

# Changwoo Bae, Ph.D.

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## Employment History

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- 2025 (Sep.) – Current 📌 **Postdoctoral researcher** at Sciences et Ingénierie de la Matière Molle, ESPCI-PSL University, France.
- 2025 📌 **Postdoctoral researcher** at Institut Lumière Matière, Université de Lyon, France.
- 2021 📌 **Research fellow** in Mechanical Engineering, Inha University, South Korea.
- 2020 📌 **Research fellow** in Mechanical Engineering, Kyung Hee University, South Korea.

## Education

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- 2021 – 2024 📌 **Ph.D., Physics** in Institut Lumière Matière, Université de Lyon.  
Thesis: *'Nanofluidics with Soap Bubbles and Surfactants'*.
- 2018 – 2020 📌 **M.E. Mechanical Engineering** in Kyung Hee University.  
Thesis title: *'Penetration Dynamics of Water Droplet on Janus Mesh'*.
- 2010 – 2018 📌 **B.E. Mechanical Engineering** in Kyung Hee University.  
\*Military service in the Republic of Korea army (Jan. 2011 - Nov. 2012)

## Research Experience

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**PhD, Nanofluidics in Soap Films** 2021 – 2024  
(PI: Prof. Anne-Laure Bianco)  
Agence Nationale de la Recherche (ANR), CNRS, France

- Project aim: Investigate mass, electronic, and ionic transport at liquid/gas interfaces.
- Characterized homemade electronic surfactants using Langmuir-Blodgett and UV-vis.
- Developed techniques for measuring electronic conduction of surfactants.
- Studied bubble translation under electric fields with varying surfactant concentrations.
- Explored soap films as nanochannels for ion/particle depletion effects.
- **Outcome:** 1 first-authored peer-reviewed paper, 1 co-authored peer-reviewed paper, 1 in preparation. 5 international conference papers.

**Post-Master Research Fellow, Basic Research Laboratory Program** 2021  
(PI: Prof. Sunmin Kim)  
Ministry of Science, ICT (MSIT), Korea

- Project aim: Studying hypoxia effects on liver and kidney cells in a microfluidic device.
- Developed microchannels for oxygen depletion to near 0%.
- Designed microchannels for concentration and temperature gradients using PEG hydrogel.
- Conducted diffusiophoresis experiments with ionic and non-ionic gradients.
- **Outcome:** 1 domestic conference paper, 1 Korean patent.

**Post-Master Research Fellow**, National Research Foundation of Korea  
(PI: Prof. Choongyeop Lee)  
Ministry of Science, ICT and Future Planning (MSIT), Korea

2020

- Project aim: Enhancement of energy conversion through membranes.
- Developed hydrogel and PES membrane-based microchannels for diffusio-phoretic studies.
- Investigated rebound phenomena on LIS with varying viscosity.
- Analyzed penetration and rebound dynamics on LIS meshes.
- **Outcome:** 1 first-authored peer-reviewed paper, 1 co-authored peer-reviewed paper, 1 peer-reviewed conference paper.

**Master**, National Research Foundation of Korea  
(PI: Prof. Choongyeop Lee)  
Ministry of Science, ICT and Future Planning (MSIT), Korea

2018 – 2020

- Project aim: Development of nanomaterials for anti-fouling applications.
- Fabricated superhydrophobic and Lubricant-Infused Surfaces (LIS).
- Conducted droplet impact experiments on flexible superhydrophobic mesh.
- Analyzed retraction and contact time on curved surfaces.
- **Outcome:** 1 first-authored peer-reviewed paper, 1 co-authored peer-reviewed paper, 4 conference papers.

**Research internship**, Basic Research Laboratory Program  
(PI: Prof. Dukhyun Choi)  
Ministry of Science and ICT (MSIT), Korea

2016 – 2018

- Project aim: Generation of electric energy based on nanostructured surfaces.
- Suggested an idea of an ionic-diode membrane using PDMS and Nafion membrane.
- Developed an experimental setup for energy harvesting in a saline environment.
- Analyzed theoretical redox potential and characterized membrane performance.
- **Outcome:** 1 co-authored peer-reviewed paper.

## Research Publications

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## Skills

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### Experimental Techniques

- High-speed imaging and analysis
- Microfluidics and Nanofluidics
- Data analysis and visualization
- Surface characterization (mechanical, electrical, optical, etc.)
- Tensiometry, Zeta potentiometry, Ellipsometry, Electrometry, etc.

### Programming & Software

- Python, L<sup>A</sup>T<sub>E</sub>X
- Rhinoceros 3D, Adobe Illustrator, Inkscape

### Fabrication

- Microfluidic device fabrication (PDMS, NOA, Hydrogel)
- Soft lithography
- Surface functionalization and modification

## Honors & Awards

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- 2020 **Excellent Paper Award**, The Korean Society of Mechanical Engineers, South Korea.
- 2017 **Academic Scholarship**, Kyung Hee University, South Korea.
- 2009 **Silver Prize** in Korean Physics Olympiad

## Teaching & Mentoring

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- 2021-2024 Mentor for two Master's students on research projects
- 2019-2020 Research assistant
  - Supervising undergraduate research projects

## Professional Activities

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### Converence Presentations

- Charged Matter 2025, Wien, Austria, 2025
- 15th European Foam Conference (EUFOAM), Dresden, Germany, 2024
- American Physical Society Division of Fluid Dynamics Meeting, Washington DC, 2023
- Journées Plenieres GDR MicroNanoFluidique, Lyon, France, 2023
- Congres Français de Mécanique, Nantes, France, 2022
- Journées de Physique Statistique, Paris, France, 2022
- The Korean BioChip Society, South Korea, 2021
- The 11th National Congress of Fluids Engineering, South Korea, 2020

## Professional Activities (continued)

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- 📖 The Korean Society of Mechanical Engineering Fall Conference, South Korea, 2019
- 📖 The Korean Society of Mechanical Engineering Spring Conference, South Korea, 2019
- 📖 The 10th National Congress on Fluids Engineering, South Korea, 2018

### Academic Schools

- 📖 Complex Motion in Fluids, Homerton College in Cambridge, UK, 2023
- 📖 International School of Soft Matter, Cargese, France, 2022

### Professional Service

- 📖 Reviewer for scientific journals (Physics of Fluids)
- 📖 Reviewer for scientific journals (Microfluidics and Nanofluidics)