

## **Dong Liu, Ph.D.**

### **Associate Professor**

N236 Engineering Bldg 1  
Department of Mechanical Engineering  
University of Houston, Houston, TX77204-4006  
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### **Professional Preparation**

Tsinghua University, China	Thermal Engineering	B. S.	1996
Tsinghua University, China	Thermal Engineering	M. S.	1999
Purdue University	Mechanical Engineering	Ph.D.	2006

### **Appointments**

Associate Professor, University of Houston	2013-present
Assistant Professor, University of Houston	2007-2013
Post-doctoral Research Associate, Purdue University	2006-2007

### **Research Interests**

Micro/nanoscale thermal transport, boiling heat transfer enhancement, micro/nanofluidics, convective heat transfer, electrokinetics

### **Teaching**

MECE 4364 Heat Transfer  
MECE 4371 Thermal Fluids Laboratory  
MECE 6334 Convection Heat Transfer  
MECE 6335 Heat Transfer with Phase Change  
MECE 7397 Microscale Thermal Transport Phenomena

### **Service**

Associate Editor, ASME Journal of Electronic Packaging, 2017-present  
Vice Chair, ASME Heat Transfer Division K-9 Nanoscale Transport Phenomena, 2016-present  
Co-Chair, Faculty Search Committee for Thermal Science and Fluid Mechanics, 2014-2015  
Chair, Faculty Search Committee for Biophysics, 2014-2015  
Chair, Faculty Search Committee for Thermal Science, 2013-2014  
Faculty Search Committee for Thermal Science, 2011-2012  
Undergraduate Advising Director, 2015-present  
Undergraduate Lab Reform Committee, 2014-present

### **Current Students**

Yu Deng (Ph.D.), Yi Lu (Ph.D.), Abhinay Sivuni (Ph.D.), Prakhar Behar (M.S.)  
Yingjie Tang (Post-doctoral research associate)

## Students Advised

Guliang He (Ph.D.), Aritra Sur (Ph.D.), Leyuan Yu (Ph.D.), Feng Chen (Post-doctoral research associate), Xiaoxiang Wang (M.S.), Da Lin (M.S.), Vani Aparna Peri (M.S.), Ravi Teja (M.S.), Yu Deng (Undergraduate), Yang Sun (Undergraduate)

## Professional Societies

ASME

## Proposal Review

1. NSF, Chemical Bioengineering, Environmental and Transport Systems (CBET), 2009, 2015.
2. Netherlands Foundation for Fundamental Research on Matter, Dr. Michel van den Hout, 2014.
3. DOE, Office of Workforce Development for Teachers and Scientists (WDTS), Office of Science, Graduate Fellowship Program, 2012.
4. American Institute of Biological Sciences (AIBS), external reviewer, “New Biomimetic Technology for “Just-In-Time” Delivery of Anti-Convulsants Following Traumatic Brain Injury”, June, 2009.

## Conference Organization

1. Topic co-organizer on Track 4 “Nanoscale Thermal Transport”, ASME *Summer Heat Transfer Conference (SHTC)*, Washington, DC, 2017
2. Topic organizer on Track 4 “Nanoscale Thermal Transport”, ASME *Summer Heat Transfer Conference (SHTC)*, Washington, DC, 2016
3. Session organizer on "Symposium on Phase Change Heat Transfer", ASME *2014 International Mechanical Engineering Congress & Exposition (IMECE)*, Montreal, Canada, 2014.
4. Topic co-organizer on "Engineered Surfaces of Phase Change Heat Transfer", ASME *2013 International Mechanical Engineering Congress & Exposition (IMECE)*, San Diego, California, 2013.
5. Topic co-organizer on "Fundamentals of Phase Change Heat Transfer", ASME *2011 International Mechanical Engineering Congress & Exposition (IMECE)*, Houston, Texas, 2012.
6. Session chair on “Single-Phase Liquid Cooling”, *13<sup>th</sup> Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITHERM)*, San Diego, California, 2012.
7. Session co-chair on “Microchannels and Heat Pipes II”, ASME *2011 International Mechanical Engineering Congress & Exposition (IMECE)*, Denver, Colorado, 2011.
8. Session chair on “Interfacial Thermal Behavior at Micro/Nano Scales”, *11<sup>th</sup> Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITHERM)*, Orlando, Florida, 2008.

## Invited Presentations

Rice University, Department of Mechanical Engineering, Houston, Texas, USA, April 2015.

Tianjin University, Dept. Power Engineering and Engineering Thermophysics, Tianjin, China, June 2012 and June 2013.

Tsinghua University, Beijing, Dept. Thermal Engineering, China, July 2010 and May 2011.

Beijing Jiaotong University, School Mechanical, Electronic and Control Engineering, Beijing, China, July 2010, May 2011, June 2012, June 2013 and July 2014.

Huawei Technologies, Plano, TX, October 2010.

University of Colorado, Boulder, Co, Dept. Mechanical Engineering, September 2010.  
University of Texas, Depart. Material Science and Engineering, Arlington, TX, October 2008.  
University of Houston, Dept. Mechanical Engineering, Houston, TX, April 2007.  
Binghamton University, Dept. Mechanical Engineering, Binghamton, NY, April 2007.  
Rutgers University, Dept. Mechanical Engineering and Aerospace, Piscataway, NJ, March 2007.  
Stony Brook University, Dept. Mechanical Engineering, Stony Brook, NY, March 2007.  
University of Missouri, Dept. Mechanical Engineering and Aerospace, Rolla, MO, March 2007.  
University of Arizona, Dept. Aerospace and Mechanical Engineering, Tucson, AZ, April 2006.  
University of Illinois, Dept. Mechanical and Industrial Engineering, Urbana Champaign, IL, Feb 2006.  
Clemson University, Dept. of Mechanical Engineering, Clemson, SC, Feb 2006.  
Purdue University, School of Mechanical Engineering, West Lafayette, IN, Nov 2005.

### **Journal Review**

Nature Communications, Journal of Heat Transfer, International Journal of Heat and Mass Transfer, Nanoscale, Applied Physics Letters, Experiments in Fluids, Journal of Micromechanics and Microengineering, Journal of Physics, Nanotechnology, Experimental Thermal and Fluid Science, Microfluidics and Nanofluidics, International Journal of Thermal Sciences, Heat Transfer Engineering, IEEE Transaction on Components and Packaging Technologies, International Journal of Refrigeration, Journal of Thermophysics and Heat Transfer, Journal of Enhanced Heat Transfer, Energy and Fuels, Journal of Biomicrofluidics, Journal of Thermal Science and Engineering Applications, ASHRAE Journal, Waste Management Research, Journal of Natural Gas Science and Engineering

### **Patent**

1. Liu, D., and Cao, Q. L., Magnetic Directed Alignment of Stem Cell Scaffolds for Neuron Regeneration, UHOU.P005US.P1
2. Liu, D., and Garimella, S. V., Microfluidic Pumping based on Dielectrophoresis, U.S. patent No. 20130075259

### **Book**

Liu, D., and Garimella, S. V., *Thermal Transport in Microchannels: Single-Phase and Two-Phase Fluid Flow and Heat Transfer*, ISBN: 3639117034, VDM Verlag, 2009.

### **Book Chapters**

1. Liu, D., and Garimella, S. V., “Electromechanical Actuation of Nanofluids”, in *Nanoparticles: Synthesis, Characterization and Applications*, Ramesh S. Chaughule (ed.), American Scientific Publishers, 2009.
2. Liu, D., and Garimella, S. V., “Cooling Techniques for Electronic Devices”, in *Encyclopedia of Life Support Systems (EOLSS)*, EOLSS Publishers, in review

### **Journal Publications**

1. Sur, A., Lu, Y., Pascente, C., Ruchhoeft, P., and Liu, D., Enhancing critical heat flux with electrowetting, *Applied Physics Letters*, to be submitted, 2017.
2. Sur, A., Lu, Y., Pascente, C., Ruchhoeft, P., and Liu, D., Nucleate boiling heat transfer enhancement with electrowetting, *International Journal of Heat and Mass Transfer*, submitted, 2017.

3. Yi, L., Bao, J. M., and Liu, D., Dynamics of a Leidenfrost droplet modulated by electrowetting, *Journal of Heat Transfer*, accepted, 2017.
4. Wang, H. X., Liu, D., and Liu, L.P., Equilibrium shapes of a heterogeneous bubble in an electric field: a variational formulation and numerical verifications, *Proceedings of Royal Society A*, in press, 2017.
5. Wang, Y., Tang, Y. J., Cheng, P. H., Zhou, X. F., Zhu, Z., Liu, Z. P., Liu, D., Wang, Z. M., and Bao, J. M., Interaction of light with liquid suspensions of 2D nanomaterials: Nonlinear optics, thermal lens effect and flow-induced alignment, *Nanoscale*, in press (DOI: 10.1039/C6NR08487G), 2017.
6. Lu, Y., Sur, A., Pascente, C., Annapragada, S., Ruchhoeft, P., and Liu, D., Dynamics of droplet motion induced by electrowetting, *International Journal of Heat and Mass Transfer*, 106(3): 920-931, 2017.
7. Ebrahimi, B., He, G. L., Tang, Y. J., Franchek, M., and Liu, D., Characterization of high-pressure cavitating flow through a thick orifice plate, *International Journal of Thermal Sciences*, 114(4): 229-240, 2017.
8. Yu, L. Y., Sur, A., and Liu, D., Flow boiling heat transfer and two-phase flow instability of nanofluids in a minichannel, *Journal of Heat Transfer*, 137(5): 051502, (2015)
9. Sur, A., Lu, Y., Pascente, C., Ruchhoeft, P., and Liu, D., Bubble ebullition on a hydrophilic surface, *Journal of Heat Transfer*, 137(2): 020905, (2015)
10. Yang, L.X., Guo, A., and Liu, D., Experimental investigation of subcooled vertical upward flow boiling in a narrow rectangular channel, *Experimental Heat Transfer*, 29(2): 221-243, (2014)
11. Yin, L., Jia, L., Guan, P., and Liu, D., Experimental investigation on bubble confinement and elongation in microchannel flow boiling, *Experimental Thermal and Fluid Science*, 54(2): 290-296, (2014)
12. He, G. L., and Liu, D., Coupled electrohydrodynamic-dielectrophoretic pumping of colloidal suspensions in a microchannel, *International Journal of Micro-Nanoscale Thermal Fluid Transport Phenomena*, 4(1): 1-21, (2013)
13. Yu, L. Y., and Liu, D., A study of thermal transport of nanofluids and their suitability for electronics cooling, *IEEE Transactions on Components and Packaging Technologies*, 3(10): 1693-1704 (2013)
14. Gadogbe, M., Ansar, S. M., He, G. L., Collier, W. E., Rodriguez, J., Liu, D., Chu, I. W., and Zhang, D., Determination of colloidal gold nanoparticle surface areas, concentrations and sizes through quantitative ligand adsorption, *Analytical and Bioanalytical Chemistry*, 405(1): 413-422, (2013)
15. Li, D., Wu, G. S., Wang, W., Wang, Y. D., Liu, D., Zhang, D. C., Chen, C. F., Peterson, G. P., and Yang, R. G., Monolithic silicon-nanowire coatings for enhancing flow boiling heat transfer in microchannels, *Nano Letters*, 12(7): 3385-3390, (2012)
16. Vangala, K., Ameer, F., Salomon, G., Le, V., Lewis, E., Yu, L. Y., Liu, D. and Zhang, D., Studying protein and gold nanoparticle interaction using organothiols as molecular probes, *Journal of Physical Chemistry*, 116(5): 3645-3652, (2012)
17. Yu, L. Y., Liu, D., and Botz, F., Laminar convective heat transfer of alumina-Polyalphaolefin nanofluids containing spherical and non-spherical nanoparticles, *Experimental Thermal and Fluid Science*, 37(2): 72-83, (2012)
18. Sur, A., and Liu, D., Adiabatic air-water two-phase flow in circular microchannels, *International Journal of Thermal Sciences*, 53(3): 18-34, (2012)

19. Ansar, S, Haputhanthri, R., Edmonds, B., Liu, D., Yu, L. Y., Sygula, A. and Zhang, D., Determination of the binding affinity, packing, and conformation of thiolate and thione ligands on gold nanoparticles, *Journal of Physical Chemistry*, 115(3): 653-660 (2011)
20. Liu, D., and Yu, L. Y., Single-phase thermal transport of nanofluids in a minichannel, *Journal of Heat Transfer*, 133(3): 031009 (2011)
21. Liu, D., and Garimella, S. V., Microfluidic pumping based on traveling-wave dielectrophoresis, *Nanoscale and Microscale Thermophysical Engineering*, 13(2): 109-133 (2009)
22. Garimella, S. V., and Liu, D., Microscale thermal transport and electromechanical microfluidic actuation, *Journal of Enhanced Heat Transfer*, 16(3):1-30 (2009)
23. Liu, D., and Garimella, S. V., Flow boiling heat transfer in microchannels, *Journal of Heat Transfer*, 129(10): 1321-1331 (2007)
24. Garimella, S. V., Singhal, V., and Liu, D., On-chip thermal management with microchannel heat sinks and integrated micropumps, *Proceedings of the IEEE* (invited paper), 94(8): 1534-1548 (2006)
25. Liu, D., Lee, P. S., and Garimella, S. V., Prediction of the onset of nucleate boiling in microchannel flow, *International Journal of Heat and Mass Transfer*, 48(25): 5134-5149 (2005)
26. Liu, D., Lee, P. S., and Garimella, S. V., Nucleate boiling in microchannels, *Journal of Heat Transfer*, 127(8): 803 (2005)
27. Liu, D., Garimella, S. V., and Wereley, S. T., Infrared micro-particle velocimetry in silicon-based microdevices, *Experiments in Fluids*, 38(3): 385-392 (2005)
28. Lee, P. S., Garimella, S. V., and Liu, D., Investigation of heat transfer in rectangular microchannels, *International Journal of Heat and Mass Transfer*, 48(9): 1688-1704 (2005)
29. Liu, D., and Garimella, S. V., Analysis and optimization of the thermal performance of microchannel heat sinks, *International Journal of Numerical Methods for Heat and Fluid Flow*, 15(1): 7-26 (2005)
30. Liu, D., and Garimella, S. V., Investigation of fluid flow in microchannels, *AIAA Journal of Thermophysics and Heat Transfer*, 18(1): 65-72 (2004)
31. Peng, X. F., Liu, D., and Lee, D. J., Dynamic characteristics of microscale boiling, *Heat and Mass Transfer*, 37: 81-86 (2001)
32. Peng, X. F., Liu, D., Lee, D. J., Yan, Y., and Wang, B. X., Cluster dynamics and fictitious boiling in microchannels, *International Journal of Heat and Mass Transfer*, 43(23): 4259-4266 (2000)

### Conference Publications

1. Liu, D., Nucleate boiling heat transfer enhancement with electrowetting (invited), *International Microelectronics and Packaging Society (IMAPS) Advanced Technology Workshop on Thermal Management*, Los Gatos, California, 2014.
2. Sur, A, Lu, Y., Pascente, C., Ruchhoeft, P., and Liu, D., Bubble dynamics in AC electrowetting-enhanced nucleate boiling, *11<sup>th</sup> AIAA/ASME Joint Thermophysics and Heat Transfer Conference*, Atlanta, Georgia, 2014
3. Sur, A, Lu, Y., Pascente, C., Ruchhoeft, P., and Liu, D., AC electrowetting-modulated nucleate boiling heat transfer, *11<sup>th</sup> AIAA/ASME Joint Thermophysics and Heat Transfer Conference*, Atlanta, Georgia, 2014
4. Sur, A, Lu, Y., Pascente, C., Ruchhoeft, P., and Liu, D., AC electrowetting-assisted pool boiling, *11<sup>th</sup> AIAA/ASME Joint Thermophysics and Heat Transfer Conference*, Atlanta, Georgia, 2014
5. Sur, A, Lu, Y., Pascente, C., Ruchhoeft, P., and Liu, D., Bubble dynamics in AC electrowetting-enhanced nucleate boiling, *11<sup>th</sup> AIAA/ASME Joint Thermophysics and Heat Transfer Conference*, Atlanta, Georgia, 2014

6. He, G. L., Pan, T. W., and Liu, D., Numerical investigation of dielectrophoresis directed assembly of nanoparticles and nanowires, *ASME International Mechanical Engineering Congress & Exposition (IMECE)*, San Diego, California, 2013.
7. Yu, L. Y. and Liu, D., Flow boiling heat transfer and two-phase flow instability of nanofluids in a minichannel, *ASME Summer Heat Transfer Conference*, Minneapolis, Minnesota, 2013
8. Yu, L. Y. and Liu, D., A study of thermal effectiveness of laminar forced convection of nanofluids, *ASME International Mechanical Engineering Congress & Exposition (IMECE)*, Houston, Texas, 2012.
9. Yu, L. Y., and Liu, D., A study of thermal transport of nanofluids and their suitability for electronic cooling (invited), *International Microelectronics and Packaging Society (IMAPS) Advanced Technology Workshop on Thermal Management*, Palo Alto, California, 2011.
10. Yu, L. Y., Liu, D., and Botz, F., Laminar convective heat transfer of alumina-Polyalphaolefin nanofluids containing spherical and non-spherical nanoparticles, *ASME 2011 Pacific Rim Technical Conference & Exposition on Packaging and Integration of Electronic and Photonic Systems (InterPACK)*, Portland, Oregon, 2011.
11. He, G. L., and Liu, D., Coupled electrohydrodynamic-dielectrophoretic pumping of colloidal suspensions in a microchannel, *9<sup>th</sup> International Conference on Nanochannels, Microchannels, and Minichannels*, Edmonton, Canada, 2011.
12. Sur, A., and Liu, D., Adiabatic air-water two-phase flow in circular microchannels, *9<sup>th</sup> International Conference on Nanochannels, Microchannels, and Minichannels*, Edmonton, Canada, 2011.
13. Liu, D., and Yu, L. Y., Experimental investigation of single-phase convective heat transfer of nanofluids in a minichannel, *14<sup>th</sup> International Heat Transfer Conference*, Washington, D. C., 2010.
14. Sur, A., and Liu, D., Experimental and numerical investigation of two-phase patterns in a cross-junction microfluidic chip, *8<sup>th</sup> International Conference on Nanochannels, Microchannels, and Minichannels*, Montreal, Canada, 2010.
15. Yu, L. Y., and Liu, D., Single-phase thermal transport of nanofluids in a minichannel, *ASME International Mechanical Engineering Congress and Exposition*, Orlando, Florida, 2009.
16. Liu, D., and Sur, A., Two-phase flow with surfactants in a microchannel, *ASME Summer Heat Transfer Conference*, San Francisco, California, 2009.
17. Liu, D., and Garimella, S. V., Microfluidic pumping based on dielectrophoresis for thermal management of microelectronics, *11<sup>th</sup> Intersociety Conference on Thermal and Thermomechanical Phenomena in Electronic Systems (ITHERM)*, Orlando, Florida, 2008.
18. Garimella, S. V. and Liu, D., Microscale thermal transport and electromechanical microfluidic actuation, (Keynote), *19<sup>th</sup> National and 8<sup>th</sup> ISHMT-ASME Heat and Mass Transfer Conference*, Hyderabad, India, 2008.
19. Liu, D., and Garimella, S. V., Flow boiling in a microchannel heat sink, *ASME International Mechanical Engineering Congress and Exposition*, Orlando, Florida, 2005.
20. Liu, D., Lee, P. S., and Garimella, S. V., Nucleate boiling in microchannels, Photogallery in *ASME International Mechanical Engineering Congress and Exposition*, Anaheim, California, 2004.
21. Liu, D., Garimella, S. V., and Wereley, S. T., Infrared micro-particle velocimetry of fluid flow in silicon-based microdevices, *ASME Heat Transfer/Fluids Engineering Summer Conference*, Charlotte, North Carolina, 2004.
22. Singhal, V., Liu, D., and Garimella, S. V., Analysis of pumping requirements for microchannel cooling systems, *International Electronic Packaging Technical Conference and Exhibition*, Maui, Hawaii, 2003.

23. Liu, D. and Garimella, S. V., Optimization of the thermal performance of microchannel heat sinks, *International Electronic Packaging Technical Conference and Exhibition*, Maui, Hawaii, 2003.
24. Liu, D., and Garimella, S. V., Experimental investigation of fluid flow in microchannels, *the 8<sup>th</sup> AIAA/ASME Thermophysics and Heat Transfer Conference*, St. Louis, Missouri, June 2002.

### **Funded Research**

1. Project: Erosion Modeling of Rubber in Blowout Preventers  
 Role: **Co-PI** (PI: M. Franchek)  
 Source: National Oilwell Varco  
 Amount: \$436,766, 2015-2017
2. Project: Creating Tunable Adaptive Boiling Heat Transfer Surfaces with Electrowetting  
 Role: **PI** (Co-PI: P. Ruchhoeft)  
 Source: CBET, National Science Foundation (NSF)  
 Amount: \$299,997, 2012-2016
3. Project: Magnetic Directed Alignment of Injectable Neural Stem Cell Scaffold for Regeneration after Spinal Cord Injury  
 Role: **PI** (Co-PIs: Q. L. Cao and L. Sun)  
 Source: CBET, National Science Foundation (NSF)  
 Amount: \$390,000 (UH share: \$263,301), 2011-2015
4. Project: Magnetic Self-Assembly of Linear Chain Lattices of Neural Stem Cells Labeled with Magnetic Cationic Liposome for in vivo Spinal Cord Nerve Regeneration without Using Scaffold  
 Role: **PI** (Co-PIs: Q. L. Cao and L. Sun)  
 Source: U. S. Army Medical Research and Material Command's Telemedicine and Advanced Technology Research Program (TATRC) through Methodist Hospital Research Institute  
 Amount: \$150,000 (UH share: \$119,998), 2011-2013
5. Project: Study of Colloidal Electrohydrodynamics for Dielectrophoresis-Directed Fluidic Assembly of Nanostructures  
 Role: **PI**  
 Source: CMMI, National Science Foundation (NSF)  
 Amount: \$175,000, 2009-2012.
6. Project: Design and Develop Magnetic Nanostructures for Multiplexing MRI Diagnostics  
 Role: **Co-PI** (PI: L. Sun)  
 Source: Alliance for Nanohealth (ANH)  
 Amount: \$120,000 (UH share: \$100,000), 2009-2012.
7. Project: Electromechanical transport of nanofluids: microfluidic pumping and heat transfer enhancement  
 Role: **PI** (Co-PI: S. Garimella)  
 Source: NSF Cooling Technologies Research Center (CTRC)  
 Amount: \$80,000 (UH share: \$80,000), 2008-2009.
8. Project: Magnetically-Assisted Fabrication of Thin Film Nanocomposites with Tunable Thermal Conductivity as Thermal Interface Materials  
 Role: **PI** (Co-PI: L. Sun)  
 Source: Texas Center for Superconductor at University of Houston (TcSUH)  
 Amount: \$20,000, 2008-2009.
9. Project: Flow Boiling and Two-Phase Flow of Surfactant Solutions in microchannel Heat Sinks: Heat Transfer Enhancement and Drag Reduction  
 Role: **PI**

Source: New Faculty Award  
Amount: \$6,000, UH, 2007-2008

10. Project: Dielectrophoresis-based Microfluidic pumping and Heat Transfer Enhancement

Role: **PI**

Source: Small Grant  
Amount: \$6,000, UH, 2007-2009