

Ravi Bhadauria
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August 25, 2016

Dr. Daren Chen

Department of Mechanical and Nuclear Engineering
Virginia Commonwealth University
East Hall, Room E2250
401 West Main Street
Richmond, VA 23284-3067

Dear members of the search committee, Dr. Daren Chen:

I am writing to apply for the tenure-eligible Assistant Professor position in the department of Mechanical and Nuclear Engineering at VCU. I am currently completing my doctoral degree in Mechanical Engineering at the University of Illinois at Urbana-Champaign and will graduate in summer 2017. I believe that my research and teaching interests in multiscale transport phenomena and material characterization for energy and environmental applications are a perfect match for this department and will complement the existing research program and course offerings.

My research has focused on different aspects of surface-fluid interactions on fluid flow, both at the micro- and nanoscale. I have significantly contributed to understanding the impact of surface friction and adsorption on flow profiles in porous media. I have published my work in peer-reviewed journals, including *The Journal of Chemical Physics*. I have also presented my research at various national and international conferences, including APS-DFD and US Congress on Computational Mechanics. I possess experience in teaching both undergraduate and graduate level courses, as a teaching assistant and laboratory instructor. Currently, as a senior graduate student in the lab, I am mentoring new graduate students in their research.

My expertise in the fundamentals of interfacial chemical physics equips me to solve a multitude of topical problems. Components of my future research will explore the role of novel materials as therapeutic agents in synergy with the top-ranked medical school at VCU. I will also address challenges in energy harvesting and storage that will help to optimally utilize natural energy sources and minimize our dependence on fossil fuels. The resulting high-density energy storage solutions will be commercialized in cooperation with the VCU School of Business. I am looking forward to teaching fluid mechanics, thermodynamics, and numerical methods courses at both undergraduate and graduate levels, and eager to develop specialized courses on liquid state dynamics.

I am committed to further the mission and vision of VCU to excel as a research university and possess the necessary background to develop an outstanding externally funded research group. Please do not hesitate to contact me if you require additional information. I thank you for your consideration and look forward to meeting you in person.

Sincerely yours,

Ravi Bhadauria

Attached: curriculum vitae with list of references, research and teaching statements

Ravi Bhadauria

Doctoral Candidate

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Education

- 2010— **Doctor of Philosophy (expected 2017)**, *University of Illinois at Urbana-Champaign*.
Department Mechanical Science and Engineering
Title *Multiscale methods for transport phenomena*
Supervisor Professor N R Aluru
Description Developed variety of continuum multiscale methods to capture flow phenomena for single and multi-component fluids with multiphysics.
- 2009 **Master of Science**, *Virginia Commonwealth University*.
Department Mechanical and Nuclear Engineering
Title *Design And Optimization Of Peristaltic Micropumps Using Evolutionary Algorithms*
Supervisors Professor Mohamed Gad-el-Hak & Professor Ramana M Pidaparti
Description Introduced a design optimization methodology to achieve a target flow rate through a peristaltic micropump.
- 2007 **Bachelor of Technology**, *Indian Institute of Technology Kanpur*.
Department Mechanical Engineering

Research Experience

- Jan 2010— **Research Assistant**, *University of Illinois at Urbana-Champaign*.
- Developed high fidelity multiscale quasi-continuum methods representative of adsorption and liquid-surface interfacial friction effects.
 - Proposed stochastic models that capture essential liquid-surface interfacial physics to compute interfacial friction.
 - Studied memory effects on dynamics of solvated nanoparticles and their associated stochastic transport across a potential energy barrier.
- Aug 2007— **Research Assistant**, *Virginia Commonwealth University*.
May 2009
- Developed theoretical models of one way coupled fluid-structure interaction phenomenon and fluid velocity field response due to actuation by piezoelectric material.
 - Implemented coupled fluid-solid interaction models using FEA and CFD to model a novel design of a valveless peristaltic micropump.
 - Shape optimized the pump design for target drug delivery rates using Genetic Algorithms and Artificial Neural Network.
- Aug 2006— **Research Assistant**, *Indian Institute of Technology Kanpur*.
May 2007
- CFD simulations and experiments on mixing at the microscale.

Peer Reviewed Publications

- 2016 **R Bhadauria** and N R Aluru, "Asymmetric and reversed velocity profiles in electric-field mediated transport at nanoscale," *In Preparation*
- 2016 **R Bhadauria** and N R Aluru, "Multiscale modeling of electroosmotic flow: effects of discrete ion, enhanced viscosity and surface friction," *Submitted*
- 2016 T Sanghi, **R Bhadauria** and N R Aluru, "Memory effects in nanoparticle dynamics and transport," *The Journal of Chemical Physics*, Under Review
- 2016 **R Bhadauria** and N R Aluru, "A multiscale transport model for Lennard-Jones binary mixtures based on interfacial friction," *The Journal of Chemical Physics*, 145 (7), p. 074115.
- 2015 **R Bhadauria**, T Sanghi and N R Aluru, "Interfacial friction based quasi-continuum hydrodynamical model for nanofluidic transport of water," *The Journal of Chemical Physics*, 143 (17), p. 174702.
- 2013 **R Bhadauria** and N R Aluru, "A quasi-continuum hydrodynamic model for slit shaped nanochannel flow," *The Journal of Chemical Physics*, 139 (7), p. 074109.
- 2010 **R Bhadauria**, R Pidaparti and M Gad-el-Hak, "Solution of two-dimensional viscous flow driven by motion of flexible walls," *CFD Letters*, 2 (1), pp. 1–12.
- 2009 **R Bhadauria**, R Pidaparti and M Gad-el-Hak, "Optimization of a peristaltic micropump with multiple moving actuators," *Journal of Microelectronics & Electronic Packaging*, 6 (4), pp. 189–197.

Presentations and Conference Proceedings

- 2015 **R Bhadauria**, T Sanghi and N R Aluru, "A Nanoscale Hydrodynamical Model for Transport of Water," In *American Physical Society (APS) DFD Meeting*, Abstract BAPS.2015.DFD.M9.6, 22–24 November, Boston, MA.
- 2013 **R Bhadauria** and N R Aluru, "A Quasi-Continuum Hydrodynamic Model for Transport in Nanofluidic Channels," In *12th US National Congress on Computational Mechanics*, 22–25 July, Raleigh, NC.
- 2009 **R Bhadauria**, R Pidaparti and M Gad-el-Hak, "Design and Optimization of a Peristaltic Micropump using Evolutionary Algorithms," In *10th US National Congress on Computational Mechanics*, 16–19 July, Columbus, OH.
- 2009 **R Bhadauria**, R Pidaparti and M Gad-el-Hak, "CFD Simulations of a Valveless Micropump" In *87th Annual Meeting of Virginia Academy of Science*, 27–29 May, Richmond, VA.
- 2009 **R Bhadauria**, J Czerwinska, R Pidaparti and M Gad-el-Hak, "Numerical Modeling of a Valveless Micropump," In *International Conference on MEMS '09*, 3–5 January, IIT Madras, Chennai, India.
- 2009 **R Bhadauria**, J Czerwinska, R Pidaparti and M Gad-el-Hak, "Fluid–Structure Interaction Study of a Valveless Micropump," *Proceedings of the International Conference on MEMS '09*, 3–5 January, IIT Madras, Chennai, India, Paper no. PO17, 4 pages, CD-ROM Publication.

Research Interests

- Interfacial transport phenomena
- Mesoscale simulations of biological systems
- Nanoparticle dynamics and transport
- Energy harvesting and storage using ionic liquids

Teaching Experience

- Fall 2012 **Teaching Assistant**, *University of Illinois at Urbana-Champaign*.
- Fluid Dynamics
- Fall 2009 **Teaching Assistant**, *Virginia Commonwealth University*.
- Mechatronics
 - Mechanical Systems Design
- Spring 2009 **Teaching Assistant**, *Virginia Commonwealth University*.
- Advanced Engineering Mathematics
- Fall 2008 **Teaching Assistant**, *Virginia Commonwealth University*.
- Fluid Mechanics

Awards

- 2013 List of teachers ranked as excellent, University of Illinois at Urbana-Champaign
- 2007–2009 Dean's Fellow, Virginia Commonwealth University
- 2009 Academic Excellence Award, Virginia Commonwealth University
- 2009 Graduate School Scholarship, Phi Kappa Phi Honor Society, Virginia Commonwealth University Chapter
- 2008 Inductee, Phi Kappa Phi Honor Society, Virginia Commonwealth University Chapter
- 2003–2007 Merit Scholarship, Indian Institute of Technology Kanpur

Professional Activities

- Reviewer The Journal of Chemical Physics, Microfluidics and Nanofluidics
- Member Virginia Academy of Science, American Physical Society

Computer skills

- Programming C, C++, FORTRAN 77/90/95
- Scripting PYTHON, R, Matlab, Mathematica, shell, tcl/tk
- Markup L^AT_EX, XML
- Multiphysics FLUENT, ANSYS, CFX, COMSOL, TECPLOT
- Atomistics LAMMPS, GROMACS, NAMD, VMD
- Miscellaneous Linux, Mac OS, Microsoft Windows

References

- 1 **Dr. N. R. Aluru**, *Richard W. Kritzer Distinguished Professor*.
Department of Mechanical Science and Engineering
University of Illinois at Urbana-Champaign
(217) 333-1180
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- 2 **Dr. R. M. Pidaparti**, *Associate Dean for Academic Programs*.
College of Engineering
University of Georgia at Athens
(706) 542-4057
rmparti@uga.edu

- 3 **Dr. P. W. Longest**, *Professor*.
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- 4 **Dr. K. M. Mossi**, *Associate Professor and Graduate Program Director*.
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