香港中文大學理學院
FACULTY OF SCIENCE
THE CHINESE UNIVERSITY OF HONG KONG

Science Faculty 60th Anniversary Distinguished Science Lectures cum Research Day 2023

Learning from Academicians

11 June 2023 (Sun) | 2:00 – 6:30 pm

LT1, Esther Lee Building, The Chinese University of Hong Kong

Science Empowers Your Dreams

PROGRAMME

2:00 - 2:15 pm	**Welcoming Remarks** ***Professor SONG Chunshan*** Dean of Science
2:15 - 3:25 pm	**Sharing from FoS Young Faculty Members** ***Professor CHOW Hei Man Kim*** School of Life Sciences ***Professor ZHUANG Xiaohong*** School of Life Sciences ***Professor XIA Jiang*** Department of Chemistry ***Professor LUI Lok Ming Ronald*** Department of Mathematics ***Professor WU Yilin*** Department of Physics ***Professor LIN Zhixiang*** Department of Statistics ***Professor TAI Pui Kuen Amos*** Earth and Environmental Sciences Programme
3:25 - 3:45 pm	**Break with Tea Refreshment (20 minutes)**
3:45 - 4:45 pm	Keynote Lecture and Sharing: **Harnessing Actin Assembly Forces to Drive Vesicle Formation during Clathrin-mediated Endocytosis** ***Professor David DRUBIN*** Ernette Comby Chair in Microbiology Professor of Cell Biology, Development and Physiology, Department of Molecular and Cell Biology, UC Berkeley
4:45 - 5:45 pm	Keynote Lecture and Sharing: **Exosomes and the Traffic of Proteins and RNA between Cells** ***Professor Randy SCHEKMAN*** University Professor, Department of Molecular and Cell Biology, UC Berkeley Investigator of the Howard Hughes Medical Institute Nobel Laureate of 2013 Physiology or Medicine
5:45 - 6:15 pm	**Discussion Forum** ***Professor David DRUBIN*** ***Professor Randy SCHEKMAN*** ***Professor SONG Chunshan and other speakers*** ***Moderator: Professor JIANG Liwen***
6:15 - 6:30 pm	**Closing Remarks** ***Professor SONG Chunshan*** Dean of Science

Message from the Dean of Science

Welcome to the Science Faculty 60th Anniversary Distinguished Science Lectures cum Research Day 2023 at The Chinese University of Hong Kong (CUHK) on 11 June 2023. As part of the Faculty's Diamond Jubilee celebrations, we established the 60th Anniversary Distinguished Science Lecture Series in 2023. We are so honoured and pleased to have world-renowned leading scholars, Prof. Randy SCHEKMAN and Prof. David DRUBIN from the University of California, Berkeley to deliver Distinguished Science Lectures cum Research Day Keynote Lectures on their scientific breakthroughs and discoveries in life sciences, as well as sharing their insights into scientific research.

Prof. Randy Schekman of the Department of Molecular and Cell Biology (MCB), UC Berkeley, is an Investigator of the Howard Hughes Medical Institute (HHMI). He studied the enzymology of DNA replication as a graduate student with Arthur Kornberg at Stanford University. His current interest in cellular membranes developed during a postdoctoral period with S. J. Singer at the University of California, San Diego. Schekman's laboratory investigates the mechanism of membrane protein traffic in the secretory pathway in eukaryotic cells. In recent years his lab has turned to aspects of vesicular traffic in human cells, most recently on the biogenesis and sorting of small RNAs into extracellular vesicles. Among his awards are the Gairdner International Award, the Albert Lasker Award in Basic Medical Research and the 2013 Nobel Prize in Physiology or Medicine, which he shared with James Rothman and Thomas Südhof. From 2006-2011 he served as Editor-in-Chief of the *Proceedings of the NAS*. In 2011, he founded and until 2019 served as the Editor-in-Chief of the Open Access journal, *eLife*, sponsored by the HHMI, Wellcome Trust and the Max Planck Society. Beginning in 2018, Schekman assumed a leadership role in an effort supported by the Sergey Brin Family Foundation to identify and support basic research on the mechanisms of Parkinson's Disease initiation and progression (https://parkinsonsroadmap.org).

Prof. David DRUBIN has served on the faculty at UC Berkeley for 35 years, where he holds the Ernette Comby Chair in Microbiology. His research combines live cell imaging, molecular and cell biology, genetics, biochemistry and mathematical modelling. The primary focuses of his research are the cytoskeleton and membrane trafficking. He studies these processes in budding yeast, human cells and zebrafish. In recent years, he has begun to use genome-edited human stem cells for investigations of how the cytoskeleton and membrane trafficking events are altered during differentiation to serve the specific biological demands of the differentiated cells. Through collaboration with Fyodor Urnov and his colleagues at Sangamo Biosciences, Drubin's lab became the first to use genome editing to express fluorescent fusion proteins at native levels in human cells to avoid perturbing the processes being investigated. He has served as Editor-in-Chief of the American Society for Cell Biology's research journal, *Molecular Biology of the Cell*, as Chair of the MCB Department and as Head of the MCB Department's Division of Cell and Developmental Biology and Graduate Programme at UC Berkeley. Among the awards he has received are the Searle Scholar Award, the American Cancer Society Faculty Research Award, the Ira Herskowitz Award, an NIH Merit Award, and election to the National Academy of Sciences, the American Academy of Arts and Sciences, and the American Association for Advancement to Science. He is a fellow of the American Society for Cell Biology and a Senior Investigator at the Allen Institute for Cell Science.

Prof. Schekman's and Prof. Drubin's Distinguished Science Lectures will also serve as the keynotes for the Faculty Research Day 2023. Our Faculty of Science at CUHK organises a Research Day annually where researchers gather to learn new scientific advances, exchange ideas and explore research collaboration within and beyond the Faculty and CUHK. The Faculty has also conducted the Research Day online in the past three years when there were strict measures of COVID-19 pandemic control. Now Hong Kong is back to normal in 2023 and we are very pleased to have two of the 60th Anniversary Distinguished Science Lectures cum Research Day 2023 conducted as an in-person event with the theme of "Learning from Academicians" this very special year. We have invited seven active researchers to discuss their recent work at the Faculty Research Day 2023, and they represent our academic staff in all the teaching units across the Faculty, including Prof. CHOW Hei Man Kim and Prof. ZHUANG Xiaohong in life sciences, Prof. XIA Jiang in chemistry, Prof. LUI Lok Ming Ronald in mathematics, Prof. WU Yilin in physics, Prof. LIN Zhixiang in statistics, and Prof. TAI Pui Kuen Amos in earth and environmental sciences. They will share their interdisciplinary research and also present their perspectives for linking various backgrounds with biological problems.

CUHK is committed to encouraging faculty members to build research collaborations with the vision of advancing the frontiers of science and technology. The Science Faculty Research Day serves as a platform to exchange ideas from recent research advances and to encourage collaborative research across different disciplines. The scientific breakthrough is frequently enhanced by interdisciplinary research collaboration among people with diverse expertise but complementary perspectives. Our Faculty has also identified seven interdisciplinary and multidisciplinary research areas in the Faculty Strategic Planning in 2020-2021 which have also been incorporated in three of the four theme areas in the CUHK Strategic Plan 2021-2025. The Faculty has also developed and implemented a cross-disciplinary collaborative seed grant scheme in 2020-2021. Through collaborative efforts of our researchers over the past five years, the Faculty has successfully developed nine Collaborative Research Fund (CRF) projects, one Young Collaborative Research Grant (YCRG) project and secured three Area of Excellence (AoE) projects funded by the Research Grants Council (RGC) in Hong Kong.

We hope the presentations and discussions around the theme of "Learning from Academicians" at the Science Faculty 60th Anniversary Distinguished Science Lectures cum Research Day 2023 will stimulate our staff and students both within and beyond the Science Faculty at CUHK to be more open-minded, think outside the box, and strive for excellence through collaborative efforts; will further promote original, creative and innovative research and collaboration, especially in interdisciplinary collaborative research at CUHK Science. Undoubtedly this special and exciting event will foster the Faculty's initiatives to promote discussion between researchers in different disciplines and Units towards more interdisciplinary collaborative research and development.

I look forward to a stimulating day of learning with lively discussion and hope all participants will enjoy this exciting event and benefit from this rare opportunity of learning from world leaders.

Prof. Chunshan SONG
Dean of Science and
Wei Lun Professor of Chemistry

Keynote Lecture:

Exosomes and the Traffic of Proteins and RNA between Cells

Professor Randy SCHEKMAN

- University Professor, Department of Molecular and Cell Biology, University of California, Berkeley
- Investigator of the Howard Hughes Medical Institute
- Nobel Laureate of 2013 Physiology or Medicine

Eukaryotic cells employ membrane vesicles for the movement of most membrane and secretory proteins that are exported at the cell surface. An alternative form of traffic involves the release of a distinct population of vesicles, exosomes to the cell exterior. Two questions of current interest include the signals that stimulate exosome secretion and the role of exosomes in mediating traffic of proteins and RNA between cells. It has been known for over a century that cells have an active process of plasma membrane repair in response to physical, chemical and biological damage. Others have shown that repair involves the mobilization of lysosomes which fuse to the plasma membrane at the site of Ca^{2+} influx in response to damage. Using a luciferase-CD63 fusion protein to mark and quantify exosome release, we have found that various physical and chemical insults that cause membrane damage elicit a substantial increase in exosome secretion. Further, we have found that several different Ca^{2+} binding proteins, including two different annexins, bind in a Ca^{2+}-dependent manner to isolated MVBs and are required for damage-induced secretion of exosomes. Our work suggests that at least some fraction of exosomes in circulation are released as a result of the stress and damage to tissues and cells thought to occur under basal conditions.

In order to address the function of exosomes in cargo delivery to target cells, we developed a means to deliver Cas9 and a gRNA enclosed within exosomes. Recipient cells containing an integrated copy of N-luciferase whose expression depended on efficient genome editing were used to assay functional uptake of Cas9/gRNA exosomes. We found that purified Cas9/gRNA exosomes were taken up by reporter cells but failed to elicit the expected activation of luciferase expression. In contrast, donor and acceptor cells cocultured to near confluence showed a 60-fold increase in luciferase expression. Transfer of Cas9 is mediated by open-end membrane tubular connections, likely dependent on membrane fusion at the point of junction between a tubule from one cell and the target. We find that a viral-like cellular fusogen, syncytin, and its receptor are required to form open-ended tubular connections between cells.

Professor Randy SCHEKMAN's Introduction

Professor Randy SCHEKMAN is a Professor in the Department of Molecular and Cell Biology, University of California, Berkeley, and an Investigator of the Howard Hughes Medical Institute (HHMI). He studied the enzymology of DNA replication as a graduate student with Arthur Kornberg at Stanford University. His current interest in cellular membranes developed during a postdoctoral period with S. J. Singer at the University of California, San Diego. Schekman's laboratory investigates the mechanism of membrane protein traffic in the secretory pathway in eukaryotic cells. In recent years his lab has turned to aspects of vesicular traffic in human cells, most recently on the biogenesis and sorting of small RNAs into extracellular vesicles.

Professor Schekman had been appointed as the Chairman of the Selection Committee for Hong Kong's Shaw Prize in Life Science and Medicine from 2016 to 2020. CUHK awarded Professor Schekman the degree of Doctor of Science, *honoris causa* in 2016. He has been also a collaborator with CUHK's Area of Excellence Centre for Organelle Biogenesis and Function.

During the 1970s, Professor Schekman studied yeast cells using genetic approaches to define the genes required for protein secretion. The genes were then cloned and the protein products studied biochemically to understand the functions essential for protein translocation into and vesicular traffic from the endoplasmic reticulum.

Among his awards are the Gairdner International Award, the Albert Lasker Award in Basic Medical Research and the 2013 Nobel Prize in Physiology or Medicine, which he shared with James Rothman and Thomas Südhof. From 2006-2011 he served as Editor-in-Chief of the *Proceedings of the NAS*. In 2011, he founded and until 2019 served as the Editor-in-Chief of the Open Access journal, *eLife*, sponsored by the HHMI, Wellcome Trust and the Max Planck Society. Beginning in 2018, Professor Schekman assumed a leadership role in an effort supported by the Sergey Brin Family Foundation to identify and support basic research on the mechanisms of Parkinson's Disease initiation and progression (https://parkinsonsroadmap.org).

Keynote Lecture:

Harnessing Actin Assembly Forces to Drive Vesicle Formation during Clathrin-mediated Endocytosis

Professor David DRUBIN

- Ernette Comby Chair in Microbiology Professor of Cell Biology, Development and Physiology, Department of Molecular and Cell Biology, University of California, Berkeley

Clathrin-mediated endocytosis is a critical process by which cells take up nutrients, control serum cholesterol levels and regulate cell signalling. It is now appreciated that from budding yeast to human cells, a burst of actin assembly generates forces to assist plasma membrane invagination during clathrin-coated vesicle formation. The studies presented address mechanisms by which mechanical forces from actin assembly are harnessed for efficient vesicle formation. These studies use both budding yeast and human cells to investigate force production, load adaptation and feedback between membrane geometry and biochemical reaction rates. Reconstitution experiments in budding yeast demonstrate that actin assembly on the surface of a lipid bilayer is sufficient to drive vesicle formation, suggesting that membrane-associated actin assembly might represent an ancient vesicle-forming mechanism. Yeast genetics have identified the core actin associated proteins required for efficient vesicle formation, and combined genetics, biochemistry and mathematical modelling are revealing the biophysical mechanisms for force generation and harnessing. Other studies in budding yeast indicate that cargo controls the rate of vesicle formation, while studies in mammalian cells indicate the membrane geometry plays a key role in controlling biochemical reaction rates. Feedback from membrane geometry, cargo and physical load are key parameters dictating progress toward vesicle formation.

Professor David DRUBIN's Introduction

Professor David DRUBIN has served on the faculty at the University of California, Berkeley for 35 years, where he holds the Ernette Comby Chair in Microbiology. His research combines live cell imaging, molecular and cell biology, genetics, biochemistry and mathematical modelling. The primary focuses of his research are the cytoskeleton and membrane trafficking. He studies these processes in budding yeast, human cells and zebrafish. In recent years, he has begun to use genome-edited human stem cells for investigations of how the cytoskeleton and membrane trafficking events are altered during differentiation to serve the specific biological demands of the differentiated cells. Through collaboration with Fyodor Urnov and his colleagues at Sangamo Biosciences, David's lab became the first to use genome editing to express fluorescent fusion proteins at native levels in human cells to avoid perturbing the processes being investigated.

Professor Drubin has been an advisory board member at the CUHK's Area of Excellence Centre for Organelle Biogenesis and Function. He had also been invited as the guest speaker for the Croucher Advanced Study Institutes and has served as co-Director of Croucher Summer Courses for many years with Prof. Liwen JIANG, as well as serving as a speaker.

Professor Drubin served as Editor-in-Chief of the American Society for Cell Biology's research journal, *Molecular Biology of the Cell* for ten years, and as Chair of the Department of Molecular and Cell Biology (MCB) for five years. He has also served as Head of the MCB Department's Division of Cell and Developmental Biology and Graduate Program at UC Berkeley. He has served on numerous editorial boards, external department review panels, and National Institutes of Health (NIH) grant review study sections, and he has organised several international research conferences. In 1999 he was Program Chair for the American Society for Cell Biology's annual national meeting.

Professor Drubin received his bachelor's degree in Biochemistry at UC Berkeley working on bacterial transcription factor enzymology with Michael J. Chamberlin, and his Ph.D. in Biochemistry and Biophysics with Marc Kirschner at the University of California, San Francisco working on microtubule-associated tau protein in neurons. He performed studies on yeast cell biology as a Hellen Hay Whitney Fellow with David Botstein at MIT. Among the awards he has received as a faculty member are the Searle Scholar Award, the American Cancer Society Faculty Research Award, the Ira Herskowitz Award, an NIH Merit Award, and election to the National Academy of Sciences, the American Academy of Arts and Sciences, and the American Association for Advancement to Science. He is a fellow of the American Society for Cell Biology and a Senior Investigator at the Allen Institute for Cell Science.

Sharing from Members of the Faculty of Science, CUHK

PROGRAMME

The Metabolic Roots of Brain Ageing and Neuronal Senescence
Professor CHOW Hei Man Kim
Assistant Professor, School of Life Sciences

Molecular Mechanism of Membrane Trafficking in Plant Autophagy
Professor ZHUANG Xiaohong
Assistant Professor, School of Life Sciences

Molecular Assemblies as "Synthetic Organelles" for Biosynthesis and Biomedicine
Professor XIA Jiang
Professor, Department of Chemistry

Computational Differential Geometry Meets Medicine
Professor LUI Lok Ming Ronald
Professor, Department of Mathematics

Self-Organisation of Bacterial Living Matter
Professor WU Yilin
Professor, Department of Physics

Statistical Methods for Integrative Analysis of Single-Cell Genomics and Epigenomics Data
Professor LIN Zhixiang
Assistant Professor, Department of Statistics

Mitigating Air Pollution and Climate Change via Sustainable Food, Agriculture and Forestry
Professor TAI Pui Kuen Amos
Associate Professor, Earth and Environmental Sciences Programme

The Metabolic Roots of Brain Ageing and Neuronal Senescence

Professor CHOW Hei Man Kim
Assistant Professor, School of Life Sciences

Cellular senescence (i.e., cell ageing) is a stress-induced fate characterized by permanent cell cycle arrest and the acquisition of a pro-inflammatory phenotype. Our team has revealed that brain cells, particularly neurons with limited metabolic plasticity, are sensitive to tissue and organismal metabolic states, which in turn drives senescent phenotypes with altered metabolic dysfunction. With an eye towards the findings at molecular and cellular level, we seek to identify both metabolic inducers of senescence and interventions that target either metabolism or senescent cells to mitigate some of the pro-ageing effects at the organ-level.

Professor CHOW Hei Man Kim is an Assistant Professor in the School of Life Sciences, CUHK. She received her graduate training at the University of Hong Kong, postdoctoral training at Cornell University and then a research assistant professorship training at Hong Kong University of Science and Technology. Professor Chow was the recipient of multiple international fellowships, including the Alzheimer's Association Research Fellowship, the World Economic Forum Global Future Council Fellowship and the National Natural Science Foundation of China (NSFC) China's Excellent Young Scientists Fund. The Chow Lab focuses on studying mechanisms underlying pathological brain ageing and related neurodegenerative disorders. Current projects aim at delineating how the body metabolic status affects the brain central metabolism, leading to elevated risks of dementia and Alzheimer's disease.

Molecular Mechanism of Membrane Trafficking in Plant Autophagy

Professor ZHUANG Xiaohong

Assistant Professor, School of Life Sciences

Regulation of protein/lipid homeostasis currently represents a major fundamental knowledge gap and an opportunity for discoveries in plant translational research. Autophagy, an essential metabolic pathway, has been shown to be linked with various fundamental processes for the turnover of lipids and proteins to balance cell growth and development under nutrient deprivation or stress conditions. Understanding of the fundamental basis unique to plant autophagy would result in scientific advances that improve the value of plants as biomass and enhance productivity in stress environments. Using both the multicellular *Arabidopsis* plant and unicellular *Chlamydomonas* green algae as model systems, we will investigate the spatial and temporal relationships for the autophagosome and other organelles in plant cells at multi-scale levels in combination with the advanced imaging and multiomics techniques.

Professor ZHUANG Xiaohong, is currently an Assistant Professor at CUHK. Her research interest is autophagosome formation in plant cells. Her current research is focused on understanding the molecular mechanism of membrane trafficking in plant autophagy. She was the recipient of NSFC China's Excellent Young Scientists Fund (Hong Kong and Macao) in 2022, the Early Career Scheme by the Research Grants Council of Hong Kong (RGC) in 2019.

Molecular Assemblies as "Synthetic Organelles" for Biosynthesis and Biomedicine

Professor XIA Jiang

Professor, Department of Chemistry

Organelles are structurally and functionally independent subcellular units of nanometer to micrometer scale. Remodelling natural organelles, or *de novo* synthesis of organelle-like structures, yields unnatural subcellular structures that we call "synthetic organelles". Our team explores various ways to construct subcellular structures that imitate the function of organelles and applies them in biosynthesis and biomedicine.

1. Multienzyme complexes as "synthetic organelles" are constructed via physical and chemical methods in bacterial cells and yeast. Multienzyme assembly markedly increases the synthetic yield of terpenoid drugs, including artemisinic acid.

2. Natural or synthetic molecules coacervate to form microdroplets in the solution and in cells via liquid-liquid phase separation. We harness these membrane-less structures to achieve enzymatic assembly, treatment of bacterial infection, and transmembrane drug delivery.

3. We also engineer exosomes for drug delivery to hard-to-access tissues. The engineered exosomes were used to treat osteoarthritis and osteoporosis, which brought hope to patients and attracted investment.

Professor XIA Jiang is a Professor in the Department of Chemistry at CUHK, also in the School of Life Sciences (by courtesy). He obtained his undergraduate and master's degrees from Nanjing University, China, and his Ph.D. in Chemistry from Stanford University, California, USA. He joined CUHK after postdoctoral training at Caltech/HHMI. He is an adjunct professor at several universities in mainland China and a chief consultant of *Trautec Inc*. He co-founded *EVLiXiR Inc.*, a company focusing on exosome-based diagnosis and drug delivery, in 2021. His research lies at the interface between chemistry, biology, and biomedicine.

Computational Differential Geometry Meets Medicine

Professor LUI Lok Ming Ronald

Professor, Department of Mathematics

We will explore how differential geometry provides a powerful tool to accurately and quantitatively study geometric shapes, with useful applications in medical imaging. We will discuss how geometric models derived from advanced differential geometry theories can be used to preprocess imperfect or low-quality medical images, resulting in more accurate results for further analysis. Additionally, we will explore how differential geometry can be used to study alterations or variations of anatomical structures across subjects, which is essential for disease analysis. Through this discussion, we will provide an overview of how medical imaging can be improved through the application of computational differential geometry. Our goal is to explore the potential of differential geometry in the medical field, and how it can be used to enhance medical imaging techniques and improve disease diagnosis.

Professor LUI Lok Ming Ronald is a Professor in the Department of Mathematics, CUHK. He is also serving as the Executive Director of the Centre for Mathematical Artificial Intelligence at CUHK. He got his Ph.D. in Applied Mathematics at University of California, Los Angeles in 2008. He was a postdoctoral scholar at Harvard University before joining CUHK in 2010. Professor Lui was awarded Morningside Mathematics (Silver) Medal in 2016, the HKMS Young Scholars Award by the Hong Kong Mathematical Society in 2018, CUHK Vice-Chancellor's Exemplary Teaching Award in 2019. His research mainly focuses on computational quasi-conformal geometry and its applications to medical imaging, computer vision and computer graphics.

Self-Organisation of Bacterial Living Matter

Professor WU Yilin

Professor, Department of Physics

Self-organisation is a hallmark of biological systems ranging from sub-cellular constituents to multicellular organisms. Using microorganisms as model systems, we seek to understand how multicellular systems can self-organise in space and time. In this talk, I will introduce several remarkable examples of bacterial self-organisation mediated by either purely physical forces or by complex sensory mechanisms, and will discuss how bacterial communities may benefit from these processes to coordinate large-scale collective translocation and to facilitate long-range material transport. The findings are relevant to microbial physiology, non-equilibrium physics, and active matter engineering.

Professor WU Yilin obtained his B.Sc. in Physics from the University of Science and Technology of China in 2004 and Ph.D. in Physics from University of Notre Dame in 2009. After postdoctoral research at Rowland Institute of Harvard University, he joined the Department of Physics, CUHK and is currently a Professor. His research interest is in the physics of living matter, with a focus on the motion and self-organisation of living matter consisting of or derived from microbes.

Statistical Methods for Integrative Analysis of Single-Cell Genomics and Epigenomics Data

Professor LIN Zhixiang

Assistant Professor, Department of Statistics

The recent advances in single-cell sequencing technology have enabled us to profile various types of genomic features at single-cell resolution, including gene expression, chromatin accessibility, methylation, histone modification and others. Different types of genomic features capture different aspects, and together they more accurately depict the cells. Massive single-cell datasets have been generated, and analysing these datasets will provide rich biological insight on cellular heterogeneity and will reveal transcriptional regulation, advancing the understanding of complex biological systems and human diseases. In this talk, I will share our recent approaches for integrative analysis of single-cell genomics and epigenomics data, which facilitates the extraction of useful information from these datasets.

Professor LIN Zhixiang received his B.Sc. in Biological Sciences from Tsinghua University in 2010 and Ph.D. in Biomathematics, Bioinformatics and Computational Biology from Yale University in 2015. He worked at Department of Statistics, Stanford University as a postdoctoral researcher from 2015 to 2018. In 2018, he was appointed as Assistant Professor in the Department of Statistics at CUHK. His research focuses on developing novel statistical methods and computational tools for addressing significant scientific questions, especially those related to the analysis and interpretation of large-scale genomic data. His work has been published in high-impact journals, including *PNAS, Nature Communications, Nature Computational Science, Science, Cell, Annals of Applied Statistics, Statistical Science, Biometrics, Nucleic Acids Research, Genome Biology,* and *Briefings in Bioinformatics*.

Mitigating Air Pollution and Climate Change via Sustainable Food, Agriculture and Forestry

Professor TAI Pui Kuen Amos

Associate Professor, Earth and Environmental Sciences Programme

Human appropriation of land resources via agriculture and forestry significantly shapes atmospheric chemistry and climate, with important ramifications for pressing environmental issues such as air pollution, climate change, food insecurity and forest degradation. In this talk, we will examine a few examples of how such activities may have led to unexpected human health and ecological consequences via Earth system connections. Integrating long-term datasets with Earth system modelling, for instance, we will show how land use change (e.g., deforestation) and rising food demands may worsen ozone pollution and damage human health, while enhancing the deposition of nitrogen and nutrients onto terrestrial ecosystems. We will also show how dietary changes in the Chinese population, mainly in the form of higher meat consumption, might have enhanced agricultural nitrogen emissions and worsened particulate matter pollution in China, thus leading to more premature deaths. We will further discuss how more sustainable dietary options, agricultural and forest management may help alleviate some of these pressing global environmental problems.

Professor TAI Pui Kuen Amos obtained his B.Sc. from Massachusetts Institute of Technology (MIT), Ph.D. in Environmental Science and Engineering from Harvard University, and was a Croucher Postdoctoral Fellow at MIT. Professor Tai specialises in atmospheric chemistry and physics, ecoclimatology, biosphere-atmosphere interactions and sustainable food systems. His research combines high-performance Earth system modelling and global observational analysis to address pressing issues such as air pollution, climate change, food insecurity and forest ecosystem degradation. His work has been published in top-ranking journals including *Nature Climate Change*, *Nature Food*, and *Atmospheric Chemistry and Physics*, and earned him the WMO Research Award for Young Scientists, RGC Early Career Award, and founding membership of Hong Kong Young Academy of Sciences. Professor Tai is also a passionate educator, having received the CUHK Vice-Chancellor's Exemplary Teaching Award and Faculty of Science Exemplary Teaching Award.

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