “Complex motions of vesicles and red blood cells in flow” (poster), IMA Workshop on Flowing Complex Fluids, October 12-16, 2009r
* “Dynamics of drops and vesicles in electric fields” (poster), IMA Workshop on Flowing Complex Fluids, December 07-11, 2009

2010

* “Symmetry breaking and chaos in droplet electrohydrodynamics” with P. Salipante, APS-DFD meeting November 20-23, 2010
* “Deformation and stability of lipid membranes in electric fields”, APS-DFD meeting November 20-23, 2010
* “Vesicle Electrohydrodynamics” with J. Schwabe and M. Miksis, APS-DFD meeting November 20-23, 2010
* “Dynamics of a compound vesicle: analytical modeling” with Y-n Young, S. Veerapaneni and Jerzy Blawzdziewicz, APS-DFD meeting November 20-23, 2010
* “Dynamics of a compound vesicle: numerical simulations” with S. Veerapaneni, Y-n Young and Jerzy Blawzdziewicz , APS-DFD meeting November 20-23, 2010

2011

* “Deformation and stability of lipid membranes in electric fields” session in Biomembrane Mechanics and Dynamics, 241st ACS National Meeting, March 27-31, 2011
* “Electrohydrodynamics Of Bilayer Membranes” with Paul Salipante, SES meeting, October 12-14, 2011
* “Lipid Bilayer Vesicle Electrohydroynamics In DC Electric Fields” with Lane McConnell and Michael Miksis, SES meeting, October 12-14, 2011
* “Nonlinear Particle Dynamics In a Uniform Electric Field”, with Paul F. Salipante, Adam W. Musial, AIChE meeting, October 16-21, 2011
* “Interfacial Effects on Droplet Dynamics in Poiseuille Flow” with J. Schwalbe, F. Phelan and S. Hudson, APS-DFD meeting November 20-22, 2011
* “Dynamics of Lipid Bilayer Vesicles and Droplets in DC Electric Fields” with L. McConnell and M. Miksis, APS-DFD meeting November 20-22, 2011
* “Electrohydrodynamics of bilayer membranes” with P. Salipante and R. Dimova APS-DFD meeting November 20-22, 2011
* “Electrohydrodynamic instabilities of biomimetic bilayer membranes” with J. Seiwert APS-DFD meeting November 20-22, 2011

2012

* “Nonlinear electrohydrodynamics of a viscous droplet” with P. F. Salipante, APS March meeting, February 27-March 2, 2012
* “Electrohydrodynamic instabilities of biomimetic bilayer membranes” with J. Seiwert, APS March meeting, February 27-March 2, 2012
* “Interfacial Effects on Droplet Dynamics in Poiseuille Flow” with S. Hudson, J. Schwalbe, K. Erk, and F. Phelan Jr. APS March meeting, February 27-March 2, 2012
* Electrohydrodynamic Instabilities of Bilayer Membranes, with J. Seiwert, P. F. Salipante, and M. Miksis, AIChE Annual Meeting, Pittsburgh, PA, October 28-November 2, 2012
* “Nonlinear Electrohydrodynamics of a Viscous Droplet” with P. F. Salipante, Annual Meeting of the American Electrophoresis Society (AES), Pittsburgh, PA, October 28-November 2, 2012
* “Lipid Bilayer Vesicle Dynamics in DC Electric Fields”, with L. McConnell and M. Miksis, APS-DFD meeting, November 18-20, 2012
* “Tension induced phase transitions in biomimetic fluid membranes”, with M. Shapiro,APS-DFD meeting, November 18-20, 2012
* “Instability of a fluctuating membrane driven by an AC electric field”, with J. Seiwert, APS-DFD meeting November 18-20, 2012
* “Electro-deformation of a surfactant-laden viscous drop”, with H. Nganguia, Y.-n. Young, J. Zhang, H. Lin, APS-DFD meeting November 18-20, 2012
* “Deformation and stability of biomimetic membranes in DC electric pulses”, with P. F. Salipante, APS-DFD meeting November 18-20, 2012
* AmeriMech 2012: Mechanics in Biology, Virginia Tech, Dec 11-12, 2012, APS-DFD meeting November 18-20, 2012

2013

* “Nonlinear electrohydrodynamics of a viscous droplet ”, with P. F. Salipante, SOR meeting, February 10-14, 2013
* “Effects of drop-fluid interface and hydrodynamic interactions on Quincke rotation” with M. Ouriemi, SES, July 28-31, 2013
* “Deformation and stability of biomimetic membranes in DC electric pulses” with P. F. Salipante, July 28-31, SES 2013
* “Electro-deformation of a surfactant-laden viscous drop”, with Y-n. Young, H. Nganguia and H. Lin, July 28-31, SES 2013
* “Effects of drop-fluid interface and hydrodynamic interactions on Quincke rotation” with M. Ouriemi, AIChE Annual Meeting, November 3-8, 2013
* “The Electrokinetic Properties of Cationic Surfactants Adsorbed On a Hydrophobic Substrate: Effect of Chain Length and Concentration” with G. Azadi and A. Tripathi, AIChE Annual Meeting, November 3-8, 2013
* “The Electrohydrodynamics of Lipid Bilayer Vesicles in AC and DC Fields” with P. F. Salipante, APS-DFD meeting, November 24-26, 2013
* “ Deformation of biomimetic membranes under electroporation using DC electric pulses”, L. McConnell and M. Miksis, APS-DFD meeting, November 24-26, 2013
* “ Electrorotation of a viscous droplet in a uniform direct current electric field” with H. He and P. F. Salipante, APS-DFD meeting, November 24-26, 2013
* “ Electrohydrodynamics of drops covered with small particles” with M. Ouriemi, APS-DFD meeting, November 24-26, 2013
* “ Rotors in low Re fluid: interactions and dynamics near a wall” with E. Lushi, APS-DFD meeting, November 24-26, 2013

2014

* “Electromechanics of biomimetic membranes” (poster), Gordon Research Conference Bioelectrochemistry, July 6-11
* “Electromechanics of biomimetic membranes”, SES, October 1-3
* “Electrohydrodynamic Particle Structuring on a Drop Interface” with M. Ouriemi, AIChE Annual Meeting, November 16-21
* “Electric-Field-Driven Deformation, Poration, and Phase Separation in Biomimetic Membranes” with with P. F. Salipante, AIChE Annual Meeting, November 16-21
* “Interfacial effects on droplet electrohydrodynamics: particle vortices, patchy membranes, and vesicle drums”, APS-DFD meeting, November 23-25
* “Electromechanics of biomimetic membranes”, L. McConnell and M. Miksis, APS-DFD meeting, November 23-25
* “Thermal undulations of biomimetic bilayer membranes in external fields” with N. Fricke, APS-DFD meeting, November 23-25
* “Electrohydrodynamics of a surfactant-covered drop” (poster) with A. Oberlander and M. Ouriemi, APS-DFD meeting, November 23-25
* “Collective dynamics and mixing in a suspension of micro-rotors” with E. Lushi and K. Yeo, APS-DFD meeting, November 23-25
* “Phase behavior of monolayer suspensions of counter rotating rotors” with E. Lushi and K. Yeo, APS-DFD meeting, November 23-25
* “Electrohydrodynamics of a particle-covered drop” with M. Ouriemi, APS-DFD meeting, November 23-25

2015

* “Deformation and stability of particle laden drops” with Q. Brosseau, 6th international workshop on bubble and drop interfaces, Potsdam Germany, July 6-10
* “Electrohydrodynamic structuring of surface-adsorbed colloidal particles” , GRC Soft Condensed Matter Physics: Self-Assembly and Active Matter, poster, August 9-14
* “Electric Field Effects of the Thermal Undulations of Lipid Bilayer Membranes” with N. Fricke, AIChE Annual Meeting meeting, November 8-13
* “Self-Organization in Active Suspensions of Micro-Rotors” with E. Lushi and K. Yeo, AIChE Annual Meeting meeting, November 8-13
* “Hydrodynamic Self-Organization and Mixing in Suspensions of Micro-Rotors” with E. Lushi, AIChE Annual Meeting meeting, November 8-13
* “Electrohydrodynamic Deformation of a Particle-Coated Drop” with M. Ouriemi, AIChE Annual Meeting, November 8-13
* “Deformation and stability of surfactant - or particle-laden drop” with Q. Brosseau, A. Oberlander, G. Pradillo, APS-DFD meeting, November 22-24
* “ Simulations of particle structuring driven by electric fields” with Y. Hu and M. Miksis, APS-DFD meeting, November 22-24
* “Fluctuation and dynamics of a lipid bilayer membrane under an electric field” with Y. nan Young and M. Miksis, APS-DFD meeting, November 22-24
* “ Shape fluctuations of a giant lipid vesicle in an external electric field” with N. Fricke
* “Transition to collective motion and mixing in suspensions of micro-rotors” with E. Lushi, APS-DFD meeting, November 22-24
* “ Phase transition of active rotors due to passive particles”, with K. Yeo and E. Lushi, APS-DFD meeting, November 22-24

2016

* “Quincke rotation of an ellipsoid” with Q. Brosseau, APS-DFD meeting, November 20-22
* “Streaming instability at the equator of an oblately deformed drop” with Q. Brosseau, APS-DFD meeting, November 20-22
* “Electrorotation instability of a liquid bridge”, with G. Pradillo, APS-DFD meeting, November 20-22
* “Simulations of electrically induced particle structuring on spherical drop surface” with Y. Hu and M. Miksis, APS-DFD meeting, November 20-22

2017

* “Shape fluctuations of a giant lipid vesicle” with H. Faizi and N. Galle, APS-DFD meeting, November 19-21
* “Quincke random walkers”, with G. Pradillo and A. Heintz, APS-DFD meeting, November 19-21
* “The “Saturn-rings” instability: streaming from the equator of a drop in a uniform electric field”, with Q. Brosseau, APS-DFD meeting, November 19-21, invited talk in focus session: The Physics of Electrospray and Electrospinning: Current Knowledge and State of the Art

**9. Service**

**9.1 University**

Completed at Dartmouth College (Thayer School of Engineering):

1. Bachelor of Engineering program committee (2007-2009)
2. Freshman Advisor (2007 – 2009)
3. Co-organizing with Prof. Alex Barnett the Applied Math and Computational Science seminar
4. Development of undergraduate minor in Biophysics

Completed at Brown

1. Organizer for the joint CFM and FTCP seminar series (2010-2011).
2. Member, search committees for Chemical, Biological and Environmental Engineering faculty (2010, 2012).
3. Faculty Executive Committee (2011-2013)
4. Childcare Planning Board (2013-2014)
5. Preliminary exams: Ruike Zhao (2014), Teng Zhang (2013), Ski Krieger (2013), Joon-sik Park (2015)

Ongoing:

1. Engineering Executive Committee – FTS representative (2015-)
2. UTRA committee (2015, 2016)
3. Freshman advisor
4. Thesis committee: Lei Zhang (BME), William Maulbetsch (Physics), Alix Witthoft (Applied Math, defended 2014), External examiner Rui Cao (Math, NJIT)

**9.2 Community and profession**

Completed:

1. Co-organizer, Mini-symposium on “Biological Cells and Capsules” at the 8th World Congress on Computational Mechanics, 2008
2. Co-Organizer, Summer school on “Complex- and Bio- Fluids”(2009), “Biological Complex Fluids” (2012), “Active Complex Matter” (2016), Cargese, Corsica, France
3. Co-organizer, Mini-symposium on “Biological Cells and Capsules” at ECCM, 2010
4. Organizer, Mini- symposium on “Microhydrodynamics of lipid bilayer membranes and vesicles”, APS-DFD, 2010
5. Co-organizer, Mini-symposium on “Computational mechanics of biomembranes”, SES, 2013
6. 2010 Rapporteur for a PhD thesis “Dynamics and rheology of a suspension of vesicles and red blood cells” submitted by Mr. Giovanni Ghigliotti, Universite L’Grenoble. Examining committee Dominique Barthès-Biese, Stefano Guido, Didier Jamet, Chaouqi Misbah, Jacques Prost, Bart Van Tiggelen
7. Scientific Committee, IUTAM symposium on “Dynamics of Capsules, Vesicles and Capsules” 2014
8. Co-Organizer, workshop “Statistical Physics and Mechanics of Forms and Shapes", hosted by Aalto University and Nordita, 27-30 May 2015.
9. 2017 External reader, PhD thesis “Cell mechanics in flow: algorithms and
applications”, Kirill Lykov, advisor Prof. Igor Pivkin, Institute of Computational Science, ICS (Switzerland)
10. 2017 External reader, PhD thesis, Gilad Kaufman, advisor Prof. Osuji, Chemical Engineering, Yale University
11. 2017 External examiner, PhD thesis, Rui Cao, Applied Math, NJIT
12. Evaluation Committee for the EPFL Fellows postdoctoral fellowship programme, 2014, 2015
13. Session chair:

2006 APS DFD “Biofluid Dynamics”

2008 APS DFD “Bio-Fluids: General I”

2009 AIChE “Interfacial flows”

2010 APD DFD “Biofluids: Physiological Circulatory II”

2010 APS DFD “Mini-Symposium on Microhydrodynamics of Lipid Bilayer Membranes”

2011 AES/AIChE “Nanoscale electrokinetics”

2011 APS-DFD Interfacial/Thin Film Instability VI

2012 AIChE “Bio-Fluid Dynamics”

2012 AES (American Electrophoresis Society) “Electric Fields At Interfaces: Electro-Wetting, Droplets, and Vesicles”

2013 Society of Rheology Annual Meeting “Emulsions, Foams and Interfacial Rheology”

2013 AIChE Annual Meeting Poster Session

2013 APS-DFD “Drops: Shape Dynamics and Confinement”

2014 APS-DFD “Biofluids: Membranes, Vesicles and Micelles”

Current:

1. Reviewer for numerous archival journals, including: Physical Reviews, Journal of Fluid Mechanics, PNAS, Nature Scientific Reports, Biophysical Journal, Soft Matter, Reviews of Modern Physics, Physics of Fluids, Journal of Applied Physics, Journal of Condensed Matter Physics, Journal of Engineering Mathematics, Journal of Fluids and Structures, Journal of Colloid and Interface Science, Colloids and Surfaces B: Biointerfaces, Chemical Engineering Science, Langmuir, PLOS
2. Panel reviewer for National Science Foundation (including CAREER proposals), US-Israel Bi-national Science Foundation, ACS-PRF, French National Research Agency (ANR), ISF
3. Program Committee, APS-DFD, 2015-present
4. Diversity Committee, APS-DFD 2017-present
5. 2018 Evaluator Europostdoc porgramme

**10 Students supervised**

**10.1 Undergraduate research**

At Dartmouth: Women in Science Project

1. Claudine Gregorio 2008-2010 (electroformation of vesicles, osmotic-pressure driven transformations in vesicle shapes)
2. Xue (Shelley) Han 2009-2010 (domains in multicomponent membranes)
3. Emily DeBaun, 2010 –2012 (electrorotation of cells)

At Brown:

1. Joe Goldberg 2010-2011 (microfluidic stretcher to test cell mechanics)
2. Lynn Della Grotta 2012-Spring (bending rigidity of charged membranes from fluctuation analysis)
3. Stephen Palazola 2012 Summer (nonlinear electrohydrodynamics)
4. Olivia Mickle 2012 Fall (multicomponent membranes)
5. Anna Brown 2013 Fall (drop electrohydrodynamics)
6. Andrew Oberlander 2013 Fall –Spring 2015(electrohydrodynamics of surfactant-covered drops)
7. Greg Hickey (Fall 2015)
8. Tim Valicenti (Fall 2015-Spring 2017)
9. Aneesh Heinz (Spring 2017, independent project)

**10.2 Senior capstone projects/theses**

At Dartmouth: Engs190/290 senior capstone project

1. 2007 "Heavy Truck Tail-end Aerodynamics Technology": Alex Bruccoleri, Jonathan Feldman, Jeffrey Grossman
2. 2008: Group 25 “DFR-Aerodynamics” and Group 12 “Hydroelectric turbine”
3. 2009: “Low-Tech Piston-Less Irrigation Pump”

At Brown, Honors Sc.B. theses:

1. 2015: Andrew Oberlander “Electrohydrodynamics of surfactant covered drops in DC fields”
2. 2017: Tim Valicenti “In Silico Mechanical Properties of Shape Fluctuating Biomimetic Membranes”

**10.3 MS. theses**

At Dartmouth:

1. Paul Salipante. September 2009: “Electrohydrodynamics of drops in strong fields”
2. Scott Decker, May 2011 : “Design and fabrication of a microfluidic set-up to probe red cell mechanics”
3. Adam Musial, May 2011 :“Electrohydrodynamics of non-spherical particles”

At Brown University

1. Marc Shapiro Sc.M. 2013 “Tension Induced Phase Transitions in Biomimetic Membranes”

**10.4 Doctoral theses**

At Brown:

1. Paul Salipante, PhD 2013 “Electrohydrodynamics of simple and complex interfaces”

1. Hui (April) He, PhD 2014 “Electrorotation of a viscous droplet in a uniform direct current electric field”

At Northwestern:

1. Gerardo Pradillo, PhD student(ME), Fall 2015 –present
2. Hammad Faizi, PhD student (ME), Fall 2016-present
3. Cody Reeves, PhD student (ESAM), Fall 2017-present

**10.5 Post-Doctoral training**

At Dartmouth:

1. James Hanna, 2009 (surfactant effects on drop dynamics in Poiseuille flow)

At Brown:

1. Jacopo Seiwert, October 2010-March 2012 (Membrane stability, tension induced phase transitions in biomimetic membranes)
2. Tatiana Kuriabova (joint with T. Powers) September 2011- August 2013 (Mechanics of charged membranes)
3. Malika Ouriemi January 2013-March 2014(electrohydrodynamics of complex interfaces)
4. Enkeleida Lushi September 1 2013 – present (rheology of active suspensions)
5. Nico Fricke February 2014- July 2015(electromechanics of bilayer membranes)
6. Nicolas Galle, November 2014- April 2017 (vesicles and capsule mechanics)
7. Quentin Brosseau, October 2014- October, 2016 (microfluidics of drops, electrohydrodynamics)

At Northwestern University

1. Jeremy Koch, September 2017- present (electrohydrodynamics)
2. Hamid Karani, January 2018- present (electrohydrodynamics)

**11 Teaching**

**11.1 Classroom Teaching** (Since 2003)

At Dartmouth College

|  |  |  |  |
| --- | --- | --- | --- |
| *Year Taught* | *Course Number* | *Course Name* | *Enrollment* |
| W2007 | Engs34 | Fluid Dynamics | 6 |
| W2008 | Engs34 | Fluid Dynamics | 18 |
| W2008 | Engg199 | Cellular and Molecular biomechanics | 7 |
| W2009 | Engs 34 | Fluid Dynamics | 18 |
| W2009 | Engg164 | Cellular and molecular biomechanics | 9 |
| S2009 | Engs199-02 | Microhydrodynamics | 1 |
| W2010 | Engs34 | Fluid Dynamics | 29 |
| S2010 | Engs30/Phys30 | Biological Physics | 4 |
| S2010 | Engs156 | Heat, mass, and momentum transfer | 9 |

At Brown University

|  |  |  |  |
| --- | --- | --- | --- |
| *Year Taught* | *Course Number* | *Course Name* | *Enrollment* |
| F2003 | ENGN0810 | Fluid Mechanics | 25 |
| S2004 | ENGN2820 | Fluid Mechanics | ~10 |
| F2004 | ENGN2910 | Complex Fluids | 9 |
| S2005 | ENGN2820 | Fluid Mechanics | ~10 |
| F2010 | ENGN0810 | Fluid Mechanics | 74 |
| S2011 | ENGN2920 | Complex Fluids: Particles and Interfaces | 15 |
| F2011 | ENGN0810 | Fluid Mechanics | 70 |
| S2012 | ENGN2760  | Heat and mass transfer | 9 |
| S2013 | ENGN2820 | Fluid Mechanics | 11 |
| F2013 | ENGN0810 | Fluid Mechanics | 68 |
| S2014 | ENGN2820 | Fluid Mechanics | 13 |
| F2015 | ENGN0810 | Fluid Mechanics | 118 |
| S2017 | ENGN0040 | Dynamics and Vibrations | ~150 |
| S2017 | ENGN2920 | Complex Fluids: Particles and Interfaces | 5 |
| W2018 | MATH 234 | Multiple Integration and Vector Calculus |  |
| W2018 | ESAM 311-2 | Methods of Applied Mathematics |  |

**11.2 Courses description**

*Dartmouth College*

|  |  |
| --- | --- |
| Engs34 | *Fluid Mechanics*Junior-level fluid mechanics course. Topic include hydrostatics; mass, momentum, and energy conservation; control volume analysis; Navier-Stokes equations; viscous flow in pipes; lift and drag; compressible flow; and open-channel flows. Laboratory and project. |
| Engs30/Phys30 |   *Biological Physics* (**new course**)Sophomore-level course introducing physics and engineering approaches to analyze biological problems. Topics include the architecture of biological cells, molecular motion, entropic forces, enzymes and molecular machines, and nerve impulses. |
| Engs156 | *Heat, mass, and momentum transfer*Advanced undergraduate/beginning graduate course on transport phenomena. |
| Engg164 | *Cellular and molecular biomechanics* (**new course**)Advanced undergraduate/beginning graduate course on the engineering principles of cell design. Topics include elasticity of biopolymers and biomembranes, rheology of cytoskeletal components, molecular motors, cell motility. The course connects cell mechanics to micro- and nano- technology. |
| Engs199-02 | *Micro-hydrodynamics* (**new course**)Graduate level course in microscale flows. Topics include Stokes flow, lubrication theory, free-surface flows, hydrodynamic stability, rheology of suspensions. |

*Brown University*

|  |  |
| --- | --- |
| ENGN0810 | *Fluid Mechanics* Junior-level fluid mechanics course. Topic include hydrostatics; mass, momentum, and energy conservation; control volume analysis; Navier-Stokes equations; viscous flow in pipes; lift and drag; compressible flow; and open-channel flows. Laboratory and project. |
| ENGN2920 | *Complex fluids: particles and interfaces* (**new course**)Graduate level course introducing disperse systems (colloidal suspensions, emulsions, surfactant solutions, blood) with special attention to the thermodynamics and mechanics of interfaces. The course bridges the physico- chemical and mechanical perspectives in the study of structured fluids. |
| ENGN2760 | *Heat and mass transfer*Graduate level course providing an unified study of momentum, heat and mass transfer; kinetic theory of transport properties; scaling and order-of-magnitude concepts; analytical and approximate solutions to the equations of change; forced and natural convection; radiation; diffusion in mixtures; simultaneous momentum, heat and mass transfer; Taylor dispersion; transport in electrolyte solutions; special topics (e.g., transport at interfaces, porous media). |
| ENGN 2820  | *Fluid Mechanics II*This is the second part of a two-semester graduate course following APMA2410/ENGN2810 taught in the Fall. It covers topics from incompressible, Newtonian flows (Stokes flow, lubrication theory, free-surface flows, hydrodynamic stability), electrokinetics, geophysical fluid dynamics, and if time permits explores some more specialized topics of current research interest. The emphasis is on basic physics, scaling and nondimensionalization, and approximations that can be used to obtain analytical solutions.  |
| ENGN 0040  | *Dynamics and Vibrations*Study of the kinematics and dynamics of particles and rigid bodies. Principles of motion of mechanical systems. Concepts of inertia, work, kinetic energy, linear momentum, angular momentum, and impact. Applications to engineering systems, satellite orbits, harmonic vibrations of one and two degree of freedom systems. Lectures, recitations, and laboratory. |

*Northwestern University*

|  |  |
| --- | --- |
| ESAM 311-2 | *Methods of Applied Mathematics*Ordinary differential equations; Sturm-Liouville theory, properties of special functions, solution methods including Laplace transforms. Fourier series: eigenvalue problems and expansions in orthogonal functions. Partial differential equations: classification, separation of variables, solution by series and transform methods. |
| MATH 234 | *Multiple Integration and Vector Calculus*Cylindrical and spherical coordinates, double and triple integrals, line and surface integrals. Change of variables in multiple integrals; gradient, divergence, and curl. |