College of Biomedicine
香港城市大學
City University of Hong Kong

# ADVANCES IN BIOMEDICINE SYMPOSIUM 2026

## Celebrating the College of Biomedicine's First Anniversary

7-9 January 2026 City University of Hong Kong

# PROGRAMME

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PROGRAMME BOOKLET

# COLLEGE OF BIOMEDICINE

## Vision

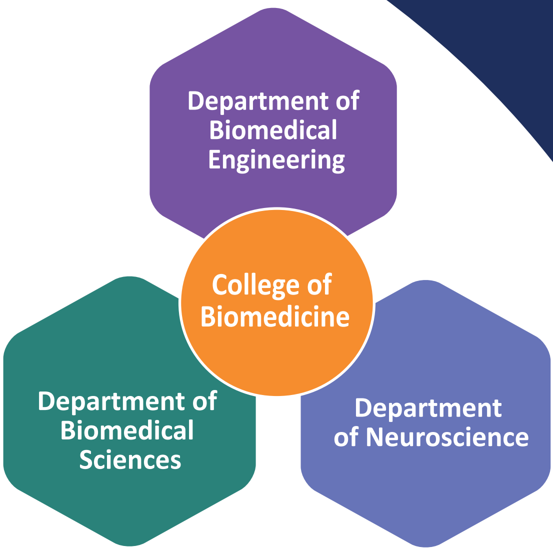
To become a global leader in interdisciplinary education, research, and innovation in biomedicine and health.

## Areas of Excellence

**Department of Biomedical Engineering**
- BioMEMS
- Biomedical Robotics
- Bioimaging
- Nanomedicine / Biomaterials
- Flexible Bioelectronics

**Department of Biomedical Sciences**
- Cancer Biology and Therapy
- Genomics and Bioinformatics
- Vascular, Metabolic, and Regenerative Biology
- Infectious Diseases and Immunity

**Department of Neuroscience**
- Basic and Translation Research on Alzheimer's Disease
- Treatment of Brain Disorders
- Neural Network Learning




## Management Team

Professor ARKIN Isaiah Tuvia
*Dean*

Professor XU Chenjie
*Associate Dean (Research)*

Professor LO Pui Chi Gigi
*Associate Dean (Undergraduate Education)*

Professor LAU Chun Yue Geoffrey
*Associate Dean (Postgraduate Education)*

Professor ZHANG Yong
*Head of Department of Biomedical Engineering*

Professor HUANG Yu
*Head of Department of Biomedical Sciences*

Professor HE Jufang
*Head of Department of Neuroscience*

## Symposium Organizing Committee:

[Chairman] Professor XU Chenjie, College of Biomedicine
[Coordinator] Professor CHEN Chia-hung, Department of Biomedical Engineering
[Member] Professor ZHANG Jilin, Department of Biomedical Sciences
[Member] Professor ZHANG Qinrong, Department of Biomedical Engineering
[Member] Professor ZHU Xiaowei, Department of Neuroscience

**Enquiry:** cbm.office@cityu.edu.hk 3442 8207 https://www.cityu.edu.hk/cbm/

SCHEDULE

## 7 January 2026 (Wednesday) – Day 1

### *Session #1 - Chaired by Prof. Chia-Hung CHEN, CityUHK*

| | |
|---|---|
| 08:20 – 08:50 | *Registration* |
| 08:50 – 09:00 | **Opening Remarks**<br>Prof. Isaiah ARKIN (CityUHK) |
| 09:00 – 09:40 | **Signaling by Growth Factor Receptor Tyrosine Kinases**<br>Prof. Mark LEMMON (Yale University, USA) |
| 09:40 – 10:20 | **Biological Chip for Cell-Based Diagno sis and Therapy**<br>Prof. Lingqian CHANG (Beihang University, China) |
| 10:20 – 11:00 | **Rapid Antibiotic Susceptibility Screening by Super-Resolution Microscopy**<br>Prof. Dayong JIN (University of Technology Sydney, Australia) |
| 11:00 – 11:15 | *Coffee Break* |
| 11:15 – 11:55 | **Nanocoated Bacterial Therapeutics**<br>Prof. Jinyao LIU (Shanghai Jiao Tong University, China) |
| 11:55 – 12:25 | **Skin Interfaced Electronics for Healthcare and VR/AR**<br>Prof. Xinge YU (CityUHK) |
| 12:25 – 13:55 | *Lunch (By Invitation)* |

### *Session #2 - Chaired by Prof. Qinrong ZHANG, CityUHK*

| | |
|---|---|
| 13:55 – 14:35 | **Allosterically Regulation of Oligomeric Receptor Tyrosine Kinases**<br>Prof. Kathryn FERGUSON (Yale University, USA) |
| 14:35 – 15:15 | **Biomaterials to Boost Cancer Immunotherapy, from Bench to Bedside**<br>Prof. Zhuang LIU (Soochow University, China) |
| 15:15 – 15:45 | **From Mechanotransduction to Anti-Atherososis Therapeutics**<br>Prof. Li WANG (CityUHK) |
| 15:45 – 16:00 | *Coffee Break* |
| 16:00 – 16:40 | **Multimodal Photoacoustic Ultrasound Imaging: From Bench To Bedside and Products**<br>Prof. Chulhong KIM (Pohang University of Science and Technology, Korea) |
| 16:40 – 17:20 | **Brain Stimulation for Treatment of Parkinson's Disease: Network Perspective**<br>Prof. Jin BAO (Chinese Academy of Sciences, China) |
| 17:20 – 18:00 | **Minimally Invasive Bioelectronics**<br>Prof. Xi XIE (Sun Yat-Sen University, China) |
| 18:00 – 20:00 | *Dinner (By Invitation)* |

## 8 January 2026 (Thursday) – Day 2

### *Session #3 - Chaired by Prof. Xiaowei ZHU, CityUHK*

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|---|---|
| 09:00 – 09:35 | *Registration* |
| 09:35 – 09:40 | **Welcome Remarks**<br>Prof. Xiaowei ZHU (CityUHK) |
| 09:40 – 10:20 | **Silent Waves, Powerful Effects: How Ultrasound Shapes the Brain**<br>Prof. Joo Min PARK (Institute for Basic Science, Korea) |
| 10:20 – 11:00 | **Revolutionizing Cell Manufacturing and Regenerative Therapy with Microtissue Engineering**<br>Prof. Yanan DU (Tsinghua University, China) |
| 11:00 – 11:15 | *Coffee Break* |
| 11:15 – 11:55 | **Development of Cross-Scale Imaging Probes for Tumor Boundary Identification**<br>Prof. Aiguo WU (Chinese Academy of Sciences, China) |
| 11:55 – 12:25 | **Microfluidics for Single Cell Applications**<br>Prof. Megan HO (The Chinese University of Hong Kong, China) |
| 12:25 – 13:55 | *Lunch (By Invitation)* |

## 8 January 2026 (Thursday) – Day 2 *(Cont'd)*

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|---|---|
| ***Session #4 - Chaired by Prof. Jilin ZHANG, CityUHK*** | |
| 13:55 – 14:35 | **Engineering the Structure of Genome**<br>Prof. Hao YIN (Wuhan University, China) |
| 14:35 – 15:05 | **How Miniaturized Robots Could Revolutionize Healthcare by Minimizing Invasiveness and Enabling New Capabilities**<br>Prof. Jiachen ZHANG (CityUHK) |
| 15:05 – 15:45 | **Formation and Function of Circular RNAs in Human Development and Disease**<br>Prof. Simon CONN (Flinders University, Australia) |
| 15:45 – 16:00 | *Coffee Break* |
| 16:00 – 16:40 | **Self-Powered Medical Devices and Electrical Stimulation Therapy**<br>Prof. Zhou LI (Tsinghua University, China) |
| 16:40 – 17:20 | **Somatic Mosaicism for Understanding Human Development and Ageing**<br>Prof. Young Seok JU (Korea Advanced Institute of Science and Technology, Korea) |

## 9 January 2026 (Friday) – Day 3

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|---|---|
| ***Session #5 - Chaired by Prof. Chenjie XU, CityUHK*** | |
| 08:30 – 08:55 | *Registration* |
| 08:55 – 09:00 | **Welcome Remarks**<br>Prof. Chenjie XU (CityUHK) |
| 09:00 – 09:40 | **Transfer RNA Fragments, Molecular Regulators of Neurodegeneration and Stress**<br>Prof. Hermona SOREQ (The Hebrew University of Jerusalem, Israel) |
| 09:40 – 10:20 | **Living Materials Powered by Microorganisms**<br>Prof. Ziyi YU (Nanjing Tech University, China) |
| 10:20 – 11:00 | **A New Principle in Vesicle Trafficking**<br>Prof. Da JIA (Sichuan University, China) |
| 11:00 – 11:15 | *Coffee Break* |
| 11:15 – 11:55 | **Chasing RNA in Motion: Exploring RNA Dynamics in Cells and Beyond**<br>Prof. Hanae SATO (Kanazawa University, Japan) |
| 11:55 – 12:25 | **RNA G-Quadruplex Structures: Key Regulators in Biology and Promising Targets for Disease**<br>Prof. Chun Kit KWOK (CityUHK) |
| 12:25 – 13:55 | *Lunch (By Invitation)* |
| 13:55 – 14:35 | **Mechanomedicine: From Biomechanics and Mechanobiology to Mechanodiagnosis and Mechanotherapy**<br>Prof. Feng XU (Xi'an Jiaotong University, China) |
| 14:35 – 15:15 | **Microfluidic and AI-Driven Platforms for Next-Generation Assisted Reproduction**<br>Prof. Majid Ebrahimi WARKIANI (University of Technology Sydney, Australia) |
| 15:15 – 15:45 | **Spinal Astrocytes Heterogeneity in Neuropathic Pain Pathogenesis**<br>Prof. Jessica Aijia LIU (CityUHK) |
| 15:45 – 16:00 | *Coffee Break* |
| ***Session #6 – Student Poster Session*** | |
| 16:00 – 17:00 | **Prize Presentation Ceremony & Closing Remarks** |

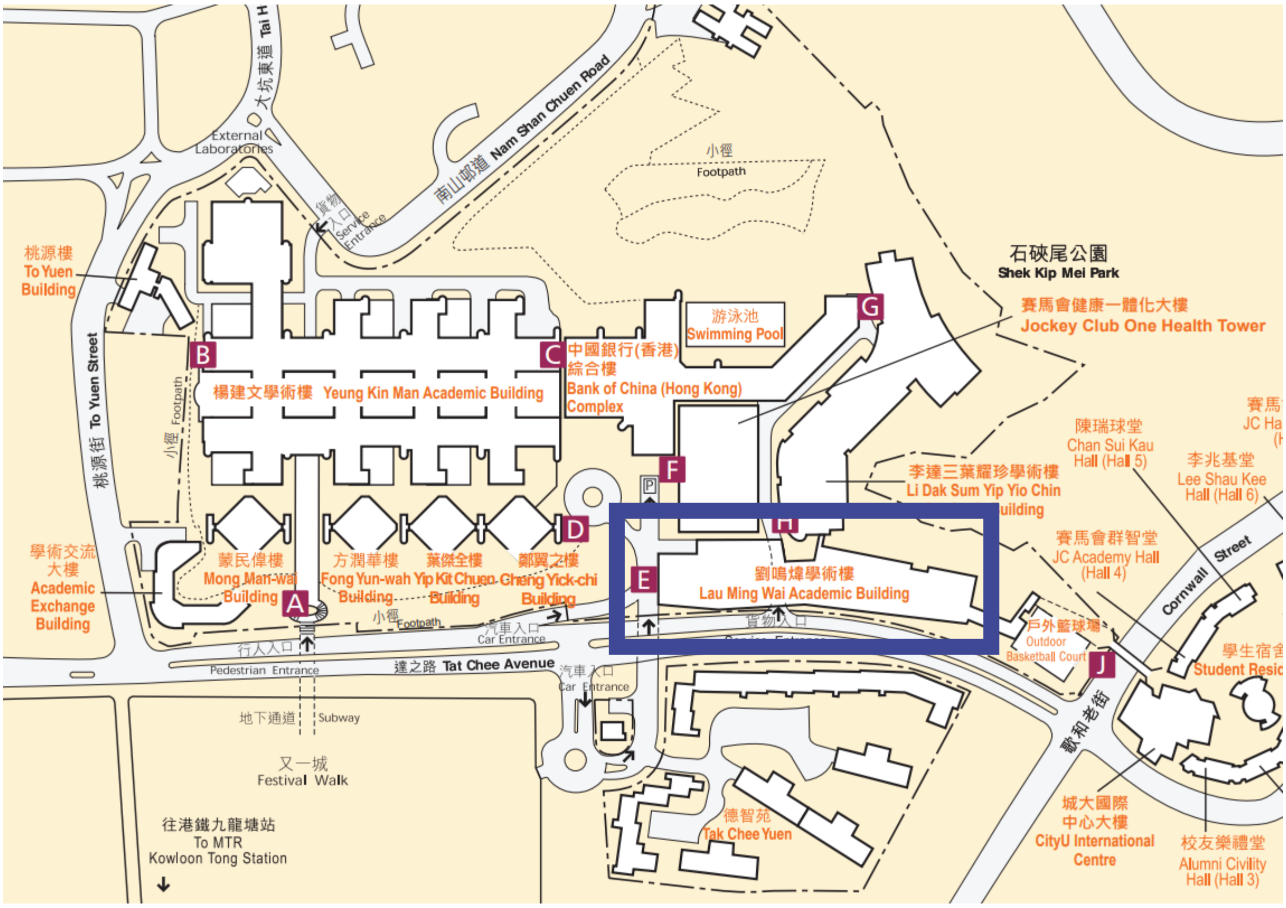
SCHEDULE

VENUE

# The Senate Room

19/F, Lau Ming Wai Academic Building (LAU), CityUHK

(Campus Map)
(LAU Building)




# How to get to CityUHK:

https://www.cityu.edu.hk/en/about/campus/getting-to-cityu

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83 Tat Chee Ave, Kowloon Tong
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香港城市大學
City University of Hong Kong

# Jin BAO

**Professor Jin BAO**

*Shenzhen Institutes of Advanced Technology,*
*Chinese Academy of Sciences, China*

**Biography**

Dr. Jin BAO is Principal Investigator of Neuroscience in Shenzhen Institutes of Advanced Technology (SIAT), Chinese Academy of Science (CAS). She received her Bachelor's degree of Biomedical Engineering from Zhejiang University in China and PhD of Neuroscience from Goettingen University in Germany. The research team led by Dr. Bao applies multi-disciplinary approaches to understand the brain's "language": how the brain encodes information into patterns of electrical and chemical signals. Dr. Bao was awarded Marie Curie Fellow from Europe and is now the PI of Excellent Young Researcher Grant from National Science Foundation of China (NSFC). Her research work has been published in leading neuroscience journals, such as Cell and Neuron.

**Brain Stimulation for Treatment of Parkinson's Disease: Network Perspective**

The central, and still largely unresolved, scientific challenge in brain-computer interface (BCI) technology is understanding the fundamental principle of neural code—how the brain encodes information into patterns of electrical and chemical signals. In medicine, development of treatments of brain disease also benefits from understanding neural codes that give rise to behaviors. This study demonstrates how targeted modulation of neural circuits regulates neuronal dynamics to alleviate motor symptoms of Parkinson's disease, which represents how potential applications in medicine can be derived from the fundamental principles of neural information processing.

# Lingqian CHANG

**Professor Lingqian CHANG**
*School of Biological Science and Medical Engineering,*
*Beihang University, China*

**Biography**

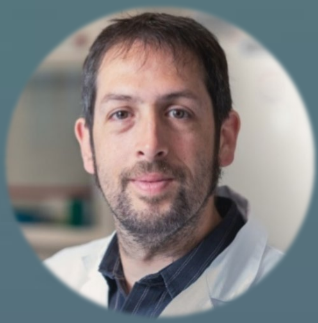
Lingqian Chang is the Vice Dean of the School of Medical Engineering at Beihang University, Dean of the Academy of Medical-Engineering Interdisciplinary Research, and Director of the Key Laboratory of Big Data-Based Precision Medicine under the Ministry of Industry and Information Technology. He previously served as an Assistant Professor at the University of North Texas. His primary research focuses on nano-electroporation and drug delivery technologies. He has been supported by prestigious programs including the National Science Fund for Distinguished Young Scholars, the Young Yangtze River Scholar, and the Young Thousand Talents Plan. He has published over 80 papers in journals such as Nature, Cell, Nature Electronics, Nature Photonics, Nature Protocols, PNAS, Nature Communications, and Science Advances as a corresponding author. His honors include the MIIT Distinguished Young Scholar Award, the Micro Nano Engineering Young Scientist Award, and the China Rising Scientist and Innovator Award. His technologies have been successfully commercialized, securing two rounds of funding and currently valuing the company at 120 million yuan.

**Biological Chip for Cell-Based Diagnosis and Therapy**

The precise sampling, detection, and regulation of biomolecules in living cells constitute a fundamental basis for the accurate diagnosis and treatment of major diseases such as cancer. However, the cell membrane poses a substantial barrier to the delivery of biotherapeutics, presenting a major challenge for cell-based diagnosis and therapy. To address this issue, the presenter has designed a biochip based on nano-electroporation technology, achieving efficient, safe, and controllable cell sampling and molecular delivery. In the field of cell therapy, it enhances the in vivo delivery efficiency of gene drugs from less than 1% (with conventional methods) to over 30%, demonstrating promising potential in organ injury repair and cancer treatment (Nature, 2025; Cell, 2025; Nature Electronics, 4; Nature Protocols, 2025). For cell detection, it reduces the genetic testing time for lung cancer and breast cancer from two days to 30 minutes (Nature Photonics, 2024; PNAS, 2024). In terms of cell sampling, it achieves a 100-fold improvement in sensitivity compared to traditional PCR technology for rapid diagnosis of diseases such as lung cancer and influenza (Nature Communications, 2023; Science Advances, 2024).

# Simon James CONN


**Professor Simon James CONN**
*College of Medicine and Public Health,*
*Flinders University, Australia*

**Biography**

Professor Simon Conn completed his PhD at Flinders University in 2006 and has become an internationally recognised molecular biologist for his pioneering discoveries in circular RNA biology and cancer research, being listed in the top 2% of global scientists since 2020. Simon has over 70 publications in journals including Cell (2 papers), Cancer Cell, Nature Biotechnology, Nature Plants, Nature Reviews Cancer and has over 8,500 career citations. He has been awarded over $18M in competitive research grants as chief investigator, continuously funded via research fellowships since 2011 and currently holds his second prestigious National Health and Medical Research Council Investigator Leadership Grant. Professor Conn's team investigates the role of circular RNAs in leukemia, brain cancer and in stem cell differentiation. His discoveries have reshaped scientific understanding of RNA function and opened new avenues for precision medicine to improve cancer survival.

**Formation and Function of Circular RNAs in Human Development and Disease**

Circular RNAs arise from canonical pre-mRNAs during RNA splicing and are covalently-closed, single stranded, largely non-coding RNA molecules (Conn et al (2024) Nature Reviews Cancer). My laboratory has shown the first evidence of directed circular RNA biogenesis (Conn et al (2015) Cell), and that these endogenous circular RNAs are able to drive oncogenic DNA mutations in the context of cancer (Conn et al. (2023) Cancer Cell) and even regulate plant floral patterning (Conn et al (2019) Nature Plants). This presentation will summarise our discoveries and elaborate on our unpublished data indicating the ability of circular RNAs, profiled across human embryonic stem cell differentiation, to be critical for neurectoderm lineage commitment. Undescoring the emergence of RNA therapeutics in contemporary biomedicine, I will also demonstrate how these Trojan Horses of Oncogenesis can be both therapeutics and druggable targets.

# Yanan DU

**Professor Yanan DU**
*School of Biomedical Engineering,*
*Tsinghua University, China*

**Biography**

Dr. Yanan Du received his B.Eng. degree in Chemical Engineering from Tsinghua University and Ph.D. in Bioengineering from National University of Singapore. Dr. Du completed his postdoctoral training at Harvard-MIT Division of Health Science and Technology, MIT and Brigham &Women's hospital, Harvard Medical School. In 2010, he joined the faculty at Department of Biomedical Engineering, School of Medicine, Tsinghua University as principal investigator, obtained full professorship in 2019. He was appointed as Vice Dean of the School of Biomedical Engineering, at Tsinghua University in 2024.

Dr. Du's research team have been innovating in the field of 'Microtissue Engineering by fine-tuning the microscale 3D regenerative or fibrotic microenvironments. provides innovative and effective tools and solutions for cell manufacturing, regenerative medicine, and pathology study. Dr. Du has published ~120 high-impact papers in journals including Nature Materials, Nature BME, PNAS. Meanwhile, He has obtained the grant of 20 patents, including 2 patents of micro-tissue engineering, which have been commercially translated with related products approved as the first cell pharmaceutical excipients by both China CDE and US FDA. He has been also serving as Editorial Board Members of five journals including Tissue Engineering Part C, ACS Biomaterials Science & Engineering and Cell Regeneration.

**Revolutionizing Cell Manufacturing and Regenerative Therapy with Microtissue Engineering**

I will introduce our efforts in 'Micro-Tissue Engineering', which integrates micro/nano fabrication technology, biomaterials, gene editing and biomechanics to construct 3D micro-scale cellular niches with precise control and biomimetic structure/function.

Through the construction of 'Stem Cell 3D micro-niches', large-scale, high-quality in vitro stem cell manufacture were realized to empower regenerative medicine. Compared to traditional methods, 3D cell manufacturing significantly reduces contamination risk, improves batch-to-batch consistency, and lowers material, labor, and time costs, while meeting stringent clinical quality standards. This innovation underpins the production of 'amimestrocel injection', China's first approved stem cell drug.

We also established a framework to decipher, reconstruct, and intervene in ‘fibrotic micro-niches’ by integrating measurements of ECM structure, viscoelasticity, and crosslinking. These findings inspire new therapies targeting fibrotic microenvironment components such as aberrantly expressed collagen fibers, which provide new avenues to promote tissue regeneration.

# Kathryn M. FERGUSON

**Professor Kathryn M. FERGUSON**

*Yale School of Medicine,*
*Yale University, United States*

**Biography**

Kathryn Ferguson is an Associate Professor of Pharmacology and a member of the Yale Cancer Biology Institute at Yale University. Her laboratory focuses on understanding extracellular control of receptor tyrosine kinase activation, and how this can be modulated by therapeutic agents. Dr. Ferguson began her training at Yale, where she obtained a Ph.D. in Biophysical Chemistry under the mentorship of Paul B. Sigler. She went on to complete postdoctoral training at the University of Pennsylvania Perelman School of Medicine, where she joined the Department of Physiology as an Assistant Professor in 2003, gaining tenure in 2008. She returned to Yale in 2015 to join the Yale Cancer Biology Institute and Department of Pharmacology. Dr. Ferguson is strongly committed to graduate education, serving as Chair of the Biochemistry and Molecular Biophysics Graduate Group at UPenn (2009-2015), and at Yale she is co-Director of Admissions for the Translational Biology, Molecular Medicine, Pharmacology, and Physiology (TMMPP) Track of the Combined Ph.D. Program in Biological and Biomedical Sciences (BBS), Yale University School of Medicine, and co-Director of Graduate Studies for the Pharmacology Graduate Program.

**Allosterically Regulation of Oligomeric Receptor Tyrosine Kinases**

Ligand-induced receptor dimerization is widely recognized as a component of the activation mechanism for most receptor tyrosine kinases (RTKs). Challenging this view, however, the insulin receptor (IR) family of RTKs are allosterically regulated covalent dimers. Moreover, substantial evidence supports the existence of pre-formed dimers of other RTKs. Notably, the epidermal growth factor receptors (EGFRs) from D. melanogaster and C. elegans) are known to form dimers mediated by the extracellular regions in the absence of ligand. In addition, numerous studies have suggested the presence of pre-formed dimers of cell-surface human EGFR, although the role of these is controversial, and no structure has been defined. I will describe the first high-resolution structural view of a preformed EGFR dimer seen in C. elegans (LET-23), from single-particle cryo-EM studies. Information from this structure led us to reveal in vivo that the preformed LET-23 dimer is not required for signaling by the receptor, but plays a key role in enhancing sensitivity to its EGF-like ligand (LIN-3). I will also describe the substantial conformational changes in LET-23 that occur upon binding of activating ligand. Our structures reveal unexpected similarities between regulation of LET-23 and the IR, suggesting that LET-23 may represent an evolutionary 'missing link' between the IR and EGFR families. I will discuss the implications of our findings for the activation of other preformed dimers of human RTKs.

# Megan HO


**Professor Megan HO**

*Department of Biomedical Engineering,*
*The Chinese University of Hong Kong, China*


**Biography**

Yi-Ping (Megan) Ho is currently a Professor, the Vice Chairman (Research) and the MSc Programme Director in the Department of Biomedical Engineering at the Chinese University of Hong Kong. She received her B.S. and M.S. in Power Mechanical Engineering from National Tsing-Hua University, Taiwan. She received her Ph.D. in Mechanical Engineering from the Johns Hopkins University. After her postdoctoral training with Duke University, she received the Young Elite Researcher Award from the Danish Research Council and started her independent career at Aarhus University in Denmark. She has published 90 peer-reviewed journal articles, 7 book chapters, 96 conference papers, edited 1 book and holds 6 granted patents. The results that she presented have been recognized internationally by the American Society of Gene Therapy and Controlled Release Society. Her research is focused on developing nanosensors and microfluidics as diagnostic tools that may potentially expand the capacity of disease detection and treatment evaluation.

**Microfluidics for Single Cell Applications**

Cellular heterogeneity among seemingly identical cells governs the wheel of cellular fate and consequently shapes embryonic development, tissue homeostasis, disease progression, and therapeutic outcomes. Understanding cellular heterogeneity has therefore become the holy grail in biology and medicine. Our research is centered on the development of platform technologies for the integrated processing and analysis of individual cells/organelles. This presentation will highlight our efforts on microfluidic-based deformability cytometry and droplet microfluidics, showcasing how these technologies may be applied for single cell investigation. In particular, I will discuss our recent advancement on a framework developed to improve the robustness of the so-called real-time deformability cytometry, as well as the development of quantitative phase deformability cytometry, combining the off-axis quantitative phase imaging with a microfluidic chip, to image the quantitative phase shift of cells. Subsequently, I will present a novel surfactant based on fluorinated plasmonic nanoparticles, rendering a previously unavailable feature of photo-responsiveness in droplets produced by microfluidics. I will also demonstrate our explorations on utilizing this light-responsive surfactant for rapid thermal cycling in the so-called droplet droplet digital polymerase chain reactions and on-demand selective release of trapped droplets. Last but not least, the presentation will touch base on a streamlined microfluidic platform integrating multistep processes for single-cell reverse transcription polymerase chain reaction in double emulsions, as well as a recently developed Generic Single Entity Sequencing (GSE-seq), a single-cell DNA sequencing platform based on degradable hydrogel beads for the long-read sequencing of single entities. Development of these platform technologies is expected to advance our understanding of single cell characteristics and address critical challenges in biomedical applications.

# Da JIA

## Professor Da JIA

*State Key Laboratory of Biotherapy,*
*Sichuan University, China*

**Biography**

Affiliation: West China Second University Hospital, State Key Laboratory of Biotherapy, Sichuan University

Position: Vice Director, Research Institute of West China Second University Hospital

Honors: Recipient of the National Science Fund for Distinguished Young Scholars (National "Jie Qing"); National High-Level Overseas Young Talent

Education:
B.S., Jilin University (2000)
Ph.D., Emory University, USA (2007)
Postdoctoral Training: UT Southwestern Medical Center/HHMI (2008-2015)

Research: Dr. Jia's group investigates the dynamic regulation of organelles, vesicular trafficking, and pathogenic mechanisms of related neurological disorders. His group is also dedicated in developing novel therapeutic strategies for these diseases.

Publications: over 70 papers with more than 7,800 citations. In the past 5 years, as corresponding author, published research articles in journals including Cell, Molecular Cell, Nature Metabolism, Nature Structural & Molecular Biology, Nature Communications, PNAS, Journal of Cell Biology, STTT, and Cell Research.

Professional Service:
Executive Vice President, Sichuan Society for Cell Biology
Vice Chair, Membrane Biology Committee, Chinese Biophysical Society
Vice Chair, Young Investigator Committee, Chinese Society for Cell Biology
Convener, Whangpoo Laboratory Leadership Academy (WLLA)

**A New Principle in Vesicle Trafficking**

Vesicle trafficking plays a vital role in maintaining cellular homeostasis by regulating the localization of various intracellular components in eukaryotic cells. Dysregulation of vesicle trafficking gives rise to a spectrum of disorders, including neurological, respiratory, immune, and metabolic disorders. The process of vesicle trafficking involves a series of interconnected events, including cargo recognition and vesicle formation mediated by protein coats at the donor membrane, movement along the cytoskeleton by coupling to motor proteins, vesicle capture by tethering proteins at the target membrane, and subsequent fusion mediated by SNARE complexes. Cargo recognition primarily occurs through coats and the associated proteins at the donor membrane. However, it remains unclear whether cargoes can also be selected at other stages of vesicle trafficking to further enhance the fidelity of the process. The WDR11-FAM91A1 complex functions downstream of the clathrin-associated AP-1 complex to facilitate protein transport from endosomes to the TGN. Here, we report that WDR11 directly and specifically recognizes a subset of acidic clusters, which we term super acidic clusters (SACs). WDR11 complex assembly and its binding to SAC-containing proteins are indispensable for the trafficking of SAC-containing proteins and proper neuronal development in zebrafish. Our studies thus uncover the first example of cargo proteins being recognized in a sequence-specific manner downstream of a protein coat.

Keywords: Vesicle trafficking, tether, SNARE, cargo selection, neuronal development

# Dayong JIN

**Professor Dayong JIN**
*School of Mathematical and Physical Sciences,*
*University of Technology Sydney, Australia*

**Biography**
Dayong Jin is a distinguished professor at UTS, an ARC Laureate Fellow, Fellow of Australian Academy of Technology and Engineering, and a Clarivate Top 0.1% Highly Cited Researcher, with expertise covering biomedical engineering, nanotechnology, microscopy, microfluidics, and analytical chemistry, to enable rapid detection of cells and molecules. He established the UTS Institute for Biomedical Materials & Devices (IBMD) to transform advances in phonics and materials into disruptive biotechnologies. He is the recipient of the 2017 Australian Academy of Science Engineering Science Award, and the 2017 Australian Prime Minister's Prize for Science. He published 300+ papers, including 40+ in Nature and its sister journals.

**Rapid Antibiotic Susceptibility Screening by Super-Resolution Microscopy**
Rapid and accurate antibiotic susceptibility testing (AST) has become critical for effective infection management and antimicrobial resistance (AMR) mitigation. While current clinical methods require more than 72 hours - significantly delaying life-saving treatments - our newly developed HAPA Platform offers an ultra-fast phenotyping solution capable of classifying Gram-negative pathogen susceptibility in just 2-4 hours.

Clinical validation studies demonstrate exceptional performance, with 97% concordance relative to FDA-approved broth microdilution methods across 75 clinical isolates, and a remarkably low 1.51% minor error rate that comfortably surpasses the FDA's stringent <3% threshold.

The HAPA Platform combines multiple key advantages including cost-effectiveness, scalability, automation compatibility, and point-of-care deployment potential. This positions the technology as both a future cornerstone for accelerated diagnostics and a powerful driver of global antimicrobial stewardship initiatives, promising to transform current clinical practice in infection management.

# Youngseok JU

**Professor Youngseok JU**
*Graduate School of Medical Sciences and Engineering,*
*Korea Advanced Institute of Science and Technology, Korea*

**Biography**

He serves as a Professor at the Graduate School of Medical Science and Engineering at KAIST (Korea Advanced Institute of Science and Technology), where he directs the Center for Somatic Mutation and Mosaicism (SMM). He received his MD (2007) and PhD (2010) from Seoul National University and conducted postdoctoral research at the Wellcome Sanger Institute. Notably, he conducted the first whole-genome analysis of a Korean individual (Nature, 2009) and discovered the KIF5B-RET fusion oncogene in lung adenocarcinomas (Genome Res, 2011). Presently, his research is primarily focused on understanding somatic mosaicism in the human body. He has authored several papers on somatic mutations acquired during early human embryogenesis (Nature, 2017, 2021), as well as on widespread LINE-1 retrotranspositions in human normal colon epithelium (Nature 2023) and mitochondrial DNA mosaicism in human normal cells (Nature Genetics 2024). Additionally, he is a co-founder of Inocras, a precision medicine company based in San Diego, USA.

**Somatic Mosaicism for Understanding Human Development and Ageing**

The human body consists of approximately 40 trillion cells, each accumulating genomic mutations as development, tissue homeostasis, and aging proceed. These mutations give rise to somatic mosaicism, a fundamental yet underexplored feature of human biology. Over the past decade, our research team has systematically investigated somatic mosaicism across multiple tissues and developmental stages, leveraging whole-genome analyses to reconstruct key aspects of human development and aging. Our work has quantified mutation accumulation rates during embryogenesis, reconstructed early developmental phylogenies of somatic cells, characterized mitochondrial heteroplasmy originating in the zygote, and uncovered mosaic patterns of LINE-1 retrotransposition and DNA methylation in colonic epithelial cells across the lifespan. Together, these findings illuminate the molecular trajectories that shape human tissues from conception through aging. In this presentation, I summarize these discoveries and discuss future research directions aimed at understanding how somatic mosaicism contributes to human development, aging, and disease.

# Chulhong KIM

**Professor Chulhong KIM**
*Department of Electrical Engineering,*
*Pohang University of Science and Technology, Korea*

**Biography**

Dr. Chulhong Kim studied for his Ph.D. degree under Prof. Lihong Wang at Washington University in St. Louis. He currently holds Namgo Chair Professorship, Young Distinguished Professorship, and Mueunjae Chair Professorship of School of Convergence Science and Technology (Head), Convergence IT Engineering (Department Chair), Electrical Engineering, Mechanical Engineering, and Medical Science and Engineering (Program Chair) at Pohang University of Science and Technology in Republic of Korea. He is the Director of Medical Device Innovation Center supported by Ministry of Education and the Vice-Director of POSTECH-CATHOLIC BioMed Engineering. He is also the Chief Executive Officer of Opticho Inc., a spinoff company to commercialize preclinical and clinical photoacoustic imaging systems. He was the recipients of the 2022 Korean Presidential Award from Ministry of SMEs and Startups, the Science and Technology Award of the Month for December 2021 by the Korean Minister of Science and ICT, the LINA+50 Creative Innovation Award, the 2020-2021 IEEE EMBS Distinguished Lecturer, the 2017 IEEE EMBS Early Career Achievement Award, the 2017 KAST Young Scientist Award, etc. He has published 275 peer-reviewed journal articles (Nature and Science portfolio journals, PNAS, Chemical Reviews, Radiology, IEEE Transactions, etc). His Google Scholar h-index and citations have reached 83 and over 22,300, respectively. His group's works have been selected for the 1st positions of the USenhance and TDSC-ABUS Challenges in the 26th International Conference on Medical Image Computing and Computer Assisted Intervention (MICCAI 2023), the 2022/2025 Photoacoustics Journal and TomoWave Best Paper Award and Seno Medical Best Paper Award Finalists continuously in Photons Plus Ultrasound Conference (Photonics West, SPIE), the 2020 Hitachi High-tech Best Presentation Award in High Speed Imaging and Spectroscopy Conference (Photonics West, SPIE), and the 2020 Microscopy Today Innovation Award. He has currently served as a Section Editor of Photoacoustics Journal (premier journal in the field), a Senior Area Editor of IEEE T. Medical Imaging, an Associate Editor of IEEE T. Biomedical Engineering, an Editorial Board Member of Biomedical Engineering Letters, etc. He is also elected as a member of the National Academy of Engineering of Korea (NAEK) and Young Korean Academy of Science and Technology (Y-KAST). He is a Fellow of the IEEE, SPIE, OPTICA, IAMBE and AIMBE.

**Multimodal Photoacoustic Ultrasound Imaging: From Bench To Bedside and Products**

Trans-energy imaging modalities have been significantly explored to overcome existing problems in conventional imaging modalities with respect to spatial/temporal resolutions, penetration depth, signal-to-noise ratio, contrast, and so on. Among them, photoacoustic imaging, an emerging hybrid modality that can provide strong endogenous and exogenous optical absorption contrasts with high ultrasonic spatial resolution, has overcome the fundamental depth limitation while keeping the spatial resolution. The image resolution, as well as the maximum imaging depth, is scalable with ultrasonic frequency within the reach of diffuse photons. In this presentation, the following topics will be discussed; (1) multiscale and multiparametric trans-energy imaging systems, (2) novel deep-learning powered image processing, (3) recent clinical study results in pathology, endocrinology, oncology, cardiology, dermatology, and radiology, (4) label-free ultrafast ultrasound Doppler imaging, and (5) efforts to commercialization.

# Chun Kit KWOK

**Professor Chun Kit KWOK**
*Department of Chemistry,*
*City University of Hong Kong, China*

**Biography**

Dr. Kit Kwok obtained his B.Sc. in Chemistry (2009) from the Chinese University of Hong Kong, after completing an exchange program at University of California, Los Angeles in 2007-2008. He completed his PhD in Pennsylvania State University (2014), mentored by Professor Philip C. Bevilacqua and Professor Sarah M. Assmann. In Apr 2014, Dr. Kwok worked as a Croucher Postdoctoral Fellow in University of Cambridge under Professor Sir Shankar Balasubramanian. In Oct 2016, Dr. Kwok's joined the City University of Hong Kong (CityU) as an Assistant professor and has been promoted to Associate professor in July 2021. Over the years, Dr. Kwok have received numerous awards, including CityU President Award (2019), Croucher Innovation Award (2019), Hong Kong Institute for Advanced Study Rising Star in Chemistry (2021), CityU Outstanding Research Award (2022), NSFC Excellent Young Scientist Fund (優青) (2022), RNA Society Early-Career Award (2024), and RGC Research Fellowship (2025). In 2022, he has been recognized as an elected member of Hong Kong Young Academy of Science (YASHK).

Dr. Kwok’s current research focus is to explore the roles of RNA structures and interactions in biology, especially the functions of G-quadruplex structures/interactions in diverse classes of RNAs, as well as characterizing their formation, dynamics, interactions, and functions in different species and their relevance to gene regulation, RNA metabolism and diseases. Two other ongoing research directions in the Kwok lab are to develop aptamer-based and peptide-based targeting tools for detection, imaging, intervention of these important RNA structures and interactions, as well as to invent innovative nucleic acid-based technologies for sensing chemical pollutants and pathogens.

To cultivate a stimulating learning environment for students and to establish the RNA community in Hong Kong, Dr. Kwok, together with Dr. Minh Le, has founded the Hong Kong RNA Club in Aug 2017 and organized RNA seminar and symposium events regularly (http://www.kitkwok.com/hk-rna-club.html). The Hong Kong RNA Club has been recognized and supported by the International RNA Society and various industrial companies. Dr. Kwok is currently one of the RNA Society’s Asia RNA research ambassadors.

**RNA G-Quadruplex Structures: Key Regulators in Biology and Promising Targets for Disease**

RNA G-quadruplexes (rG4s) are unique four-stranded structures formed by guanine-rich RNA sequences, playing crucial roles in various biological processes, including transcription, RNA processing, and translation. This talk will explore examples of rG4s found in both coding and non-coding RNAs, highlighting their interactions with specific protein partners and their diverse functional implications in mammalian cells. We will discuss how rG4s serve as key regulatory elements influencing gene expression and RNA stability, as well as our lab's innovative efforts to selectively target these structures using novel L-RNA aptamers. Given their association with diseases such as cancers and neurological disorders, these molecular and chemical tools hold significant potential for therapeutic applications. Specific case studies and some unpublished data will be presented to underscore the importance of understanding RNA G-quadruplexes in both basic biology and medicine.

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# Mark LEMMON

**Professor Mark LEMMON**
*Yale School of Medicine,*
*Yale University, United States*

**Biography**

Mark Lemmon is Alfred Gilman Professor and Chair of Pharmacology at Yale University and Co-Director of the Yale Cancer Biology Institute. His research focuses on mechanistic, structural and biochemical aspects of signaling by growth factor receptor tyrosine kinases. Educated in Oxford, England (BA Hons, 1st class, biochemistry), Yale (PhD in Mol. Biophysics and Biochemistry) and NYU (postdoc in pharmacology), he became an Assistant Professor of Biochemistry and Biophysics at the University of Pennsylvania Perelman School of Medicine in 1996, promoted to Associate Professor in 2001, and Full Professor in 2004. He was George W. Raiziss Chair of Biochemistry and Biophysics at Penn from 2008 to 2015. Dr. Lemmon moved to Yale in 2015 to build a new Cancer Biology Institute on the West Campus, and was appointed Chair of Pharmacology in 2023. Dr. Lemmon serves on the Editorial Boards of Cell, Molecular Cell, Science Signaling, and other journals, and is Chair of the Editorial Board of the Biochemical Journal. He was ASBMB Secretary from 2007 to 2013. Honors include the Dean's Award for Graduate Student Training at Penn (2005), Penn's Stanley Cohen Biomedical Research Award (2009), the Protein Society's Dorothy Crowfoot Hodgkin Award (2012) and Yale Cancer Center's Basic Science Research Award (2018). He was elected as a Fellow of the Royal Society (FRS) in 2016, as an ASBMB Fellow and a Life Fellow of the European Academy of Medical Sciences in 2023, and as a member of the Connecticut Academy of Science and Engineering (CASE) in 2024.

**Signaling by Growth Factor Receptor Tyrosine Kinases**

The 58 different human growth factor receptor tyrosine kinases (RTKs) provide a useful palette of signaling mechanisms used by receptors with a single transmembrane domain. Although initial studies of examples such as the epidermal growth factor receptor (EGFR) suggested a simple ligand-induced dimerization mechanism, it is now clear that RTK signaling is much more complex than this, with substantial diversity across the superfamily. Early work with *Drosophila* and *C. elegans* EGFRs suggested models for allosteric regulation of dimeric receptors. More recently, we have found that different growth factors that promote different cellular outcomes through EGFR do so by stabilizing receptor dimers with different strengths and lifetimes – leading to different signaling kinetics (transient versus sustained) as a basis for biased signaling. I will describe how we think EGFR distinguishes between its different activating ligands, and how this is lost with extracellular EGFR mutations seen in glioblastoma. I will also describe recent cryo-EM studies of intact EGFR bound to each of its seven different ligands, which have given us new insights into the dynamic nature of the activated receptor/ligand complex with important implications for developing new classes of targeted therapeutics.

# Zhou LI

**Professor Zhou LI**
*School of Biomedical Engineering,*
*Tsinghua University, China*

**Biography**

Li Zhou is a tenured Associate Professor at the School of Biomedical Engineering, Tsinghua University, and holds dual appointments as a Researcher at Tsinghua University's Clinical Medicine/Beijing Tsinghua Changgung Hospital, where he also serves as Director of the Vita Tech Innovation Center.

He has been honored with numerous prestigious awards, including the National Science Fund for Distinguished Young Scholars, the Beijing Natural Science Fund for Distinguished Young Scholars, the National Ten-Thousand Talents Program—Young Top-notch Talent, the Ministry of Education's New Century Excellent Talents Award, the Beijing High-Level Talent Development Plan, and the Beijing Science and Technology Rising Star Award.

Dr. Li also holds several key leadership positions within academic societies, including Council Member of the Chinese Society of Biomedical Engineering (CSBME) and Vice Chair of its Youth Committee; Vice Chair of the Intelligent Medical Materials and Devices Branch of the Chinese Materials Research Society; Youth Vice Chair of the Life Electronics Society of the Chinese Institute of Electronics; Vice Chair of the Metaverse Branch of the Chinese Association for System Simulation; and Vice Chair of the Rehabilitation Engineering Committee of the China Association of Assistive Products.

Additionally, he serves as an expert advisor on several national strategic research and planning committees, such as the strategic research group on sensors in advanced manufacturing for China's Medium- and Long-Term Science and Technology Development Plan and as a specialist in the guideline formulation and steering committee for the "Smart Sensors" priority project under the National Key R&D Program during the 14th Five-Year Plan. He is also appointed as an expert in the special review process for innovative medical devices under the National Medical Products Administration (NMPA).

Dr. Li's research focuses on novel bioelectronic devices and medical instrumentation. He received the Second Prize of the Beijing Science and Technology Award as the primary contributor and was awarded the Young Scientist Award by the International Federation for

Medical and Biological Engineering (IFMBE). He has authored 23 articles in prestigious journals such as Nature, Science, and Cell sub-journals, with over 30 papers recognized as ESI Highly Cited Papers and 3 papers ranking in the top 0.1% by citation frequency. His work has been cited more than 26,000 times, and his H-index stands at 86. Dr. Li has been named a Highly Cited Researcher by Clarivate Analytics and is listed among the world's top 2% most-cited scientists.

**Self-Powered Medical Devices and Electrical Stimulation Therapy**

Electrical activity is fundamental to human biological functions. By regulating electrical activity, we can alter the excitation and inhibition states of cells, tissues, and organs, thereby achieving disease treatment. Nanogenerators are a new type of energy conversion device that can convert low-frequency mechanical energy into electrical energy. Due to their diverse and flexible structures, a wide range of selectable materials, and high output voltage, they have attracted significant attention from researchers. We have conducted systematic research on building self-powered electronic medical devices and medical sensors by efficiently converting the mechanical energy of human motion into electrical energy to power electrical stimulation devices and biosensors. For example, using heartbeat-generated electricity, we have developed a symbiotic cardiac pacemaker that can operate long-term, and for the first time, conducted large animal experiments to enhance heart rates and treat arrhythmias; we have also developed biodegradable, self-powered electrical stimulation devices for directing the growth of nerve cells, enhancing electrical integration between cardiomyocytes, promoting osteoblast proliferation and differentiation, and accelerating skin wound healing. These devices can be fully absorbed by the body after the treatment process is completed. Additionally, we are researching minimally invasive, biocompatible, self-driven cardiovascular biosensing devices. These studies focus on self-powered electronic medical devices and electrical stimulation therapy, holding significant potential for transformation into clinically usable electronic medical devices and sensors.

# Jessica Aijia LIU

**Professor Jessica Aijia LIU**
*Department of Neuroscience,*
*City University of Hong Kong, China*

**Biography**

Jessica Ai-jia Liu is an Assistant Professor in the Department of Neuroscience, College of Biomedicine at City University of Hong Kong(CityU). Her research work is dedicated to unraveling the molecular mechanisms of glial-neuronal interactions in nervous system development, disorders, and repair, with a strong focus on translational medicine. Prof. Liu earned her PhD from the Department of Surgery at the University of Hong Kong (HKU), where she also completed her postdoctoral training in the School of Biomedical Sciences. She was appointed as a Research Assistant Professor in HKU's Department of Anaesthesiology in 2019 before joining CityU in 2022. Her impactful work has been published in leading international journals, including Nature Communications, PNAS, Advanced Science, and Annals of Neurology four filed patents. Prof. Liu's contributions have been recognized with several prestigious awards, such as the Early Career Award and Hong Kong Young Scientist Award. Her work has also garnered media attention, being featured in university press releases and highlighted by local and international outlets.

**Spinal Astrocytes Heterogeneity in Neuropathic Pain Pathogenesis**

Neuropathic pain (NeP) is a debilitating condition caused by nerve injury or disease, lacking effective treatments. Astrocytes in the dorsal horn are one of ket drivers of NeP development, while directly targeting them is not feasible due to their essential roles in neuronal homeostasis and pain resolution. A key unanswered question is how specific, deleterious astrocyte subsets emerge and are regulated during pain. Through a comprehensive approach involving metabolomic, single-cell transcriptomic, epigenomic profiling and regional astrocyte-specific perturbation studies, we identified distinct astrocyte clusters under physiological and pathological pain conditions.

We identified a molecular cascade initiated by nerve injury, beginning with aberrant phosphorylation of the astrocyte specifier Sox9. This led to the transcriptional upregulation of Hexokinase 1 (HK1), a critical enzyme for glycolysis, resulting in a high glycolytic rate. The consequent overproduction of lactate served as a substrate for histone lactylation (H3K9la), which remodeled gene promoters. This epigenetic reprogramming activated proinflammatory and neurotoxic transcriptional modules, driving the emergence of a neuroinflammatory astrocyte subset and persistent pain. Concurrently, we discovered a separate pathogenic pathway involving a distinct astrocyte subset expressing PAK1, which is crucial for blood-spinal cord barrier (BSCB) maintenance. Nerve injury activated astrocytic PAK1, disrupting astrocyte-endothelial interactions and causing BSCB leakage. This breach allowed peripheral monocytes to infiltrate the CNS, further exacerbating neuroinflammation and chronic pain.

Collectively, our findings unveil key mechanisms in regulating two distinct pathogenic astrocyte subsets for NeP development. These findings reveal multiple potential targets for developing precise therapeutic strategies to treat neuropathic pain by selectively modulating these pathogenic astrocyte subpopulations.

# Zhuang LIU

**Professor Zhuang LIU**
*College of Nano Science & Technology,*
*Soochow University, China*

**Biography**

Dr. Zhuang Liu is a Changjiang Distinguished professor at Soochow University. Dr. Liu's team is developing biomaterials tools for novel therapies against cancer and other diseases. Dr. Liu has authored over 400 peer-reviewed papers, with a total citation of >100,000 times and an H-index at 175. He has been listed as one of 'Highly Cited Researchers' (Materials, Chemistry) since 2015. He is a Fellow of the Royal Society of Chemistry (FRSC), a Fellow of the American Institute for Medical and Biological Engineering (AIMBE), and a Fellow of the Chinese Chemical Society (FCCS). He has received many awards, including the Xplorer Prize, the CCS-RSC Young Chemist Award, the Biomaterials Science Lectureship, the Periodic Table of Younger Chemists (IUPAC). He has founded a start-up company, InnoBM, which is focused on the development of novel therapeutics for cancer immunotherapy.

**Biomaterials to Boost Cancer Immunotherapy, from Bench to Bedside**

Cancer immunotherapy has attracted tremendous attention in recent years. In our recent studies, by employing rationally designed biomaterials as well as nanoscale delivery systems, we are able to enhance cancer immunotherapy via developing novel nano-vaccines, modulating tumor microenvironment, and achieving combinational immunotherapy, as evidenced by various animal model experiments. In this presentation, I would introduce our latest efforts in this exciting research direction. In particular, we have tried to combine various types of local tumor treatment methods with immunotherapy using biomaterials as the bridge. Stimulated by the tumor antigens released after local tumor ablation, the triggered immunological responses if in combination with immune checkpoint blockade (ICB) therapy could result in effective inhibition of tumor cells remaining in the body, promising for treatment of cancer metastasis. A strong immune-memory effect could also be observed after such treatment. Beyond that, we are also working on biomaterials that are capable of modulating tumor microenvironment for enhanced immunotherapy. A start-up company has been founded based on the technologies from our laboratory. Several pipelines are now being tested in clinical trials.

# Jinyao LIU

**Professor Jinyao LIU**

*The Institute of Molecular Medicine, School of Medicine,*
*Shanghai Jiao Tong University, China*

**Biography**

Jinyao Liu is a Distinguish Professor at Shanghai Jiao Tong University, China. After received his PhD at Shanghai Jiao Tong University under the supervision of Prof. Deyue Yan in 2013, Jinyao joined Prof. Ashutosh Chilkoti's group at Duke University (04. 2013-08. 2015) and Prof. Robert Langer's laboratory at MIT (09. 2015-03. 2018) as a postdoc associate. He is the Executive Editor of Journal of Nanobiotechnology (Springer Nature, IF=12.6) and Associate Editor of Biotechnology Journal (Wiley, IF=3.2). His current research interests include nanobiotechnology and microbial bioagents. As corresponding author, he has published over 50 papers during the past 5 years, including 3 Nat. Biomed. Eng., 2 Nat. Protoc., Matter, 8 Nat. Commun., 9 Sci. Adv., 2 J. Am. Chem. Soc., 2 Angew. Chem. Int. Ed., 8 Adv. Mater., etc. Jinyao was also awarded numerous prestigious grants and prizes, including the National Science Fund for Distinguished Young Scholars, Young Thousand Talents Program of China, etc.

**Nanocoated Bacterial Therapeutics**

As appealing living agents, bacteria not only play beneficial effects in immune modulation and homeostasis maintenance, but also are able to target and colonize specific bio-interfaces. As such, bacteria have been widely applied as either therapeutic agents or drug delivery vehicles for treating different diseases. However, the use of bacteria in vivo inevitably suffers from significant challenges, including rapid immune clearance, insufficient bioavailability, dose-dependent side effect, and uncontrolled colonization. Surface nanocoating of living bacteria can introduce different functional motifs on the surface and endow coated bacteria with various unique characteristics for application in disease treatment. Strategies that are able to form an entire coating on bacterial surface include:1-4 1) a chemical strategy of forming coated living bacteria by interfacial self-assembly; 2) a physical strategy of coating bacteria with eukaryotic cell membranes from red cells and yeast cells by mechanical extrusion; and 3) a biological strategy of encapsulating bacteria through either using a specific culture medium to induce the production of biofilm-self-coated bacteria or employing irradiation to trigger the formation of apoptotic body-coated bacteria. Coated bacteria that can be endowed with a wide range of coating-derived exogenous functions are highlighted and their appealing characteristics of reduced immune clearance, increased bioavailability, improved safety, and preferential colonization for treating diseases, particularly inflammatory bowel diseases and different types of cancer, are also enumerated. It is anticipated that the introduction of the progresses and perspectives of bacterial surface engineering can provide insights to guide further research to explore innovative living bacterial agents for various biomedical applications.

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# Joo Min PARK

**Professor Joo Min PARK**
*Center for Cognition and Sociality,*
*Institute for Basic Science, Korea*

**Biography**
I am a Research Fellow and Principal Investigator at the Center for Memory and Glioscience (IBS) and Professor at the University of Science and Technology (UST). My research focuses on the fundamental question of how the brain learns, remembers, and adapts, with particular emphasis on neuro–glia interactions and activity-dependent plasticity.
Early in my career, I made influential contributions to synaptic plasticity by uncovering how NMDA receptors, mGluR1/5, and activity-dependent genes such as Arc, Homer1a, and Narp regulate experience-driven synaptic modifications. My work, published in Cell, Nature Neuroscience, Neuron, and Cell Reports, has significantly shaped current understanding of molecular pathways underlying learning, stress vulnerability, addiction, and neurodevelopmental disorders.

In recent years, I established a new research direction centered on acoustic neuromodulation, introducing brainwave-patterned low-intensity ultrasound as a method to induce long-lasting changes in neural circuits. My studies demonstrated that ultrasound can modulate both neurons and astrocytes, enabling physiologically meaningful plasticity without surgical intervention. This work has led to publications in Brain Stimulation (2023), Science Advances (2024), and Nature Communications (2025).

My long-term goal is to create next-generation neuromodulation strategies that harness mechanotransduction and neuron–glia signaling to restore cognitive function, alleviate chronic pain, and treat disorders involving network-level dysregulation. I aim to build an interdisciplinary research program that advances both fundamental neuroscience and translational therapeutic development.

**Silent Waves, Powerful Effects: How Ultrasound Shapes the Brain**
Ultrasound (US) stimulation has emerged as a promising noninvasive neuromodulation strategy, yet its sustained effects and underlying mechanisms remain incompletely understood. Here, we demonstrate that brainwave-patterned US entrainment induces bidirectional and long-lasting plasticity across intact and diseased brain circuits. This form of

plasticity engages conserved molecular pathways of synaptic modulation, including NMDAR activation, BDNF/TrkB signaling, and de novo protein synthesis. Importantly, these effects are mediated not only by neurons but also through astrocyte-centered modulation, astromodulation, wherein US stimulation activates astrocytic TRPA1 channels to regulate astrocyte–neuron interactions and drive long-term circuit remodeling. Collectively, these findings delineate the cellular and molecular basis of US-induced long-term plasticity and establish brainwave-patterned US as a novel therapeutic paradigm for restoring circuit homeostasis and enhancing neuroplasticity in both healthy and pathological conditions.

# Hanae SATO

**Professor Hanae SATO**
*WPI Nano Life Science Institute,*
*Kanazawa University, Japan*

**Biography**

Hanae Sato is an RNA biologist whose research focuses on how cells regulate gene expression through mRNA decay, coordinated transcription–translation–decay processes, and RNA condensation. She earned her Ph.D. at the University of Tokyo and expanded her expertise in RNA biology during postdoctoral training at the University of Rochester and Albert Einstein College of Medicine, USA.

Sato uses advanced live-cell single-molecule mRNA imaging to visualize RNA dynamics and degradation in real time. By combining quantitative imaging with biochemical and biophysical approaches, her work reveals how RNAs transition between translation, decay, and condensate-associated states, offering new insights into the spatial and temporal organization of gene expression.

In 2022, she established her laboratory at the Nano Life Science Institute (NanoLSI), Kanazawa University. Her group investigates fundamental RNA regulatory mechanisms and develops RNA-targeted therapeutic strategies, particularly for genetic disorders caused by nonsense mutations.

Through interdisciplinary collaborations integrating imaging, molecular biology, and nano-scale analysis technologies, Sato aims to connect basic mechanistic understanding with therapeutic innovation, advancing a comprehensive view of how RNA regulation shapes cellular physiology and disease.

**Chasing RNA in Motion: Exploring RNA Dynamics in Cells and Beyond**

How do RNA dynamics across molecular and cellular scales shape gene regulation? Gene expression is highly dynamic, yet the coordination of transcription, translation, localization, and decay in individual mRNA molecules remains poorly understood. Our research addresses this question using single-molecule imaging approaches that allow real-time visualization of RNA life-cycle events with high spatiotemporal resolution. By combining multiple fluorescent RNA tagging systems, we can directly monitor transcriptional bursting, translation, mRNA localization, and decay in single cells.

In the first part of the talk, I will discuss the crosstalk between transcription and mRNA decay. Using live-cell imaging, we found that cytoplasmic mRNA decay can directly influence transcription in the nucleus. This feedback mechanism is invisible in bulk measurements and highlights how RNA regulation is coordinated across cellular compartments.

In the second part, I will present a collaborative project using high-speed atomic force microscopy (HS-AFM) to visualize RNA condensation. HS-AFM enables label-free imaging of biomolecules at nanometer resolution in real time, capturing dynamic structural changes that are difficult to observe by other methods. Liquid–liquid phase separation (LLPS) drives the formation of intracellular condensates composed of proteins and RNAs, but the contribution of RNA to early condensate formation is unclear. Using HS-AFM, we captured structural transitions during the earliest stages of RNA-driven LLPS, suggesting that intrinsic RNA folding properties modulate condensate formation and may influence stress granule dynamics and other LLPS-related processes.

Together, these approaches reveal previously hidden RNA behaviors and connect molecular events to cellular outcomes. By integrating live-cell single-molecule imaging with nanoscale HS-AFM, we provide a unified framework for understanding RNA dynamics and their role in gene regulation and condensate biology.

# Hermona SOREQ

**Professor Hermona SOREQ**
*Department of Biological Chemistry,*
*The Hebrew University of Jerusalem, Israel*

**Biography**

I study neuroscience and molecular biology regulators of nervous system functioning, including microRNAs and transfer RNA fragments (miRs, tRFs), and focusing on acetylcholine-mediated processes and inflammation in health and disease, in women and men and across ages. I developed a tRFs-based early RNA-based blood test diagnosis for Parkinson's disease, and study the multi-leveled mental disease-related cholinergic mechanisms and the anti-cholinergic impact of dementia medications in the elderly. Trained at The Hebrew University of Jerusalem (HUJ), Tel Aviv University, The Weizmann Institute of Science and the Rockefeller University, I joined The Hebrew University as a Faculty member in 1984, hold the endowed University Slesinger Chair in Molecular Neuroscience and am a founding member of the Edmond and Lily Safra Center for Brain Science (ELSC) and the elected President of the International Organization of Cholinergic Mechanisms. I served as the elected Dean of the HUJ Faculty of Science (2005-2008), authored hundreds of publications, including dozens in high-impact journals and won significant awards and funding from US, European and Israeli National foundations (e.g. an Advanced ERC Award and an Israeli I-Core Center of Excellence on mass trauma). I serve at the Board of Governors of The Hebrew University, the Neuro-Cure Center, Berlin, the ImmunoSensation Center, Bonn, the Advisory Boards of the UK-Israel Council, the Luxembourg University's Brain Research Center, and advise the Azrieli fellowships network in Israel. Notably, 29 of my trainees are faculty members in Israel and overseas. Others contribute to government and private biotechnology organizations and companies involved in Life Sciences.

**Transfer RNA fragments, Molecular Regulators of Neurodegeneration and Stress**

Both mental stress and neurodegenerative diseases notably exert long-term alterations of brain networks, but the mechanisms involved and the molecular initiators of these alterations are incompletely understood. Recently, we find that transfer RNA fragments (tRFs), which were previously considered insignificant tRNA-degradation products may actively contribute to these alterations. Over the past decade, tRFs emerged as functional small noncoding RNAs performing novel and intriguing roles both within the nervous system and in its brain-body interactions. In this context, specific tRFs changes found in blood samples from the umbilical cord of newborn babies, especially females may initiate long-lasting neuronal network rewiring; supporting this notion, the cholinergic targeted tRFs of newborn females reflect more drastically than male newborns the pre-delivery stress conferred on their mothers during their pregnancy; later on in life, ischemic stroke patients blood shows tRFs-mediated changes that suppress neuroimmune links. Furthermore, the accelerated cognitive deterioration in women living with Alzheimer's disease (AD) compared to male patients may reflect rapid loss of their mitochondrial genome-originated tRFs targeted to acetylcholine-regulated transcripts in the brain's nucleus accumbens. Also, altered cerebrospinal fluid and blood tRFs profiles can precede the emergence of Parkinson's disease, which might be rooted in far earlier trauma events. Together, our findings indicate that novel diagnostics/therapeutics avenues may open for mental and neurodegenerative diseases, especially in women, which may involve profiled interacting molecules that potentiate tRFs' impact on neuronal network activities and enable discoveries of the structure-function links involved.

# Li WANG

**Professor Li WANG**
*Department of Biomedical Sciences,*
*City University of Hong Kong, China*

**Biography**

Dr. Li Wang is an Assistant Professor in the Department of Biomedical Sciences at the City University of Hong Kong. Dr. Wang earned his Bachelor's degree in Biological Sciences from Yunnan University (1998–2002) and his Master's degree in Biochemistry and Molecular Biology from the Shanghai Institutes for Biological Sciences, Chinese Academy of Sciences (2003–2006). Dr. Wang completed his Ph.D. in Biomedical Sciences at the Chinese University of Hong Kong (2011–2014), where he also undertook postdoctoral training. His doctoral research focused on metabolic disorders and atherosclerotic cardiovascular diseases.

Dr. Wang's research interests include hemodynamic shear stress and its effects on the endothelium during atherosclerosis, the role of the Hippo signaling pathway in cardiovascular regulation, and the endocrine function of the endothelium in health and disease. He is also dedicated to identifying novel biomarkers for early diagnosis of atherosclerotic vascular disease, as well as discovering new compounds for its prevention and treatment. Additionally, his research explores inter-organ crosstalk and the impacts of physical exercise on cardiovascular health. Dr. Wang has co-authored 66 SCI-indexed publications in prestigious journals, including Nature, Circulation Research, Diabetes, Cardiovascular Research, PNAS, etc. with h-index of 29, Scopus H-index of 26. His groundbreaking research on endothelial Yap signaling in atherogenesis was published in Nature and earned him notable accolades, including the Research Excellence Award from the Chinese University of Hong Kong in 2017 and the Higher Education Outstanding Scientific Research Output Award (First-Class Award) from China's Ministry of Education in 2019.

**From Mechanotransduction to Anti-Atherososis Therapeutics**

Atherosclerosis remains a leading cause of cardiovascular morbidity and mortality worldwide. Endothelial cells, which line the inner surface of blood vessels, play a pivotal role in vascular health and disease. Mechanical forces generated by blood flow, particularly shear stress, significantly influence endothelial function and phenotype. Our lab focused on the impact of shear stress on atherogenesis, emphasizing the role of flow-induced mechanotransduction in endothelial inflammation.

For the first time, we identified Yes-associated protein (YAP), a key mechanotransducer activated under disturbed flow conditions. Further exploring the underlying mechanism revealed that disturbed shear force-induced YAP activation leads to endothelial inflammation through the Integrin-YAP-JNK cascade and promotes the development of atherosclerotic lesions. Suppression of components in the cascade ameliorated the atherosclerotic plaque formation. By elucidating the molecular mechanisms underlying YAP-mediated responses to shear stress, we provide new insights into the pathogenesis of atherosclerosis.

Translational studies stemming from this work explore YAP as a promising target for therapeutic intervention. In this presentation, I will give examples of the potential of establishing a drug screening platform for YAP inhibitors for atherogenesis treatment.

# Majid Ebrahimi WARKIANI

**Professor Majid Ebrahimi WARKIANI**
*School of Biomedical Engineering,*
*University of Technology Sydney, Australia*

**Biography**

Dr Warkiani is a Professor and CINSW Fellow in the School of Biomedical Engineering, University of Technology Sydney (UTS), Australia. He received his PhD in Bioengineering from Nanyang Technological University (NTU, Singapore), and undertook postdoctoral training at Massachusetts Institute of Technology (MIT, USA). Dr. Warkiani is the co-director of the Institute for Biomedical Materials & Devices (IBMD) at UTS and the co-founder of two startups, NeoGenix Biosciences (https://www.neogenixbiosciences.com/) and SMART MCs (https://smartmcs.com.au/). Dr Warkiani's research focuses on developing innovative cell biology solutions through microfluidics and organoid-on-a-chip systems. His team has pioneered advanced cell sorting technologies for stem cells, exosomes, circulating tumor cells, and fetal cells, enhancing diagnostic precision and advancing regenerative therapies. In organoid-on-a-chip technology, he designs sophisticated 3D platforms that replicate tissue functions, such as human skin, offering valuable insights into disease modeming and drug discovery with stem cell-derived exosomes.

Group webpage: www.warkianilab.com

**Microfluidic and AI-Driven Platforms for Next-Generation Assisted Reproduction**

Assisted reproductive technologies (ART) are undergoing a major transformation, driven by innovations in microengineering and artificial intelligence (AI). In this seminar, I will present our recent work aimed at improving sperm selection in IVF through the integration of biologically inspired microfluidic platforms and intelligent imaging tools. Sperm selection remains a critical yet highly subjective step in ART, often performed manually and prone to variability between embryologists. Drawing inspiration from natural selection processes within the female reproductive tract—such as rheotaxis and thigmotaxis—we have developed microfluidic systems that gently and efficiently guide motile sperm (*SpermGuide*) with greater physiological relevance. To complement these advances, we have developed and clinically validated AI-powered sperm identification and tracking tools, including SpermSearchAI, trained on thousands of clinical cases to support real-time selection of viable sperm from challenging surgical samples like mTESE. Our goal is not to replace clinical expertise but to enhance it—providing more consistent, objective, and accessible tools to support better patient outcomes. I will discuss our findings to date, ongoing clinical translation efforts, and the broader potential of these technologies in reshaping the future of assisted reproduction.

# Aiguo WU

**Professor Aiguo WU**
*Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences, China*

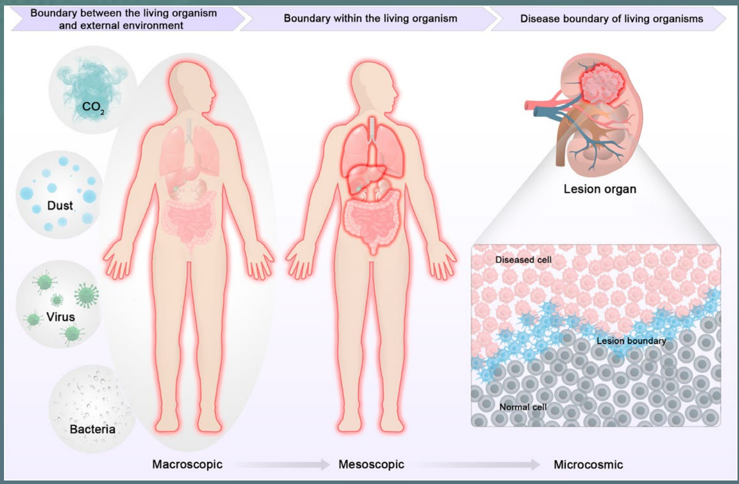
**Biography**

Professor Wu is performing his research at the interface of materials and biomedicine for creation of new magnetic and optical nanoprobes and multi-modal imaging technologies, conducting the research on tumor boundary recognition and mechanism analysis, and pioneering the field of boundarics in biomedicine. Professor Wu has published over 300 peer-reviewed articles (h-index 79), that were cited more than 25,000 times (Google Scholar) and 6 books. His research has also led to 151 awarded patents, with a variety of commercial applications. He has had the pleasure of supervising more than 36 PhD students who have received their doctoral degree, and 32 postdoctors. Professor Wu, is currently a fellow of FRSC (UK), FRSB (UK) and FBSE from the International Union of Societies for Biomaterials Science and Engineering (IUSBSE) and fellow of FCSBM (China), Chair Professor of Bio-/Nano-Materials, Ningbo Institute of Materials Technology and Engineering, Chinese Academy of Sciences (CAS)and Director of Ningbo Cixi Institute of Biomedical Engineering.

**Development of Cross-Scale Imaging Probes for Tumor Boundary Identification**

"Biomedical Boundarics" or "Boundarics in Biomedicine" is a cutting-edge interdisciplinary discipline involving multiple fields (e.g., bioscience, medicine, chemistry, materials science, and information science) dedicated to investigating and solving key scientific questions in the formation, identification, and evolution of living organism boundaries [1,2]. Specifically, it encompasses three levels: (1) the boundary between the living organism and the external environment; (2) internal boundary within living organism; and (3) the boundary related to disease in living organism. The advancement of research in biomedical boundarics is of great scientific significance for understanding the origin of life, the interaction between internal and external environments, and the mechanism of disease occurrence and evolution, thus providing novel principles, technologies, and methods for early diagnosis and prevention of major diseases, personalized drug development, and prognosis assessment, etc. In this talk, we will discuss the details on biomedical boundarics driven by an identification of tumor boundary, particularly on imaging probe materials.

Keywords: Boundarics, tumor boundary, imaging probes

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2. TUMOR BOUNDARICS IN BIOMEDICINE, AG Wu, **2025**, November, EDP Sciences & Science Press.

# Xi XIE

**Professor Xi XIE**

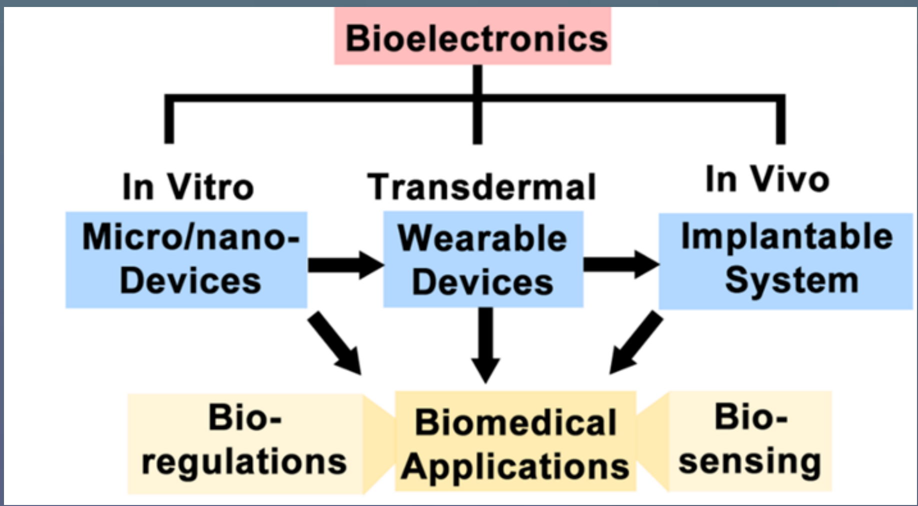
*School of Electronics and Information Technology (School of Microelectronics),*
*Sun Yat-Sen University, China*

**Biography**

Prof. Xi Xie is currently a full professor in the School of Electronics and Information Technology at Sun Yat-sen University, and was awarded by the National Science Fund for Distinguished Young Scholars (国家杰青). He is also an adjunct professor in the First Affiliated Hospital of Sun Yat-sen University. He graduated from Stanford University in USA with PhD degree on 2014, and then worked as a postdoc researcher in the Prof. Robert Langer's lab at Massachusetts Institute of Technology. On 2016, he started his own research lab at Sun Yat-sen University. Prof. Xi Xie has been focusing on the research on minimally invasive biosensing technologies. In specific, he has been working on microneedles or nanoneedles technologies for detection of biological information in vivo or even inside cells. He has published >100 manuscripts. As corresponding author, >100 manuscripts have been published on journals including Nature Materials (2025), Nature Sensors (2026), Nature Biomedical Engineering, Nature Nanotechnology, Nature Protocols, Nature Communications, Science Advances and et al. He has applied for >100 patents. He was also awarded by "MIT Technology Reviews Innovators Under 35 China", the "Outstanding Scientific Award of Chinese Institute of Electronics", and the "Microsystems & Nanoengineering Summit 2019 Young Scientist Award". He serves as Associate editor in Microsystems & Nanoengineering (Nature Publishing Group, JCR Q1) and Bio-designs and Manufacturing (JCR Q1).

**Minimally Invasive Bioelectronics**

Biomedical sensing is the key to access biological information. In recent years. The development of biosensing has gradually evolved from detection from blood detection level to in situ detection on tissue or cellular level. The technology of detection has also evolved from single point detection, to in situ sensing for long time or even sensing with high resolution. Among the existing in situ biosensing technologies, non-invasive sensing does not reach the detection target in the tissue, making it difficult to accurately reflect the real situation. Invasive sensing through implanted devices, on the other hand, has safety concerns. Therefore, how to balance safety and accuracy has been challenging in the field of biosensing. Microneedle arrays, as a minimally invasive technology, can balance the accuracy of invasive sensing with the safety of non-invasive sensing. Our research of minimally invasive biosensing technology employs microneedle arrays as the core structure to penetrate skin layers or cell membranes minimally invasively to detect information in tissues or cells in vivo. The key technologies we have developed for minimally invasive devices consist of three aspects: first, the delicate preparation of microneedle arrays and the preparation of highly sensitive sensing modules on the surface of microneedles; second, the development of technologies for efficient and safe penetration of microneedle arrays through tissue mucosa and cell membranes. The third is the design and development of miniaturized multifunctional circuit systems to support the functions of minimally invasive devices. The minimally invasive biosensing technologies we have developed have been validated and applied in penetrating cell membranes to record intracellular physiological signals, penetrating organ mucosa layers to measure biochemical signals in tissues, and penetrating skin layers to measure in vivo physiological signals, respectively. These minimally invasive biosensing technologies are expected to provide new tools and solutions for the diagnosis and treatment of major diseases.



# Feng XU

**Professor Feng XU**

*School of Life Science and Technology,*
*Xi'an Jiaotong University, China*

**Biography**

Dr. Feng Xu received his bachelor degree in both Thermal Energy and Power Engineering and Industrial Engineering in 2001, master degree in Thermal Energy Engineering in 2004, all from Xi'an Jiaotong University, and his Ph.D. in Engineering from the University of Cambridge in 2008. Subsequently, he worked as a research fellow at Harvard Medical School and Harvard-MIT Health Science & Technology (HST) from 2008 to 2011. In 2011, he founded the Bioinspired Engineering & Biomechanics Center (BEBC) at Xi'an Jiaotong University, where he currently holds the positions of full professor, Dean of the School of Life Science and Technology, and Director of The Key Laboratory of Biomedical Information Engineering of Ministry of Education.

**Mechanomedicine: From Biomechanics and Mechanobiology to Mechanodiagnosis and Mechanotherapy**

Throughout the history of technological development, the progress of any discipline is not isolated. Interdisciplinary research is necessary for modern scientific and technological innovation, and it is also the catalyst for rapid technology development. From traditional Chinese acupuncture and massage to modern physical rehabilitation, mechanics has always been associated with the development of medicine. As an endogenous element of living organisms, mechanical factors can not only serve as important criteria for disease diagnosis but are also efficient and powerful in disease intervention. With the development of science and technology, our understanding of life and health has gradually increased, especially in the past few decades. The rapid development in biomechanics and mechanobiology research has continuously raised the importance of mechanics in life and health. This has promoted the emergence and development of mechanopathology and mechanomedicine, and meanwhile has revitalized the field of biomedicine. In the context of the rapid development of biomedical engineering technology and its protection of public health, emphasizing the intersection of mechanics and biomedicine helps guide the high-quality development of science. Conducting mechanopathology and Mechanomedicine studies which are based on biomechanics and biophysics is of significant importance in promoting industries of medical diagnosis and treatment, as well as providing multiple new ideas for developing intervention measures for serious and chronic diseases.

1. The Key Laboratory of Biomedical Information Engineering of Ministry of Education, Xi’an Jiaotong University, Xi'an 710049, P.R. China
2. Bioinspired Engineering and Biomechanics Center (BEBC), Xi’an Jiaotong University, Xi'an 710049, P.R. China
Keywords: Mechanomedicine, Biomechanics, Mechanobiology

# Hao YIN

**Professor Hao YIN**
*Medical Research Institute,*
*Wuhan University, China*

**Biography**

Hao Yin is a Hongyi Distinguished Professor at the Medical Research Institute of Wuhan University. He earned his bachelor's degree from Nanjing University and his PhD from the University of Colorado Anschutz Medical Campus. He completed his postdoctoral training in the laboratory of Robert Langer and Daniel Anderson at the Massachusetts Institute of Technology and then as a researcher at Vertex Pharmaceuticals. Since 2018, he has established and led a research lab at Wuhan University. His research focuses on developing genome editing tools and their biomedical applications. Dr Yin has published over 50 research articles including Cell, Nature Biotechnology and Nature Methods. His research has been featured by major international media and highlighted in commentary articles in Nature series journals.

**Engineering the Structure of Genome**

Genomic duplication is a fundamental force in molecular evolution and a major contributor to genetic and complex diseases. Chromosomal inversion, another prevalent form of structural variation, profoundly influences cellular fitness and genome stability. Here, we introduce two genome engineering platforms: amplification editing (AE), which enables programmable DNA duplication, and Prime Editing-based Inversion with Enhanced Performance (PIE), which achieves efficient induction of large-scale inversions in mammalian cells. AE supports the duplication of human genomic regions from as small as 20 base pairs to as large as 100 megabases (Mb), a scale comparable to entire human chromosomes. Using PIE, we reconfigured human chromosomes from metacentric to telocentric by inverting segments of 30 Mb and 100 Mb. Together, these technologies establish powerful approaches for engineering chromosomal structural variations, with broad applications in both medicine and biotechnology.

# Xinge YU


## Professor Xinge YU

*Department of Biomedical Engineering,*
*City University of Hong Kong, China*


**Biography**

Xinge Yu is a Professor of Biomedical Engineering at City University of Hong (CityU), the Member of the Hong Kong Young Academy of Sciences, Young Member of Hong Kong Academy of Engineering. He is the Associate Director of Institute of Digital Medicine at CityU, Associate Director of Hong Kong Centre for Cerebro-cardiovascular Health Engineering. Prof Yu is the recipient of NSFC Distinguished Young Scientist Grant (Scheme A), RGC Research Fellow, NSFC Excellent Young Scientist Grant (Hong Kong & Macao), Innovators under 35 China (MIT Technology Review), New Innovator of IEEE NanoMed, MINE Young Scientist Award, Stanford's top 2% most highly cited scientists etc. Prof. Yu is the Associate Editor of Science Advances, Microsystem & NanoEngineering, Bio-Design and Manufacturing etc. Xinge Yu's research group is focusing on skin-integrated electronics and systems for VR and biomedical applications. He has published 200 papers in Nature, Nature Materials, Nature Biomedical Engineering, Nature Machine Intelligence, Nature Communications, Science Advances etc., and 50 patents filed/granted.

**Skin Interfaced Electronics for Healthcare and VR/AR**

Soft bio-integrated electronics have attracted great attentions due to the advantages of soft, lightweight, ultrathin architecture, and stretchable/bendable, thus has the potential to apply in various areas, especially in the field of biomedical engineering. By engineering the classes of materials processing and devices integration, the mechanical properties of the flexible electronics can well match the soft biological tissues to enable measuring bio signals and monitoring human body health. In this report, we will present materials, device structures, power delivery strategies and communication schemes as the basis for novel soft bio-integrated electronics. For instance, we will discuss a wireless, battery-free platform of electronic systems and haptic interfaces capable of softly laminating onto the skin to communicate information via spatio-temporally programmable patterns of localized mechanical vibrations. The resulting technology, which we refer as epidermal VR, creates many opportunities in social media/personal engagement, prosthetic control/feedback and gaming/entertainment. Other demonstrations will include skin-interfaces human machine interface for robotic VR, and skin like patches as sensors for healthcare monitoring.

# Ziyi YU

**Professor Ziyi YU**
*College of Chemical Engineering,*
*Nanjing Tech University, China*

**Biography**

Ziyi Yu is a Professor of Chemical Engineering and the Deputy Director of the State Key Laboratory of Materials-Oriented Chemical Engineering at Nanjing Tech University. He is a recipient of the National Science Fund for Excellent Young Scholars, Principal Investigator of key projects in the National Key R&D Program and a Jiangsu Distinguished Professor. His research focuses on materials synthetic biology and microfluidic technologies, with an emphasis on engineering living materials through the integration of microorganisms and polymer systems. Prof. Yu's contributions have been recognized with numerous honors, including the Second Prize of the Higher Education Outstanding Scientific Research Achievement Award (Natural Science), the Second Prize of the China Invention Association Innovation Award, and the Jiangsu Science and Technology Third Prize

**Living Materials Powered by Microorganisms**

Living materials powered by microorganisms represent a rapidly emerging research frontier that bridges materials science with synthetic biology. By integrating living cells as active and functional components, these materials acquire unique capabilities such as self-adaptation, self-assembly, and metabolic activity-features unattainable in traditional inert systems. This talk focuses on designing and constructing microorganism-driven living materials through the development of microcarriers that can sustain long-term microbial viability, stable proliferation, and programmable function. Using droplet microfluidic techniques, the microcarriers, spatial structure and physicochemical properties are precisely tuned to achieve accurate microbial encapsulation and maintain functional activity, establishing well-controlled microenvironments for cell growth and metabolism. Building on this foundation, 3D bioprinting is employed to assemble the microcarriers into porous architectures and hierarchical scaffolds that support programmable spatial organization and dynamic response. These engineered living systems are further applied in biocatalysis and therapeutic contexts, demonstrating their ability to stabilize microbial consortia, modulate intercellular interactions, and maintain long-term functional output. Overall, this work reveals how confined microenvironments shape microbial adaptation and how material design principles can be leveraged to guide microbial behavior. It highlights the evolution of living materials from simple encapsulation systems toward fully programmable multicellular constructs, establishing a foundation for their future deployment in green biomanufacturing, precision medicine, and environmental remediation.

# Jiachen ZHANG

**Professor Jiachen ZHANG**

*Department of Biomedical Engineering,*
*City University of Hong Kong, China*

**Biography**

Dr. Jiachen Zhang is an Assistant Professor with the department of Biomedical Engineering at the City University of Hong Kong since 2021. He graduated with a Ph.D. degree from University of Toronto in 2018. After graduation, Dr. Zhang worked from 20192021 as a Humboldt Research Fellow at Max Planck Institute for Intelligent Systems, Germany. Dr. Zhang's research focuses on the development of millimeter- and micrometer-scale robotic systems for biomedical applications. He utilizes magnetic field as the primary actuation and control signal for multi-functional small-scale robots. Dr. Zhang envisions that small-scale robots are ideal candidates to meet the demands posed by modern healthcare in its evolution to minimize invasiveness.

**How Miniaturized Robots Could Revolutionize Healthcare by Minimizing Invasiveness and Enabling new capabilities**

We are witnessing an exponential growth of the impact of small-scale robotics in recent years. These tiny robots have a characteristic length from several millimetres down to tens of nanometers. This extreme miniaturization enables these robots to access constrained space buried deep inside human body, and thus it dramatically benefits minimally invasive diagnosis and treatment. In this talk, I will introduce my past and current research projects in small-scale robotics. I will talk about the design, fabrication, control, and application of these robots. Furthermore, I will discuss how this emerging field could have imminent and far-reaching positive impact on modern healthcare.