

JAYABRATA DHAR

NIT Durgapur
Department of Mechanical Engineering
Durgapur, West Bengal, India, 713209
D.O.B.: 28/06/1987
Mobile: (+91)8017362102
Email: jaybratadhar@gmail.com

RESEARCH & EDUCATION

Assistant Professor, 2022 (April) – 2022 (September),
Department of Mechanical Engineering,
BITS Pilani, Hyderabad Campus

Human Frontiers (Post-Doctoral) Fellow, 2019 – 2022,
Physics of Living Matter Group
The Physics and Materials Science Department,
University of Luxembourg - Limpertsberg Campus,
L-1511 Luxembourg

Post-Doctoral Fellow, 2018 – 2019,
Team DIMENV, Geosciences Rennes (UMR 6118),
Université Rennes 1, France

PhD student, 2013 - 2017,
Department of Mechanical Engineering,
Indian Institute of Technology Kharagpur, India
PhD advisor: Dr. Suman Chakraborty

Master of Technology (MTech), 2011–2013,
Department of Mechanical Engineering,
Indian Institute of Technology Kharagpur, India
MTech specialization: Thermal Science and Engineering

Bachelor of Engineering (BE), 2007–2011,
Department of Mechanical Engineering,
National Institute of Technology Durgapur, India

Higher Secondary Education (12th Standard), 2006,
St. Joseph's College, West Bengal, India
Indian School Certificate Board

Secondary Education (10th Standard), 2004,
St. Joseph's College, West Bengal, India
Indian Council of Secondary Education

PUBLICATIONS

Referred Journal Papers:

1. Bandopadhyay, A., **Dhar, J.**, & Chakraborty, S. (Sept, 2013). "*Effects of solvent-mediated nonelectrostatic ion-ion*

-
- interactions on a streaming potential in microchannels and nanochannels*". Physical Review E, 88(3), 33014, APS. <https://doi.org/10.1103/PhysRevE.88.033014> (SCI/Scopus Indexed)
2. **Dhar, J.**, Bandopadhyay, A., & Chakraborty, S. (Nov., 2013). "Electro-osmosis of electrorheological fluids". Physical Review E, 88(5), 53001, APS. <https://doi.org/10.1103/PhysRevE.88.053001> (SCI/Scopus Indexed)
 3. **Dhar, J.**, Ghosh, U., & Chakraborty, S. (March, 2014). "Alterations in streaming potential in presence of time periodic pressure-driven flow of a power law fluid in narrow confinements with nonelectrostatic ion-ion interactions". Electrophoresis, 35(5), 662–669, Wiley-VCH. <https://doi.org/10.1002/elps.201300428> (SCI/Scopus Indexed)
 4. **Dhar, J.**, Bandopadhyay, A., & Chakraborty, S. (July 2015). "Taylor–Couette flow of electrorheological fluids under electrical double layer phenomenon". Journal of Non-Newtonian Fluid Mechanics, 223, 165–175, Elsevier. <https://doi.org/10.1016/j.jnnfm.2015.07.001> (SCI/Scopus Indexed)
 5. Majumder, S., **Dhar, J.**, & Chakraborty, S. (October, 2015). "Resolving Anomalies in Predicting Electrokinetic Energy Conversion Efficiencies of Nanofluidic Devices". Scientific Reports, 5, 14725, Nature Research. <https://doi.org/10.1038/srep14725> (SCI/Scopus Indexed)
 6. **Dhar, J.**, Ghosh, U., & Chakraborty, S. (Aug., 2015). "Electro-capillary effects in capillary filling dynamics of electrorheological fluids". Soft Matter, 11(35), 6957–6967, Royal Society of Chemistry. <https://doi.org/10.1039/C5SM01092F> (SCI/Scopus Indexed)
 7. **Dhar, J.**, Jaggi, P., & Chakraborty, S. (June, 2016). "Oscillatory regimes of capillary imbibition of viscoelastic fluids through concentric annulus". RSC Adv., 6(65), 60117–60125, Royal Society of Chemistry.. <https://doi.org/10.1039/C6RA05002F> (SCI/Scopus Indexed)
 8. Goswami, P., **Dhar, J.**, Ghosh, U., & Chakraborty, S. (March, 2017). "Solvent-mediated nonelectrostatic ion-ion interactions predicting anomalies in electrophoresis". Electrophoresis, 38(5), 712–719, Wiley-VCH. <https://doi.org/10.1002/elps.201600394> (SCI/Scopus Indexed)
 9. Poddar, A., **Dhar, J.**, & Chakraborty, S. (July, 2017). "Electroosmosis of Nematic Liquid Crystals under Weak Anchoring and Second-Order Surface Effects". Physical Review E, 96(1), 013114. <https://doi.org/10.1103/PhysRevE.96.013114> (SCI/Scopus Indexed)
 10. Mukherjee, S., Goswami, P., **Dhar, J.**, Dasgupta, S., & Chakraborty, S. (July, 2017). "Ion-Size Dependent Electroosmosis of Viscoelastic Fluids in Hydrophobic Microchannels: An Analytical Approach". Physics of Fluids, 29(7), 072002, AIP Publishing. <http://dx.doi.org/10.1063/1.4990841> (SCI/Scopus Indexed)
 11. **Dhar, J.**, & Chakraborty, S. (Sept., 2017) "Spontaneous Electrorheological Effect in Nematic Liquid Crystals under Taylor-Couette Flow Configuration". Physics of Fluids, 29(9), 092008, AIP Publishing. <http://dx.doi.org/10.1063/1.5003379> (SCI/Scopus Indexed)
 12. Mukherjee, S., Das, S. S., **Dhar, J.**, Dasgupta, S., & Chakraborty, S. (Sept., 2017) "Electroosmosis of Viscoelastic Fluids: The Role of Wall Depletion Layer" Langmuir, 33(43), 12046–12055, American Chemical Society. <http://pubs.acs.org/doi/abs/10.1021/acs.langmuir.7b02895> (SCI/Scopus Indexed)
 13. **Dhar, J.** and Chakraborty, S. (April, 2018) "Electrically modulated capillary filling imbibition of nematic liquid crystals" Phys. Rev. E, 97(4), 043107, American Physical Society. <https://journals.aps.org/pre/abstract/10.1103/PhysRevE.97.043107> (SCI/Scopus Indexed)
 14. Kunti, G., **Dhar, J.**, Bhattacharya, A. and Chakraborty, S. (June, 2018) "Electro-thermally driven transport of a non-conducting fluid in a two-layer system for MEMS and biomedical applications" J. App. Phys, 123(24), 24490, American Institute of Physics. <https://doi.org/10.1063/1.5011659> (SCI/Scopus Indexed)
 15. Kunti, G., **Dhar, J.**, Bandyopadhyay, S., Bhattacharya, A. and Chakraborty, S. (Sept., 2018) "Energy-Efficient Generation of Controlled Vortices on Low-Voltage Digital Microfluidic Platform" App. Phys. Lett, 113(12), 124103, American Institute of Physics. <https://doi.org/10.1063/1.5042143> (SCI/Scopus Indexed)
 16. Kunti, G., **Dhar, J.**, Bhattacharya, A. and Chakraborty, S. (Feb., 2019) "Joule heating-induced particle manipulation on a microfluidic chip" Biomicrofluidics, 13(1), 014113, American Institute of Physics. <https://doi.org/10.1063/1.5082978> (SCI/Scopus Indexed)
 17. Mukherjee, S., **Dhar, J.**, Dasgupta, S., and Chakraborty, S. (Jan., 2019) "Patterned surface charges coupled with

thermal gradients may create giant augmentations of solute dispersion in electro-osmosis of viscoelastic fluids” Proc. R. Soc. A, 475, 20180522, Royal Society. <http://dx.doi.org/10.1098/rspa.2018.0522> (SCI/Scopus Indexed)

18. **Dhar, J.**, Mukherjee, S., Raj M, K. and Chakraborty, S. (Jan., 2019) “*Universal oscillatory dynamics in capillary filling*” Europhys. Lett, 125 (1) , 14003, IOP Publishing. <https://doi.org/10.1209/0295-5075/125/14003> (SCI/Scopus Indexed)
19. Kunti, G., **Dhar, J.**, Bhattacharya, A. and Chakraborty, S. (Sept., 2019) “*Directionally controlled open channel microfluidics*” Phys. of Fluids 31 (9), 092003, AIP Publishing. <https://doi.org/10.1063/1.5118728> (SCI/Scopus Indexed)
20. Kunti, G., **Dhar, J.**, Chakraborty, S. and Bhattacharya, A. (June, 2020) “*Alternating Current Electrothermal Flow for Cooling of Localized Hot Spots in Microelectronic Devices*” IEEE Transactions on Components, Packaging and Manufacturing Technology 10 (6) 1020 – 1027. IEEE. <https://ieeexplore.ieee.org/abstract/document/9025244> (DOI: 10.1109/TCPMT.2020.2976659) (SCI/Scopus Indexed)
21. Paul, A., Mukherjee, S., **Dhar, J.**, S, Ghosal and Chakraborty, S. (April, 2020) “*The effect of the finite size of ions and Debye layer overspill on the screened Coulomb interactions between charged flat plates*” Electrophoresis 41 (7-8), 607-614, Wiley-VCH. <https://doi.org/10.1002/elps.201900318> (SCI/Scopus Indexed)
22. **Dhar, J.**, Meunier, P. and Meheust, Y. (June, 2022) “*Convective dissolution of carbon dioxide in two- and three-dimensional porous media: The impact of hydrodynamic dispersion*” Physics of Fluids 34, 064114; <https://doi.org/10.1063/5.0086370>
23. **Dhar, J.**, Thai, A. L. P., Ghoshal, A., Giomi, L. and Sengupta, A. (July, 2022) “*Self-regulation of phenotypic noise synchronizes emergent organization and active transport in confluent microbial environments*” Nat. Phys. 18, 945–951. <https://doi.org/10.1038/s41567-022-01641-9>
24. Mukherjee, S., **Dhar, J.**, DasGupta, S. and Chakraborty, S. (July, 2022) “*Electrokinetically Augmented Load Bearing Capacity of a Deformable Microfluidic Channel*” Physics of Fluids, 34, 082019; <https://doi.org/10.1063/5.0101298>
25. **Dhar, J.***, Sengupta, A, Danza, F., Ghoshal, A., Müller, S. and Kakavand, N. (Nov, 2021) “*Phytoplankton actively shuttle cytoplasmic lipid droplets to control vertical migration in nutrient-limited environments*” (*Joint first author), Science Advances, 8 (44). 1-16; <https://www.science.org/doi/10.1126/sciadv.abn6005>

Patents granted:

1. Kunti, G., **Dhar, J.**, Bhattacharya, A., Chakraborty, S. (Filed: 05/06/2019, Granted: 26/09/2022) “System For Particle Manipulation And Aggregation”, Patent No.: 407594; Ref. No. 201931022341 (Indian Institute of Technology Kharagpur)

Referred Conference Papers:

1. Mukherjee, S., **Dhar, J.**, Dasgupta, S., & and Chakraborty, S. (2017) “*Forced convection in electroosmotic flow of Phan-Thien-Tanner fluids*”. INCOM 2018, pp: INCOM18-062, 4th Jan to 6th Jan, 2018, Jadavpur University, Kolkata, India.
2. **Dhar, J.**, Nadal, F., Borgne, TL., Meunier, P. and Méheust, Y. (2019) “*Solubility Trapping Of CO₂: Analog Experiment and Three-Dimensional Numerical Modeling*”. EGU General Assembly 2019, Geophysical Research Abstracts vol. 21, pp: EGU2019-17594, 7th April to 12th April, 2019, Vienna, Austria. (Poster presentation)
3. Kunti, G., **Dhar, J.**, Bhattacharya, A. and Chakraborty, S. (2019) “*Alternating Current Electrothermal Flow for Energy Efficient Thermal Management of Microprocessor Hot Spots*” 25th International Workshop on THERMINIC, 25th Sept. to 27th Sept., 2019, Lecco, Italy.
4. **Dhar, J.**, Nadal, F., Borgne, TL., Meunier, P. and Méheust, Y. (2019) “*Gravitational Instability and Convection in a Granular Porous Medium: Pore Scale Experimental Study and Implications for Solubility Trapping Of CO₂*” American Geophysical Union, Fall Meeting 2019, pp: abstract #H41E-01, 9th Dec. to 13th Dec., 2019, San Francisco, California, USA. (Oral presentation)
5. **Dhar, J.**, Danza, F., Ghoshal, A. and Sengupta, A. (2021) “*Emergent activity of motile phytoplankton in nutrient landscapes*” DPG BCPPDYSOE 2021, BP 2.3 BPb-pp-1, 22nd March to 24th March, 2021, Dresden,

Germany. (Online Oral presentation)

6. **Dhar, J.**, Ashraf, S., Meunier, P., Nadal, F. and Méheust, Y. (2021) “*Gravitational instabilities in a 2D porous medium for carbon dioxide sequestration*”. Interpore 2021, 31st May to 3rd June, 2021, University of Stuttgart, Germany. (Online Oral presentation)
7. **Dhar, J.**, Meunier, P., Nadal, F. and Méheust, Y. (2021) “*Rayleigh-Taylor Instability in 2D and 3D Dispersive Porous Medium*”. Interpore 2021, 31st May to 3rd June, 2021, University of Stuttgart, Germany. (Online Oral presentation)
8. **Dhar, J.**, Ghoshal, A. and Sengupta, A. (2021) “*Bioconvective chaos shapes dynamics and lifetime of harmful algal blooms*”. 20th HFSP Awardees Meeting 2021, Session 1-32, pp: 106, 5th July to 8th July, 2021, HFSP Office Online Event. (Online Poster presentation)

RESEARCH AREAS

Topics Analytically and Numerically researched on:

1. Electrokinetic flows of Dielectric Electrorheological and Viscoelastic Fluids.
2. Nematic Liquid Crystals
3. Rayleigh-Taylor Instability in porous medium
4. Stability of shape-changing phytoplankton
5. Bioconvection flows
6. Stokesian Dynamics
7. Capillary filling dynamics

Topics Experimentally researched on:

1. Capillary filling Phenomenon of complex fluids.
2. Crack Dynamics and Prevention.
3. Refractive Index Matched visualization of porous medium flows
4. Bioconvection flow of algae (Species: *HA3017* and *HA3374*)
5. Active nematic flow in *E. Coli* bacterial suspensions.

COMPUTER SKILLS

Programming Language: Python / MATLAB / C++

Math Packages: MATLAB, MAPLE

Image Processing: MATLAB / OpenCV

CFD Packages: COMSOL Multiphysics, OpenFOAM, FEniCS

FDM: 2D and 3D codes for Rayleigh-Taylor Instability using Geometric Multigrid Methods and Parallelization.

Editor Tools: MS Office, LaTeX

Post-processing Tools: Paraview, ImageJ, MATLAB

Operating Systems: Microsoft *Windows*, Linux *Ubuntu* 20.04 LTS