

Jin Liu, Ph.D.

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EDUCATION

- Ph.D.** (08/2008) **Johns Hopkins University**, Baltimore MD
Department of Mechanical Engineering,
Advisors: Profs Shiyi Chen and Mark Robbins
- M.S.** (12/2003) **The University of Michigan**, Ann Arbor, MI
Department of Mechanical Engineering
- B.S.** (06/2001) **University of Science and Technology of China**, Anhui, China
Department of Mechanical Engineering

RESEARCH INTERESTS

- Fluid mechanics, computational fluid dynamics (CFD), computational biology, drug delivery, virus entry through endocytosis, turbulent flows
- Micro-and nano-fluidics, electrokinetic flows, heat transfer, energy conversion, fuel cells, granular flows, multiscale modeling, electrowetting, bio-fluidics, membrane dynamics
- Spectral method, molecular dynamics, Monte Carlo simulations, lattice Boltzmann method, multigrid method, parallel computing

RESEARCH EXPERIENCE

- **Assistant Professor** 01/2012-present
School of Mechanical and Materials Engineering
Washington State University, Pullman, WA
- **Postdoctoral Associate** 02/2009-12/2011
Department of Bioengineering
University of Pennsylvania, Philadelphia, PA
- **Postdoctoral Research Fellow** 09/2008-01/2009
Department of Mechanical Engineering
Johns Hopkins University, Baltimore, MD
- **Visiting Graduate Student** 08/2006 - 07/2007
Theoretical Division, Fluid Dynamics Group T3

Los Alamos National Laboratory, Los Alamos, NM

- **Graduate Student Research Assistant** 01/2004 - 08/2008
Department of Mechanical Engineering
Johns Hopkins University, Baltimore, MD
- **Graduate Student Research Assistant** 10/2001 - 12/2003
Department of Mechanical Engineering
The University of Michigan, Ann Arbor, MI
- **Research Assistant** 09/1999 - 06/2001
Department of Mechanics and Mechanical Engineering
University of Science and Technology of China, Anhui, China

TEACHING EXPERIENCE

- Instructor, Spring 2014
School of Mechanical and Materials Engineering, Washington State University
ME515, **Advanced Heat Transfer**
- Instructor, Fall 2012, Spring 2013, Fall 2013
School of Mechanical and Materials Engineering, Washington State University
ME303, **Fluid Mechanics**
- Teaching Assistant, Fall 2007
Department of Mechanical Engineering, Johns Hopkins University
EN.530.766, **Numerical Methods**
- Teaching Assistant, Fall 2007
Department of Mechanical Engineering, Johns Hopkins University
EN.530.621, **Fluid Dynamics I**

FUNDED RESEARCH GRANTS

- "Multiscale Modeling of Biomolecular Assembly on a Targeted Surface", National Science Foundation (**NSF**) Eng/CBET-1250107, \$431,882, 2012-2015 (**PI**)
- "Multiscale Modeling and Simulation of Virus Entry", Washington State University New Faculty Seed Grant, \$19,970, 2012-2013 (**PI**)
- "Performance Evaluation of HMA with RAP in Idaho", Idaho Department of Transportation, \$189,063, 2012-2014 (**co-PI**)

HONORS AND AWARDS

- Graduate Student Research Assistantship
Johns Hopkins University 2004-2008
- NR-Engineering Grad Fellowship
The University of Michigan, Ann Arbor 2003
- Graduate Student Research Assistantship
The University of Michigan, Ann Arbor 2001-2003
- Climbing Award in Mechanics
University of Science and Technology of China 2001
- Excellent Student Scholarship
University of Science and Technology of China 1996-2000

PUBLICATIONS

Journal Articles

1. T.J. Sze, P. Dutta and J. Liu, Study of protein facilitated water and nutrient transport in plant phloem, *Journal of Nanotechnology in Engineering and Medicine* 4 (3): 031005 (2014)
2. J. Liu, P.S. Ayyaswamy, D.M. Eckmann and R. Radhakrishnan, Modeling of binding free energy of targeted nanocarriers to cell surface, *Heat and Mass Transfer* 50 (3): 315-321 (2014)
3. K. Yoo, J. Shim, J. Liu and P. Dutta, Efficient algorithm for simulation of isoelectric focusing, *Electrophoresis* 35 (5): 638-645 (2014)
4. T.J. Sze, J. Liu and P. Dutta, Numerical modeling of flow through phloem considering active loading, *Journal of Fluids Engineering* 136 (2): 021206 (2014)
5. E. Barrow, A.V. Nicola and J. Liu, Multiscale perspectives of virus entry via endocytosis, *Virology Journal* 10: 177 (2013)
6. B. Zern, A. Chacko, J. Liu, C. Greineder, E. Blankemeyer, R. Radhakrishnan and V. Muzykantov, Reduction of nanoparticle avidity enhances the selectivity of vascular targeting and PET detection of pulmonary inflammation, *ACS Nano* 7 (3): 2461-2469 (2013)

7. R. Radhakrishnan, B. Uma, J. Liu, P.S. Ayyaswamy and D.M. Eckmann, Temporal multiscale approach for nanocarrier motion with simultaneous adhesion and hydrodynamic interactions in targeted drug delivery, *Journal of Computational Physics* 244: 252-263 (2013)
8. J. Liu, M. Wang, S. Chen and M. Robbins, Uncovering molecular mechanisms of electrowetting and saturation with simulations, *Physical Review Letters* 108 (21): 216101 (2012)
9. J. Liu, R. Tourdot, V. Ramanan, N.J. Agrawal and R. Radhakrishnan, Mesoscale simulations of curvature-inducing protein partitioning on lipid bilayer membranes in the presence of mean curvature field, *Molecular Physics* 110 (11-12): 1127-1137 (2012)
10. J. Liu, P.S. Ayyaswamy, D.M. Eckmann and R. Radhakrishnan, "Modeling of binding free energy of targeted nanocarriers to cell surface", *Proceedings of ITP2011, Interdisciplinary Transport Phenomena VII*, p 6-6 to 6-11 (2011)
11. T.N. Swaminathan, J. Liu, U. Balakrishnan, P.S. Ayyaswamy, R. Radhakrishnan and D.M. Eckmann, Dynamic factors controlling carrier anchoring on vascular cells, *IUBMB Life* 63 (8): 640-647 (2011)
12. V. Ramanan, N.J. Agrawal, J. Liu, S. Engles, R. Toy and R. Radhakrishnan, Systems biology and physical biology of Clathrin-mediated endocytosis, *Integrative Biology* 3 (8): 803-815 (2011)
13. J. Liu, R. Bradley, D.M. Eckmann, P.S. Ayyaswamy and R. Radhakrishnan, Multiscale modeling of functionalized nanocarriers in targeted drug delivery, *Current Nanoscience* 7 (5): 727-735 (2011)
14. J. Liu, N. Agrawal, A. Calderon, P.S. Ayyaswamy, D.M. Eckmann and R. Radhakrishnan, Multivalent binding of nanocarrier to endothelial cells under shear flow, *Biophysical Journal* 101 (2): 319-326 (2011) (**Featured cover story**)
15. J. Liu, G. Weller, B. Zern, P.S. Ayyaswamy, D.M. Eckmann, V.R. Muzykantov and R. Radhakrishnan, Computational model for nanocarrier binding to endothelium validated using in vivo, in vitro and atomic force microscopy experiments, *Proc. Natl. Acad. Sci. USA*. 107 (38): 16530-16535 (2010)
16. J. Liu, M. Wang, S. Chen and M. Robbins, Molecular simulations of electroosmotic flows in rough nanochannels, *Journal of Computational Physics* 229 (20): 7834-7847 (2010)

17. J. Liu, M. Wang, S. Chen and M. Robbins, Molecular simulation of electrokinetic transport in nanofluidics, *Proceedings of ASME Micro/Nanoscale Heat and Mass Transfer International Conference 2009, MNHMT2009*, 1: 233-241 (2010)
18. J. Liu, S. Chen and D.Z. Zhang, Species interactions in binary particulate systems, *Physical Review E* 77: 066301 (2008)
19. J. Liu, S. Chen, X. Nie and M. Robbins, A continuum-atomistic multi-timescale algorithm for micro/nano flows, *Communications in Computational Physics* 4 (5): 1279-1291 (2008)
20. J. Liu, S. Chen, X. Nie and M. Robbins, A continuum-atomistic simulation of heat transfer in micro- and nano-flows, *Journal of Computational Physics* 227 (1): 279-291 (2007)
21. M. Wang, J. Liu and S. Chen, Electric potential distribution in nanoscale electroosmosis: from molecules to continuum, *Molecular Simulation* 33 (15): 1273-1277 (2007)
22. M. Wang, J. Liu and S. Chen, Similarity of electroosmotic flows in nanochannels, *Molecular Simulation* 33 (3): 239-244 (2007)
23. J. Liu, X. Lu, G. Liao and W. Fan, Application of large eddy simulation to smoke movement, *J. Fire Safety Science* (in China) 11 (1): 5-14 (2002)
24. J. Liu, X. Lu, G. Liao and W. Fan, Large eddy simulation of smoke movement with a water spray, *J. Fire Safety Science* (in China) 11 (1): 15-23 (2002)

Book Chapters

1. J. Liu, N.J. Agrawal, D.M. Eckmann, P.S. Ayyaswamy and R. Radhakrishnan (2012), chapter "Top-down mesoscale models and free energy calculations of multivalent protein-protein and protein-membrane interactions" for book "*Innovations in Biomolecular Modeling and Simulation*" edited by Tamar Schlick and published by Royal Society of Chemistry (RSC): 272-292.

CONFERENCE PRESENTATIONS

1. American Physical Society (APS)-Division of Fluid Dynamics (DFD), 2013, Nov. 24-26, Pittsburgh, PA. Volume 58, No. 18, D19.00003 "Numerical Modeling of Flow through Phloem Considering Active Loading".
2. ASME International Mechanical Engineering Congress & Exposition, 2013, Nov. 15-21, San Diego, CA. "Segregated Parallel Computing for Isoelectric Focusing of Proteins".

3. ASME International Mechanical Engineering Congress & Exposition, 2013, Nov. 15-21, San Diego, CA. "Numerical Modeling of Fluidic Pumping in Micronetworks of Plants".
4. American Physical Society (APS)-Division of Fluid Dynamics (DFD), 2012, Nov. 18-20, San Diego, CA. Volume 57, No. 17, D18-7 "Multiscale Modeling of Virus Entry via Receptor-Mediated Endocytosis".
5. ASME 3rd Micro/Nanoscale Heat and Mass Transfer International Conference, 2012, Mar. 3-6, Atlanta, Georgia. "Mesoscale Model of Targeted Vascular Drug Delivery using Functionalized Nanocarriers".
6. American Physical Society (APS)-Division of Fluid Dynamics (DFD), 2011, Nov. 20-22, Baltimore, MD. Volume 56, No. 18, R26.00005 "Atomistic simulations of nanoscale electrokinetic transport".
7. Interdisciplinary Transport Phenomena VII: Fluid, Biological, Materials, and Space Sciences, 2011, Sep. 19-23, Dresden, Germany. "Computational Modeling of Binding Free Energy of Targeted Nanocarriers to Cell Surfaces".
8. Biophysical Society 55th Annual Meeting, 2011, Mar. 5-9, Baltimore, Maryland. Poster session 3327-Pos "Monte Carlo Simulations of Absolute Binding Free Energy of Targeted Nanocarriers to Cell Surfaces".
9. American Physical Society (APS)-Division of Fluid Dynamics (DFD), 2010, Nov. 21-23, Long Beach, CA. Volume 55, No. 16, MK 4 "Monte Carlo Simulations of Absolute Binding Free Energy of Targeted Nanocarriers to Cell Surfaces".
10. American Physical Society (APS)-Division of Fluid Dynamics (DFD), 2010, Nov. 21-23, Long Beach, CA. Volume 55, No. 16, MK 8 "Modeling Protein-induced Membrane Deformation using Monte Carlo and Langevin Dynamics Simulations".
11. Biophysical Society 54th Annual Meeting, 2010, Feb. 20-24, San Francisco, California. Poster session "Simulations of Functionalized Nanocarrier Binding to Cells: Calculations of Absolute Binding Free Energies, Effect of Shear Flow and Glycocalyx and Comparison to Experiments".
12. ASME Micro/Nanoscale Heat and Mass Transfer International Conference, 2009, Dec.18-21, Shanghai, China. "Molecular simulation of electrokinetic transport in nanofluidics".
13. American Physical Society (APS)-Division of Fluid Dynamics (DFD), 2008, Nov. 23-25, San Antonio, Texas. Volume 53, No. 15, MN 10 "Molecular simulation of electrokinetic flows".

14. American Physical Society (APS)-Division of Fluid Dynamics (DFD), 2007, Nov. 18-22, Salt Lake City, Utah. Volume 52, No. 17, JI 12 "Stresses in Binary Particulate Systems".
15. American Physical Society (APS)-Division of Fluid Dynamics (DFD), 2005, Nov. 20-22, Chicago, IL. Volume 50, No. 9, FC 5 "A hybrid continuum-atomistic simulation of heat transfer in micro flow".
16. American Physical Society (APS)-Division of Fluid Dynamics (DFD), 2004, Nov. 21-23, Seattle, WA. "A new multiscale time algorithm for Micro/Nano flow".
17. American Physical Society (APS)-Division of Fluid Dynamics (DFD), 2003, Nov. 23-25, East Rutherford, NJ. Volume 48, No. 10, FC 2 "DNS of Drag Reduction by Dilute Polymer Solutions using a Backward-tracking Lagrangian Particle Method".
18. DARPA Friction Drag Reduction Program Principal Investigators' Meeting, May 21-22, 2003, San Diego, California.
19. American Physical Society (APS)-Division of Fluid Dynamics (DFD), 2002, Nov. 24-26, Dallas, TX. Volume 47, No. 10, KK 8 "Direct Numerical Simulation of Polymer Drag Reduction in a Turbulent Channel Flow Using the FENE-P Model".
20. DARPA Friction Drag Reduction Program Principal Investigators' Meeting, November 19-20, 2002, Orlando, Florida.

PROFESSIONAL SERVICES

Invited Reviewer for:

- Langmuir
- Journal of Computational Physics
- Microfluidics & Nanofluidics
- Physica A
- International Journal of Heat & Mass Transfer
- Heat and Mass Transfer
- ASME Journal of Fluids Engineering
- Experimental Thermal and Fluid Science
- Mathematical Problems in Engineering
- Advances in Mechanical Engineering
- The Arabian Journal for Science and Engineering
- ASME FEDSM2010-ICNMM2010 conference

MEMBERSHIP IN PROFESSIONAL SOCIETIES

- American Society of Mechanical Engineering (ASME)
- American Physical Society (APS)
- Biophysical Society