Advanced Biomedical Instrumentation Centre
先進生物醫學儀器中心

ABIC International Symposium on Biomedical Research Translation 2024

The ABIC symposium serves as a global and cross-disciplinary platform for scientists, researchers, practitioners, policymakers, and thought leaders to exchange ideas on biomedical innovation, translation, and commercialization. Attendees will benefit from engaging with domain experts in the rapidly changing biomedical areas.

Date & Time:
7 June 2024
09:30 – 17:30
(Registration start @ 09:00)

Venue:
Conference Hall 04-07, Hong Kong Science Park

Register:

Prof. Sun Dong, JP
Secretary for Innovation, Technology and Industry

Dr. Sunny Chai, SBS, BBS, JP
Chairman, HKSTP

Prof. Andreas Bausch (TU Munich)

Prof. Barbara Chan (CUHK)

Prof. Rong Fan (Yale)

Prof. Daniel Fletcher (UC Berkeley)

Prof. Wei Gao (Caltech)

Prof. Tuomas Knowles (Cambridge)

Prof. Jia Liu (Harvard SEAS)

Prof. Lingyan Shi (UCSD)

Prof. Anderson Shum (HKU)

Prof. David Weitz (Harvard SEAS)

Prof. Denis Wirtz (Johns Hopkins)

Prof. Kenneth Wong (HKU)

Prof. Bing Xu (Brandeis)

Prof. Shrike Zhang (Harvard Medical School)

Prof. Yongguan Zhu (UCAS)

Ms. Yingzi Ming
Upgrade Biopolymers Ltd. (ABIC spin-off)

Mr. Martin Musiol
Brainsmart Technology Ltd. (ABIC spin-off)

Dr. Virgile Thiévenaz
CNRS Researcher, PMMH Lab, ESPCI Paris

Prof. Kevin Tsia
Conzeb Limited

Dr. Joy Zhuo Xu
PharmaEase Tech Ltd. (ABIC spin-off)

Ms. Luyao Zhang
OptoC Technology Ltd. (ABIC spin-off)

Organizer:
Advanced Biomedical Instrumentation Centre 先進生物醫學儀器中心

Supporting Organizations:
Hong Kong Life Sciences Society 香港生命科技青年會
HKSTP
Techno-Entrepreneurship Core, The University of Hong Kong

ABIC International Symposium on Biomedical Research Translation 2024

Date:	Jun 7, 2024 (Fri)
Time:	0930-1730 (Registration start @ 0900)
Venue:	Conference Hall 04-07, Building 10W, Hong Kong Science Park

Organizer:

Advanced Biomedical Instrumentation Centre

Supporting Organizers:

Hong Kong Life Sciences Society	Hong Kong Science & Technology Parks Corporation	Techno-Entrepreneurship Core, the University of Hog Kong

Abstract:

The symposium brings together leading scientists, researchers, clinicians, industry professionals, and policymakers from around the world to exchange knowledge and discuss the latest advancements in the field. It aims to bridge the gap between scientific discoveries and their successful translation into clinical applications and innovative therapies. It provides a platform for collaboration, networking and knowledge sharing, fostering interdisciplinary interactions among experts in various fields, including molecular diagnostics, high throughput screening, drug delivery, cellular biology, medical technology and healthcare.

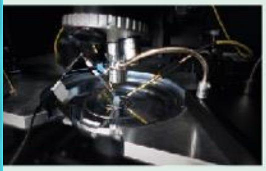
In addition to scientific sessions, the symposium will feature ABIC's exhibits, showcasing the latest advancements in biomedical technologies, devices, and pharmaceuticals. Attendees will have the opportunity to engage with industry stakeholders, explore potential collaborations, and gain insights into the future direction of biomedical research and healthcare.

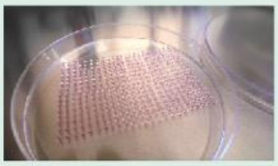
Rundown

Time	Topics	Speakers
0900 - 0930	Registration	
0930 - 0940	Welcome Remark	Prof Anderson Shum
0940 - 0950	Opening Remark	Dr. Sunny Chai, SBS, BBS, JP
0950 - 1000	Keynote Speech	Prof. Sun Dong, JP
1000 - 1005	Group Photo	
1005 - 1030	Keynote 1: Understanding antimicrobial resistance under One Health Framework	Prof Yongguan Zhu (U of CAS)
1030 - 1050	Talk 1: 3D(Bio) Printing for in-situ Regeneration	Prof. Shrike Zhang (Harvard Medical School)
1050 - 1105	MoU Ceremony	
1105 - 1155	Networking Break	ABIC Spinoffs' showcases
1115 - 1135	Talk 2: Organoids in Droplets	Prof. Andreas Bausch (TU Munich)
1135 - 1155	Talk 3: Building optical devices for medicine with consumer electronics	Prof. Daniel Fletcher (UC Berkeley)
1155 - 1215	Talk 4: Soft and flexible bioelectronics for brain-machine interfaces	Prof Jia Liu (Harvard SEAS)
1215 - 1235	Talk 5: Skin-Interfaced Wearable Biosensors	Prof. Wei Gao (Caltech)
1235 - 1250	Entrepreneurs/ Researchers' Sound Bite (5-min each) 1. Brain-computer Interface // Mr Martin Musiol (Brainsmart Limited) 2. GaN based Photonic Sensor // Ms Luyao Zhang (OptoC Technology Limited) 3. Unfold the hidden value of agricultural by-streams // Ms Yingzi Ming (Upgrade Biopolymers Ltd)	
1250 - 1400	Lunch	
1400 - 1420	Keynote 2: Droplet Microfluidics for Bio-Medicine	Prof. David Weitz (Harvard SEAS)
1420 - 1440	Talk 6: Biomedical Imaging Empowered by Ultrafast Photonics	Prof Kenneth KY Wong (HKU)
1440 - 1500	Talk 7: Identification and Engineering of Type-2 Function for Enhancing CAR T Cell Therapy	Prof. Rong Fan (Yale)
1500 - 1520	Talk 8: New technology for Protein Science	Prof. Tuomas Knowles (Cambridge)
1520 - 1540	Talk 9: Multimodal Metabolic Nanoscopy for Studying Aging and Diseases	Prof. Lingyan Shi (UCSD)
1540 - 1600	Talk 10: All-aqueous assembly	Dr. Guo Wei (HKU), Prof Anderson Shum (HKU)
1600 - 1610	Networking Break	ABIC Spinoffs' showcases
1610 - 1630	Talk 11: Multiphoton Microfabrication and Micropatterning – a platform technology for cell niche engineering	Prof Barbara Chan (CUHK)
1630 - 1650	Talk 12: Self-assembly in Vivo	Prof. Bing Xu (Brandeis U)
1650 - 1710	Talk 13: Cell therapies for Solid Tumors	Prof. Denis Wirtz (Johns Hopkins)
1710 - 1730	Entrepreneurs/ Researchers' Sound Bite (5-min each) 1. Fragmentation of Complex Fluids // Dr Virgile Thievenaz (ESPCI Paris) 2. Rescue of Insoluble Drug Candidate // Dr Joy Xu (PharmaEASE Ltd) 3. Toward Petabyte-scale Label-free Cellular Morphological Profiling of Health and Disease // Prof. Kevin Tsia (Conzeb Limited)	
1730 -1735	Closing Remark	Prof Anderson Shum

Advanced Biomedical Instrumentation Centre
先進生物醫學儀器中心

Biomedical instrumentation plays a critical and increasing role, albeit invisible to most people, in the healthcare industry by enabling more accurate diagnoses, effective treatments, and earlier intervention and prevention capabilities. Advancing the development of cutting-edge medical devices, actuators and sensors requires collaboration among talented scientists, engineers and clinicians, as well as an environment that facilitates the commercialisation of research results into real-world applications that are accessible to a broader population.





Community Values

ABIC aims to foster collaboration among top-notch engineers, scientists, and clinicians worldwide, to build a first-rate Hong Kong-based laboratory for developing next-generation microfluidics and innovating the best low-cost instrumentation technologies for precision medicine, in taking advantage of Hong Kong's vibrant start-up community to commercialize research works tailored for all patients, spreading benefits beyond.

Our Mission

The Centre accelerates progress in translating advanced biomedical instrumentation from research and development into real-world healthcare solutions that elevate a broader spectrum of medical benefits to address health and well-being for all.

Ir. Prof. Anderson Ho Cheung Shum

Centre Director,
Advanced Biomedical Instrumentation Centre (ABIC)

Professor, Department of Mechanical Engineering,
Faculty of Engineering, HKU

Welcome Message

Dear Members, Partners, and Friends,

It is my distinct honor and privilege, as the ABIC Director, to welcome you to the 'ABIC International Symposium on Biomedical Research Translation 2024.' This esteemed event is co-organized by ABIC, the HKU Techno-Entrepreneurship Core, the Hong Kong Life Science Society, and the Hong Kong Science and Technology Park.

The symposium will shine a spotlight on the remarkable advancements in biomedical research, including groundbreaking developments in Organoids, Biomedical Imaging, disease modeling, Biosensors, and related biomedical instrumentation. Crucially, it will also emphasize the pivotal role of the collaborative efforts from researchers, industry professionals, and policymakers. The overarching aim of this event is to bridge the gap between scientific discoveries and their successful translation into clinical applications and innovative therapies.

We are confident that this symposium will inspire new ideas and foster valuable collaborations. It is with deep gratitude that we acknowledge the guest speakers who have graciously shared their innovative work and expertise.

Thank you.

Keynote 1

Prof Yong-Guan Zhu
Research Centre for Eco-environmental Sciences,
Chinese Academy of Sciences, Beijing, China

Understanding antimicrobial resistance under One Health framework

The microbiome contributes to ecosystem sustainability and human health through complex interactions between the physical environment and other organisms dwelling in that environment. Given the enormous diversity and functions performed by ecosystem microbiomes, in this presentation, I will use antimicrobial resistance (AMR) as an example to explore microbial connectivity across entire ecosystems. We find that both urban wastewater treatment plants and intensive animal farms are major sources of AMR pollution in the environment. Once anthropogenic AMR enters the environment, it can be spread through mass microbial movement within the ecosystem and transported through various pathways at regional and even global scales. I will highlight the application of single-cell methodologies for *in situ* analysis of AMR, specifically targeting the "distribution-diffusion-development" (3D) process of active antibiotic-resistant bacteria (ARB). Targeted single-cell sorting and metagenomics make it possible to pinpoint “who is doing what and how” in the most active ARB, and to track the physiological evolution of resistance and analyze the underlying genetic mechanisms. In summary, AMR within the ecosystem can be cycled between humans, animals, plants and the environment, and we should adopt the One Health framework in assessing microbial cycling.

Biography:
Prof. Yongguan Zhu is the Director General of the Institute of Urban Environment, Chinese Academy of Sciences (CAS). He has been working on the biogeochemistry of nutrients, metals and emerging pollutants (such as antibiotics and antibiotic resistance genes). Professor Zhu is a leader in taking multi-scale and multi-disciplinary approaches to soil and environmental problems. Before returning to China in 2002, he was working as a research fellow (Supported by the Royal Society London), the Queen's University of Belfast, UK (1994-1995); and a postdoctoral fellow in The University of Adelaide (1998-2002), Australia. He obtained his BSc from Zhejiang Agricultural University in 1989, and MSc from CAS in 1992, and then a PhD in environmental biology from Imperial College, London in 1998. Dr Zhu is currently the co-editor-in-chief of Environmental Technology & Innovation (Elsevier), associate editor of Environment International (Elsevier), and editorial members for a few other international journals. He is a scientific committee member for the ICSU program on Human Health and Wellbeing in Changing Urban Environment, and served for nine years as a member of Standing Advisory Group for Nuclear Application, International Atomic Energy Agency (2004-2012). Professor Zhu is the recipient of many international and Chinese merit awards, among them including TWAS Science Award 2013, National Natural Science Award 2009; Professor Zhu has published over 255 papers in international journals, and these publications have attracted over 10,000 citations (Web of Science) with an H-index of 56.

Talk 1

Prof. Y. Shrike Zhang
Department of Medicine, Harvard Medical School
Division of Engineering in Medicine, Brigham and Women's Hospital
Harvard Stem Cell Institute, Harvard University
Broad Institute, MIT and Harvard

3D(Bio) Printing for in-situ Regeneration

Three-dimensional (3D) bioprinting has emerged as a class of promising techniques in biomedical research for a wide range of related applications. Specifically, vat-polymerization techniques such as digital light processing (DLP), are highly effective methods of bioprinting, which can be used to produce high-resolution and architecturally sophisticated structures. Nevertheless, conventional DLP bioprinting systems are hampered by several key limitations such as their bulky footprints, their insufficient multi-material bioprinting capacities, and their usual requirements on mechanically strong materials for bioprinting of volumetric tissues due to the layer-by-layer fabrication mechanism. In this talk, I will discuss our recent efforts on developing various DLP-based platforms that successfully tackle these challenges. Additional discussions towards the more newly developed volumetric bioprinting strategy will also be covered. These platforms will likely provide new opportunities in constructing functional regenerative and tissue modeling products in the future.

Talk 2

Prof Andreas R. Bausch
Center for functional Protein Assemblies (CPA), Center of Organoid Systems (COS), Technical University Munich, Germany

Email: abausch@mytum.de

Organoids in Droplets

Self-organized 3D organoids, originating from a single cell, emerge as a potent tool for both medical and fundamental research. The three-dimensional architecture of the organoid mimics more closely organ structures in vivo, what makes them a very good model for studying many diseases, including cancer. A limitation of organoids growing in bulk is the heterogeneous population of 3D and 2D cells and lack of reproducibility and high cost of production. Here I present a microfluidic approach allowing to encapsulate pancreatic tumor organoids within micron sized collagen droplets, which helps to overcome these limitations.

Biography:
Prof. Bausch targets a quantitative understanding of the mechanical properties of cells, active matter and the mechanisms of self-organization in molecular and organoid systems. After his Ph.D. in physics at TUM and his postdoctoral stay at Harvard University he accepted the Chair position at the Technical University in 2008. He received an ERC Starting, Advanced Grant and Synergy Grant. He is founder of two start up companies and spin offs. He is founding director of two research buildings and centers: the Center of Functional Protein Assemblies (2014) and Center for Organoid Systems (2021).

Talk 3

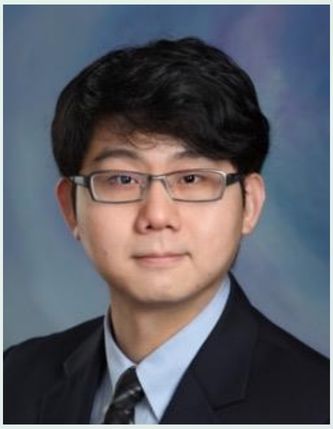
Prof Daniel A. Fletcher
Professor; Purnendu Chatterjee Chair in Engineering Biological System,
Dept of Bioengineering
UC Berkeley

Building optical devices for medicine with consumer electronics

Optical imaging is at the heart of many medical diagnoses, from diagnosing retinal diseases to monitoring ear infections. However, the availability of medical instruments and trained clinicians limits access to basic healthcare in many areas. My laboratory is interested in harnessing mass-produced consumer electronics, specifically mobile phones, to create medical devices that enable great access to diagnostic testing. This talk will present recent work developing mobile phone based medical devices and discuss the challenges associated with scaling and translation.

Biography:
Dr. Daniel Fletcher is Professor of Bioengineering and Biophysics at UC Berkeley and the Pernendu Chatterjee Chair of Engineering Biological Systems. He is also a Chan-Zuckerberg Biohub Investigator, Faculty Scientist at Lawrence Berkeley National Laboratory, Visiting Investigator at the Gladstone Institute of Virology, and currently serves as Faculty Director of the Blum Center for Developing Economies at UC Berkeley. Dr. Fletcher received a B.S. from Princeton University, a D.Phil. from Oxford University, and a Ph.D. from Stanford University. He received UC Berkeley's Carol D. Soc Distinguished Graduate Student Mentoring Award, is an elected Fellow of the American Institute for Medical and Biological Engineering, and served as a White House Fellow in the Office of Science and Technology Policy.

Talk 4



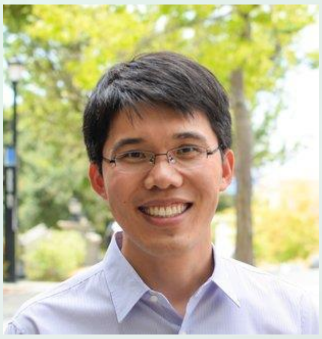
Prof Jia LIU
Assistant Professor
School of Engineering and Applied Sciences
Harvard University

Soft and flexible bioelectronics for brain-machine interfaces

Large-scale brain mapping through brain-machine interfaces is important for deciphering neuron dynamics, addressing neurological disorders, and developing advanced neuroprosthetics. Ultimately, brain mapping aims to simultaneously record activities from millions, if not billions, of neurons with single-cell resolution, millisecond temporal resolution and cell-type specificity, across three-dimensional (3D) brain tissues over the course of brain development, learning, and aging. In this talk, I will first introduce flexible and soft bioelectronics with tissue-like properties that can track electrical activity from the same neurons in the brain of behaving animals over their entire adult life. Specifically, I will discuss the fundamental limitations of the electrochemical stability of soft electronic materials in bioelectronics and present our strategies to overcome these limitations, enabling a scalable platform for large-scale, long-term, stable brain mapping. Then, I will discuss the creation of “cyborg organisms”, achieved by embedding stretchable mesh-like electrode arrays in 2D sheets of stem/progenitor cells and reconfiguring them through 2D-to-3D organogenesis, which enables continuous 3D electrophysiology during the development of human stem cell-derived brain organoids and animal embryonic brains. Next, I will highlight our current efforts that merge 3D single-cell spatial transcriptomics, machine learning, and electrical recording, enabling cell-type-specific brain activity mapping. In conclusion, I will envision the fusion of soft and flexible electronics, spatial transcriptomics, and AI for a comprehensive brain cell functional atlas to enhance future brain-machine interface applications.

Biography:
Professor Liu received his PhD in Chemistry from Harvard University in 2014, after which he completed postdoctoral research at Stanford University from 2015-2018. He joined the faculty at the Harvard School of Engineering and Applied Sciences as an Assistant Professor in 2019. At Harvard University, Professor Liu’s lab focuses on the development of soft bioelectronics, cyborg engineering, genetic/genomic engineering, and computational tools for addressing questions in brain-machine interfaces, neuroscience, cardiac diseases, and developmental disorders. Professor Liu has pioneered in bioelectronics where he developed new paradigms for soft electronic materials and nanoelectronics architectures for “tissue-like electronics”, as well as their applications for long-term stable brain-machine interface, high-density cardiac mapping, stem cell maturation, and multimodal spatial biology. His work has been recognized as a milestone in bioelectronics by Science in 2013 and 2017, and as Most Notable Chemistry Research and Top 10 World-Changing Ideas in 2015. He has received numerous awards for his independent career, including the 2022 Inventors Under 35 (Global List) by MIT Technology Review, the 2022 Young Investigator Program (YIP) Award from the Air Force Office of Scientific Research (AFOSR), the 2021 NIH/NIDDK Catalyst Award from the NIH Director’s Pioneer Award Program, the 2020 William F. Milton Award, and the 2019 Aramont Award for Emerging Science Research Fellowship. He is also the cofounder and scientific advisor of Axoft, Inc., a brain-machine interface company.

Talk 5



Prof. Wei Gao, Ph.D.
Assistant Professor of Medical Engineering
Ronald and JoAnne Willens Scholar
Investigator, Heritage Medical Research Institute
Division of Engineering and Applied Science
California Institute of Technology

Skin-Interfaced Wearable Biosensors

The rising research interest in personalized medicine promises to revolutionize traditional medical practices. This presents a tremendous opportunity for developing wearable devices toward predictive analytics and treatment. In this talk, I will introduce our efforts in developing wearable biosensors for non-invasive molecular analysis. Such wearables can autonomously access body fluids (e.g., human sweat) across the activities and continuously measure a broad spectrum of analytes including metabolites, nutrients, hormones, proteins, and drugs. To manufacture these high-performance nanomaterial-based wearable biosensors at a large scale and minimal cost, we employ techniques such as laser engraving, inkjet printing, and 3D printing. The clinical utility of our wearable systems is assessed through a series of human trials, focusing on precision nutrition, stress response and mental health assessment, chronic disease management, fertility management, and drug personalization. I will also delve into our ongoing research into energy harvesting from both the human body and the surrounding environment, with the ultimate aim of achieving battery-free, wireless wearable biosensing. The integration of these wearable technologies has the potential to unlock a wide spectrum of applications, ranging from personalized monitoring and diagnostics to innovative therapeutic solutions.

Keynote 2

Prof. David Weitz

Mallinckrodt Professor of Physics and of Applied Physics,
John A. Paulson School of Engineering and Applied Sciences,
Harvard University

Droplet Microfluidics for Bio-Medicine

Biography:
Weitz received his PhD in physics from Harvard University and then joined Exxon Research and Engineering Company, where he worked for nearly 18 years. He then became a professor of physics at the University of Pennsylvania and moved to Harvard at the end of the last millennium as professor of physics and applied physics. He leads a group studying soft matter science with a focus on materials science, biophysics and microfluidics. Several startup companies have come from his lab to commercialize research concepts.

Talk 6

Prof Kenneth Kin-Yip Wong

Professor
Department of Electrical & Electronic Engineering,
The University of Hong Kong,
Email: kywong@eee.hku.hk

Biomedical Imaging Empowered by Ultrafast Photonics

Biophotonics, the marriage of photonics and biological sciences, is an emerging frontier providing challenges for fundamental research and opportunities for new technologies. It deals with interactions between light and biological matter. One of the most spectacular developments is in the regime of ultrafast optical imaging, which is enabled by the state-of-art fiber optic components and technologies. In this presentation, we will present our latest research advancement in the directions of spectroscopy, microscopy and tomography, and how they are enhanced by the ultrafast photonics technologies.

Biography:
Kenneth Kin-Yip Wong received combined B.E. (1st class honor with medal award) degree in electrical engineering and B. S. degree in physics from the University of Queensland, Brisbane, Australia, in 1997. He received the M.S. degree in 1998 and the Ph.D. degree in 2003, both in electrical engineering at Stanford University. He was a member of the Photonics and Networking Research Laboratory at Stanford University. His research field included novel optical generation, photonic parametric processing, ultrafast optical communications and imaging (spectroscopy, microscopy, and tomography). He is author or coauthor of over 450 journal and conference papers. He worked in Hewlett-Packard Laboratories as research engineer and contributed in projects included parallel optics and VCSEL in 1998-99. He won the Best Teacher Award 2005-06, Outstanding Young Researcher Award 2008-09, Outstanding Teaching Award 2012-13 (Team), and Outstanding Research Student Supervisor Award 2019-20 at the University of Hong Kong. He served at Publications Committee of SPIE, as an Associate Editor of IEEE Photonics Technology Letters and Optica (formerly OSA) Optics Express. He is a senior member of the IEEE (Photonics Society) and recently selected as the 2022 SPIE and 2023 Optica Fellows. He is also the immediate past Chair of IEEE Hong Kong Section.

Talk 7

Prof Rong Fan
Harold Hodgkinson Professor of Biomedical Engineering
School of Engineering & Applied Science
Yale University

Identification and Engineering of Type-2 Function for Enhancing CAR T Cell Therapy

Biography:
Dr. Fan's research is focused on the development and deployment of single-cell and spatial multi-omics profiling technologies, often based on microfabricated devices, to investigate pathogenesis and therapeutic response of complex human diseases including cancer, autoimmunity, and cardiovascular disease. In particular, his laboratory is interested in hematologic malignancies, brain tumors, and systemic lupus erythematosus. He is also interested in cellular immune function characterization and the application to cancer immunotherapies. A microchip technology his laboratory developed for simultaneous measurement of 42 immune effector proteins in single cells, which remains the highest multiplexing to date for a single-cell protein secretion assay, has been commercialized as IsoCode and IsoLight, and currently used by >100 pharmaceutical companies and medical centers in the U.S. and around the world. Recently, his laboratory developed a novel NGS-based approach called DBiT-seq for spatial transcriptome mapping, spatial high-plex protein mapping, and spatial epigenome mapping, which may find wide-spread applications in developmental biology, cancer research, neuroscience, and immunobiology.

Talk 8

Prof Tuomas Knowles
Professor of Physical Chemistry and Biophysics
1920 Professor of Physical Chemistry
Yusuf Hamied Department of Chemistry
University of Cambridge

New Technology for Protein Science

Biography:

Tuomas Knowles studied Biology at the University of Geneva, and Physics at ETH Zurich. He moved to Cambridge in 2004 to work towards his PhD in the Cavendish Laboratory and the Nanoscience Centre. In 2008 he was elected to a Research Fellowship at St John's College, Cambridge, and was then appointed to a University Lectureship in Physical Chemistry in 2010. Since 2015 he is Professor of Physical Chemistry and Biophysics in the Department of Chemistry and at the Cavendish Laboratory, and is co-director of the Centre for Misfolding Diseases at the University of Cambridge. He is a co-founder of four biotechnology companies, and was also the Cambridge Enterprise Academic Entrepreneur of the year in 2019.

Talk 9

Prof Lingyan Shi
Assistant Professor
Shu Chien-Gene Lay Department of Bioengineering,
University of California San Diego

Multimodal Metabolic Nanoscopy for Studying Aging and Diseases

Metabolism is a complex biochemical process in living organisms that involves different biomolecules and consists of various reaction steps. To understand the multi-step biochemical reactions involving various components, it is essential to elucidate in-situ dynamics and the correlations between different types of biomolecules at subcellular resolution. In this context, we have developed and integrated deuterium-probed picosecond stimulated Raman scattering (DO-SRS), multiphoton fluorescence (MPF), and second harmonic generation (SHG) into a single nanoscopy system to study metabolic changes in aging and diseases.

By developing A-PoD and PRM algorithms, our current multimodal metabolic nanoscopy provides super-resolution with hyperspectral volumetric imaging capability. Combined with deuterated molecules (glucose, amino acids, fatty acids, water molecules, etc.) as probes, the metabolic heterogeneity of the brain, adipose tissue, liver, muscle, retina, kidney, lung, and ovaries (in Human, Mouse, and Drosophila tissues) is quantitatively imaged. One of our significant findings unveiled that lipid turnover diminishes more rapidly in aged female Drosophila compared to males. Meanwhile, dietary restriction, downregulation of the insulin/IGF-1 signaling (IIS) pathway, or activation of AMPK, notably changed lipid metabolism in aged or Alzheimer’s brains. This platform equips researchers to quantitatively visualize various molecular events within the same region of interest, offering tools for early-stage disease detection, prognosis, and treatment, as well as fostering a deeper mechanistic understanding of the fundamentals of aging and diseases.

Biography

Lingyan Shi is currently an Assistant Professor in the Shu Chien-Gene Lay Department of Bioengineering at UC San Diego. Her Lab’s research focuses on developing high-resolution, high-speed metabolic nanoscopy for studying aging and diseases. She discovered the "Golden Window" for deep tissue imaging and developed metabolic imaging platforms including “DO-SRS” and “STRIDE”. Shi group at UC San Diego transformed SRS into a super-resolution multiplex nanoscopy using A-PoD and PRM algorithms, uncovering lipid metabolic dynamics in various organ tissues during aging processes and disease development. Dr. Shi holds 8 awarded patents and 7 pending ones. She received the Blavatnik Regional Award for Young Scientist in 2018, the Hellman Fellowship Award in 2021-2022, the "Rising Star Award" from Nature Light Science & Applications in 2021, the “Advancing Bioimaging Scialog Fellow" by RCSA and CZI, the “David L. William Lecture & Scholarship” Award from the Kern Lipid Conference, and the “Sloan Research Fellow” Award in Chemistry in 2023, and the 2024 rising star award by BMES-Cell and Molecular Bioengineering (CMBE) society.

Talk 10

Prof Anderson Shum
Centre Director,
Advanced Biomedical Instrumentation Centre (ABIC)

Professor, Department of Mechanical Engineering,
Faculty of Engineering,
The University of Hong Kong

All-aqueous assembly

Biography:
Prof. Anderson Ho Cheung SHUM received his B.S.E., summa cum laude, in Chemical Engineering from Princeton University, and S.M. and Ph.D. degree in Applied Physics from Harvard University. He is currently a Professor in the Department of Mechanical Engineering and a core member in the Biomedical Engineering Programme at the University of Hong Kong, and Associate Vice-President (Research and Innovation) at the University of Hong Kong. He is also the Director of the Advanced Biomedical Instrumentation Centre in Hong Kong. He leads a group studying soft matter and microfluidics. His research interests include liquid–liquid phase separation, emulsions, microfluidics, emulsion-templated materials and soft matter.

Talk 11

Prof Barbara Chan

Professor
School of Biomedical Sciences
The Chinese University of Hong Kong

Multiphoton Microfabrication and Micropatterning – A platform technology for cell niche engineering

Cells reside in a complex and tissue-specific microenvironment or niche in native tissues. Multiple types of cell niche factors orchestrate to maintain the phenotype and determine the fate of cells. Technologies able to recapitulate, reconstitute or engineer such cell niche in vitro are useful platforms for cell-niche interaction and mechanistic studies, as well as rationalized biomimetic design for scaffolds. Our lab has developed a multiphoton microfabrication and micropatterning (MMM) technology to reconstitute a range of cell niche factors including soluble signals, extracellular matrices, neighboring cells, topological features and mechanical cues, in a precisely, quantitatively and spatially controlled manner. In this presentation, the technical capabilities and the biomedical applications of the MMM cell niche engineering platform will be discussed.

Biography:
Prof. Chan obtained her Bachelor degree in Biochemistry and PhD degree in Surgical Science from the Chinese University of Hong Kong. She received Postdoctoral Fellowship in Laser Medicine from the Massachusetts General Hospital in US. Prof. Chan served the Biomedical Engineering programme of the University of Hong Kong since 2003. She joined the School of Biomedical Sciences, Department of Biomedical Engineering, and Institute of Tissue Engineering and Regenerative Medicine, of the Chinese University of Hong Kong since 2023.

Prof. Chan established the Tissue Engineering Laboratory with the vision to improve the quality of life in patients through bioengineering biomaterials- and stem cell-based tissues for personalized therapies. Her research interests centered around tissue engineering and regenerative medicine, natural and biomimetic biomaterials, multi-cellular organoids and tumoroids, mechano-regulation, multiphoton microfabrication and micropatterning, cell niche engineering and laser medicine.

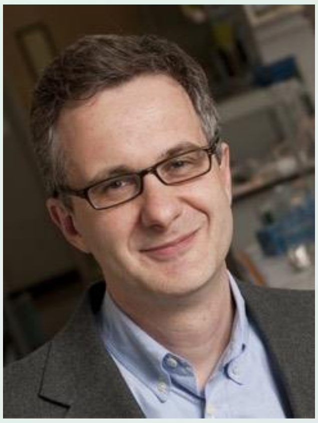
Talk 12

Prof. Bing Xu
Department of Chemistry,
Brandeis University

Self-assembly in Vivo

This talk discusses self-assembly inside living cells (**vivo-SA**). Self-assembly, a cornerstone of life, has profoundly influenced materials development. However, despite remarkable progress over the past five decades, most research has focused on mimicking cellular self-assembled structures rather than their functions, and primarily in vitro. It's time to explore self-assembly within the **very foundation of life, the cell**. Cells offer a unique and complex environment compared to in vitro settings, brimming with a vast array of biological molecules that can influence the self-assembly of synthetic molecules. vivo-SA not only **equips synthetic molecules with novel functionalities, but also opens the door to engineering cells themselves as the ultimate biomaterial** using physicochemical approaches instead of solely biological ones. We will use enzyme-instructed self-assembly (EISA), **a powerful technique that combines** enzymatic reactions and self-assembly, as an example to showcase the power of vivo-SA, such as the use of EISA to generate intracellular supramolecular assemblies for targeting mitochondria, endoplasmic reticulum, Golgi apparatus, lysosomes, and nucleus. Particularly, we will show the use of EISA to generate peptide assemblies, as in-situ nanomedicine, for developing therapeutics to counter drug resistance and immunosuppression in cancer therapy.

Talk 13



Prof. Denis Wirtz
Vice Provost for Research and Theophilus Halley Smoot Professor
Department of chemical and biomolecular engineering
Johns Hopkins University

Cell therapies for Solid Tumors

Chimeric antigen receptor (CAR) T cells express antigen-specific synthetic receptors, which upon binding to cancer cells, elicit T cell anti-tumor responses. CAR T cell therapy has enjoyed success in the clinic for hematological cancer indications, giving rise to decade-long remissions in some cases. However, CAR T therapy for patients with solid tumors has not seen similar success. Solid tumors constitute 90% of adult human cancers, representing an enormous unmet clinical need. Current approaches do not solve the central problem of limited ability of therapeutic cells to migrate through the stromal matrix. We discover that T cells at low and high density display low- and high-migration phenotypes, respectively. The highly migratory phenotype is mediated by a paracrine pathway from a group of self-produced cytokines that include IL5, TNFα, IFNγ, and IL8. We exploit this finding to “lock-in” a highly migratory phenotype by developing and expressing receptors, which we call velocity receptors (VRs). VRs target these cytokines and signal through these cytokines’ cognate receptors to increase T cell motility and infiltrate lung, ovarian, and pancreatic tumors in large numbers and at doses for which control CAR T cells remain confined to the tumor periphery. In contrast to CAR therapy alone, VR-CAR T cells significantly attenuate tumor growth and extend overall survival. This work suggests that approaches to the design of immune cell receptors that focus on migration signaling will help current and future CAR cellular therapies to infiltrate deep into solid tumors.

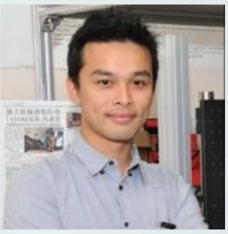
Researcher/ Entrepreneur Sound Bite Session:

Unfold the hidden value of agricultural by-streams

Ms Yingzi Ming
(CEO of Upgrade Biopolymer Ltd)

Fragmentation of Complex Fluids

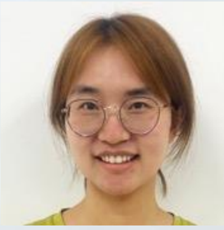
Dr Virgile Thievénaz
(CNRS Researcher, PMMH Laboratory, ESPCI Paris)



Prof. Kevin Tsia
(Founder, Conzeb Limited)

Brain-computer Interface

Mr Martin Musiol
(Project Manager of Brainsmart Ltd)



Rescue of Insoluble Drug Candidate

Dr Joy Xu
(Scientist, PharmaEase Ltd)

GaN based Photonic Sensor

Ms Luyao Zhang
(Business Development lead, OptoC Limited)

We extend our sincere gratitude to our supporting organizations for their generous support of this symposium.

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See you in next year!

Advanced Biomedical Instrumentation Centre
先進生物醫學儀器中心