Rohit N. Karnik

Tata Professor
Department of Mechanical Engineering
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Education

University of California, Berkeley — Ph.D. in Mechanical Engineering — 2006
Ph.D. Thesis – Manipulation and Sensing of Ions and Molecules in Nanofluidic Devices
Advisor: Prof. Arun Majumdar

University of California, Berkeley — M.S. in Mechanical Engineering — 2004
M. S. Thesis – A Microfluidic Platform for the Study of Millisecond Biochemical Kinetics in Crowded Solutions
Advisor: Prof. Arun Majumdar

Indian Institute of Technology, Bombay — B. Tech. in Mechanical Engineering — 2002
B. Tech. Thesis – Finite Element Analysis of 3D Cracks
Advisor: Prof. S. K. Maiti

Experience

Massachusetts Institute of Technology Abdul Latif Jameel Water and Food Systems Lab	Associate Director	July 2023 – present
Massachusetts Institute of Technology Department of Mechanical Engineering	Interim Co-Department Head	Dec. 2022 – June 2023
Massachusetts Institute of Technology	Tata Professor	July 2021 – present
Massachusetts Institute of Technology Department of Mechanical Engineering	Professor	July 2019 – present
Massachusetts Institute of Technology Department of Mechanical Engineering	Associate Department Head for Education	July 2018 – Dec. 2022
Massachusetts Institute of Technology Department of Mechanical Engineering	Undergraduate Officer	July 2016 – June 2018
Massachusetts Institute of Technology Department of Mechanical Engineering	Associate Professor	July 2012 – June 2019
Massachusetts Institute of Technology Department of Mechanical Engineering	D'Arbeloff Assistant Professor	July 2008 – June 2012
Massachusetts Institute of Technology Department of Mechanical Engineering	Assistant Professor	Sept. 2007 – June 2008
Massachusetts Institute of Technology	Postdoctoral Associate (Advisor: Prof. Robert Langer)	Oct. 2006 – August 2007
University of California, Berkeley	Graduate Student Researcher	Aug. 2002 – July 2006
EPFL, Lausanne	Summer Intern	June 2000 – July 2000

Awards & Honors

- Inaugural recipient of the Tata Professorship at MIT, for outstanding accomplishments and service to MIT and dedication to the mission and goals of the MIT Tata Center for Technology and Design (2021)
- Senior Member, National Academy of Inventors (2021)
- Ruth and Joel Spira Award for Excellence in Teaching, MIT School of Engineering (2018)
- Top reviewer in 2016, Nature journals (2018)
- Best Poster Award, 11th International Congress on Membranes and Membrane Processes (ICOM), San Francisco, CA (2017)
  "Transport across Tunable Pore Size Distribution in Macroscopic Graphene Membranes"
- PLOS ONE 10 Year Anniversary: Staff Editors' Favorites collection (2017)
  Paper "Water Filtration Using Plant Xylem" featured among 19 papers selected out of ~165,000 papers
- National Academies Arab-American Frontiers of Science, Engineering, and Medicine Symposium (2016)
- Best Poster Award, 2016 MRS Fall Meeting, Boston MA (2016)
  "Water Filtration Using Naturally-Occurring Membranes in Plant Xylem"
- Top Referee in 2015, Nature (2016)
- Young Alumni Achiever Award, IIT Bombay (2014)
- Best Poster Award, MIT Water Night 2014
  "Desalination of Water by Fast Vapor Transport through Osmosis Membranes with Nanoscale Vapor Traps"
- Best Poster Award in the MEMS Division, Nanotechnology Forum, ASME Congress (2013)
  "Automated Microfluidic Platform for Multiplexed Measurement of Solid-State Nanopores"
- Best Poster Award, 3rd Asia-Pacific Chemical and Biological Microfluidics Conferences (2013)
  "High-throughput synthesis of polymeric nanoparticles using 3D flow focusing in parallel microchannels towards in vivo study"
- Outstanding Paper Award, ASME Global Congress on Nano Engineering for Medicine and Biology (2013)
  "On-chip ultrahigh purity isolation of neutrophils from whole blood for point-of-care applications"
- Department of Energy Early Career Award (2012)
  "Graphene Membranes with Tunable Nanometer-scale Pores", Basic Energy Sciences
- Keenan Award for Innovation in Undergraduate Education (2011)
  For contributions to the undergraduate Micro/Nano Engineering Laboratory course 2.674
- Grand Prize in the Nanotechnology Forum in the 2010 ASME Congress (2010)
  Best poster out of 162 posters "Vapor-trapping membrane for reverse osmosis"
- National Science Foundation CAREER Award (2010)
  "Cell Separation by Rolling on Asymmetric Receptor Patterns", Chemical and Biological Separations
- D'Arbeloff Career Development Assistant Professor, Massachusetts Institute of Technology (2008)
- Institute Silver Medal (2002)
  First position in Mechanical Engineering in IIT Bombay.
- Best Outgoing Student in Mechanical Engineering (2002)
  Best extracurricular and academic performance in Mechanical Engineering, IIT Bombay.
- Subramaniam Award (2001)
  Academic excellence in the Mechanical Engineering class till the junior year, IIT Bombay.
- National Talent Search Scholarship, Government of India (1996).

Publications (Google scholar profile)

Journal Publications

1. **R. Karnik**, R. Fan, M. Yue, D. Li, P. Yang and A. Majumdar. Electrostatic control of ions and molecules in nanofluidic transistors. ***Nano Letters*** 5, 943-948 (2005).
2. **R. Karnik**, K. Castelino, R. Fan, P. Yang and A. Majumdar. Effects of biological reactions and modifications on conductance of nanofluidic channels. ***Nano Letters*** 5, 1638-1642 (2005).
3. A. Liau, **R. Karnik**, A. Majumdar and J. Doudna-Cate. Mixing biological crowded solutions in milliseconds. ***Analytical Chemistry*** 77, 7618-7625 (2005).
4. S. Satyanarayana, **R. Karnik** and A. Majumdar. Stamp-and-stick room-temperature bonding technique for microdevices. ***Journal of Microelectromechanical Systems*** 14, 392-399 (2005).
5. R. Fan, **R. Karnik**, M. Yue, D. Li, A. Majumdar and P. Yang. DNA translocation in inorganic nanotubes. ***Nano Letters*** 5, 1633-1637 (2005).
6. K. Dunphy, **R. Karnik**, C. Trinkle and A. Majumdar. Analysis of governing parameters of silver-silver chloride electrodes in microfluidic electrokinetic devices. ***Microscale Thermophysical Engineering*** 9, 199-211 (2005).
7. R. Fan, M. Yue, **R. Karnik**, D. Li, A. Majumdar and P. Yang. Polarity switching and transient responses in single nanotube nanofluidic transistors. ***Physical Review Letters*** 95, Art. No. 086607 (2005).
8. **R. Karnik**, K. Castelino, C. Duan and A. Majumdar. Diffusion-limited patterning of molecules in nanofluidic channels. ***Nano Letters*** 6, (2006).
9. **R. Karnik**, K. Castelino and A. Majumdar. Field-effect control of protein transport in a nanofluidic transistor circuit. ***Applied Physics Letters*** 88, 123114 (2006).
10. K. Dunphy, **R. Karnik**, J. Newman and A Majumdar. Spatially controlled microfluidics using low-voltage electrokinetics. ***Journal of Microelectromechanical Systems***, 15, 237-245 (2006).
11. M-C Lu, S. Satyanarayana, **R. Karnik**, A. Majumdar and C-C Wang. Mechanical-electrokinetic battery by using a nano-porous membrane. ***Journal of Micromechanics and Microengineering*** 16, 667-675 (2006).
12. **R. Karnik**, C. Duan, K. Castelino, A. Majumdar. Rectification of ionic transport in a nanofluidic diode. ***Nano Letters*** 7, 547-551 (2007).
13. F. Gu, **R. Karnik**, et al. Targeted nanoparticles for cancer therapy. ***Nano Today*** 2, 14-21 (2007).
14. **R. Karnik**, S. Hong, H. Zhang, Y. Mei, D. Anderson, J. M. Karp, and R. Langer. Nanomechanical control of cell rolling in two dimensions through surface patterning of receptors. ***Nano Letters*** 8, 1153-1158 (2008).
15. **R. Karnik**, F. Gu, P. Basto, C. Cannizzaro, L. Dean, W. Kyei-Manu, R. Langer, and O. C. Farokhzad. Microfluidic platform for controlled synthesis of polymeric nanoparticles ***Nano Letters*** 8, 2906-2912 (2008).
16. D. Sarkar, P. K. Vemula, G. S. L. Teo, D. Spelke, **R. Karnik**, L. Y. Wee, and J. M. Karp. Cell surface conjugation of sialyl Lewis X induces a rolling response for human mesenchymal stem cells. ***Bioconjugate Chemistry*** 19, 2105-2109 (2008).
17. Y-H. Sen and **R. Karnik**. Investigating the translocation of λ-DNA molecules through PDMS nanopores. ***Analytical and Bioanalytical Chemistry*** 394, 437-446 (2009).
18. P. M. Valencia, P. A. Basto, L. Zhang, M. Rhee, R. Langer, O. C. Farokhzad, and **R. Karnik**. Single-step assembly of homogenous lipid-polymeric and lipid-quantum dot nanoparticles enabled by microfluidic rapid mixing. ***ACS Nano*** 4, 1671-1679 (2010).
19. D. Sarkar, P. K. Vemula, W. Zhao, A. Gupta, **R. Karnik**, and J. M. Karp. Engineered mesenchymal stem cells with self-assembled vesicles for systemic cell targeting. ***Biomaterials*** 31, 5266-5274 (2010).
20. J. Lee and **R. Karnik**. Desalination of water by vapor-phase transport through hydrophobic nanopores. ***Journal of Applied Physics*** 108, 044315 (2010).
21. N. Kolishetti, S. Dhar, P. M. Valencia, L. Q. Lin, **R. Karnik**, S. J. Lippard, R. Langer, and O. C. Farokhzad. Engineering of self-assembled nanoparticle platform for precisely controlled combination drug therapy. ***Proc. Natl. Acad. Sci. (USA)*** 107, 17939-17944 (2010).
22. S. Bose, S. K. Das, J. M. Karp, and **R. Karnik**. A semi-analytical model to study the effect of cortical tension on cell rolling. ***Biophysical Journal*** 99, 3870-3879 (2010).

23. C. Lee, S. Bose, K. J. Van Vliet, J. M. Karp, and **R. Karnik**. Examining lateral displacement of HL60 cells rolling on asymmetric P-selectin patterns. ***Langmuir*** 27, 240-249 (2011).

24. C. Lee, S. Bose, K. J. Van Vliet, J. M. Karp, and **R. Karnik**. Studying cell rolling trajectories on asymmetric receptor patterns. ***Journal of Visualized Experiments*** 48, (2011).

25. M. Rhee, P. M. Valencia, M. I. Rodriguez, R. Langer, O. C. Farokhzad, and **R. Karnik**. Synthesis of size-tunable polymeric nanoparticles enabled by 3D hydrodynamic flow focusing in single-layer microchannels. ***Advanced Materials*** 23, H79-H83 (2011). *Frontispiece Article*

26. W. Zhao, S. Schafer,J. Choi, Y. J. Yamanaka, M. L. Lombardi, S. Bose, A. L. Carlson, J. A. Phillips, W. Teo, I. A. Droujinine, C. Cui, R. K. Jain, J. Lammerding, J. C. Love, C. P. Lin, D. Sarkar, **R. Karnik**, and J. M. Karp. Cell-surface sensors for real-time probing of cellular nanoenvironments. ***Nature Nanotechnology*** 6, 524-531 (2011).

27. T. Humplik, J. Lee, S. C. O'Hern, B. A. Fellman, M. A. Baig, S. F. Hassan, M. A. Atieh, F. Rahman, T. Laoui, **R. Karnik**, and E. N. Wang. Nanostructured materials for water desalination. ***Nanotechnology*** 22, 292001 (2011).

28. P. M. Valencia, M. H. Hanewich-Hollatz, W. Gao, F. Karim, R. Langer, **R. Karnik**, and O. C. Farokhzad. Effects of Ligands with Different Water Solubilities on Self-Assembly and Properties of Targeted Nanoparticles. ***Biomaterials*** 32, 6226-6233 (2011).

29. W. Zhao, W. Loh, I. A. Droujinine, W. Teo, N. Kumar, S. Schafer, C. H. Cui, L. Zhang, D. Sarkar, **R. Karnik**, and J. M. Karp. Mimicking the Inflammatory Cell Adhesion Cascade by Nucleic Acid Aptamer Programmed Cell-Cell Interactions. ***The FASEB Journal*** 25, 3045-3056 (2011).

30. D. Sarkar, J. A. Spencer, J. A. Phillips, W. Zhao, S. Schafer, D. P. Spelke, L. J. Mortensen, J. P. Ruiz, P. K. Vemula, R. Sridharan, S. Kumar, **R. Karnik**, C. P. Lin, and J. M. Karp. Engineered Cell Homing. ***Blood*** 118, e184-e191 (2011).

31. Y.-H. Sen, T. Jain, C. A. Aguilar, and **R. Karnik**. Enhanced Discrimination of DNA Molecules in Nanofluidic Channels Through Multiple Measurements. ***Lab on a Chip*** 12, 1094-1101 (2012).

32. M. A. Cartas-Ayala, and **R. Karnik**. Local Temperature Profile Measurement in Microchannels Using Temperature Sensitive Leuco-Dye Microbeads. ***International Journal of Micro-Nano Scale Transport*** 2, 41-56 (2012).

33. S. Choi, J. M. Karp, and **R. Karnik**. Cell Separation by Deterministic Cell Rolling. ***Lab on a Chip*** 12, 1427-1430 (2012). *Front Cover Article*

34. C. Duan, **R. Karnik**, M. Lu and A. Majumdar. Evaporation-induced Cavitation in Nanofluidic Channels. ***Proc. Natl. Acad. Sci. (USA)*** 109, 3688-3693 (2012).

35. J. Lee, F. Rahman, T. Laoui, and **R. Karnik**. Bubble-induced Damping in Displacement-driven Microfluidic Flows. ***Physical Review E*** 86, 026301 (2012).

36. P. M. Valencia, O. C. Farokhzad, **R. Karnik**, and R. Langer. Microfluidic Technologies for Accelerating the Clinical Translation of Nanoparticles. ***Nature Nanotechnology*** 7, 623-629 (2012).

37. S. C. O'Hern, C. A. Stewart, M. S. H. Boutilier, J.-C. Idrobo, S. Bhaviripudi, S. K. Das, J. Kong, T. Laoui, M. Atieh, and **R. Karnik**. Selective Molecular Transport through Intrinsic Defects in a Single Layer of CVD Graphene. ***ACS Nano*** 6, 10130-10138 (2012).

38. W. Zhao, C. H. Cui, S. Bose, D. Guo, C. Shen, W. P. Wong, K. Halvorsen, O. C. Farokhzad, G. S. L. Teo, J. Philips, D. M. Dorfman, **R. Karnik**, and J. M. Karp. A Bioinspired Multivalent DNA Network for Capture and Release of Cells. ***Proc. Natl. Acad. Sci. (USA)*** 109, 19626-19631 (2012).

39. W. K. Cho, J. A. Ankrum, D. Guo, S. A. Chester, S. Y. Yang, A. Kashyap, G. A. Campbell, R. J. Wood, R. K. Rijal, **R. Karnik**, R. Langer, and J. M. Karp. Microstructured Barbs on the North American Porcupine Quill Enable Easy Tissue Penetration and Difficult Removal. ***Proc. Natl. Acad. Sci. (USA)*** 109, 21289-21294 (2012).

40. M. A. Cartas-Ayala, M. Raafat, and **R. Karnik**. Self-sorting of Deformable Particles in an Asynchronous Logic Microfluidic Circuit. ***Small*** 9, 375-381 (2013). *Front Cover Article*

41. C. Salvador-Morales, P. M. Valencia, W. Gao, ***R. Karnik***, and O. C. Farokhzad. Spontaneous Formation of Heterogeneous Patches on Polymer-lipid Core-shell Particle Surfaces during Self-assembly. ***Small*** 9, 511-517 (2013).

42. T. Jain, R. S. Guerrero, C. A. Aguilar, and **R. Karnik**. Integration of Solid-State Nanopores in Microfluidic Networks via Transfer Printing of Suspended Membranes. ***Analytical Chemistry*** 85, 3871-3878 (2013).

43. P. M. Valencia, E. M. Pridgen, B. Perea, S. Gadde, C. Sweeney, P. W. Kantoff, S. J. Lippard, R. Langer, **R. Karnik**, and O. C. Farokhzad. Synergistic Cytotoxicity of Irinotecan and Cisplatin in Dual-Drug PSMA-Targeted Polymeric Nanoparticles. ***Nanomedicine*** 8, 687-698 (2013).

44. H. Y. Yang, Z. J. Han, S. F. Yu, K. L. Pey, K. Ostrikov, and **R. Karnik**. Carbon Nanotube Membranes with Ultrahigh Specific Adsorption Capacity for Water Desalination and Purification. ***Nature Communications*** 4, 2220 (2013).

45. S. Bose, R. Singh, M. Hanewich-Hollatz, C. Shen, C.-H. Lee, D. M. Dorfman, J. M. Karp, and **R. Karnik**. Affinity Flow Fractionation of Cells via Transient Interactions with Asymmetric Molecular Patterns. ***Scientific Reports*** 3, 2329 (2013).

46. E. M. Pridgen, F. Alexis, T. T. Kuo, E. Levy-Nissenbaum, **R. Karnik**, R. S. Blumberg, R. Langer, and O. C. Farokhzad. Transepithelial Transport of Fc-Targeted Nanoparticles by the Neonatal Fc Receptor for Oral Delivery. ***Science Translational Medicine*** 5, 213ra167 (2013).

47. P. M. Valencia, E. M. Pridgen, M. Rhee, R. Langer, O. C. Farokhzad, and **R. Karnik**. Microfluidic Platform for Combinatorial Synthesis and Optimization of Targeted Nanoparticles for Cancer Therapy. ***ACS Nano*** 7, 10671-10680 (2013).

48. O. Levy, P. Anandakumaran, J. Ngai, **R. Karnik**, and J. M. Karp. Systematic Analysis of In Vitro Cell Rolling Using a Multi-Well Plate Microfluidic System. ***Journal of Visualized Experiments***, 80, (2013).

49. S. Choi, O. Levy, M. B. Coelho, J. M. S. Cabral, J. M. Karp, and **R. Karnik**. A Cell Rolling Cytometer Reveals the Correlation between Mesenchymal Stem Cell Dynamic Adhesion and Differentiation State. ***Lab on a Chip*** 14, 161-166 (2014). *Inside Cover Article, Selected as Hot Article*

50. J. M. Lim, N. Bertrand, P. M. Valencia, M. Rhee, R. Langer, S. Jon, O. C. Farokhzad, and **R. Karnik**. Parallel Microfluidic Synthesis of Size-tunable Polymeric Nanoparticles Using 3D Flow Focusing towards *in Vivo* Study. ***Nanomedicine: Nanotechnology, Biology, and Medicine*** 10, 401-409 (2014).

51. M. A. Cartas-Ayala, L. Gilson, C. Shen, and **R. Karnik**. Oscillations in Light-triggered Logic Microfluidic Circuit. ***Microsystem Technologies*** 20, 437-444 (2014).

52. C. Sun, M. S. H. Boutilier, H. Au, P. Poesio, B. Bai, **R. Karnik**, and N. G. Hadjiconstantinou. Mechanisms of Molecular Permeation through Nanoporous Graphene Membranes. ***Langmuir*** 30, 675-682 (2014).

53. M. S. H. Boutilier, C. Sun, S. C. O'Hern, H. Au, N. G. Hadjiconstantinou, and **R. Karnik**. Implications of Permeation through Intrinsic Defects in Graphene on the Design of Defect-Tolerant Membranes for Gas Separation. ***ACS Nano*** 8, 841-849 (2014).

54. M. A. Cartas-Ayala and **R. Karnik**. Time Limitations and Geometrical Parameters in the Design of Microfluidic Comparators. ***Microfluidics and Nanofluidics*** 17, 359-373 (2014).

55. J. Lee, T. Laoui, and **R. Karnik**. Nanofluidic Transport Governed by the Liquid/Vapour Interface. ***Nature Nanotechnology*** 9, 317-323 (2014).

56. M. S. H. Boutilier, J. Lee, V. Chambers, V. Venkatesh, and **R. Karnik**. Water Filtration Using Plant Xylem. ***PLOS ONE*** 9, e89934 (2014).

57. T. Jain, M. Aernecke, V. Liberman, and **R. Karnik**. High Resolution Fabrication of Nanostructures using Controlled Proximity Nanostencil Lithography. ***Applied Physics Letters*** 104, 083117 (2014).

58. S. C. O'Hern, M. S. H. Boutilier, J. C. Idrobo, Y. Song, J. Kong, T. Laoui, M. A. Atieh, and **R. Karnik**. Selective Ionic Transport through Tunable Sub-Nanometer Pores in Single-Layer Graphene Membranes. ***Nano Letters*** 14, 1234-1241 (2014).

59. J. M. Lim, A. Swami, L. M. Gilson, S. Chopra, S. Choi, J. Wu, R. Langer, **R. Karnik**, and O. C. Farokhzad. Ultra-high Throughput Synthesis of Nanoparticles with Homogeneous Size Distribution Using a Coaxial Turbulent Jet Mixer. ***ACS Nano*** 8, 6056-6065 (2014).

60. A. Ibrahim, S. Akhtar, M. Atieh, **R. Karnik**, and T. Laoui. Effects of Annealing on Copper Substrate Surface Morphology and Graphene Growth by Chemical Vapor Deposition. ***Carbon*** 94, 369-377 (2015).

61. T. Jain, B. C. Rasera, R. J. S. Guerrero, M. S. H. Boutilier, S. C. O'Hern, J.-C. Idrobo, and **R. Karnik**. Heterogeneous Sub-Continuum Ionic Transport in Statistically Isolated Graphene Nanopores. ***Nature Nanotechnology*** 10, 1053-1057 (2015).

62. S. C. O'Hern, D. Jang, S. Bose, J.-C. Idrobo, Y. Song, T. Laoui, J. Kong, and **R. Karnik**. Nanofiltration across Defect-Sealed Nanoporous Monolayer Graphene. ***Nano Letters*** 15, 3254-3260 (2015).

63. X. Zhu, J. Wu, W. Shan, W. Tao, L. Zhao, J. M. Lim, M. D'Ortenzio, **R. Karnik**, Y. Huang, J. Shi, and O. C. Farokhzad. Polymeric Nanoparticles Amenable to Simultaneous Installation of Exterior Targeting and Interior Therapeutic Proteins. ***Angewandte Chemie*** 55, 3309-3312 (2016).

64. F. M. Kafiah, Z. Khan, A. Ibrahim, **R. Karnik**, M. Atieh, and T. Laoui. Monolayer Graphene Transfer onto Polypropylene and Polyvinylidenedifluoride Microfiltration Membranes for Water Desalination. ***Desalination*** 388, 29-37 (2016).

65. M. S. H. Boutilier, R. Ramakrishnan, H. Al-Qahtani, and **R. Karnik**. A Micro/Nano Engineering Laboratory Module on Superoleophobic Membranes for Oil-Water Separation. ***Journal of Materials Education*** 38, 75-92 (2016).

66. M. A. Qasaimeh, Y. C. Wu, S. Bose, A. Menachery, S. Talluri, G. Gonzalez, M. Fulciniti, J. M. Karp, P. H. Rao, and **R. Karnik**. Isolation of Circulating Plasma Cells in Multiple Myeloma Using CD138 Antibody-Based Capture in a Microfluidic Device. ***Scientific Reports*** 7, 45681 (2017).

67. S. Chopra, N. Bertrand, J. M. Lim, A. Wang, O. C. Farokhzad, and **R. Karnik**. Design of Insulin-Loaded Nanoparticles Enabled by Multistep Control of Nanoprecipitation and Zinc Chelation. ***ACS Applied Materials and Interfaces*** 9, 11440-11450 (2017).

68. L. Wang, C. M. Williams, M. S. H. Boutilier, P. R. Kidambi, and **R. Karnik**. Single-Layer Graphene Membranes Withstand Ultrahigh Applied Pressure. ***Nano Letters*** 17, 3081-3088 (2017).

69. W. Wang, L. N. Yao, C. Y. Cheng, T. Zhang, H. Atsumi, L. D. Wang, G. Y. Wang, O. Anilionyte, H. Steiner, J. F. Ou, K. Zhou, C. Wawrousek, K. Petrecca, A. M. Belcher, **R. Karnik**, X. Zhao, D. I. C. Wang, and H. Ishii. Harnessing the Hygroscopic and Biofluorescent Behaviors of Genetically Tractable Microbial Cells to Design Biohybrid Wearables. ***Science Advances*** 3, e1601984 (2017).

70. M. S. H. Boutilier, N. G. Hadjiconstantinou, and **R. Karnik**. Knudsen Effusion through Polymer-Coated Three-Layer Porous Graphene Membranes. ***Nanotechnology*** 28, 184003 (2017).

71. P. R. Kidambi, M. S. H. Boutilier L. D. Wang, D. Jang, J. Kim, and **R. Karnik**. Selective Nanoscale Mass Transport across Atomically Thin Single Crystalline Graphene Membranes. ***Advanced Materials*** 29, 1605896 (2017).

72. L. D. Wang, M. S. H. Boutilier, P. R. Kidambi, D. Jang, N. G. Hadjiconstantinou, and **R. Karnik**. Fundamental Transport Mechanisms, Fabrication and Potential Applications of Nanoporous Atomically Thin Membranes. ***Nature Nanotechnology*** 12, 509-522 (2017).

73. M. S. H. Boutilier, D. Jang, J. C. Idrobo, P. R. Kidambi, N. G. Hadjiconstantinou, and **R. Karnik**. Molecular Sieving across Centimeter-Scale Single-Layer Nanoporous Graphene Membranes. ***ACS Nano*** 11, 5726-5736 (2017).

74. P. R. Kidambi, R. A. Terry, L. D. Wang, M. S. H. Boutilier, D. Jang, J. Kong, and **R. Karnik**. Assessment and Control of the Impermeability of Graphene for Atomically Thin Membranes and Barriers. ***Nanoscale*** 9, 8496-8507 (2017).

75. P. R. Kidambi, D. Jang, J. C. Idrobo, M. S. H. Boutilier, L. D. Wang, J. Kong, and **R. Karnik**. Nanoporous Atomically Thin Graphene Membranes for Desalting and Dialysis Applications. ***Advanced Materials*** 29, 1700277 (2017).

76. D. Jang, J. C. Idrobo, T. Laoui, and **R. Karnik**. Water and Solute Transport Governed by Tunable Pore Size Distributions in Nanoporous Graphene Membranes. ***ACS Nano*** 11, 10042-10052 (2017).

77. N. Bertrand, P. Greiner, M. Mahmoudi, E. M. Lima, E. A. Appel, F. Dormont, J. M. Lim, **R. Karnik**, R. Langer, and O. C. Farokhzad. Mechanistic Understanding of In Vivo Protein Corona Formation on Polymeric Nanoparticles and Impact on Pharmacokinetics. ***Nature Communications*** 8, 777 (2017).

78. T. Jain, B. C. Rasera, R. J. S. Guerrero, J. M. Lim, and **R. Karnik**. Microfluidic Multiplexing of Solid-State Nanopores. ***Journal of Physics – Condensed Matter*** 29, 484001 (2017).

79. T. Humplik, J. Lee, S. O'Hern T. Laoui, **R. Karnik**. and E. N. Wang. Enhanced Water Transport and Salt Rejection through Hydrophobic Zeolite Pores. ***Nanotechnology*** 28, 505703 (2017).

80. P. R. Kidambi, D. D. Mariappan, N. T. Dee, A. Vyatskikh, S. Zhang, **R. Karnik**, and A. J. Hart. A Scalable Route to Nanoporous Large-Area Atomically Thin Graphene Membranes by Roll-to-Roll Chemical Vapor Deposition and Polymer Support Casting. ***ACS Applied Materials and Interfaces*** 10, 10369-10378 (2018).

81. J. B. McAlvin, R. G. Wylie, K. Ramchander, M. T. Nguyen, C. K. Lok, M. Moroi, A. Shomorony, N. V. Vasilyev, P. Armstrong, J. Yang, A. M. Lieber, O. S. Okonkwo, **R. Karnik**, and D. S. Kohane. Antibody-Modified Conduits for Highly Selective Cytokine Elimination from Blood. ***The Journal of Clinical Investigation – Insight*** 3, e121133 (2018).

82. R. Rosenberg, M. S. Bono Jr, S. Braganza, C. Vaishnav, **R. Karnik**, and A. J. Hart. In-Field Determination of Soil Ion Content Using a Handheld Device and Screen-Printed Solid-State Ion-Selective Electrodes. ***PloS ONE*** 13, e0203862 (2018).

83. P.R. Kidambi, G. D. Nguyen, S. Zhang, Q. Chen, J. Kong, J. Warner, A. P. Li, and **R. Karnik**. Facile Fabrication of Large-Area Atomically Thin Membranes by Direct Synthesis of Graphene with Nanoscale Porosity. ***Advanced Materials*** 30, 1804977 (2018).

84. J. M. Lim, T. Cai, S. Mandaric, S. Chopra, H. Han, S. Jang, W. I. Choi, R. Langer, O. C. Farokhzad, and **R. Karnik**. Drug Loading Augmentation in Polymeric Nanoparticles Using a Coaxial Turbulent Jet Mixer: Yong Investigator Perspective. ***Journal of Colloid and Interface Science*** 538, 45-50 (2019).

85. M. S. Bono, M. S., S. B. Beasley, E. B. Hanhauser, A. J. Hart, **R. Karnik**, and C. Vaishnav. Fieldwork-based Determination of Design Priorities for Point-of-Use Drinking Water Quality Sensors for Use in Resource-Limited Environments. ***PLoS ONE*** 15, e0228140 (2020).

86. E. Hanhauser, M. S. Bono, C. Vaishnav, A. J. Hart, and **R. Karnik**. Solid-Phase Extraction, Preservation, Storage, Transport, and Analysis of Trace Contaminants for Water Quality Monitoring of Heavy Metals. ***Environmental Science & Technology*** 54, 2646-2657 (2020).

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2. Karnik, R., Duan, C., Castelino, K., Fan, R., Yang, P. and Majumdar, A., "Transport of Ions and Molecules in Nanofluidic Devices," Proceedings of the 6th International ASME Conference on Nanochannels, Microchannels, and Minichannels, Darmstadt, Germany, June 2008.
3. Bose, S., Hong, S., Langer, R., Karp, J. M., and Karnik, R," Microfluidic Patterning of P-selectin for Cell Separation through Rolling," Proceedings of the 12th International Conference on Miniaturized Systems for Chemistry and Life Sciences, San Diego, CA, October 2008.
4. Sen, Y-H., and Karnik, R., "Multiple Measurements on the Same Molecule in a Nanopore System with Feedback Control, Proceedings of the 12th International Conference on Miniaturized Systems for Chemistry and Life Sciences, San Diego, CA, October 2008.
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18. A. Majumdar, R. Karnik, and W. Kim, “Nanostructured Micro Heat Pipes,” PCT/US2006/031196 filed on August 9, 2006; US 12/063,226.
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28. R. Karnik and D. Jang, “Coatings to Improve Selectivity of Atomically Thin Membranes,” US Provisional Patent Application filed June 2018; US 16/457,349 filed on June 28, 2019.
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31. E. B. Hanhauser, M. C. Strawser, C. M. Chow, K. Ramchander, and R. Karnik, “Device and Method for Isolation and Detection of Soluble or Particulate Analytes from Complex Background Matrices,” US Provisional Patent Application filed on October 10, 2021.

32. R. Karnik, R. P. Field, A. Persad, C. Cheng, L. Kim, “Hydrogen Selective Membranes and Related Methods,” US Provisional Application No.: 63/427,712 filed on November 23, 2022.

Invited Lectures

September 2006, “Manipulation and Sensing of Ions and Molecules in Nanofluidic Devices,” Department of Mechanical Engineering, Indian Institute of Technology, Mumbai, India.

April 2007, “Manipulation and Sensing of Ions and Molecules in Nanofluidic Devices,” NanoNed Meeting, The Netherlands.

April 2007, “Manipulation and Sensing of Ions and Molecules in Nanofluidic Devices,” Department of Physics, Delft University, The Netherlands.

October 2007, “Microfluidic Synthesis of Polymeric Nanoparticles for Targeted Drug Delivery,” at Bind Biosciences Inc., Cambridge, MA.

May 2008, “Manipulation and Sensing of Ions and Molecules in Nanofluidic Devices,” Nanofluidics Workshop, Joint NSLS/CFN User Meeting, Brookhaven National Laboratory, Brookhaven, NY.

June 2008, “Transport of Ions and Molecules in Nanofluidic Devices,” 6th International ASME Conference on Nanochannels, Microchannels, and Minichannels, Darmstadt, Germany. (*Keynote lecture*)

November 2008, “Nudging Cells Using Molecular Interactions- Towards Label-free Cell Separation,” Chemical and Biomolecular Engineering Department Seminar Series, University of Notre Dame, IN.

February 2009, “Label-free Sorting of Cells- Potential for Rapid Assessment of Sepsis,” Workshop on Safe and Effective Instruments and Devices for Use in NICU, National Institute of Child Health and Human Development, Rockville, MD.

March 2009, “Nudging Cells Using Molecular Interactions- Towards Label-free Cell Rolling Separation,” CIMIT (Center for Integration of Medicine and Innovative Technology) Forum, Massachusetts General Hospital, Boston, MA.

April 2009, “Microfluidic Systems for Detection and Analysis of Single Molecules and Particles,” Northeast Bioengineering Conference (NEBEC), Boston, MA.

August 2009, “Label-Free Separation of Cells by Rolling on Patterned Receptors,” The Bioprocessing Summit, Cambridge Healthtech Institute, Cambridge, MA.

December 2009, “Analysis of Single Molecules and Particles by Active Control in Nanofluidic Devices,” MIT Lincoln Laboratory, Technology Office Special Seminar, Lexington, MA.

October 2010, “Analysis of Single Molecules and Particles by Active Control In Nanofluidic Devices,” Joint Fall Meeting of the New England Sections of the American Physical Society and the American Association of Physics Teachers, Brown University, Providence, RI.

November 2010, “Microfluidic Devices for Direct Separation and Analysis of Cells,” Clinical Pathology Conference Series, Department of Pathology, Brigham and Women’s Hospital, Boston, MA.

December 2010, “Microfluidic Devices for Direct Separation and Analysis of Cells,” Department of Mechanical Engineering, University of Michigan, Ann Arbor, MI.

January 2011, “Microfluidic Devices for Direct Separation and Analysis of Cells,” Singapore-MIT Alliance for Research and Technology, National University of Singapore, Singapore.

January 2011, “Microfluidic Devices for Direct Separation and Analysis of Cells,” National Center for Biological Sciences, Bangalore, India.

October, 2011, “Microfluidics for Synthesis and Development of Nanotherapeutics and Nano-Imaging Agents,” Northeastern University, Boston, MA.

October, 2011, “Nudging Cells Using Molecular Interactions: Direct Separation of Cells in a Flow,” Mechanics: Modeling, Experimentation, Computation Seminar Series, MIT, Cambridge, MA.

May 2012, “Ionic and Molecular Transport through Graphene Membranes,” NATO Advanced Research Workshop, Alternative Water Resources in Arid Areas by Retrieving Water from Secondary Sources, Daniel Dead Sea Hotel, Israel.

June 2012, “Measuring Ionic and Molecular Transport through Graphene Membranes,” Boston Area Carbon Nanoscience (BACON) Meeting, Boston University, Boston, MA.

August 2012, “Nudging Cells Using Molecular Interactions: Direct Separation and Analysis of Cells in a Continuous Flow,” Department of Mechanical Engineering, Iowa State University, Ames, IA.

October 2012, “Nudging Cells Using Molecular Interactions: Direct Separation and Analysis of Cells in a Continuous Flow,” Department of Mechanical Engineering, Texas Tech University, Lubbock, TX.

February 2013, “Microfluidics for Synthesis and Development of Nanotherapeutics and Nano-Imaging Agents,” 2013 ASME Global Congress on Nano Engineering for Medicine and Biology (NEMB 2013), Boston, MA.

February 2013, “Nudging Cells Using Molecular Interactions: Direct Separation and Analysis of Cells in Continuous Flow,” Department of Mechanical Engineering, Ohio State University, Columbus, OH.

March 2013, “Nudging Cells Using Molecular Interactions: Direct Separation and Analysis of Cells in Continuous Flow,” University of Waterloo Biomedical Seminar Series, Waterloo, Canada.

March 2013, “Direct Separation and Analysis of Cells Mediated by Transient Molecular Interactions,” US-Japan Young Researcher Exchange, Massachusetts Institute of Technology, Cambridge, MA.

April 2013, “Direct Separation and Analysis of Cells Mediated by Transient Molecular Interactions,” Department of Mechanical Engineering, Stanford University, Palo Alto, CA.

April 2013, “Direct Separation and Analysis of Cells Mediated by Transient Molecular Interactions,” Berkeley Sensor and Actuator Center, University of California, Berkeley, CA.

April 2013, “Nanostructured Membranes for Water Purification and Gas Separations,” Department of Mechanical Science and Engineering, University of Illinois Urbana-Champaign, Urbana, IL.

August 2013, “Direct Separation and Analysis of Cells Mediated by Transient Molecular Interactions in Microfluidic Devices,” Department of Chemical and Biomolecular Engineering, Sogang University, Korea.

August 2013, “Microfluidics for Synthesis and Development of Nanomedicines,” 3rd Asia-Pacific Chemical and Biological Microfluidics Conferences, Seoul, Korea. (*Keynote lecture*)

August 2013, “Microfluidics for Synthesis and Development of Nanotherapeutics and Nano-imaging Agents,” Theranostic Macromolecules Research Center, Sungkyunkwan University, Korea.

October 2013, “Development of Nanostructured Membranes for Water Purification and Gas Separations,” Division of Materials Science and Engineering, Boston University, Boston, MA.

January 2014, “Direct Separation and Analysis of Cells Mediated by Transient Molecular Interactions in Microfluidic Devices,” International Workshop on Advances in Healthcare Engineering, College of Engineering and Management, Kolaghat, India.

March 2014, “Direct Separation and Analysis of Cells Mediated by Transient Molecular Interactions in Microfluidic Devices,” Microfluidics Workshop, Microfluidics in Biomedical Sciences Training Program, University of Michigan, Ann Arbor, MI.

May 2014, “Nanostructured Membranes for Water Filtration and Desalination,” 1st International Conference on Micro and Nanofluidics, Twente, Netherlands.

June 2014, “Direct Separation and Analysis of Cells Mediated by Transient Molecular Interactions in Microfluidic Devices,” 88th ACS 2014 Colloids and Surface Science Symposium, Philadelphia, PA.

July 2014, “Direct Separation and Analysis of Cells Mediated by Transient Molecular Interactions in Microfluidic Devices,” Micro- and Nanotechnologies for Medicine: Emerging Frontiers and Applications Workshop, Cambridge, MA.

September 2014, “Direct Separation and Analysis of Cells Mediated by Transient Molecular Interactions in Microfluidic Devices,” Lab-on-a-Chip & Microarray World Congress, San Diego, CA.

October 2014, “Experimental Investigation of Mass Transport and Filtration across Nanoporous Monolayer Graphene Membranes,” CECAM Workshop- Nanofluidics in Physics and Biology, EPFL, Lausanne, Switzerland.

February 2015, “Label-Free Cell Sorting and Analysis Using Weak Molecular Interactions,” Novartis Institutes for Biomedical Research, Cambridge, MA.

March 2015, “Engineering Flows in Nanostructured Materials: From Graphene Membranes to Xylem Filters,” Department of Mechanical Engineering, University of Massachusetts Amherst, Amherst, MA.

March 2015, “Label-Free Cell Sorting and Analysis Using Weak Molecular Interactions,” Squishy Physics Seminar Series, Harvard University, Cambridge, MA.

April 2015, “Engineering Flows in Nanostructured Materials: From Graphene Membranes to Xylem Filters,” Department of Physics, Northeastern University, Boston, MA.

June 2015, “Nanofluidic Transport in Single-Layer Graphene Membranes,” Gordon Research Conference on the Physics and Chemistry of Microfluidics, West Dover, VT.

June 2015, “Engineering Mass Transport and Filtration across Nanoporous Single-layer Graphene Membranes,” Environment and Water Industry Technology Workshop 2015: Graphene for Desalination: The Path Forward, PUB, Singapore.

August 2015, “Nanofluidic Transport across Nanoporous Monolayer Graphene Membranes,” 250th ACS National Meeting and Exposition, Boston, MA.

December 2015, “Direct Separation and Analysis of Cells Mediated by Transient Molecular Interactions in Microfluidic Devices,” 2015 International Chemical Congress of the Pacific Basin Societies, Honolulu, HI.

February 2016, “Engineering Flows in Nanostructured Materials,” Mechanical and Industrial Engineering seminar, University of Toronto, Toronto, Canada.

June 2016, “Graphene Membranes for Water Purification,” Workshop on: Two-Dimensional Materials: Probing the Limits of Physics and Engineering, Fundacion Ramon Areces & MIT, Madrid, Spain.

August 2016, “Nanostructured Membranes for Water Purification and Separations,” Tata Steel Inc., Jamshedpur, India.

November 2016, “Engineering Flows in Nanostructured Membranes for Water Purification and Separations,” National Academies 4th Arab-American Frontiers of Science, Engineering and Medicine Symposium, Masdar Institute, Abu Dhabi, U.A.E.

December 2016, “Micro and Nano Materials and Systems for Water Purification and Contaminant Sensing,” DARPA Microsystems Technology Office, Washington D.C.

February 2017, “Nanostructured Membranes for Water Purification and Separations,” MIT MTL Industrial Advisory Board Meeting, MIT, Cambridge, MA.

April 2017, “Microfluidic Cell Sorting and Analysis Mediated by Weak Molecular Interactions,” NYU Biomedical and Biosystems Conference, New York University Abu Dhabi, Abu Dhabi, United Arab Emirates.

June 2017, “Label-Free Sorting and Analysis of Cells Mediated by Weak Molecular Interactions in Microfluidic Devices,” Workshop on Fundamentals and Applications of Microfluidic Compartmentalization, Okinawa Institute of Science and Technology, Okinawa, Japan.

July 2017, “Label-Free Sorting and Analysis of Cells Mediated by Weak Molecular Interactions in Microfluidic Devices,” Micro- and Nanotechnologies for Medicine: Emerging Frontiers and Applications Workshop, Cambridge, MA.

September 2017, “Dry Sampling Technology for Centralized Analysis and

Management of Water Quality,” Tata Center 3rd Annual Symposium and Conference, MIT, Cambridge, MA.

October 2017, “Natural Water Filters from Plant Xylem: MIT Research Meets Developing World Reality,” MIT D-Lab 15th Anniversary Symposium, MIT, Cambridge, MA.

October 2017, “Nanoporous Graphene Membranes for Efficient Water Purification and Bio/Chemical Separations,” MIT-MTL Center of Graphene Devices & 2D Systems Annual Review Meeting, MIT, Cambridge, MA.

November 2017, “Perspectives on Technologies for Water Desalination and Reclamation of the Future,” Busan Water Authority Special Session, 10th International Desalination Workshop, Busan, Republic of Korea.

November 2017, “Engineering Flows in Nanostructured Materials: From Graphene Membranes to Xylem Filters,” 10th International Desalination Workshop, Busan, Republic of Korea. (*Plenary lecture*).

January 2018, “Natural Water Filters from Plant Xylem,” 1st Annual Symposium, Tata Center for Technology and Design, IIT Bombay, Mumbai, India.

March 2018, “Label-Free Sorting and Analysis of Cells Mediated by Weak Molecular Interactions in Microfluidic Devices,” MGH BioMEMS Resource Center, Cambridge, MA.

June 2018, “Preservation and Transport of ‘Dry’ Water Samples for Centralized Analysis and Management of Water Quality,” MIT Sense.nano symposium, Cambridge, MA.

June 2018, “Biomimetic Label-Free Sorting and Analysis of Cells Using Weak Molecular Interactions in Microfluidic Devices,” Center for Business Innovation Eighth Microfluidics Consortium, Boston, MA.

June 2018, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next-Generation Membrane,” From Solid State to Biophysics X, Nanopores and Nanofluidics Symposium, Cavtat, Croatia.

July 2018, “Nanoporous Atomically Thin Graphene Membranes for Water Purification and Biochemical Separations,” Graphene Flagship – Graphene Study, Hindas, Sweden.

September 2018, “Unconventional Nanomaterials and Paradigms for Water Purification and Quality Control in the 21st Century,” Micahel Faraday Memorial Lecture, Convergence of Nanotechnology and Food Manufacturing, University of Minnesota, MN.

September 2018, “Nanoporous Atomically Thin Graphene Membranes for Water Purification and Bio/Chemical Separations,” Fresenius Medical Care, Waltham, MA.

March 2019, “Unconventional Materials and Paradigms for Water Purification and Quality Control in the 21st Century,” Department of Chemical and Biomolecular Engineering, National University of Singapore, Singapore.

March 2019, “Biomimetic Label-Free Sorting and Analysis of Cells Using Weak Molecular Interactions in Microfluidic Devices,” Symposium on Healthcare Technology, Indian Institute of Technology Kharagpur, India.

April 2019, “Unconventional Materials and Paradigms for Water Purification and Quality Control in the 21st Century,” Institute for Molecular Engineering, University of Chicago, Chicago, IL.

June 2019, “Biomimetic Label-Free Sorting and Analysis of Cells Using Weak Molecular Interactions in Microfluidic Devices,” NanoTech 2019, Boston, MA.

December 2019, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next Generation Membrane,” Symposium on 2D Nanomaterials-Based Nanofluidics, Materials Research Society Fall Meeting and Exhibit, Boston, MA.

May 2020, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next-Generation Membrane,” Center for Enhanced Nanofluidic Transport (DOE EFRC) seminar series, virtual.

June 2020, “MIT MechE Education: Adapting to COVID-19,” Workshop on COVID-19 Disruption and its Implications for Education, USAID/MIT Center of Excellence for Energy, virtual.

July 2020, “Unconventional Materials and Paradigms for Water Purification and Quality Control in the 21st Century,” Distinguished Lecture Series, Faculty of Engineering, Universiti Teknologi Malaysia (UTM), virtual.

February 2021, “Unconventional Materials and Paradigms for Water Purification and Quality Control in the 21st Century,” Department of Mechanical and Aerospace Engineering, University of Virginia, virtual.

March 2021, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next-Generation Membrane,” World Nano Congress on Advanced Science and Technology (WNCST 2021), March 8-13, 2021, Vellore, India (virtual). (*Plenary lecture*)

March 2021, “Nanostructured Membranes for Water Filtration and Bio/Chemical Separations,” International Webinar Series on the topic “Fluids under Confinement”, Scheme for Promotion of Academic and Research Collaboration (SPARC) Program, supported by the Ministry of Education, Government of India.

April 2021, “Unconventional Materials and Paradigms for Water Purification and Quality Control in the 21st Century,” MIT Industrial Liaison Program Webinar Series, virtual.

July 2021, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next-Generation Membrane,” BK21 Program, Soonchunhyang University, Korea.

October 2021, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next-Generation Membrane,” Chemical Engineering Seminar, EPFL.

November 2021, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next-Generation Membrane,” Department of Materials Science & NanoEngineering, Rice University.

May 2022, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next-Generation Membrane,” Symposium on Nanoscale Mass Transport Through 2D and 1D Nanomaterials, Materials Research Society Spring Meeting and Exhibit, Honolulu, HI.

May 2022, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next-Generation Membrane,” Tahoe Nanofluidics 2022 Conference, Tahoe City, CA.

June 2022, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next-Generation Membrane,” Nanofiltration 2022, Achalm, Germany.

August 2022, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next-Generation Membrane,” Marmon Water Research Center, Chennai, India.

September 2022, “Nanoporous Atomically Thin Graphene Membranes” J-WAFS' Workshop: Managing Industrial Wastewater Through Research and Innovation, MIT, Cambridge, MA.

January 2022, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next-Generation Membrane,” Department of Chemical and Biomolecular Engineering seminar, National University of Singapore, Singapore.

January 2022, “Nanofluidic Transport across Nanoporous Atomically Thin Graphene and its Development as a Next-Generation Membrane,” International Nanofluidics Symposium, Singapore.

Professional Service

Departmental and Institute Service

M.E. Graduate Admissions Committee (Dept.)	Jan. 2008 – March 2008
Undergraduate Programs Committee (Dept.)	Sept. 2008 – present
M.E. Graduate Admissions Committee (Dept.)	Jan. 2009 – March 2009
M.E. Graduate Admissions Committee (Dept.)	Jan. 2010 – March 2010
Bioengineering Faculty Search Committee (Dept.)	Oct. 2010 – July 2011
M.E. Graduate Admissions Committee (Dept.)	Jan. 2011 – March 2011
Micro/Nano Engineering Laboratory Instructor Search Committee (Dept.)	May 2011 – Aug. 2011
Organizer, MechE Research Speed Dating Event	Feb. 2012
Chair, Mechanical Engineering Colloquia	Jan. 2012 – Dec. 2015
M.E. Graduate Admissions Committee (Dept.)	Jan. 2012 – March 2012
M.E. Graduate Admissions Committee (Dept.)	Jan. 2013 – March 2013
M.E. Graduate Admissions Committee (Dept.)	Dec. 2013 – March 2014
Undergraduate Programs Committee International Affairs (Dept.)	Sept. 2012 – Oct. 2016
Organizer, Joint Workshop with Tokyo Institute of Technology (Dept.)	July 2014 – Sept. 2014
Ad hoc committee on the M. E. Qualifying Exam (Dept.)	Sept. 2014 – May 2015
M. E. Faculty Search Committee (Dept.)	Dec. 2014 – April 2015
M. E. Graduate Admissions Committee (Dept.)	Dec. 2014 – March 2015
MIT M.E. – Tokyo Tech Collaboration (Dept.)	Dec. 2014 – present
M. E. Strategic Planning Committee (Dept.)	Sept. 2015 – Oct. 2016
M. E. Undergraduate Officer (Dept.)	July 2016 – June 2018
Chair, Undergraduate Programs Committee (Dept.)	Sept. 2016 – June 2018
M. E. Faculty Search Committee (Dept.)	Nov. 2016 – March 2017
M. E. Graduate Admissions Committee (Dept.)	Dec. 2016 – March 2017
M. E. Thermal-fluids Curriculum Review Committee (Dept.)	May 2017 – Nov. 2017
M. E. Faculty Search Committee (Dept.)	Dec. 2017 – March 2018
M. E. Department Head Search Advisory Committee (SoE)	March 2018 – May 2018
M. E. Graduate Programs Committee (Dept.)	July 2018 – present
Co-Chair, School of Engineering Ad hoc Working Group	Jan. 2019 – April 2019
Co-Lead, School of Engineering Ad hoc Committee	May 2019 – Sept. 2019
M. E. Education Strategy Committee (Dept.)	Sept. 2019 – April 2022
Co-Organizer, MechE SummerX virtual events (Dept.)	May 2020 – August 2020
Chair, M. E. Planning Committee for Teaching in Fall 2020 (Dept.)	June 2020 – Sept. 2020
M. E. Faculty Search Committee (Dept.)	Dec. 2020 – March 2021
Faculty Advisory Committee, MIT Materials Research Laboratory	Feb. 2021 – Oct. 2021

Co-Chair, NEET program review committee (SoE)	Jan. 2022 – March 2022
Committee on Curricula (Institute)	Sept. 2022 – present

Other Service

NSF Review Panel (Thermal Transport Processes)	April 2007
Journal paper reviewing, 2007-present	-
ACS Applied Materials and Interfaces, ACS Nano, Advanced Science, Analytical Chemistry, Analytical and Bioanalytical Chemistry, Applied Physics Letters, Biomedical Microdevices, Biomicrofluidics, Biotechnology and Bioengineering, Carbon, Chemical Engineering Science, Chemical Physics Letters, Desalination, Desalination and Water Treatment, Electrophoresis, Environmental Science and Technology, IEEE Sensors, Integrative Biology, Journal of Applied Physics, Journal of Heat Transfer, Journal of Materials Chemistry A, Journal of Membrane Science, Journal of Microelectromechanical Systems, Journal of Physical Chemistry, Journal of Membrane Science, Journal of the American Chemical Society, Lab on a Chip, Microfluidics and Nanofluidics, Nanoscale, Nano Letters, Nature, Nature Biomedical Engineering, Nature Communications, Nature Materials, Nature Nanotechnology, Physical Chemistry and Chemical Physics, Physical Review X, Physics of Fluids, PNAS, Science, Science Advances, Scientific Reports, Sensors and Actuators, Small, Soft Matter.	
Proposal reviewing, 2007-present	-
Abdul Latif Jameel World Water and Food Security Lab (J-WAFS), ACS Petroleum Research Fund, Biotechnology and Biological Sciences Research Council (BBSRC) UK, Carver Trust, Department of Energy (DOE), Deshpande Center for Technological Innovation (MIT), Environmental Solutions initiative (MIT), ETH Zurich Research Commission, King Abdullah University of Science and Technology (KAUST), Kuwait Foundation for the Advancement of Science, MIT International Science and Technology Initiatives (MISTI), Netherlands Organization for Scientific Research (I), National Science Foundation SBIR/STTR Program, New York University – Abu Dhabi, Ontario Research Fund (Canada), Pierre Gilles De Gennes Institute, Samsung Research Funding Center for Future Technology (Samsung Electronics), Swiss National Science Foundation, United Arab Emirates University	
Judging panel for Senturia prize (MIT)	April 2008
Session Chair, MEMS Materials and MEMS for Materials, MEMS@MIT	Nov. 2008
Bioinstrumentation Session Chair, Northeast Bioengineering Conference (NEBEC 2009), Boston, MA	April 2009
Poster Session Judge, 13th International Conference on Miniaturized Systems for Chemistry and Life Sciences (microTAS)	Nov. 2009
NSF Review Panel (Biological Separations)	April 2010
Host for the visit of the Bios Lab-on-a-Chip group from University of Twente	June 2010
Coordinated Micro/Nano area effort to create display for the Hart Museum in Bldg. 5	March 2011 – April 2011
NSF Review Panel (Chemical and Biological Separations)	Sept. 2012
Proposal reviewer for MIT International Science and Technology Initiatives (MISTI)	Oct. 2012
Article editor, PNAS	Oct. 2012
Session chair, 3rd Asia-Pacific Chemical and Biological Microfluidics Conferences, Seoul, Korea, August 2013	Aug. 2013
Session chair, 2013 ASME Congress	Nov. 2013
Exhibit and Sponsorship Committee, 18th International Conference on Miniaturized Systems for Chemistry and Life Sciences, San Antonio, TX, October 2014	Dec. 2013 – Oct. 2014

Advisory Board, Lab-on-a-Chip & Microarray World Congress, San Diego, CA, September 2014	Dec. 2013 – Sept. 2014
Session co-chair, Northeast Bioengineering Conference (NEBEC), Boston, April 2014	Dec. 2013 – April 2014
Referee/evaluator for promotion, memberships, etc. 2014-present	-
Canada Research Chair, City University of Hong Kong, École Polytechnique Fédérale de Lausanne, Indian National Science Academy, Institute of Science and Technology (Austria), Korea Advanced Institute of Science and Technology, National University of Singapore, New York University Abu Dhabi, Ohio State University, Shanti Swarup Bhatnagar Prize For Science and Technology, Singapore University of Technology and Design, The World Academy of Sciences, University of British Columbia, University of Manchester, University of Michigan, University of Toronto, Vanderbilt University, York Research Chair (Canada)	
Editorial Board, Scientific Reports (Nature)	May 2014 – present
Poster judge, 1st International Conference on Micro and Nanofluidics, Twente, Netherlands	May 2014
'Carbon Nanofluidics' symposium organizer, 2016 MRS Spring Meeting	April 2015 – April 2016
NIH Enabling Bioanalytical and Imaging Technologies study section (review panel)	Oct. 2015
Session Chair, APS DFD meeting, Boston	Nov. 2015
Poster judge, 11th International Congress on Membranes and Membrane Processes (ICOM 2017), San Francisco, CA	July 2017
Session chair, International Desalination Workshop 2017, Busan, Korea	Nov. 2017
External thesis committee member, Northeastern University	Sept. 2018 – Aug. 2019
External thesis evaluator, University of Toronto	Nov. 2018
Session chair, '2D Nanomaterial Based Nanofluidics' symposium, MRS Fall Meeting	Dec. 2019
External thesis evaluator, National University of Singapore	Jan. 2020
Article Editor, PNAS	May 2020
Advisory Board and Panel Moderator, International Nanofluidics Symposium, Singapore, January 2023	Oct. 2022 – Jan. 2023
Review Committee, Boston University Nano Center	May 2023

Educational Contributions

Courses Taught

2007 Fall	2.671 Measurement and Instrumentation	Laboratory Instructor
2008 Spring	2.671 Measurement and Instrumentation	Laboratory Instructor
2008 Fall	2.006 Thermal and Fluids Engineering II	Recitation Instructor
2009 Spring	2.006 Thermal and Fluids Engineering II	Recitation Instructor
2009 Fall	2.005 Thermal and Fluids Engineering I	Recitation Instructor
2010 Spring	2.674/2.675 Micro/Nano Engineering Laboratory	Laboratory and Lecture Instructor
2010 Fall	2.006 Thermal and Fluids Engineering II	Lecture and Recitation Instructor
2011 Spring	2.674/2.675 Micro/Nano Engineering Laboratory	Laboratory and Lecture Instructor
2011 Fall	2.006 Thermal and Fluids Engineering II	Lecture Instructor
2012 Spring	2.674/2.675 Micro/Nano Engineering Laboratory	Laboratory and Lecture Instructor
2012 Fall	2.006 Thermal and Fluids Engineering II	Lecture Instructor
2013 Fall	2.006 Thermal and Fluids Engineering II	Lecture Instructor
2014 Spring	2.006 Thermal and Fluids Engineering II	Lecture Instructor
2014 Fall	2.674/2.675 Micro/Nano Engineering Laboratory	Laboratory and Lecture Instructor

2015 Spring	2.55 Advanced Heat & Mass Transfer	Lecture Instructor
2015 Fall	2.674/2.675 Micro/Nano Engineering Laboratory	Laboratory and Lecture Instructor
2016 Fall	2.006 Thermal and Fluids Engineering II	Lecture Instructor
2017 Spring	2.006 Thermal and Fluids Engineering II	Lecture Instructor
2017 Fall	2.006 Thermal and Fluids Engineering II	Lecture Instructor
2018 Spring	2.55 Advanced Heat & Mass Transfer	Lecture Instructor
2018 Fall	2.006 Thermal and Fluids Engineering II	Lecture Instructor
2019 Fall	2.671 Measurement and Instrumentation	Laboratory Instructor
2020 Fall	2.001 Mechanics and Materials I	Laboratory and Recitation Instructor
2021 Fall	2.006 Thermal and Fluids Engineering II	Lecture Instructor
2022 Fall	2.006 Thermal and Fluids Engineering II	Lecture and Recitation Instructor

Bachelor's Theses

Rondenay, Alix, “Introducing Three-Dimensional Flows in Planar Microfluidics for Mixing at Low Reynolds Numbers, ENSMP-MIT exchange student project, 2008.

Sung, Minhee, “The Effect of P-selectin Pattern Band Width on the HL-60 Cell Rolling Behavior along an Edge,” June 2010.

Gilson, Laura, “Characterization of a Coaxial Turbulent Jet Mixer for Synthesis of Nanoparticles,” June 2013.

Potash, Benjamin, “Characterization and Preservation Techniques of Plant Xylem as Low Cost Membrane Filtration Devices,” June 2014.

Arkhurst, Bettina, “Identification and Evaluation of Techniques for Quality Control of Low-Cost Xylem Filters,” June 2018.

Han, Kyung-Eun, “Transport of n-Alkanes through Graphene Nanoporous Atomically Thin Membrane,” June 2019.

Parks, Sean, “Radiation Damage Assessment of Atomically Thin Membranes,” February 2020.

Hanlon, Henry, “Analysis of the Materials and Energy Cost to Manufacture Graphene by Roll-Based Chemical Vapor Deposition,” June 2020.

Master's Theses

Sen, Yi-Heng, “Nanofluidic System for Single Molecule Manipulation and Analysis,” September 2008.

Bose, Suman, “A Microvillus Based Approach to Model Cell Rolling,” September 2009.

Raafat, Mohamed, “Self-Sorting of Deformable Particles in a Microfluidic Circuit,” September 2010.

Jain, Tarun, “Membrane Transfer Process for the Creation of Low-Noise Solid State Nanopore Devices,” June 2011.

O’Hern, Sean, “Development of Process to Transfer Large Areas of LPCVD Graphene from Copper Foil to a Porous Support Substrate,” September 2011.

Au, Harold, “Molecular Dynamics Simulations of Gas Transport through Pores in Graphene,” September 2012. (Co-supervised with Prof. Nicolas Hadjiconstantinou)

Jang, Doojoon, “Development of Experimental Methods to Measure Osmosis-Driven Water Flux and Molecular Transport across Nanoporous Graphene Membranes,” June 2015.

Ramchander, Krithika, “Development of Xylem-Based Water Filters,” June 2016.

Emily Hanhauser, “Dry Preservation of Heavy Metal Contaminants Using Cation Exchange Resins for Improved Water Quality Monitoring,” June 2017. (Co-supervised with Prof. John Hart)

An Chang, “Air Particulate Monitoring by Particle Capture on Surfaces,” June 2018.

Bondaz, Luc, “Study of Mass Transport across Nanoporous Single-Layer Graphene,” September 2020. (EPFL thesis; work done as MIT visiting student).

Benner, Tioga, “Design of Fluidic Device for Detection of Per- and Polyfluoroalkyl Substances (PFAS) in Water,” June 2023.

Cunitz, Isabelle, “Galvanic Displacement Reactions Across Graphene,” expected September 2023.

Doctoral Theses, Supervisor

Sen, Yi-Heng, “DNA Ruler: Enhancing Nanopore Sizing Resolution by Multiple Measurements on the Same DNA Molecule,” September 2012.

Valencia, Pedro M., “Microfluidic System for High-Throughput Synthesis and Screening of Polymeric Nanoparticles for Targeted Drug Delivery,” November 2012. (Co-supervised with Prof. Robert Langer and Dr. Omid Farokhzad)

Cartas, Marco Ayala, “Hydrodynamic Resistance and Sorting of Deformable Particles in Microfluidic Circuits,” January 2013.

Bose, Suman, “Affinity Flow Fractionation for Label-Free Cell Sorting,” September 2013.

Lee, Chia-Hua, “Engineered Substrates to Control Cell Adhesion,” January 2014.

Lee, Jongho, “Desalination of Water by Vapor Transport through Hydrophobic Nanopores,” July 2014.

O’Hern, Sean, “Nanoporous Monolayer Graphene Membranes for Water Purification: From Concept to Realization,” October 2014.

Jain, Tarun, “Ion Transport across Individual Sub-Continuum Graphene Nanopores: Phenomenology, Theory, and Implications for Industrial Separations,” January 2015.

Boutilier, Michael, “Development of Macroscopic Nanoporous Graphene Membranes for Gas Separation,” November 2016. (Co-supervised with Prof. Nicolas Hadjiconstantinou)

Chopra, Sunandini, “Development of Nanoparticles for Oral Delivery of Insulin,” February 2017.

Jang, Doojoon, “Macroscopic Graphene Membranes with Tunable Nanopores for Highly Selective Mass Separation,” August 2018.

Ramchander, Krithika, “Filtration and Isolation of Bacteria for Water Purification and Biomedical Diagnostics,” March 2021.

Chang, An, “Design of System for Air Particulate Monitoring by Particle Capture on Surfaces,” expected December 2021.

Tellers, Mary, “Detection of Bacteria in Human Blood,” expected December 2021.

Chow, Chun Man, “Developing Scalable Fabrication Techniques and Understanding Transport Phenomena across Nanoporous Atomically Thin Graphene Membranes,” expected June 2022.

Hanhauser, Emily, “Microtechnologies for Monitoring of Pathogens,” expected August 2023.

Kim, Lohyun, “Separation of Helium from Hydrogen Isotopes using Nanostructured Membranes,” expected December 2023.

Lehn, Andrea, “Mechanisms of Microplastic Formation under Ultraviolet Irradiation,” expected June 2024.

Mattewal, Simar, “Separation of Rare Earth Ions Using Nanoporous Graphene Membranes,” expected June 2025. (Co-supervised with Prof. Zachary Smith).

Doctoral Theses, Reader

Urbanski, John Paul, “Microfluidics for Cellular Analysis,” September 2008.

Choi, Wonjoon, “New Concepts in Energy and Mass Transport within Carbon Nanotubes,” January 2012.

Kwak, Rhokyun, “Nonlinear Ion Concentration Polarization: Fundamentals and Applications,” September 2013.

Chang, Jean, “Needle-free Interstitial Fluid Acquisition Using a Lorentz-Force Actuated Jet Injector,” December 2013.

Jeon, Jessie, “In Vitro Study of Tumor Extravasation Using Microfluidics,” December 2013.

Blasei, Aron, “The Design and Manufacture of Non-Porous, Immediate Release Dosage Forms,” May 2014.

Humplik, Thomas, “Water and Ion Transport through Zeolites for Applications in Water Desalination,” May 2014.

Goel Bajpayee, Ambika, “Development of Nanoparticle Based Drug Delivery System for Treating Post-Traumatic Osteoarthritis,” January 2015.

Dighe, Aalap, “Design of a Neural Probe with Deployable Probes,” June 2015.

Cui, Yuqing, “Study of Nucleation Mechanisms and Rational Design of Small-Scale Continuous Crystallizers,” May 2016.

Hanks, Daniel, “Evaporation from Nanoporous Membranes for High Heat Flux Thermal Management,” May 2016.

Hizir, Fahri Erinc, “Phase‐Field Modeling of Liquids Splitting between Separating Surfaces and its Application to High‐Resolution Roll‐Based Printing Technologies,” May 2016.

Schor, Alisha, “A Dielectrophoretic, Microfluidic Device for Sorting Lipid-Producing Organisms for Biodiesel Applications,” May 2016.

Warsinger, David, “Fouling and Thermodynamic Design of Membrane Distillation Systems,” June 2016.

Adera, Solomon, “Thin-Film Evaporation from Well-Defined Silicon Micropillar Wicks for High-Heat-Flux Thermal Management,” September 2016.

Chou, Nigel, “Measuring Mass Changes in Single Cells with Applications to Drug Testing in Glioblastoma Multiforme (GBM),” June 2017.

De Puig Guixé, Helena, “Immunochromatography Assays to Diagnose Tropical Viral Pathogens Using Gold Nanoparticles,” June 2017.

Chehayeb, Karim, “Thermodynamic Analysis of Electrodialysis,” June 2017.

Mutha, Heena, “Characterization and Performance of Vertically-Aligned Carbon Nanotubes in Capacitive Deionization Systems,” June 2017.

Swaminathan, Jai, “Improving Energy Efficiency of High Salinity Desalination for Zero Liquid Discharge,” June 2017.

Tow, Emily, “Organic Fouling of Desalination Membranes,” June 2017.

Lee, Hyundo, “Immiscible Liquid-Liquid Displacement in Microfluidic Channels: Effects of Wettability and Geometry,” September 2017.

Kim, Hyunho, “Development of Adsorption-based Atmospheric Water Harvesting and Thermal Energy Storage Technologies,” February 2018.

Shivanthu, Vivek, “Disrupting Dynamic F-Actin Enhances Skeletal Muscle Contraction Due to Mechanical Softening,” February 2018.

Lu, Zhengmao, “Evaporation from Nanopores: Probing Interfacial Transport,” June 2018.

Modak, Ashin, “Design and Development of a Smart, Self-contained, Portable Negative Pressure Wound Therapy Device,” June 2018.

Roy, Yaganseni, “The Influence of Temperature on Transport in Nanofiltration,” August 2018.

Jain, Pranay, “Structured Illumination Diffusion Imaging,” September 2018.

Meng, Huaiyu, “CMOS Nanofluidics,” September 2018.

Wang, Gerald, “Atomistic Engineering of Fluid Structure at the Fluid-Solid Interface,” November 2018.

Nayar, Kishor, “Improving Seawater Desalination and Seawater Desalination Brine Management,” December 2018.

Wilke, Kyle, “Tailoring Wetting Behavior at Extremes,” May 2019.

Wei, Ouyang, “Universal Amplification-Free Molecular Diagnostics by Specific and Hierarchical Electrokinetic Biomolecule Concentration,” October 2019.

Chung, Hyung Won, “Technoeconomic Analysis of Pressure-Retarded Osmosis,” February 2020.

Ahdab, Yvana, “Performance and Economics of Monovalent Selective Electrodialysis Desalination for Irrigation,” February 2021.

Sircar, Jay, “Surface Structure Enhanced Microchannel Flow Boiling of Low Surface Tension Fluids,” May 2021.

Shah, Sahil, “Making Decentralized Desalination More Affordable Using Improved Process Design, Control, and Energy Recovery,” July 2021.

Song, Youngsup, “Mechanistic Understanding and Enhancing Pool Boiling Heat Transfer via Surface Property and Structure Design,” August 2021.

Sarmadi, Morteza, “Microscale Polymeric-Based Technologies for Controlled Vaccine Delivery,” October 2021.

Beckwith, Ashley, “Rethinking Plant-Based Materials Production: Selective Growth of Tunable Materials Using Cell Culture Techniques,” November 2021.

Bouma, Andrew, “Thermodynamically-driven Advances in Efficient and Cost-Effective Desalination and Brine Concentration,” April 2022.

Faucher, Samuel, “Phase Behavior, Filling Dynamics, and Packing of Fluids inside Isolated Carbon Nanotubes,” May 2022.

Zhao, Yajing, “Scalable Micro/Nanostructured Surfaces for Thin-Film Condensation Heat Transfer Enhancement in Steam Power Plants,” July 2022.

McArthur, Jonathan, “Reversible Electrowetting Flow Control for Ion Electrospray Propulsion,” June 2023.

Chen, Sijie, “Instrumentation and Mechanistic Study for Microbial Electroporation,” expected July 2023.

Sun, Zhumei, “Develop and Evaluate Novel Nanofiltration for Continuous Assessment of Biomanufacturing Process Parameters and Product Attributes,” expected December 2023.

Foo, Zi Hao, “Computational Optimization of Resource Recovery from Hypersaline Brines,” expected June 2024.

Gokhale, Devashish, “Functional Microparticles for Water Purification,” expected February 2024.

Diaz Marin, Carlos, “Scalable Self-Assembled and Polymeric Materials for High-Performance Transport in Applications in the Water-Energy Nexus,” expected June 2024.

Ghodgaonkar, Aditya, “Design of Low-cost, Low-energy, Clog-resistant Drip Emitters,” expected June 2024.

Manda, Swathi, “The Electromoriogram: A Real-time Stochastic Molecular Sensing Platform for Protein Quantification,” expected June 2024.

Postdoctoral Associates and Fellows

Name	*Dates of Appointment*	*PhD Granting Institution*	*Current Position*
Rhee, Minsoung	Jan. 2009 – Aug. 2011	University of Michigan, Ann Arbor	Engineer and Team lead, Illumina
Lim, Jong-Min	June 2010 – Sept. 2014	Korea Advanced Institute of Science and Technology (KAIST)	Associate Professor, Soonchunhyang University
Choi, Sungyoung	Sept. 2010 – March 2013	Korea Advanced Institute of Science and Technology (KAIST)	Professor, Hanyang University
Yang, Hui Ying	Jan. 2011– Dec. 2011	Nanyang Technological University, Singapore	Professor, SUTD
Qasaimeh, Mohammad	Sept. 2013 – June 2014	McGill University	Associate Professor, New York University- Abu Dhabi
Kidambi, Piran	Sept. 2014 – present	University of Cambridge	Assistant Professor, Vanderbilt University
Wang, Luda	Sept. 2014 – March 2018	University of Colorado at Boulder	Assistant Professor, Peking University
Bono, Michael	Sept. 2014 – Aug. 2018	Cornell University	Research Scientist, Massachusetts Institute of Technology

Zhang, Sui	Oct. 2015 – Sept. 2017	National University of Singapore	Assistant Professor, National University of Singapore
Patel, Dineshkumar	Nov. 2016 – June 2017	Ryerson University	Apotex Pharmachem
Dolah, Rozzeta Binti	March 2017 – Feb. 2019	Meiji University	Senior Lecturer, Universiti Teknologi Malaysia
Cheng, Chi	Sept. 2017 – April 2021	Monash University	Arc Future Fellow, University of Melbourne
Persad, Aaron	Nov. 2017 – April 2021	University of Toronto	Research Scientist, MIT
Tottori, Soichiro	April 2020 – Oct. 2022	University of Cambridge	-