

# Avanish Mishra

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Phone: +1 (713)-503-7966 LinkedIn: [avanish-mishra](#) Citations: [Google Scholar](#)

## EDUCATION

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- 08/2011–12/2016 **Ph.D., Mechanical Engineering**, Purdue University, West Lafayette, USA  
GPA: 4.0/4.0  
**Dissertation:** *Patterning particles with light and electric field*  
**Advisor:** Professor Steve Wereley
- 04/2010–07/2011 **M.Sc. by Research, Department of Engineering and Applied Science**, Cranfield University, Shrivenham, Oxfordshire, United Kingdom  
**Dissertation:** *Numerical and experimental investigation of bubble plume dispersion in confined plunging liquid jets*
- 07/2005–05/2009 **B.Tech., Mining Machinery Engineering**, Indian Institute of Technology (IIT), Dhanbad, India  
Formerly known as the Indian School of Mines (ISM)

## PROFESSIONAL EXPERIENCE

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- 11/2020–Present **Instructor**  
Center for Engineering in Medicine and Surgery and MGH Cancer Center, **Massachusetts General Hospital, Harvard Medical School, Boston, USA**  
**Advisor:** Professor Mehmet Toner  
**Co-advisors:** Professors Daniel Haber and Shyamala Maheswaran
- 03/2017–10/2020 **Postdoctoral Fellow**  
Center for Engineering in Medicine and Surgery and MGH Cancer Center, **Massachusetts General Hospital, Harvard Medical School, Boston, USA**  
**Project Title:** *Ultra-high throughput circulating tumor cell isolation from large volume samples*  
**Advisor:** Professor Mehmet Toner  
**Co-advisors:** Professors Daniel Haber and Shyamala Maheswaran

## FUNDED RESEARCH GRANTS AS PRINCIPAL INVESTIGATOR

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- 08/2023–07/2028 **NIH K25 Research Career Development Award**  
**Principal Investigator(s):** Avanish Mishra  
**Funding Agency:** NIH/National Heart, Lung, and Blood Institute  
**Project Title:** [Precision Apheresis: stem cell isolation from patients with sickle cell disease for gene therapy using high-throughput microfluidics](#)

## TEACHING EXPERIENCE

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- Fall 2015 **Instructor, Undergraduate Fluid Mechanics, Mechanical Engineering, Purdue University**  
**Contribution:** Taught an undergraduate fluid mechanics (ME309) class of 65 students as an instructor. I developed and delivered 42-course lectures and designed homework problems along with reading assignments. **Received an overall score of 4.8/5.0 from students in anonymous course evaluations conducted by Purdue University.**

†Supported by Ward A. Lambert Graduate Teaching Fellowship

01/2013–05/2015 **Lead Teaching Assistant, Undergraduate Fluid Mechanics, Mechanical Engineering, Purdue University**

**Contribution:** Led teams of more than ten graduate teaching assistants over various semesters. Managed lab and tutoring component. Responsibilities included preparing experimental setups and lab recitations for each lab, instructing teaching assistants, delivering one recitation per week to a section of approximately 30 students, grading lab reports, quizzes, and exams, and tutoring students for four hours each week.

I designed and developed two new advanced particle image velocimetry labs for undergraduate students:

- Laminar boundary layer investigation over a flat plate using particle image velocimetry
- Wake survey using particle image velocimetry for drag force measurement

08/2011–12/2012 **Teaching Assistant, Undergraduate Fluid Mechanics, Mechanical Engineering, Purdue University**

**Contribution:** Delivered one recitation per week to a section of approximately 30 students, graded reports, quizzes, and exams, and tutored students for twelve hours each week.

## FELLOWSHIPS

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| 2016 | <b>Bilsland Dissertation Fellowship, College of Engineering, Purdue University</b><br>Fellowship awarded to one student per academic year in the School of Mechanical Engineering for an outstanding dissertation proposal |
| 2015 | <b>Ward A. Lambert Graduate Teaching Fellowship, School of Mechanical Engineering, Purdue University</b><br>Fellowship awarded to two teaching assistants per academic year for teaching a class as an instructor          |
| 2014 | <b>Summer Donald English Fellowship, School of Mechanical Engineering, Purdue University</b>   |
| 2013 | <b>Summer Donald English Fellowship, School of Mechanical Engineering, Purdue University</b>   |
| 2010 | <b>University Fellowship for M.Sc. by Research, Cranfield University, UK</b><br>Fellowship awarded by the Department of Engineering and Applied Science to support tuition and living expenses for M.Sc.                   |

## HONORS AND AWARDS

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| 2021 | <b>SAC Poster of Distinction Award, Executive Committee On Research, MGH, Boston, USA</b>        |
| 2018 | <b>Best Poster Award, Gordon Research Conference on Liquid Biopsy for Cancer, MA, USA</b>        |
| 2016 | <b>Herbert A. Pohl Best Presentation Award, Dielectrophoresis 2016 meeting, MIT, Boston, USA</b> |

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| 2016 | <b>College of Engineering Outstanding Graduate Student Research Award, Purdue University, West Lafayette, USA</b><br>Awarded to two students in the School of Mechanical Engineering for outstanding research contributions                                   |
| 2016 | <b>Teaching Academy Graduate Teaching Award, Purdue Teaching Academy and the Office of the Provost, Purdue University, West Lafayette, USA</b><br>Awarded to one recipient out of 50 graduate teaching assistants for outstanding instructional contributions |
| 2016 | <b>Estus H. and Vashti L. Magoon Award for Excellence in Teaching, Purdue University, West Lafayette, USA</b><br>Awarded to top teaching assistants in the School of Mechanical Engineering for outstanding teaching  |
| 2015 | <b>Purdue Graduate Student Government Travel Grant, Purdue University, West Lafayette, USA</b>  |
| 2015 | <b>Purdue Summer Research Grant, School of Mechanical Engineering, Purdue University, West Lafayette, USA</b>   |
| 2014 | <b>American Electrophoresis Society Travel Award, AIChE Annual Meeting</b>  |
| 2014 | <b>Best Poster Award, AES Electrophoresis Society Symposium, AIChE Annual Meeting</b>   |
| 2014 | <b>Best Video Award, AES Electrophoresis Society Symposium, AIChE Annual Meeting</b>  |
| 2009 | <b>Fachpraktikum Support, Helmholtz-Zentrum Dresden-Rossendorf, Germany</b><br>Scholarship provided for a research internship at the Department of Experimental Thermal Fluid Dynamics, Helmholtz-Zentrum Dresden-Rossendorf, Germany                         |
| 2009 | <b>Offered DAAD WISE Scholarship, The German Academic Exchange Service (DAAD)</b>   |
| 2008 | <b>Summer Intern Scholarship, Cranfield University</b><br>Scholarship provided by the Department of Engineering and Applied Science at Cranfield University for supporting a funded summer research internship  |

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#### JOURNAL PUBLICATIONS (TOTAL = 15, FIRST AUTHOR = 9, SECOND AUTHOR = 4)

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1. [A Microfluidic Transistor for Liquid Signal Processing](#), K. A. Gopinathan, **A. Mishra**, B. R. Mutlu, J. F. Edd, and M. Toner, **Nature**, 2023.
2. [Isolation of circulating tumor cells](#), J. F. Edd, **A. Mishra**, K. C. Smith, R. Kapur, S. Maheswaran, D. A. Haber, and M. Toner, **iScience (Cell Press)**, 2022.
3. [Nature of trapping forces in optically induced electrothermal vortex-based tweezers](#), **A. Mishra**, K. Gupta and S. Wereley, **Physical Review Fluids**, 2021.
4. [Ultrahigh-throughput magnetic sorting of large blood volumes for epitope-agnostic isolation of circulating tumor cells](#), **A. Mishra**, T. D. Dubash, J. F. Edd, M. K. Jewett, S. G. Garre, N. M. Karabacak, D. C. Rabe, B. R. Mutlu, J. R. Walsh, R. Kapur, S. L. Stott, S. Maheswaran, D. A. Haber, and M. Toner, **PNAS**, 2020.
5. [In-flow measurement of cell-cell adhesion using oscillatory inertial microfluidics](#), B. R. Mutlu, T. Dubash, C. Dietsche, **A. Mishra**, A. Ozbey, K. Keim, J. F. Edd, D. A. Haber, S. Maheswaran, and M. Toner, **Lab on a Chip**, 2020.

6. [Microfluidic concentration and separation of circulating tumor cell clusters from large blood volumes](#), J. F. Edd, **A. Mishra**, T. D. Dubash, S. Herrera, R. Mohammad, E. K. Williams, X. Hong, B. R. Mutlu, J. R. Walsh, F. Machado De Carvalho, B. Aldikacti, L. T. Nieman, S. L. Stott, R. Kapur, S. Maheswaran, D. A. Haber, and M. Toner, **Lab on a Chip**, 2020
7. [Trapping and viability of swimming bacteria in an optoelectric trap](#), **A. Mishra**, T. Maltais, T. Walter, A. Wei, S. Williams and S. Wereley, **Lab on a Chip**, 2015
8. [Optoelectric patterning: Effect of electrode material and thickness on laser-induced AC electrothermal flow](#), **A. Mishra**, J.-W. Khor, K. Clayton, S. Williams, X. Pan, T. Kinzer-Ursem and S. Wereley, **Electrophoresis**, 2015
9. [Trapped Chromatin Fibers Damage Flowing Red Blood Cells](#)," M. Roushan, M. Jorfi, **A. Mishra**, K. Wong, J. Jorgensen, E. Ell, J. Markmann, J. Lee, and D. Irimia, **Advanced Biosystems**, 2018.
10. [Dynamic optoelectric trapping and deposition of multiwalled carbon nanotubes](#), **A. Mishra**, K. Clayton, V. Velasco, S. Williams and S. Wereley, **Microsystems and Nanoengineering**, Nature Publishing Group, 2015.
11. [Mapping surface tension induced menisci with application to tensiometry and refractometry](#), **A. Mishra**, V. Kulkarni, J.-W. Khor and S. Wereley, Royal Society of Chemistry **Soft Matter**, 2015.
12. [Optoelectrical microfluidics as a promising tool in biology](#), A. Mishra, J.-S. Kwon, R. Thakur and S. Wereley, **Trends in Biotechnology**, Cell Press, 2014 (\*Cover Article).
13. [Photothermal heating enabled by plasmonic nanostructures for electrokinetic manipulation and sorting of particles](#), J. C. Ndukaife, **A. Mishra**, U. Guler, A. A. Nnanna, S. Wereley and A. Boltasseva, **ACS Nano**, 2014.
14. [Transient thermal analyses of midwall cooling and external cooling methods for a gun barrel](#), **A. Mishra**, A. Hameed and B. Lawton, **ASME Journal of Heat Transfer**, 2010.
15. [A novel scheme for computing gun barrel temperature history and its experimental validation](#), A. Mishra, A. Hameed and B. Lawton, **ASME Journal of Pressure Vessel Technology**, 2010.

## BOOK CHAPTERS

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1. Droplet and Digital Microfluidics Enabled Analytical Techniques K. Gupta, Z. Chen, K. Gopinathan, A. Mishra, and S. T. Wereley, Droplet and Digital Microfluidics, Elsevier, 2023.
2. [Negative-Selection Enrichment of Circulating Tumor Cells from Peripheral Blood Using the Microfluidic CTC-iChip](#), Methods in molecular biology, R. Burr, J. Edd, B. Chirn, A. Mishra, D. A. Haber, M. Toner, and S. Maheswaran, Mammary Stem Cells, Springer, 2022.

## PATENTS

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1. Hybrid device for on-chip concentration, manipulation, sorting and sensing of particles on a plasmonic substrate, [US9443632B2](#), **A. Mishra**, A. Nnanna, J. Ndukaife, A. Boltasseva, and S. Wereley, 2015.
2. Microfluidic systems and methods for low-shear isolation of rare cells from large sample volumes, [US20230033651A1](#), **A. Mishra**, J. Edd, and M. Toner, 202