

Faculty of Science

Dayong Jing Student Fellowship

IBMD Research Projects Available – 2024 Winter Round

- Quantum nanoparticles for biological imaging
- Single nanoparticle optical trapping and cooling in physiological environments
- Absolute temperature measurement of mitochondria in live cells
- Integrating the upconversion nanomaterials with nanofibers for enhance biosensing and photodynamic therapies
- Developing electrokinetically active ultrasensitive methods for cancer diagnostics
- Instrument-free electrophoretic separation and detection of complex biomarkers using low-cost textile threads
- Tracking SARS-CoV-2 virus spike within lung cells
- Oligo-based biosensors for quantification of cancer-associated microRNAs
- Recombinant CLIC Proteins as Cell Protective Agents
- Integrated Multi-Organelle Interactome Mapping: Unveiling Cellular Dynamics
- Intracellular viscosity measurements by upconversion nanoparticle tracking correlated with Brillouin imaging
- Intracellular temperature and viscosity measurement
- Rapid test of SPINT1 biomarker for diagnosis of pregnancy with risk of stillbirth
- Point-of-care testing of Preeclampsia

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IBMD Project Supervisors

Professor Jiajia Zhou

Prof Zhou currently holds an Australian Research Council Future Fellowship and National Health and Medical Research Council Investigator Grant. She has won a number of major awards including the 2022 David Syme Research Award, 2019 Sturges Prize, and 2018 Nanomaterials Young Investigator Award. In 2016, she joined UTS Institute for Biomedical Materials and Devices where she has worked on making nanoparticles even smaller while retaining their useful optical properties. This removes an obstacle to further improvements in resolution and sensitivity in areas such as security inks, display technologies, quantum biotechnology, bioimaging and sensing. She has also worked on applying these technologies in rapid COVID-19 antigen tests, and protein and pathogen detection for the food industry.

Dr Martin (Mohammad) Sadraeian

Dr Sadraeian is a Postdoctoral Researcher and a core member of IBMD. Dr Sadraeian completed his PhD in Biomolecular Physics with key contributions on Anti-HIV immunoconjugates. He has conducted projects on anti-viral photo-immunotherapy and virus photoinactivation. Dr Sadraeian is already working on photo-diagnostics for detection of miRNA and viral RNA. The major interest of the Sadraeian's project is the biomolecule manipulation, including the designing and production of novel synthetic RNA and DNA molecules, and conjugating them with antibodies and upconverting nanoparticles (UCNP). The final products will be biosensors for photo-diagnostics of cancer or virus infection.

Dr Jawairia (Jia) Khan

Dr Khan is a material scientist and core member of the Institute for Biomedical Materials and Devices (IBMD). She was awarded her PhD degree in Analytical Chemistry from University of Wollongong, Australia in 2021. Dr Khan's research focuses on developing low-cost fiber-based microfluidics for point-of-care analysis including electrophoretic separations and in-situ on-fiber analyte detection. A current focus involves the use of these fiber-based microfluidics in developing next generation lab-on-fiber devices for liquid biopsy and biosensing using upconversion nanoprobe, with the ultimate goal to integrate the system into wearable sensors. Her research expertise spans materials and devices, fabrication techniques, nanotechnology, analytical chemistry and characterization.

Dr Libing Fu

Dr Fu is a Postdoctoral Research Associate IBMD. In 2018, Dr Fu received her PhD in upconversion nanoparticle-based drug delivery supervised by Deputy Dean of Research and Innovation, Prof Roger Chung at Macquarie University Centre for Motor Neuron Disease Research. In 2014, Dr Fu acquired a full overseas scholarship from the China Scholarship Council and Macquarie University. From 2021-2023, Dr Fu joined IBMD to lead the lateral flow assay program. Her research focuses on signal-on DNA biosensors, lateral flow assay, rare-earth-doped nanoparticle-based brain drug delivery, super-resolution microscopy imaging, cell culture, and microinjection & bioimaging of zebrafish.

IBMD Project Supervisors

A/Prof Irina Kabakova

A/Prof Irina Kabakova is an Associate Head of School MaPS (Education and Students) and an Optical Physicist working in the field of Advanced Microscopy/Spectroscopy. She runs a Brillouin Microscopy Lab at UTS. Brillouin Microscopy unites optics and acoustics and looks at mechanical properties of materials at the microscale. The beauty of this technology is that mechanical parameters of the materials are read out by using only a focused beam of light, making it into a versatile and safe technique for use with biological materials such as tissues and cells. In Brillouin Imaging Lab, we explore how pathological processes in cells and tissues represent themselves in changes in tissue's elasticity. These findings are key to understanding the disease progression at the microscale as well providing means for early disease diagnostics.

Dr Le (Leo) Zhang

Dr Zhang serves as a Postdoctoral Research Fellow at UTS and plays a pivotal role as a core member of the UTS Institute for Biomedical Materials and Devices (IBMD). He completed his PhD in Biomedical and Microbiology at UTS in 2021, under the guidance of Distinguished Professor Dayong Jin. Emerging as an international leader in antimicrobial resistance (AMR), his primary focus lies in exploring the mechanisms behind bacterial evolution of antibiotic resistance through a variety of interdisciplinary approaches. These methods include single-molecule microscopy, whole-genome sequencing, and global transcription analysis. Dr Zhang's groundbreaking work involves the integration of photonics and advanced materials into molecular biology, significantly contributing to the understanding of AMR. His research has yielded 19 journal publications, featuring in prestigious outlets such as Nature Methods, eLife, and Analytical Chemistry.

Prof Stella Valenzuela

Prof Stella Valenzuela undertook her PhD studies in cell and molecular biology [identifying novel genes - CLIC1 and MIC-1 - from activated macrophage cells] at the Centre for Immunology (CFI), St Vincent's Hospital Sydney, obtaining her PhD from the University of NSW. Prior to this she had worked in the commercial sector, in the biotechnology companies Australian Monoclonal Development Pty Ltd and Cellabs Pty Ltd in research and development of monoclonal antibody technologies for research and diagnostic purposes. Following her PhD studies she was a Research Scientist at the CFI [functional studies of intracellular ion channel proteins - CLICs], later moving to the University of NSW to take up a position as an NHMRC Research Fellow [knockout mouse studies of S100 inflammatory proteins]. She later joined the University of Technology (UTS), Key Centre for Health Technologies [cellular responses to mobile phone frequencies]. She is currently the Director for the ARC Research Hub for Integrated Device for End-User Analysis at Low Levels (IDEAL Hub) at UTS. Previously she has served as both Head of School and Associate Head of School (Research) in the School of Life Sciences, UTS. Prof Valenzuela is a member of the Institute for Biomedical Materials and Devices and the Centre for Health Technologies and previously also a member of the Institute of Nanoscale Technologies, UTS. She has been instrumental in establishing Bionanotechnology research at UTS and is currently working with her industry partner Surgical Diagnostics Pty Ltd, within the IDEAL HUB, an ARC Industry transformation hub, developing devices that use ion channel proteins and tethered membrane technologies.