December, 2015

Petia M. Vlahovska
School of Engineering, Brown University
Providence, RI 02912
Tel: (401) 863-9774 Fax: (401) 863-9028
Email: petia_vlahovska@brown.edu

Research Interests:
non-equilibrium soft matter, interfacial flows, nonlinear dynamics, membrane biophysics

1 Education

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 Blawzdziewicz
2001 M.Phil. Mechanical Engineering, Yale University
1999 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", Bulgaria
Thesis: "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

2 Professional appointments

07/13-present	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. Publications

3.1 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
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

3.2 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)
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)
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)
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)
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)
6. P. M. Vlahovska, J. Blawzdziewicz and M. Loewenberg "Deformation of a surfactant-covered drop in a linear flow", Phys. Fluids 17, 103103, (2005)
7. P.M.Vlahovska and R.S.Gracia "Dynamics of a viscous vesicle in linear flows",Phys. Rev. E 75 016313 (2007)
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)
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)
10. G. Danker, P. M. Vlahovska and C. Misbah, "Vesicles in Poiseuille flow", Phys. Rev. Lett., 102 148102 (2009)
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)
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)
13. J. Hanna and P. M. Vlahovska "Surfactant-induced migration of a spherical drop in Stokes flow" Physics of Fluids 22, 013102 (2010)

14. J. 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)
15. P. F. Salipante and P. M. Vlahovska "Electrohydrodynamics of drops in strong uniform DC electric fields" Physics of Fluids 22, 112110 (2010)
16. P. M. Vlahovska “On the rheology of a dilute emulsion in an uniform electric field”, J. Fluid Mech. 670:481-503 (2011)
17. 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)
18. J. Schwalbe, P. M. Vlahovska and M. J. Miksis “Lipid membrane instability and poration driven by capacitive charging” Physics of Fluids 23: 041701 (2011)
19. J. Schwalbe, P. M. Vlahovska and M. J. Miksis “Vesicle electrohydrodynamics” Physical Review E 83:046309 (2011)
20. S. Veerapaneni, Yuan-nan Young, P. M. Vlahovska, and J. Blawzdziewicz “Dynamics of a compound vesicle” Physical Review Letters 105: 158103 (2011)
21. 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)
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)
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)
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)
25. J. Seiwert and P. M. Vlahovska “Instability of a fluctuating membrane driven by an AC electric field”, Physical Review E, 87, 022713 (2013)
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)
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)
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)
29. P. F. Salipante and P. M. Vlahovska “Electrohydrodynamic rotations of a viscous drop”, Physical Review E 88, 043003 (2013)
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)
31. P. F. Salipante and P. M. Vlahovska “Vesicle deformation in DC electric pulses”, Soft Matter 10:3386-3393 (2014)
32. M. Ouriemi and P. M. Vlahovska “Electrohydrodynamics of particle-covered drops”,J. Fluid Mech. 751:106-120 (2014)
33. K. Yeo, E. Lushi and P. M. Vlahovska “Collective dynamics in a binary mixture of hydrodynamically coupled microrotors”, Phys. Rev. Lett. 114, 188301 (2015)
34. E. Lushi and P. M. Vlahovska “Periodic and chaotic orbits of micro-rotors in creeping flows”, J Nonlinear Sci. 25:1111-1123 (2015)

35. P. F. Salipante, M. L. Shapiro, and P. M. Vlahovska "Electric field induced deformations of biomimetic fluid membranes", Procedia IUTAM 16:60-69 (2015)
36. L. C. McConnell, P. M. Vlahovska, M. J. Miksis "Vesicle dynamics in electric fields: squaring and breathing", Soft Matter 11: 4840-4846 (2015)
37. M. Ouriemi and P. M. Vlahovska "Electrodeformation and rotation of a particle-covered drop", Langmuir 32: 6298-6305 (2015)
38. 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)
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)

3.3 Non-refereed journal articles

1. P. M. Vlahovska "Dynamics of surfactant-covered drops in linear flows", PAMM 7 1101601–1101602 (2007)
2. P. M. Vlahovska "Asymmetric shapes and pearling of a stretched vesicle" Focus on Fluids article, J. Fluid Mech. 754:1-4(2014)

3.4 Articles in print or review

1. 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, accepted
2. P. M. Vlahovska and C. Misbah "Theory of vesicle dynamics in flow and electric fields" Chapter in "The giant vesicle book", Eds. R. Dimova and C. Marques, in preparation
3. P. M. Vlahovska "Electrohydrodynamics of drops and vesicles", Annual Review of Fluid Mechanics, in preparation

3.5 Conference presentations

(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

3.6 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*

3.7 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*

4 Service

4.1 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:

6. Engineering Executive Committee – FTS representative (2015-)
7. UTRA committee (2015, 2016)
8. Freshman advisor
9. Thesis committee: William Maulbetsch (Physics), Alix Witthoft (Applied Math, defended 2014), External examiner Rui Cao (Math, NJIT)

4.2 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", Cargese, Corsica, France, 2009, "Biological Complex Fluids", Cargese, Corsica, France, 2012
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. 9 December, 2010 Universite L'Grenoble. Rapporteur for a PhD thesis "Dynamics and rheology of a suspension of vesicles and red blood cells" submitted by Mr. Giovanni Ghigliotti. 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. 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, 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. Co-Organizer, Summer school on "Active Complex Matter", Cargese, Corsica, France, 2016
4. Program Committee, APS-DFD, 2015-present
5. Evaluation Committee for the EPFL Fellows postdoctoral fellowship programme, 2014, 2015

5 Honors and awards

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

6 Students supervised

6.1 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 –present (electrohydrodynamics of surfactant-covered drops)
7. Greg Hickey (Fall 2015- electrohydrodynamics)

6.2 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:

1. 2015: Andrew Oberlander "Electrohydrodynamics of surfactant covered drops in DC fields"

6.3 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"

6.4 Doctoral theses

1. Paul Salipante, PhD 2013 "Electrohydrodynamics of simple and complex interfaces"
2. Hui (April) He, PhD 2014 "Electrorotation of a viscous droplet in a uniform direct current electric field"
3. Gerardo Pradillo, PhD student, Fall 2015 -present

6.5 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-present (vesicles and capsule mechanics)
7. Quentin Brosseau October 2014- present (microfluidics of vesicles)

7 Research Grants

7.1 Current Grants

2015-2016	NSF-CBET Fluid dynamics "EAGER: Emergent order of hydrodynamically coupled microrotors" PI with Co-PI: Dr. Enkeleida Lushi	$100,001
2015-2017	NSF-CMMI Biomechanics & Mechanobiology "Electromechanical properties and deformation of biomembranes" (Principal Investigator)	$428,095
2015-2017	NSF-CBET "Electrohydrodynamics of particle-covered drops" (Principal Investigator)	$315,425+$6,000 REU supplement

7.2 Completed Grants

2008-2010	ACS-PRF "Effect of surfactant on drop electrohydrodynamics"	$50,000
2009	NSF Travel 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

7.3 Pending Proposals

	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)

8 Teaching

8.1 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

8.2 Courses description

Dartmouth College

Winter, 2007-2010 — 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.

Spring, 2010 — 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.

Spring, 2010 Engs156 *"Heat, mass, and momentum transfer"*
Advanced undergraduate/beginning graduate course on transport phenomena.

Winter, 2008,2009 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.

Spring, 2009 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

Fall, 2010-2013, 2015 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.

Spring, 2011 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.

Spring 2012 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).

Spring 2013, 2014 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.