

# NEELESH A. PATANKAR

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## EDUCATION

**BS (B.Tech)**, Mechanical Engineering, 1993, Indian Institute of Technology, Bombay, India  
**MS**, Mechanical Engineering, 1995, University of Pennsylvania, Philadelphia, PA  
**Ph.D.**, Mechanical Engineering, 1997, University of Pennsylvania, Philadelphia, PA  
Thesis: "Numerical simulation of particulate two-phase flows"  
Advisor: Prof. Howard H. Hu

## APPOINTMENTS

- Professor, Northwestern University, 2011 – present.
- Associate Professor, Northwestern University, 2006 – 2011.
- Assistant Professor, Northwestern University, 2000 – 2006.
- Senior Visiting Fellow, Center for Turbulence Research, Stanford University, summer 2001.
- Post-doctoral Research Associate, University of Minnesota, 1997 – 2000; Advisor: Professor Daniel D. Joseph.

## HONORS & AWARDS

- Cole-Higgins Award for Teaching Excellence, 2013; Honorable Mention, 2008.
- Associated Student Government Honor Roll, Northwestern University, 2009, 2013.
- Fellow, American Physical Society, 2012.
- Int. Conf. on Multiphase Flow Junior Award, 2010 (presented once every three years).
- One of 17 scientists selected to the Defense Science Study Group (2010–2011).
- NSF CAREER Award, 2002.
- Searle Center for Teaching Excellence Junior Fellowship, Northwestern University, 2001.
- John Goff prize for highest scholarship performance, University of Pennsylvania, 1998.
- Certificate of outstanding ability in mathematics (ranked 14<sup>th</sup> in India), Indian Mathematics Olympiad Association, 1988.
- National Talent Scholarship, 1987, National Council for Education Research and Training, India.

## CURRENT RESEARCH AREAS

- **Direct numerical simulation (DNS) of fluid-particle flows:** Development of fast algorithms, multiscale methods.
- **Direct simulation of freely swimming fish motion:** Development of novel fast computation techniques. Application to neuromechanics, underwater vehicle design, evolution of form and function, and animation.

- **Direct numerical simulation of Brownian motion:** Development of fundamental modeling schemes for the Brownian motion of micro/nanoscale particles, application to biological processes.
- **Phase control using textured surfaces and superhydrophobicity:** Using surface chemistry and textures to control phase transition, roughness enhanced superhydrophobicity (Lotus effect), novel material design and synthesis for high slip and heat transfer characteristics.
- **Electrohydrodynamic (EHD) flows and micromixing:** Numerical methods for EHD flows for fluid and fluid-particle systems, instabilities in EHD flows.

## SUMMARY OF TECHNICAL CONTRIBUTIONS\*

- A novel formulation of the Distributed Lagrange Multiplier (DLM) method for rigid and self-propelling bodies.<sup>3,24,38</sup>
- A fast projection scheme,<sup>25,26,35,38,39</sup> and Stokes flow algorithms<sup>27,48</sup> for rigid and self-propelling bodies.
- A new approach for the DNS of Brownian motion of particles.<sup>20</sup>
- Fundamental studies of aquatic locomotion with applications in engineering and biology.<sup>34,45,53</sup>
- Theoretical foundation for roughness-based non-wetting surfaces.<sup>14,16-19,21,23,37,40,43,44,46,47,49,51,54</sup>
- Numerical simulation of electroosmotic flows.<sup>2</sup>
- A theoretical model for 'electrokinetic' instabilities.<sup>50</sup>
- First continuum approach to reproduce molecular scale slip.<sup>42</sup>
- New power law models for the lift force on particles.<sup>7,10,13,15,28</sup>
- Rheological modeling of fluid-particle systems.<sup>5,11</sup>
- Drag model based simulation of dense fluid-particle systems by the Lagrangian approach.<sup>8,9</sup>

## PUBLICATIONS

### Citation Statistics

- Web of Science: Total citations: 3500+; h-index: 24
- Google Scholar: Total citations: 4965; h-index: 28

### Book

- Patankar NA, Fully resolved simulation of immersed bodies: From macro to micro-scales, under contract, Taylor-Francis.

### Book chapters

- Chen Y, Sharma N, Patankar NA, Fluctuating immersed material (FIMAT) dynamics for the direct simulation of the Brownian motion of particles, in IUTAM Symposium on Computational Approaches to Multiphase Flow, Editor(s): Balachandar S; Prosperetti A, Book Series: FLUID MECHANICS AND ITS APPLICATIONS, Volume: 81, Pages: 119-129, 2004.
- Patankar NA, Hydrophobicity of Surfaces with Cavities: Making Hydrophobic Substrates from Hydrophilic Materials?, in Superhydrophobic surfaces, Editor(s): Carre A; Mittal KL, 2009, Koninklijke Brill NV, Leiden, The Netherlands.

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\* Reference numbers in the list are as per the numbering of Refereed Journal Articles below.

- Patankar NA, Fundamentals of roughness induced superhydrophobicity, in Nano and cell mechanics: Fundamentals and frontiers, Editor(s): Espinosa HD; Bao G, 2013, Wiley, UK.

### **Refereed Journal Articles**

60. Neveln, Izaak D.; Bale, Rahul; Bhalla, Amneet Pal Singh; Curet Oscar M.; Patankar, Neelesh A.; Maclver Malcolm A.; Undulating fins produce off-axis thrust and flow structures, JOURNAL OF EXPERIMENTAL BIOLOGY Volume: 217 Pages: 201-213 2014.
59. Bhalla, Amneet Pal Singh; Bale, Rahul; Griffith, Boyce E.; Patankar, Neelesh A.; Fully resolved immersed electrohydrodynamics for particle motion, electrolocation, and self-propulsion, JOURNAL OF COMPUTATIONAL PHYSICS Volume: 256 Pages: 88-108 2014.
58. Bhalla, Amneet Pal Singh; Bale, Rahul; Griffith, Boyce E.; Patankar, Neelesh A.; A unified mathematical framework and an adaptive numerical method for fluid-structure interaction with rigid, deforming, and elastic bodies, JOURNAL OF COMPUTATIONAL PHYSICS Volume: 250 Pages: 446-476 OCT 1 2013.
57. Bhalla, Amneet Pal Singh; Griffith, Boyce E.; Patankar, Neelesh A.; A Forced Damped Oscillation Framework for Undulatory Swimming Provides New Insights into How Propulsion Arises in Active and Passive Swimming, PLOS COMPUTATIONAL BIOLOGY Volume: 9 Issue: 6 Article: e1003097 JUN 2013.
56. Green, Matthew H; Curet, Oscar M; Patankar, Neelesh A; et al., Fluid dynamics of the larval zebrafish pectoral fin and the role of fin bending in fluid transport., BIOINSPIRATION & BIOMIMETICS Volume: 8 Issue: 1 Pages: 016002 2013-Mar (Epub 2012 Dec 05).
55. Kopacz, Adrian M.; Patankar, Neelesh A.; Liu, Wing K., The immersed molecular finite element method, COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING Volume: 233 Pages: 28-39 AUG 2012.
54. Vakarelski, Ivan U.; Patankar, Neelesh A.; Marston, Jeremy O.; et al., Stabilization of Leidenfrost vapour layer by textured superhydrophobic surfaces, NATURE Volume: 489 Issue: 7415 Pages: 274-277 SEP 13 2012.
53. Curet Oscar M.; Patankar Neelesh A.; Lauder George V.; Maclver Malcolm A., Aquatic manoeuvring with counter-propagating waves: a novel locomotive strategy, JOURNAL OF THE ROYAL SOCIETY INTERFACE Volume: 8 Issue: 60 Pages: 1041-1050 JUL 6 2011.
52. Curet Oscar M.; Patankar Neelesh A.; Lauder George V.; Maclver Malcolm A., Mechanical properties of a bio-inspired robotic knifefish with an undulatory propulsor, BIOINSPIRATION & BIOMIMETICS Volume: 6 Issue: 2 Article Number: 026004 JUN 2011.
51. Kwon Hyuk-Min; Paxson Adam T.; Varanasi Kripa K.; Patankar Neelesh A., Rapid Deceleration-Driven Wetting Transition during Pendant Drop Deposition on Superhydrophobic Surfaces, PHYSICAL REVIEW LETTERS Volume: 106 Issue: 3 Article Number: 036102 JAN 20 2011.
50. Patankar Neelesh A., Electrokinetic instability: The sharp interface limit, PHYSICS OF FLUIDS Volume: 23 Issue: 1 Article Number: 014101 JAN 2011.
49. Kwon Y.; Choi S.; Anantharaju N.; Lee J.; Panchagnula Mahesh V.; Patankar Neelesh A., Is the Cassie-Baxter Formula Relevant?, LANGMUIR Volume: 26 Issue: 22 Pages: 17528-17531 NOV 16 2010.
48. Curet OM, AIAli IK, Maclver MA, Patankar NA, A versatile implicit iterative approach for fully resolved simulation of self-propulsion, COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING 199: 2417-2424 MAR 26 2010.

47. Patankar, NA, Vapor Stabilizing Substrates for Superhydrophobicity and Superslip, LANGMUIR 26(11): 8783-8786 JUN 1 2010.
46. Patankar, NA, Consolidation of Hydrophobic Transition Criteria by Using an Approximate Energy Minimization Approach, LANGMUIR 26(11): 8941-8945 JUN 1 2010.
45. Maclver MA, Patankar NA, Shirgaonkar AA, Energy-Information Trade-Offs between Movement and Sensing, PLOS COMPUTATIONAL BIOLOGY 6(5): Article Number: e1000769 MAY 2010.
44. Patankar, NA, Hysteresis with regard to Cassie and Wenzel states on superhydrophobic surfaces, LANGMUIR 26(10): 7498-7503 MAY 18 2010.
43. Patankar NA, Supernucleating surfaces for nucleate boiling and dropwise condensation heat transfer, SOFT MATTER, 6(8): 1613-1620 2010 (invited article).
42. Hsu HY, Patankar NA, A continuum approach to reproduce molecular-scale slip behaviour, JOURNAL OF FLUID MECHANICS, 645: 59-80 FEB 25 2010.
41. Hsu, H-Y, Sharma, N, Patankar NA, An algorithm for the simulation of electrohydrodynamic rigid particulate flows, COMMUNICATIONS IN NUMERICAL METHODS IN ENGINEERING, Published online in Wiley InterScience (www.interscience.wiley.com) DOI: 10.1002/cnm.1247, 2009.
40. Kwon Y, Patankar NA, Choi J, Lee J, Design of surface hierarchy for extreme hydrophobicity, LANGMUIR, 25 (11): 6129-6136 JUN 2 2009 (cover page article).
39. Apte, SV, Martin, M, Patankar NA, A numerical method for fully resolved simulation (FRS) of rigid particle-flow interactions in complex flows, JOURNAL OF COMPUTATIONAL PHYSICS, 228 (8): 2712-2738 MAY 1 2009.
38. Shirgaonkar, AA, Maclver MA, Patankar NA, A new mathematical formulation and fast algorithm for fully resolved simulation of self-propulsion, JOURNAL OF COMPUTATIONAL PHYSICS, 228 (7): 2366-2390 APR 20 2009.
37. Patankar NA, Hydrophobicity of Surfaces with Cavities: Making Hydrophobic Substrates from Hydrophilic Materials?, JOURNAL OF ADHESION SCIENCE AND TECHNOLOGY, 23 (3): 413-433 2009 (invited article).
36. Patankar NA, Are the hydrodynamic forces and torques zero during the electrophoresis of multiparticle systems with thin Debye layers?, MECHANICS RESEARCH COMMUNICATIONS, 36 (1): 39-45 JAN 2009 (invited article).
35. Apte, SV, Patankar, NA, A formulation for fully resolved simulation (FRS) of particle-turbulence interactions in two-phase flows, INT. J. NUM. ANALYSIS AND MODELING 5: 1-16 2008 (invited article).
34. Shirgaonkar, AA, Curet OM, Patankar NA, Maclver MA, Hydrodynamics of ribbon-fin propulsion during impulsive motion, JOURNAL OF EXPERIMENTAL BIOLOGY, 211: 3490-3503, NOV 1 2008.
33. Loh, OY, Ho, AM, Rim, JE, Kohli, P, Patankar, NA, Espinosa, HD, Electric-field Induced Direct Delivery of Proteins by a Nanofountain Probe, PROCEEDINGS OF THE NATIONAL ACADEMY OF SCIENCES 105 (43): 16438-16443 OCT 28 2008.
32. Martini A, Hsu HY, Patankar NA, Lichter S, Slip at high shear rates, PHYSICAL REVIEW LETTERS 100 (20): 206001 MAY 23 2008.
31. Liu Y, Liu WK, Belytschko T, Patankar NA, To AC, Kopacz A, Chung JH, Immersed electrokinetic finite element method, INTERNATIONAL JOURNAL FOR NUMERICAL METHODS IN ENGINEERING 71 (4): 379-405 JUL 23 2007
30. Datta S, Ghosal S, Patankar NA, Electroosmotic flow in a rectangular channel with variable wall zeta-potential: comparison of numerical simulation with asymptotic theory, ELECTROPHORESIS 27 (3): 611-619 Sp. Iss. SI FEB 2006 (invited article).
29. Liu WK, Liu Y, Farrell D, Zhang L, Wang XS, Fukui Y, Patankar NA, Zhang Y, Bajaj C, Lee J, Hong J, Chen X, Hsu HY, Immersed Finite Element Method and Its Applications to

- Biological Systems, COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING 195 (13-16): 1722-1749 2006.
28. Ko T, Patankar NA, Joseph DD, Lift and multiple equilibrium positions of a single particle in Newtonian and Oldroyd-B fluids, COMPUTERS AND FLUIDS 35: 121-146 FEB 2006.
  27. Sharma N, Chen Y, Patankar NA, A distributed Lagrange multiplier based computational method for the simulation of particulate-Stokes flow, COMPUTER METHODS IN APPLIED MECHANICS AND ENGINEERING 194: 4716-4730 NOV 2005.
  26. Patankar NA, Sharma N, A fast projection scheme for the direct numerical simulation of rigid particulate flows, COMMUNICATIONS IN NUMERICAL METHODS IN ENGINEERING 21 (8): 419-432 AUG 2005.
  25. Sharma N, Patankar NA, A fast computation technique for the direct numerical simulation of rigid particulate flows, JOURNAL OF COMPUTATIONAL PHYSICS 205 (2): 439-457 MAY 20 2005.
  24. Patankar NA, Physical interpretation and mathematical properties of the stress-DLM formulation for rigid particulate flows, INTERNATIONAL JOURNAL FOR COMPUTATIONAL METHODS IN ENGINEERING SCIENCE AND MECHANICS 6 (2):137-143 APR 2005.
  23. Lee J, He B, Patankar NA, A roughness-based wettability switching membrane device for hydrophobic surfaces, JOURNAL OF MICROMECHANICS AND MICROENGINEERING 15 (3): 591-600 MAR 2005.
  22. Hsu HY, Sharma N, Ruoff RS, Patankar NA, Electro-orientation in particle light valves, NANOTECHNOLOGY 16 (2): 312-319 FEB 2005.
  21. Chen Y, He B, Lee JH, Patankar NA, Anisotropy in the wetting of rough surfaces, JOURNAL OF COLLOID AND INTERFACE SCIENCE 281 (2): 458-464 JAN 15 2005.
  20. Sharma N, Patankar NA, Direct numerical simulation of the Brownian motion of particles by using fluctuating hydrodynamic equations, JOURNAL OF COMPUTATIONAL PHYSICS 201 (2): 466-486 DEC 10 2004.
  19. He B, Lee J, Patankar NA, Contact angle hysteresis on rough hydrophobic surfaces, COLLOIDS AND SURFACES A-PHYSICOCHEMICAL AND ENGINEERING ASPECTS 248 (1-3): 101-104 NOV 9 2004.
  18. Patankar NA, Mimicking the lotus effect: Influence of double roughness structures and slender pillars, LANGMUIR 20 (19): 8209-8213 SEP 14 2004.
  17. Patankar NA, Transition between superhydrophobic states on rough surfaces, LANGMUIR 20 (17): 7097-7102 AUG 17 2004.
  16. He B, Patankar NA, Lee J, Multiple equilibrium droplet shapes and design criterion for rough hydrophobic surfaces, LANGMUIR 19 (12): 4999-5003 JUN 10 2003.
  15. Wang J, Joseph DD, Patankar NA, Conway M, Barree RD, Bi-power law correlations for sediment transport in pressure driven channel flows, INTERNATIONAL JOURNAL OF MULTIPHASE FLOW 29 (3): 475-494 MAR 2003.
  14. Patankar NA, On the modeling of hydrophobic contact angles on rough surfaces, LANGMUIR 19 (4): 1249-1253 FEB 18 2003.
  13. Patankar NA, Joseph DD, Wang J, Barree RD, Conway M, Asadi M, Power law correlations for sediment transport in pressure driven channel flows, INTERNATIONAL JOURNAL OF MULTIPHASE FLOW 28 (8): 1269-1292 AUG 2002.
  12. Patankar NA, Huang PY, Joseph DD, Normal stresses on the surface of a rigid body in an Oldroyd-B fluid, JOURNAL OF FLUIDS ENGINEERING-TRANSACTIONS OF THE ASME 124 (1): 279-280 MAR 2002.
  11. Patankar NA, Hu HH, Finite Reynolds number effect on the rheology of a dilute suspension of neutrally buoyant circular particles in a Newtonian fluid, INTERNATIONAL JOURNAL OF MULTIPHASE FLOW 28 (3): 409-425 MAR 2002.

10. Patankar NA, Ko T, Choi HG, Joseph DD, A correlation for the lift-off of many particles in plane Poiseuille flows of Newtonian fluids, JOURNAL OF FLUID MECHANICS 445: 55-76 OCT 25 2001.
9. Patankar NA, Joseph DD, Lagrangian numerical simulation of particulate flows, INTERNATIONAL JOURNAL OF MULTIPHASE FLOW 27 (10): 1685-1706 OCT 2001.
8. Patankar NA, Joseph DD, Modeling and numerical simulation of particulate flows by the Eulerian-Lagrangian approach, INTERNATIONAL JOURNAL OF MULTIPHASE FLOW 27 (10): 1659-1684 OCT 2001.
7. Patankar NA, Huang PY, Ko T, Joseph DD, Lift-off of a single particle in Newtonian and viscoelastic fluids by direct numerical simulation, JOURNAL OF FLUID MECHANICS 438: 67-100 JUL 10 2001.
6. Hu HH, Patankar NA, Zhu MY, Direct numerical simulations of fluid-solid systems using the arbitrary Lagrangian-Eulerian technique, JOURNAL OF COMPUTATIONAL PHYSICS 169 (2): 427-462 MAY 20 2001.
5. Patankar NA, Hu HH, Rheology of a suspension of particles in viscoelastic fluids, JOURNAL OF NON-NEWTONIAN FLUID MECHANICS 96 (3): 427-443 JAN 30 2001.
4. Patankar NA, Hu HH, A numerical investigation of the detachment of the trailing particle from a chain sedimenting in Newtonian and viscoelastic fluids, JOURNAL OF FLUIDS ENGINEERING-TRANSACTIONS OF THE ASME 122 (3): 517-521 SEP 2000.
3. Patankar NA, Singh P, Joseph DD, Glowinski R, Pan TW, A new formulation of the distributed Lagrange multiplier/fictitious domain method for particulate flows, INTERNATIONAL JOURNAL OF MULTIPHASE FLOW 26 (9): 1509-1524 SEP 2000.
2. Patankar NA, Hu HH, Numerical simulation of electroosmotic flow, ANALYTICAL CHEMISTRY 70 (9): 1870-1881 MAY 1 1998.
1. Hu HH, Patankar NA, Non-axisymmetrical instability of core-annular flow, JOURNAL OF FLUID MECHANICS 290: 213-224 MAY 10 1995.

## TALKS

### Invited Talks

54. University of California, Berkeley, Mechanical Engineering and Earth and Planetary Sciences, NOV. 2012 Staying dry under water.
53. Stanford University, Mechanical Engineering, NOV. 2012 Staying dry under water.
52. 65<sup>th</sup> Annual Meeting of the Division of Fluid Dynamics, NOV. 2012 A universal constraint-based formulation for freely moving immersed bodies in fluids.
51. Duke University, Mechanical Engineering and Materials Science, OCT. 2012 Staying dry under water.
50. Purdue University, Mechanical Engineering, OCT. 2012 Staying dry under water.
49. University of Michigan, Ann Arbor, Materials Science and Engineering, SEP. 2012 Staying dry under water.
48. Courant Institute of Mathematical Sciences, APR. 2012 A universal constraint-based formulation for freely moving immersed bodies in fluids.
47. 64<sup>th</sup> Annual Meeting of the Division of Fluid Dynamics, NOV. 2011 Roughness-based Superhydrophobic Surfaces: Fundamentals and Future Directions.
46. 48th Annual Technical Conference of Society of Engineering Sciences, OCT. 2011 The Role Of Hydrodynamics On The Evolution Of Fish Form And Its Applications In Engineering.
45. ASME Applied Mechanics and Material Conference, MAY 2011, Phase manipulation and vapor stabilization using textured surfaces.
44. Massachusetts Institute of Technology, Department of Mechanical Engineering, NOV. 2010, The hydrodynamics of aquatic locomotion and its potential impact on the evolution of fish form and function.

43. Massachusetts Institute of Technology, Department of Mechanical Engineering, NOV. 2010, Fundamentals of roughness-induced superhydrophobicity.
42. Northwestern University, Department of Mechanical Engineering, NOV. 2010, Fundamentals of roughness-induced superhydrophobicity.
41. Argonne National Laboratory, JUL. 2010, Vapor stabilizing surfaces for energy efficient systems.
40. International Conference on Multiphase Flow, Keynote Junior Award Lecture, JUN. 2010, The Influence of Hydrodynamics on the Evolution of Fish Form and the Neuromechanics of Aquatic Locomotion.
39. Northwestern University, Engineering Science and Applied Mathematics, FEB. 2010, The hydrodynamics of aquatic locomotion and its potential impact on the evolution of fish form and function.
38. University of Minnesota, Symposium celebrating the 80<sup>th</sup> birthday of Professor D. D. Joseph, MAY 2009, Fully resolved simulation of self-propulsion.
37. Northwestern University, Department of Mechanical Engineering, APR 2009, The Influence of Hydrodynamics on the Evolution of Fish Form and the Neuromechanics of Aquatic Locomotion.
36. University of Pennsylvania, Department of Mechanical Engineering, FEB 2009, Fully resolved simulation of particulate flows: From macro- to micro-scales.
35. Northwestern University, Northwestern Institute on Complex Systems, JAN 2009, The Influence of Hydrodynamics on the Evolution of Fish Form and the Neuromechanics of Aquatic Locomotion.
34. IMECE 2007, Seattle, WA, NOV 2007, Fully resolved simulation of freely swimming fish.
33. University of California, San Diego, Department of Chemistry and Biochemistry, NOV 2007, A fluctuating hydrodynamics based approach for Brownian dynamics.
32. Harvard University, School of Engineering and Applied Science, OCT 2007, Fully resolved simulation of particulate flows: From macro- to micro-scales.
31. Stanford University, SIMBIOS Center, OCT 2007, A fluctuating hydrodynamics based approach for Brownian dynamics.
30. International Conference on Multiphase Flow, JUL 2007, Fully resolved simulation of particulate flows: From macro- to micro-scales, Keynote.
29. American Geological Union, Winter meeting, San Francisco, CA, DEC 2006, Fully Resolved Simulation (FRS) of sediment transport with applications in geomorphology.
28. Illinois Institute of Technology, Department of Mechanical, Materials and Aerospace Engineering, Chicago, IL, OCT 2006, Fully resolved simulation of particulate flows: From macro to sub-micron scale.
27. University of South Florida, Department of Geoscience, Tampa, FL, AUGUST 2006, Fully Resolved Simulation (FRS) of sediment transport with applications in geomorphology.
26. SC Johnson, Racine, WI, JULY 2006, Understanding the Lotus effect and beyond.
25. Brown University, Applied Mathematics, Providence, Rhode Island, MARCH 2006, Fluctuating Immersed MATerial (FIMAT) Dynamics for the DNS of Brownian Motion.
24. Indian Institute of Technology, Bombay, India, DEC 2005, Modeling and simulation of micro/nanoscale fluid dynamics.
23. Indian Institute of Science, Bangalore, India, DEC 2005, Modeling and simulation of micro/nanoscale fluid dynamics.
22. General Electric Research Center, Albany, NY, MAY 2005, Mimicking the Lotus effect.
21. IUTAM Symposium on Computational Approaches to Disperse Multiphase Flow, Argonne National Labs, OCT 2004, DNS of the Brownian motion of particles using fluctuating hydrodynamic equations.
20. University of Illinois at Urbana-Champaign, Theoretical and Applied Mechanics Department, Urbana, IL, APR 2004, CFD based on fluctuating hydrodynamics and the Lotus effect.

19. University of Iowa, Department of Mechanical Engineering, Iowa City, Iowa, APR 2004, Problems in micron/sub-micron scale fluid dynamics.
18. IMECE03, ASME Winter meeting, Washington DC, NOV 2003, The Lotus effect.
17. 7<sup>th</sup> USNCCM, Albuquerque, NM, JUL 2003, DNS of the Brownian motion of particles using fluctuating hydrodynamic equations.
16. 7<sup>th</sup> USNCCM, Albuquerque, NM, JUL 2003, The Lotus effect.
15. Michigan Technological University, Department of Mechanical Engineering, Houghton, Michigan, DEC 2002, Modeling and simulation of micron/sub-micron scale fluid dynamics.
14. IMECE02, ASME winter meeting, New Orleans, LA, NOV 2002, Modeling and simulation of micron/sub-micron scale fluid dynamics.
13. 14<sup>th</sup> US National Congress of Applied Mechanics, Super Symposium on All Kinds of Fluid Mechanics in Honor of Prof. D. D. Joseph & Prof. Andreas Acrivos, Blacksburg, VA, JUN 2002, A projection scheme for DNS of rigid particulate flows.
12. 14<sup>th</sup> US National Congress of Applied Mechanics, Symposium on Nanotechnology and MEMS: Experiments and Modeling, Blacksburg, VA, JUN 2002, Computational techniques for sub-micron/nanoscale fluid dynamics.
11. Stanford University, Center for Turbulence Research, Stanford, CA, AUG 2001, Numerical simulation of rigid particulate flows.
10. 6<sup>th</sup> USNCCM, Dearborn, MI, AUG 2001, A numerical investigation of electrophoresis and electroosmosis.
9. XII<sup>th</sup> International Workshop on Numerical Method for Viscoelastic Fluids, Monterey Bay, CA, JUL 2001, Direct numerical simulation of rigid particulate flows in viscoelastic fluids.
8. Hydraulic Fracturing Workshop, Washington D.C., Keynote Lecture, JUL 2001, Engineering correlations and computational techniques for proppant transport in hydraulic fractures.
7. University of Illinois at Urbana-Champaign, Theoretical and Applied Mechanics Department, Urbana, IL, MAR 2001, Numerical simulation of particulate flows.
6. Northwestern University, Department of Engineering Science & Applied Mathematics, Evanston, IL, FEB 2001, Numerical simulation of particulate flows.
5. STIM-LAB Inc., Rheology consortium meeting, Mesa, Arizona, FEB 2001, Towards a model and a simulation tool for fluid-proppant transport.
4. University of Massachusetts, Department of Mechanical Engineering, Amherst, MA, MAY 2000, Numerical simulation of particulate flows.
3. Microcosm Technologies, Boston, MA, APR 2000, Numerical simulation of electrokinetic flows.
2. CFD Research Corporation, Huntsville, Alabama, APR 2000, Numerical simulation of electrokinetic flows.
1. New Mexico State University, Department of Mechanical Engineering, Las Cruces, NM, FEB 2000, Numerical simulation of particulate flows.

### **Contributed Talks**

58. Jones, P., Cruz-Chu, E., Megaridis, C., Walther, J., Koumoutsakos, P., & Patankar, N. A., NOV. 2012 Staying dry under water, 65<sup>th</sup> *Annual meeting of the division of fluid dynamics, APS, San Diego, USA.*
57. Vakarelski, I., Patankar, N. A., Marston, J., Chan, D., & Thoroddsen, S., NOV. 2012 Leidenfrost vapor layer stabilization on superhydrophobic surfaces, 65<sup>th</sup> *Annual meeting of the division of fluid dynamics, APS, San Diego, USA.*
56. Bale, R., Bhalla, A. P. S., Maclver, M. A., & Patankar, N. A., NOV. 2012 Optimal number of waves for ribbon fin propulsion, 65<sup>th</sup> *Annual meeting of the division of fluid dynamics, APS, San Diego, USA.*



55. Bhalla, A. P. S., Griffith, B. E., & Patankar, N. A., NOV. 2012 Fully resolved immersed electrohydrodynamics for target-detection, particle motion, and self propulsion, 65<sup>th</sup> *Annual meeting of the division of fluid dynamics, APS, San Diego, USA.*
54. Patankar, N. A., JUN. 2012 Surface textures to control phase behavior, 18<sup>th</sup> *Symposium on thermophysical properties, Boulder, USA.*
53. Bhalla, A. P. S., Mosberg, N., Bale, R., & Patankar, N. A., NOV. 2011 Turns and maneuvers during swimming, 64<sup>th</sup> *Annual meeting of the division of fluid dynamics, APS, Baltimore, USA.*
52. Bale, R., Maclver M. A., & Patankar, N. A., NOV. 2011 Hydrodynamic optimality of ribbon fin shapes, 64<sup>th</sup> *Annual meeting of the division of fluid dynamics, APS, Baltimore, USA.*
51. Patankar, N. A., OCT. 2011 Vapor Stabilization And Phase Manipulation By Using Textured Surfaces, *48th Annual Technical Conference of Society of Engineering Sciences, APS, Evanston, USA.*
50. Bhalla, A. P. S., & Patankar, N. A., OCT. 2011 How does muscle forcing lead to translational motion in undulatory swimming?, *48th Annual Technical Conference of Society of Engineering Sciences, APS, Evanston, USA.*
49. Bale, R., Hao, M., Bhalla, A. P. S., & Patankar, N. A., OCT. 2011 On Gray's paradox and efficiency measures for swimming, *48th Annual Technical Conference of Society of Engineering Sciences, APS, Evanston, USA.*
48. Bhalla, A. P. S., & Patankar, N. A., NOV. 2010 How does muscle forcing lead to translational motion in undulatory swimming?, 63<sup>rd</sup> *Annual meeting of the division of fluid dynamics, APS, Long Beach, USA.*
47. Bale, R., Hao, M., Bhalla, A. P. S., & Patankar, N. A., NOV. 2010 On Gray's paradox and efficiency measures for swimming, 63<sup>rd</sup> *Annual meeting of the division of fluid dynamics, APS, Long Beach, USA.*
46. Varanasi, K. K., Kwon H.-M., Paxson, A. T., & Patankar, N. A., NOV. 2010 Deceleration-driven wetting transition of "gently" deposited drops on textured hydrophobic surfaces, 63<sup>rd</sup> *Annual meeting of the division of fluid dynamics, APS, Long Beach, USA.*
45. Patankar, N. A., NOV. 2010 Vapor stabilizing surfaces for superhydrophobicity, 63<sup>rd</sup> *Annual meeting of the division of fluid dynamics, APS, Long Beach, USA.*
44. Patankar, N. A., JUN. 2010 The balance between drag and thrust in undulatory propulsion and implications on balistiform and gymnotiform locomotion, Workshop on natural locomotion, Institute for Mathematics and its Applications, Minneapolis, USA.
43. Shirgaonkar, A. A., Patankar, N. A., & Maclver, M. A., NOV. 2009 On the "momentum enhancement" and hydrodynamic efficiency of gymnotiform and balistiform swimmers, 62<sup>nd</sup> *Annual meeting of the division of fluid dynamics, APS, Minneapolis, USA.*
42. Curet, O. M., Maclver, M. A., & Patankar, N. A., NOV. 2009 Multi-directional thrusting using oppositely traveling waves in knifefish, 62<sup>nd</sup> *Annual meeting of the division of fluid dynamics, APS, Minneapolis, USA.*
41. Patankar, N. A., Shirgaonkar, A. A., & Maclver, M. A., NOV. 2009 Can drag and thrust be split in undulatory swimming?, 62<sup>nd</sup> *Annual meeting of the division of fluid dynamics, APS, Minneapolis, USA.*
40. Shirgaonkar, A. A., Curet, O. M., Patankar, N. A. and Maclver, M. A. JAN. 2009 How ribbon fin swimmers swim. *Annual Meeting of the Society for Integrative and Comparative Biology, Boston, Massachusetts.*
39. Maclver, M. A., Shirgaonkar, A. A. and Patankar, N. A. JAN. 2009 Biomechanical constraints on sensory acquisition in weakly electric fish. *Annual Meeting of the Society for Integrative and Comparative Biology, Boston, Massachusetts.*
38. Patankar, N. A., & Hsu, H.-Y. NOV. 2008 A mechanism based on fluid compressibility to explain molecular scale slip behavior, 61<sup>st</sup> *Annual meeting of the division of fluid dynamics, APS, San Antonio, USA.*

37. Maclver, M. A., Shirgaonkar, A. A., & Patankar, N. A., NOV. 2008 Conflicts between sensory performance and locomotion in weakly electric fish, *61<sup>st</sup> Annual meeting of the division of fluid dynamics, APS, San Antonio, USA.*
36. Shirgaonkar, A. A., Curet, O. M., Patankar, N. A. & Maclver, M. A. NOV. 2008 Hydrodynamic aspects of thrust generation in gymnotiform swimming, *61<sup>st</sup> Annual meeting of the division of fluid dynamics, APS, San Antonio, USA.*
35. Curet, O. M., AlAli, I., Patankar, N. A. & Maclver, M. A. NOV. 2008 Fully resolved simulation of self-propulsion of aquatic organisms, *61<sup>st</sup> Annual meeting of the division of fluid dynamics, APS, San Antonio, USA.*
34. Patankar, N. A., & Hsu, H.-Y. NOV. 2007 A continuum approach to model molecular scale slip behavior, *60<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Salt Lake City, USA.*
33. Maclver, M. A., Patankar, N. A., & Curet, O. M. & Shirgaonkar, A. A. NOV. 2007 Infomechanical specializations for prey capture in knifefish, *60<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Salt Lake City, USA.*
32. Shirgaonkar, A. A., Patankar, N. A. & Maclver, M. A. NOV. 2007 An efficient algorithm for fully resolved simulation of freely swimming bodies, *60<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Salt Lake City, USA.*
31. Curet, O. M., Patankar, N. A. & Maclver, M. A. NOV. 2007 An algorithm for low to moderate Reynolds number swimming, *60<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Salt Lake City, USA.*
30. Curet, O. M., Patankar, N. A. & Maclver, M. A. 2006 Towards direct numerical simulation of freely swimming fish motion, *59<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Tampa, USA.*
29. Patankar, N. A., Curet, O. M. & Maclver, M. A. 2006 Hydrodynamics of ribbon fin based swimming with application to highly maneuverable underwater vehicles, *59<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Tampa, USA.*
28. Hsu, H.-Y. & Patankar, N. A. 2006 Thermal fluctuations and the hydrophobic effect, *59<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Tampa, USA.*
27. Patankar, N. A., Curet, O. M. & Maclver, M. A. 2006 Hydrodynamics of ribbon fin based swimming with application to highly maneuverable underwater vehicles, *IMECE06, ASME Winter meeting, Chicago, USA.*
26. Patankar, N. A. & Hsu, H.-Y. 2006 Electrokinetic instabilities in electrolytics systems, *IMECE06, ASME Winter meeting, Chicago, USA.*
25. Datta, S., Ghosal, S. & Patankar, N. A. 2005 Electroosmotic flow in rectangular microchannels: numerical simulations and asymptotic theory, *58<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Chicago, USA.*
24. Patankar, N. A. 2005 Rough hydrophobic surfaces from hydrophilic materials?, *58<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Chicago, USA.*
23. Chen Y., & Patankar, N. A. 2005 Fluctuating immersed material (FIMAT) dynamics for the direct numerical simulation of Brownian motion, *58<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Chicago, USA.*
22. Hsu, H.-Y., & Patankar, N. A. 2005 Electrokinetic mixing instability: The sharp interface limit, *58<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Chicago, USA.*
21. Apte S., & Patankar, N. A. 2005 A numerical scheme for LES/DNS of arbitrarily shaped resolved particles, *58<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Chicago, USA.*
20. Patankar, N. A. 2004 DNS of the Brownian motion of particles using fluctuating hydrodynamic equations, *57<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Seattle, USA.*

19. Patankar, N. A. 2002 A numerical technique for fast computations of rigid particulate flows, *55<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Dallas, USA.*
18. Patankar, N. A. 2002 Mimicking the Lotus Effect, *55<sup>th</sup> Annual meeting of the division of fluid dynamics, APS, Dallas, USA.*
17. Patankar, N. A. & Chen, Y. 2002 Numerical simulation of droplet shapes on rough surfaces, *Proceedings of the 5<sup>th</sup> International Conference on Modeling and Simulation of Microsystems, San Juan, Puerto Rico.*
16. Patankar, N. A. 2002 Direct numerical simulation of moving charged, flexible bodies with thermal fluctuations, *Proceedings of the 5<sup>th</sup> International Conference on Modeling and Simulation of Microsystems, San Juan, Puerto Rico.*
15. Patankar, N. A. 2001 Direct numerical simulation of the motion of elastic bodies in fluids, *54<sup>th</sup> Annual meeting of the division of fluid dynamics, American Physical Society, San Diego, USA.*
14. Patankar, N. A. 2001 Numerical simulation of the Brownian motion of sub-micron scale objects in fluids, *54<sup>th</sup> Annual meeting of the division of fluid dynamics, American Physical Society, San Diego, USA.*
13. Lee, J. & Patankar, N. A. 2001 Modeling of continuous-electrowetting-driven liquid micromotor, *6<sup>th</sup> U.S. National Congress on Computational Mechanics, Dearborn, USA.*
12. Patankar, N. A., Ko, T., Choi, H.-G. & Joseph, D. D. 2001 Direct numerical simulation of the lift-off of particles in plane Poiseuille flows of Newtonian and Oldroyd-B fluids, *ASME FED, New Orleans, USA.*
11. Joseph, D. D., Patankar, N. A., Ko, T. & Choi, H. G. 2000 Lift correlations from direct numerical simulation of solid-liquid flow, *53<sup>rd</sup> Annual meeting of the division of fluid dynamics, American Physical Society, Washington D. C., USA.*
10. Patankar, N. A., Ko, T. & Joseph, D. D. 2000 Lift-off of a single particle in Poiseuille flows, *53<sup>rd</sup> Annual meeting of the division of fluid dynamics, American Physical Society, Washington D. C., USA.*
9. Patankar, N. A. & Hu, H. H. 1998 Numerical simulation of pressure-driven flow of solid bodies in Newtonian and Oldroyd-B fluids, *ASME Fluids Engineering Division Meeting, Washington D.C., USA.*
8. Patankar, N. A. & Hu, H. H. 1998 Rheology of a suspension of neutrally buoyant solid circular particles in Newtonian and viscoelastic fluids, *ASME Fluids Engineering Division Meeting, Washington D.C., USA.*
7. Patankar, N. A. & Hu, H. H. 1997 Rheology of a suspension of neutrally buoyant solid circular particles in Newtonian fluid, *50<sup>th</sup> Annual meeting of the division of fluid dynamics, American Physical Society, San Francisco, CA, USA.*
6. Patankar, N. A. & Hu, H. H. 1997 Numerical simulation of pressure-driven flow of solid bodies in Newtonian and viscoelastic fluids, *50<sup>th</sup> Annual meeting of the division of fluid dynamics, American Physical Society, San Francisco, CA, USA.*
5. Patankar, N. A. & Hu, H. H. 1997 Chain-snapping in Newtonian and viscoelastic fluids, *ASME Fluids Engineering Division Meeting, New York, NY, USA.*
4. Patankar, N. A. & Hu, H. H. 1996 A numerical study of the Couette flow of solid-liquid mixtures, *49<sup>th</sup> Annual meeting of the division of fluid dynamics, American Physical Society, Syracuse, NY, USA.*
3. Patankar, N. A. & Hu, H. H. 1996 Chain-snapping in Newtonian and non-Newtonian fluids, *49<sup>th</sup> Annual meeting of the division of fluid dynamics, American Physical Society, Syracuse, NY, USA.*
2. Patankar, N. A. & Hu, H. H. 1996 Two-dimensional periodic mesh generation, *5<sup>th</sup> International conference on numerical grid generation in computational field simulations, Mississippi State University, USA.*

1. Hu, H. H. & Patankar, N. A. 1994 Non-axisymmetric instability of core-annular flow, *ASME Applied Mechanics Division Meeting*, New York, NY, USA.

## STUDENT SUPERVISION

### Graduate Students and Post-doc

#### M.S./Ph.D. students

- Nitin Sharma, *Direct numerical simulation of particulate flows for three different length scales: Macro, Micro and Meso*, Ph.D., JUN 2005.
- Yong Chen, *Fluctuating immersed material (FIMAT) dynamics for the Brownian motion of particles*, Ph.D., NOV 2005.
- Oscar M. Curet, *Estimation of force in gymnotiform swimming using three-dimensional fluid computational model*, M.S., MAR 2006.
- Hua-Yi Hsu, *Three problems in microfluidics: Electrokinetic instability, electrohydrodynamic self-assembly, and slip*, Ph.D., AUG 2008.
- Bo He (joint with J. Lee and J. Wang), *Micro/nanoscale friction and application of surface wettability in MEMS*, Ph.D., JUL 2008.
- Oscar M. Curet (joint with M. A. Maclver), *Direct numerical simulation of fish swimming*. Ph.D. AUG 2009.
- Max Hao, *Analysis of the swimming ability of zebrafish using numerical simulation*, M. S., JUN 2010.
- Christine Darve, *Direct numerical simulation of particle motion in superfluid Helium*, Ph.D. AUG 2011.
- Amneet Pal Singh Bhalla, *Constraint-based adaptive immersed body technique for multiphysics problems*, Ph.D. JUN 2013.
- Rahul Bale, Ph.D. *Hydrodynamics and energetics of undulatory propulsion* AUG 2013.
- Xiuqing Hao, Ph.D. exchange student, FEB 2012 – MAY 2013.
- Adrian Kirn, M.S., *Drying up under water: An application of superhydrophobicity*, DEC. 2013.
- Ling Bai, Ph.D. exchange student, SEP 2012 – JAN 2014.
- Paul Jones, Ph.D. expected JUN 2015.
- Wenjun (Walter) Kou, Ph.D. expected JUN 2015.
- Namu Patel, Ph.D. expected JUN 2015.

#### Post-doc

- Silviu Podariu, *Fluctuating hydrodynamics*, 2002 – 2003.
- Yong Chen, *Simulation of fish swimming*, 2005 – 2006.
- Anup Shirgaonkar, *Simulation of fish swimming*, 2007 – 2008.
- Srinivas Ramakrishnan, *Simulation of fish swimming*, 2009 – 2010.

### Undergraduate

- Ryan Sochol, *Directional control of cellular motility*, Independent study units, Spring/Summer/Fall 2005.
- Fabian Wittmer (exchange student from ETH, Zurich), *An introduction to numerical heat transfer and fluid flow with applications*, undergraduate thesis, AUG 2005.
- Skander Spies, *Simulation of baseball motion using FLUENT*, Independent study unit, Fall 2006.

- Ibrahim AlAli, *Normal mode analysis of proteins*, and *Artificial evolution simulation for aquatic locomotion*, Independent study units, Summer 2007 – Spring 2008.
- Scott Aikin, *Simulation of baseball motion using FLUENT*, Fall 2007.
- Noah Mosberg, Summer 2011 – present.
- David Ma, *Superhydrophobic surfaces*, 2012.
- Mark Fischer, *Wildcat Balloon*, 2012-2013.
- Yohanna Hanna, *Swimming*, 2012-2013.
- Nelson Chen, *Swimming*, 2012-2014.
- Kashyap Saxena, *Soccer dynamics*, 2014-current.
- Juan Takase, *Superhydrophobicity*, 2014-current.

### **High school**

- Martina Pillay, *Sound rendering from fluid-structure interaction simulations*, Fall 2007-Spring 2008.

### **Other project supervision**

- IDEA 298/398 projects: 2009-2010, 2008-2009.
- MMM capstone project: 2008-2009.
- ME 398 projects: 2014-current.

### **Exam Committees**

Xiaohui Ma, M.S. defense, AUG 2013; Rahul Bale, Ph.D. defense, JUN 2013; Amneet Pal Singh Bhalla, Ph.D. defense, JUN 2013; Tom Sisan, Ph.D. defense, JUN 2013; Asmahan Safi, Ph.D. proposal, 2013; Taeil Yi, Ph.D. defense, 2012; Zhen Chen, Ph.D. defense, DEC 2011; Charles Brown, MS defense, NOV 2011; Christine Darve, Ph.D. defense, AUG 2011; Adrian Kopacz, Ph.D. defense, JUN 2011; Tom Sisan, Ph.D. proposal, OCT 2010; Taeil Yi, Ph.D. proposal, OCT 2010; Christie Barbosa, Ph.D. proposal, SEP 2010; Nathan Treggar, Ph.D. defense, JUN 2010; Zhen Chen, Ph.D. proposal, MAY 2010; Max Hao, M.S. defense, MAY 2010; Oscar Curet, Ph.D. defense, JUN 2009, Hua-Yi, Ph.D. defense, SEP 2008, Bo He, Ph.D. defense, SEP 2008, Nathan Treggar, Ph.D. proposal, JAN 2008; John Bayldon, Ph.D. JUN 2007; Subhra Datta, Ph.D. MAY 2007; Raissa P. Ferron, Ph.D. proposal, JUN 2006; Yaling Liu, Ph. D., JUN 2006; Nicholas Pohlman, Ph.D., JUN 2006; Kuen-Ko Kim, Ph.D., JUN 2006; Jon Horek, Ph.D., JUN 2006; John Bayldon, Ph.D. proposal, JUN 2006; Oscar M. Curet, M.S. thesis/Ph.D. proposal, MAR 2006; Hua-Yi Hsu, Ph.D. proposal, MAR 2006; Subhra Datta, Ph.D. proposal, NOV 2005; Christine Darve, Ph.D. proposal, NOV 2005; Yong Chen, Ph.D., NOV 2005; Nitin Sharma, Ph.D., JUN 2005; Cynthia Pederson, Ph.D., JUN 2005; Jon Horek, Ph.D. proposal, MAR 2005; Yaling Liu, Ph.D. proposal & MS, NOV 2004; Jaehyun Chung, Ph.D., AUG 2004; Keun-Ho Kim, Ph.D. proposal, 2004; John A. Schwille, Ph.D., JUN 2004; Nick Pohlman, Ph.D. proposal, JUN 2004; Zhanbin Lu, Ph.D., DEC 2003; Laura J. Evans, MS, DEC 2003; Lucy T. Zhang, Ph.D., JUL 2003; Mashfiqu Salehin, Ph.D. proposal, OCT 2002; David T. Sheppard, Ph.D., JUN 2002; John A. Schwille, MS, JUL 2001; Greg T. Wagner, Ph.D., JUN 2001; Deepanjan Mitra, MS, DEC 2000.

## **TEACHING**

### **Courses Taught:**

- Engineering Fluid Mechanics (ME 373-0).
- Engineering Analysis III (GE 205-3).
- Fundamentals of Fluid Dynamics I (ME 425).

- Introduction to Computational Fluid Dynamics (ME 424-1/ME 423).
- Advanced topics in Computational Fluid Dynamics (ME 424-2/ME 424).
- Design and Analysis of Microfluidic Systems (ME 421).

**Courses Developed:** Introduction to Computational Fluid Dynamics (ME 424-1, now ME 423), Advanced topics in Computational Fluid Dynamics (ME 424-2, now ME 424), Design and Analysis of Microfluidic Systems (ME 421).

## **UNIVERSITY SERVICE**

### **Present**

- Associate Chair, Department of Mechanical Engineering.
- ME ABET co-coordinator.
- Segal Design Institute faculty member.

### **Past**

- ME-BME faculty search committee.
- Ad-hoc committee for promotion, McCormick School of Engineering.
- TAM program steering committee.
- Ad-hoc committee, Segal Design Center.
- University Library Committee.
- Coordinator for EA3 and member of the Engineering First study group.
- Chair, ME undergraduate curriculum committee.
- Northwestern University Mechanical Engineering representative at the Big 10 ABET committee.
- Chair, honors program in Mechanical Engineering.
- Member, graduate curriculum committee in Mechanical Engineering.
- Editor, Mechanical Engineering Newsletter.
- Host, Midwest Mechanics Seminar Series.

## **PROFESSIONAL ACTIVITIES**

### **Editorships:**

- Associate Editor of Journal of Computational Physics (2010 – present)
- Associate Editor of ASME Journal of Fluids Engineering (2008 – 2011).
- Editorial Advisory Board, International Journal of Multiphase Flow (2010 – present).

**Memberships:** American Physical Society (APS), American Society of Mechanical Engineers (ASME).

### **Reviewer**

- Funding agencies: National Science Foundation, Petroleum Research Fund.
- Journal referee: Many journals including – Analytical Chemistry, Electrophoresis, Europhysics Letters, IEEE/ASME Journal of MEMS, Journal of Non-Newtonian Fluid Mechanics, International Journal for Numerical Methods in Engineering, International Journal of Multiphase Flow, International Journal of Heat and Mass Transfer, Journal of Computational Physics, Journal of Fluid Mechanics, Journal of Micromechanics and Microengineering, Langmuir, Nanotechnology, Physics of Fluids.

### **Committees, advisory boards, study groups**

- Fluid Dynamics Prize Committee, American Physical Society, 2011-2013.
- Advisory Board: EUROMECH/ERCOFTAC colloquium on Immersed Boundary Methods (IBMs), June 2013.
- Future Directions for Selected Topics in Mechanical and Civil Engineering, Office of the Assistant Secretary of Defense for Research and Engineering, Basic Science Office, 2012.
- Publications and Media Committee of the APS DFD unit, 2010-2011.
- Defense Science Study Group, 2010–2011.
- Advisory Board: Royal Netherlands Academy of Arts and Sciences Colloquium on Immersed Boundary Methods, June 2009.
- Academic-Industrial Workshop on Complex and Evolving Multiphase Flows, November 2008.
- Member, Scientific Advisory Board of the Seventh World Congress on Computational Mechanics (WCCM-VII), Los Angeles, CA, July 2006.
- Organizing committee of the 58<sup>th</sup> Annual Meeting of the Division of Fluid Dynamics, American Physical Society, Chicago, IL, 2005.

### **Conferences**

- Chair of fluids, thermal, and energy track at the 2011 Annual Meeting of the Society of Engineering Science (SES).
- Co-organizer of a mini symposium on “Fish-like sensing and locomotion” at the International Mechanical Engineering Congress and Exposition at Seattle, November, 2007.
- Organizer of a mini symposium on “Modeling and simulation of micro-/nanoscale fluid dynamics” at the International Mechanical Engineering Congress and Exposition at Washington DC, November 16 – 21, 2003.
- Organizer of two mini symposia – “Immersed boundary methods and fictitious domain methods” and “Computational micro- and nano- fluidics” – at the 7<sup>th</sup> U. S. National Congress on Computational Mechanics at Albuquerque, New Mexico, July 27 – 31, 2003.
- Organizer of two sessions on Nanofluidics at the International Mechanical Engineering Congress and Exposition at New Orleans, Louisiana, November 17 – 22, 2002.
- Organizer of a symposium on “Modeling and Computational Techniques for Microfluidic Applications” at the Sixth U. S. National Congress on Computational Mechanics at Dearborn, Michigan, August 1 – 4, 2001.