Dr. Chirodeep Bakli
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Research Interests

Microfluidics and Nanofluidics, Interfacial Phenomenon, Molecular Dynamics Simulations, Renewable Energy, Thermal and Fluid Sciences, Building Energy, Thermal Energy Management Systems

Education

Exam	University / Institute	Year	Specialization	% or CGPA
Ph.D (Engg.)	Indian Institute of Technology, Kharagpur	2016	Mechanical Engineering	-
B.Tech (Hons)	Indian Institute of Technology, Kharagpur	2010	Energy Engineering	8.87/10

Appointments

Assistant Professor at Department of Mechanical Engineering IIT Ropar (Aug, 2016-Jun, 2018)

Assistant Professor at School of Energy Science and Engineering IIT Kharagpur (Jun, 2018-Present)

Journal Publications

- Nilanjan Mondal, Diptesh Biswas, Rabibrata Mukherjee, **Chirodeep Bakli*.** Touchdown dynamics of a liquid droplet on a patterned substrate: A generalized lumped parameter-based model. Physics of Fluids 35, 082117 (2023)
- Shashi Rastogi, Vinay Arya and **Chirodeep Bakli*.** Interplay of geometry and shape-engineered-nanoparticles for efficient thermal performance in forced convection-based electronic cooling. Numerical heat transfer Part A: Applications

https://doi.org/10.1080/10407782.2023.2251090 (2023)

- Saumyadwip Bandyopadhyay, **Chirodeep Bakli**, Rabibrata Mukherjee and Suman Chakraborty.Damped Oscillatory Dynamics of a Drop Impacting over Oil-Infused Slippery Interfaces─Does the Oil Viscosity Slow it Down? Langmuir https:// doi.org/10.1021/acs.langmuir.3c01689 (2023)
- Naveen Kumar, Abhirup Chaudhuri, Vinay Arya, **Chirodeep Bakli***, Chandan Bera. Significantly reduced thermal conductivity and enhanced thermoelectric performance of twisted bilayer graphene. Journal of Applied Physics 134,44301 (2023)
- Ankit Agarwal, Vinay Arya, Bhushan Golani, **Chirodeep Bakli**, and Suman Chakraborty. Mapping fluid structuration to flow enhancement in nanofluidic channels. The Journal of Chemical Physics 158, 214701 (2023)
- S Christopher, MP Vikram, **Chirodeep Bakli**, Amrit Kumar Thakur, Y Ma, Zhenjun Ma, Huijin Xu, Pinar Mert Cuce, Erdem Cuce, Punit Singh. Renewable energy potential towards attainment of net-zero energy buildings status–A critical review. Journal of Cleaner Production, 405, 136942 (2023)
- Abhirup Chaudhuri, Vinay Arya and **Chirodeep Bakli*.** Coupled Effect of Variable Wettability and Body Force on Fluid Flow through Nanochannels: A Multiscale Approach. Computational Thermal Sciences: An International Journal 15, 2, 2023
- Avinash Kumar and **Chirodeep Bakli***. Interplay of wettability and confinement enhancing the performance of heat sinks. Applied Thermal Engineering 214, 118865, (2022)
- Vinay Arya, Abhirup Chaudhuri, **Chirodeep Bakli*.** Coupling solute interactions with functionalized graphene membranes: towards facile membrane-level engineering. Nanoscale 14 16661-16672 (2022)
- Brijesh Kushwaha, Avinash Kumar, Rushikesh S. Ambekar, Vinay Arya, Solomon D. Negedu, Deep Bakshi, Emmanuel Femi Olu, Ravi Sastri Ayyagari, Varinder Pal, Kishor Kumar Sadasivuni, Nicola M. Pugno, **Chirodeep Bakli***, Chandra S. Tiwary. Understanding the Mechanics of complex topology of the 3D printed Anthill architecture. Oxford Open Materials Science 2, itac003, (2022)
- Doonjoon Jang, **Chirodeep Bakli**, Suman Chakraborty, Rohit Karnik. Molecular self-assembly Enables Tuning of Nanopores in Atomically Thin Graphene Membranes for Highly Selective Transport. Advanced Materials 34, 2108940, (2022)
- Nilanjan Mondal, Abhirup Chaudhuri, **Chirodeep Bakli,** Suman Chakraborty. Upstream events

dictate interfacial slip in geometrically converging nanopores. The Journal of Chemical Physics 154, 164709 (2021)

- Meneka Banik, Shaili Sett, **Chirodeep Bakli**, Arup Kumar Raychaudhuri, Suman Chakraborty, Rabibrata Mukherjee. Substrate wettability guided oriented self assembly of Janus particles Scientific reports 11, 1 (2021)

- Ajit Singh, Ramanujam Lenin, Naimat Kalim Bari, **Chirodeep Bakli***, Chandan Bera. Mechanistic insights into surface contribution towards heat transfer in a nanofluid. Nanoscale Advances 2, 3507 (2020)

- **Chirodeep Bakli** and Suman Chakraborty. Anomalous interplay of slip, shear and wettability in nanoconfined water. Nanoscale 11, 11254-11261 (2019)

- **Chirodeep Bakli,** Sreehari P.D., and Suman Chakraborty. Mimicking Wettability Alterations using Temperature Gradient for Water Nanodroplets. Nanoscale 9 (34), 12509-12515 (2017)

- Sreehari P.D., **Chirodeep Bakli** and Suman Chakraborty. Fractional Separation of Polymers in Nanochannels: Combined Influence of Wettability and Structure. Journal of Polymer Science, Part B: Polymer Physics 54 (20), 2118-2125 (2016)

- **Chirodeep Bakli** and Suman Chakraborty. Rapid capillary filling via ion-water interactions over nanoscale, Nanoscale 8, 6535 (2016)

- **Chirodeep Bakli** and Suman Chakraborty. Rapid capillary filling via ion-water interactions over nanoscale, Nanoscale 8, 6535 (2016) **Chirodeep Bakli** and Suman Chakraborty. Slippery to Sticky Transition of Hydrophobic Nanochannels, Nano Letters, 15, 7497-7502 (2015)

- **Chirodeep Bakli** and Suman Chakraborty. Effect of entrapped phase on the filling characteristics of closed-end nanopores Soft Matter ,11,161 (2015)

- **Chirodeep Bakli** and Suman Chakraborty. Electrokinetic energy conversion in nanofluidic channels: Addressing the loose ends in nanodevice efficiency. Electrophoresis. 36, 675 (2015).

- Suman Chakraborty, Dipankar Chatterjee and **Chirodeep Bakli**. Nonlinear Amplification in Electrokinetic Pumping in Nanochannels in the Presence of Hydrophobic Interactions" Physical Review Letters, 110,184503(2013).

- **Chirodeep Bakli** and Suman Chakraborty. Effect of presence of salt on the dynamics of water in uncharged nanochannels." The Journal of chemical physics, 138,054504(2013).

- **Chirodeep Bakli** and Suman Chakraborty. Capillary filling dynamics of water in nanopores." Applied Physics Letters, 101,153112(2012).

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Conference Publications (Selected)

- Souparna Chakraborty, Vinay Arya, Siva Shankar SS, **Chirodeep Bakli***. Optimization of building façade for passive thermal management: a machine learning based simulation study for Kolkata, India. Proceedings of the 9th ACM International Conference on Systems for Energy-Efficient Buildings, Cities, and Transportation
- Avinash Kumar and **Chirodeep Bakli***. Effect of Porous Walls and Nanofluids on the Thermo-Hydraulic Performance of Tapered DoubleLayered Microchannel Heat Sink. ASME POWER 2022
- Avinash Kumar, Vinay Arya, and **Chirodeep Bakli*** Optimizing Effectiveness of Double Pipe Heat Exchanger Using Nanofluid and Different Porous Fins Arrangement. ASME POWER 2021
- Avinash Kumar, Vinay Arya, and **Chirodeep Bakli*.** Decoding the Alteration of Thermal Conductivity of Nanofluids From Molecular Perspective. 26thNational and 4th International ISHMT-ASTFE Heat and Mass Transfer Conference
- Abhirup Chaudhuri, Nilanjan Mondal, **Chirodeep Bakli*** and Suman Chakraborty Effect of Surface Roughness in Parallel Plate Micro Channels with Varying Aspect Ratios: A Multiscale Modeling Approach. 2nd International Conference on Recent Advances in Fluid and Thermal Sciences
- Abhirup Chaudhuri, Vinay Arya and **Chirodeep Bakli*** Coupled Effect of Variable Wettability and Body Force on Fluid Flow through Nanochannels: A Multiscale Approach26thNational and 4th International ISHMT-ASTFE Heat and Mass Transfer Conference
- Souparna Chakraborty, Abhirup Chaudhuri and **Chirodeep Bakli*.** Optimizing Water Harvesting On Bioinspired Surfaces: A Mesoscopic Perspective. ASME POWER 2021
- Souparna Chakraborty, Nilanjan Mondal and **Chirodeep Bakli***. Passive Building Cooling Using Tree-Shaped Converging Microchannel Nets. 2nd International Conference on Recent Advances in Fluid and Thermal Sciences

Patents

- Storage Based Solar Cooker With Sensor-Less Dual-Axis Tracking Application no. : 201931033729, dated : 21st, aug 2019 Inventor(s) : **Chirodeep Bakli** ; Jayant Agarwal ; Khusharaj Khaddeo ; Vinay Arya. (Patent filed)

- Granted Design No. 319066-001 Storage Based Solar Cooker With Sensor-Less Dual-Axis Tracking

Awards

- J.C. Ghosh Scholarship, August, 2009
- Institute Silver Medal, IIT Kharagpur Convocation, 2010
- Graphical abstract selected as cover art in 2015 Special Issue on Fundamentals of Electrophoresis
- Faculty Excellence Award 2023 IIT Khargapur

Sponsored Research Undertaken

- DST Sponsored Project Indo-Korea Joint Network Center on Computational Material

  2018-21. Role: Co-principal Investigator. Grant: 38 lakhs INR
- IMPRINT-II Project on Micro Green Roofing. 2018-21. Role: Co-Principal Investigator Budget: 1.05 crore INR
- Energy Harvesting using Droplets on Slippery Surfaces, SRIC IIT Kharagpur 2019-22. Role: Principal Investigator Budget 28 Lakhs INR
- Confinement-inducted Dynamics in Nanoscale Phase Transition Apex Committee of SPARC2019-20 Role: Co-principal Investigator. Grant: 37 lakhs INR
- Centre of Excellence on Energy Aware Urban Infrastructure (EEA) Science and Engineering Research Board (SERB) Role: Co-principal Investigator. Grant: 1750.38 Lakhs INR
- Projects submitted to DST, ICSSR, United Nations under consideration.

Courses Taught

- Renewable Energy Systems
- Wind and Small hydro Technology
- Solar Energy Technology
- Solar Thermal Energy Engineering
- Energy Systems Modelling
- Environmental Science
- Energy Conversion Processes

Seminars and Workshops

- Convener: CompFlu 2022 - Complex Fluids Symposium, December 2022 IIT Kharagpur Rajarhat campus, Sponsored Conference 427 participants
- Co-Convener: Multiphase Flow- Research and Applications (MFRA-2023), Center of Railway Research IIT Kharagpur-India, march 2023. DST Sponsored workshop[with 100 participants
- Convener: Fluids under Confinement, School of Energy Science and Engineering IIT Kharagpur-India, March 2023. SPARC sponsored workshop with 170 participants
- Biomimetics for Pumpless fluid Transport: Non-conventional Irrigation Techniques, IIT Ropar December 2019
- Exploring nomalous Thermal Conductivity in Nanofluids: A Molecular Approach, INST Mohali December 2019
- Charge-Wettability Interactions at Interfaces: Microions, Nanofluids and Membranes: India-Korea VNC workshop, SN Bose National Centre for Basic Sciences, Kolkata, November 2019.
- Water Under Confinement: From Interfaces to Bulk, One-day Meeting on Materials Simulation from Classical to Quantum, Department of Physics, IIT Kharagpur, July 2019
- Organized Indo-UK SPARC Workshop on Multiscale Modelling Approach in Micro/Nano-fluidics

Outreach

- Founded Team Shakti, an undergraduate Society focused on Renewable Enrgy Systems.
- Faculty mentor for Solar Decathlon India and Solar Decathlon US for the year 2023 & 2024
- Organized talks at local primary schools
- Planned activities at local government colleges for knowledge dissemination

Supervision

- Ph.D. Supervision: 14(Ongoing)
- Post-Doctoral Candidates: Nil
- M.Tech./M.S. Supervision: 3 (Onoing)

  : 10 (Completed)

  - Ojaswa Anand (Dual Degree 2020). Thesis title: Investigations on flutter based wind energy harvesting system
  - Sidharth Vyas (M.Tech 2020). Thesis title: Wind speed forecasting in High altitude area
  - Vinay Arya (M.Tech 2020) Thesis title: Studying The Effect Of Ionic Inclusions On Fluid Transport Around Membranes
  - S.S.Siva Shankar(M. Tech 2021)Thesis title: Building Energy Report: Analysis on Shading Systems and Building Materials
  - Jayant Agarwal (M. Tech 2021) Thesis title: Transient Analysis of Flow during Intermittent Gas Lift using ANSYS Fluent
  - Abhirup Chaudhuri (**M.S. 2022**) Thesis title: Modulating Nanofluidic Transport via Interfacial Interactions over Molecular Scales
  - M. Krupakar (M. Tech 2022) Thesis title: Design of Solar Panel Powered Ground Support Equipment
  - Soumar Saikia (M. Tech 2022) Thesis title: Study on sizing of a Microgrid for a typical Residential Building
  - Souparno Chakraborty (**M.S. 2023**) Thesis title: Optimization of Some Passive Technologies Towards an Energy Efficent Building
  - Diptesh Biswas (M. Tech 2023) Effect of substrate texture and Droplet

Geometry onCoalescence and Post-Coalescence Dynamics of Droplets

- B.Tech Guidance : (14 completed & 4 ongoing)

Additional Information

Other Professional Contributions:

- Chair for the Student Branch Activities for IEEE Kharagpur Section
- Organizer of Fluids Under Confinement 2021 Web Symposium and workshop under the SPARC scheme with collaboration of University of Warwick held during 15-31 March 2021 at IIT,

Membership of Professional Bodies:

Kharagpur, India

- Served as Reviewer for
  - **Journals:** Nature Scientific Reports, Soft Matter, Macromolecules, Energy Conversion and Managment **,** etc
  - **Funding Bodies** SPARC, DST SERB
  - **And several conferences**

- ✦ Member IEEE
- ✦ Member American Physical Society
- ✦ Member American Society of Mechanical Engineers
- ✦ Member of World Alliance of Universities on Carbon Neutrality
- ✦ Member of Association of Computing Machinery
- ✦ Life Member National Society for Fluid Mechanics and Fluid Power