

Science Faculty Research Day 2019



29 MAY

0910 – 1235

Lecture Theatre 1
Mong Man Wai Building



PROGRAMME

- 09:10 – 09:25 **Opening Ceremony**
- 09:25 – 09:50 **The Network for Asian Open Research (NAO):
A BASF Academic Research Alliance**
Dr. Thomas Wesley HOLCOMBE
- 09:50 – 10:15 **Bacterial Self-organization in Space and Time:
From Physical Forces to Chemical Signaling**
Professor WU Yilin
- 10:15 – 10:40 **Precise Targeting in the Complex System:
From Basic Science to Translational Research**
Professor XIA Jiang
- 10:40 – 11:00 **Tea Break**
- 11:00 – 11:25 **Nexus of Rare Neurodegenerative Diseases –
Enabling Research without Boundaries**
Professor CHAN Ho Yin Edwin
- 11:25 – 11:50 **Statistical Platform for Common Bioinformatics Analyses**
Professor FAN Xiaodan
- 11:50 – 12:15 **Integrated Earth System Modeling to Tackle Food-water-energy
Nexus and Sustain Planetary Health in the 21st Century**
Professor TAI Pui Kuen Amos & Professor TAM Chi Yung Francis
- 12:15 – 12:30 **How to Become Highly Cited**
Professor YU Chai Mei Jimmy
- 12:30 – 12:35 **Event Closing**



Science

Empowers Your Dreams



Message from Dean of Science

Welcome to the Faculty of Science Research Day 2019. Every year, the Faculty organizes a Research Day where staff members are gathered together to share ideas and experiences in promoting research at the Faculty. The highlight of this year's Research Day is strategic collaborative research.

Collaborative research has long been treated as one of the most effective ways to address complex issues. When researchers with expert knowledge in different areas collaborate on a project of common interests, the respective areas of expertise could achieve the common goal of producing new scientific knowledge to solve problems. Whether it is across labs in the units, across areas in a department, or across disciplines, there is much to be gained by bridging the divide between isolated research silos. To create greater societal impact, collaborations with academic units should not be our end. To facilitate feedback for basic research projects from the perspective and knowledge of the industrial sector, we would also need to promote collaboration and partnerships with industrial sectors.

Over the past five years, the Faculty has successfully secured nine RGC CRF and two AoE projects. Project coordinators come from different units of the Faculty. Riding on the success of our collaborative efforts, we would like to present you today some of the latest collaborative research across different disciplines. I hope this could stimulate new research clusters in the Faculty and to bolster our competitiveness in the global research arena.

This year, we are honored to have a total of eight invited speakers. Our guest speaker, Dr. Thomas Holcombe from the BASF Advanced Chemicals Co. Ltd., will share with us their collaborations with Asian universities and how these kinds of collaborations and partnerships can lead to business impact and talent development. Six colleagues, Prof. Wu Yilin, Prof. Xia Jiang, Prof. Edwin Chan, Prof. Fan Xiaodan, Prof. Amos Tai and Prof. Francis Tam, will share with us their latest collaborative research projects across different disciplines. Before the end of our Research Day, Prof. Jimmy Yu, a highly cited researcher selected by the Clarivate Analytics, will share with us his invaluable experience on how to become highly cited researchers.

It is indeed our pleasure to have a Panel of eight distinguished speakers today. I am sure the event is an invaluable and unique occasion for exchange of ideas among our colleagues and distinguished guests. I wish you every success in your new collaborative research grant applications.



Yours sincerely,

A handwritten signature in black ink, consisting of stylized cursive letters that appear to be 'XZ' followed by a dot.

XIE Zuowei



Presentation Abstracts and Speaker Introductions

The Network for Asian Open Research (NAO): A BASF Academic Research Alliance

Dr. Thomas Wesley HOLCOMBE

Group Leader, Functional Polymers Research Asia Pacific

Academic Research Alliance: Network for Asian Open-Research BASF Advanced
Chemicals Co. Ltd.

Since 2014, BASF has approached open research in Asia Pacific via our “NAO” Academic Research Alliance. This has led to more than 30 joint development projects between Asian universities and BASF. Through these collaborations, we’ve fostered partnerships that have borne fruit in terms of business impact and talent development. Further, we’ve identified ever-increasing formats and opportunities to grow and strengthen this network and contact between BASF and Academia in Asia. Today’s talk aims to highlight some of these activities and to point out some opportunities for continued exchange with CUHK.

Speaker's Introduction:

Dr. Holcombe was born in Silver Spring, Maryland, USA. He studied Chemistry and Biochemistry at the University of Texas, Austin and obtained his doctorate in Organic Chemistry from the University of California, Berkeley – setting records in the field of “organic photovoltaics.” Following the Ph.D., Dr. Holcombe completed a 2-year post-doc at the École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland – still trying to save the world with solar cells. Dr. Holcombe started his industrial career in 2013 as a research scientist in the BASF division “Biological & Effect Systems Research.” There he worked on OLED materials for advanced displays, before transitioning into research for Home Care materials in 2015. As part of the group for Amphiphilic Systems, he worked primarily on joint developments with Unilever. Since August 2018, he’s taken up a couple new roles at the BASF Innovation Campus Shanghai – namely leading two groups: one primarily focused on functional additives for home and personal care and the 2nd, with much support from the team leader Sunny Feng, is all about increasing our connection to Asian academic institutes.

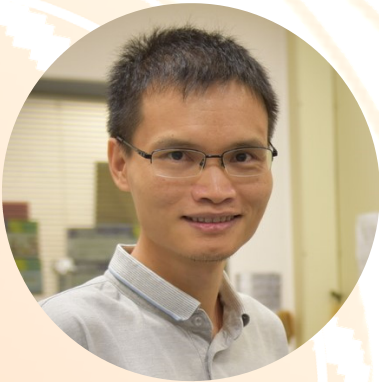


Bacterial Self-organization in Space and Time: From Physical Forces to Chemical Signaling

Professor WU Yilin

Associate Professor, Department of Physics

Self-organization is a hallmark of biological systems ranging from sub-cellular constituents to multicellular organisms. Using swimming bacteria as a model system, we seek to understand how multicellular systems can self-organize in space and time. In this talk I will introduce several remarkable examples of bacterial self-organization 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.



Speaker's Introduction:

Prof. Wu 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 has been a faculty member in the Department of Physics, CUHK as Assistant Professor (2012-2018) and Associate Professor (2018-present). His research interest is in biophysics and quantitative biology, with a focus on the motion and self-organization of microbial systems ranging from single cells to microbial communities, such as bacterial swarms and biofilms.

Precise Targeting in the Complex System: From Basic Science to Translational Research

Professor XIA Jiang

Associate Professor, Department of Chemistry

Complexity is the inherent nature of biology, but yet precise targeting is prevalent. Antibodies, enzymes, cell-surface receptors..... Nature creates remarkable solutions for precise control of biological systems, our human body included. Our lab aims to follow nature's examples to devise precise targeting in complex biological systems, and to apply the new tools and platforms to disease treatment and biosynthesis of valuable chemicals. Three project clusters have agglomerated in my lab in the past ten years. Each of them aims to tackle one grand challenge in the real world related with precise targeting and regulation. These projects involve multi-disciplinary, multi-faculty and multi-institutional collaborations. We also established extensive collaborations with researchers and medical doctors in several medical schools and hospitals, and long-term attachment with entrepreneurs and investors.

Speaker's Introduction:

Prof. Xia is an Associate Professor at Department of Chemistry, CUHK with a courtesy appointment at School of Life Sciences. He holds bachelor's and master's degrees from Nanjing University, and a Ph.D. degree from Stanford University. He was also trained at California Institute of Technology and Howard Hughes Medical Institute as a postdoctoral scholar. His research interest lies at the interface between chemistry, biology, engineering and medicine. His laboratory focuses on the site-specific protein reactions, new synthetic methodologies for peptide photocaging, exosome-based drug delivery for infectious diseases and arthritis, the engineering of enzymes and synthetic organelles for enhanced biosynthesis.



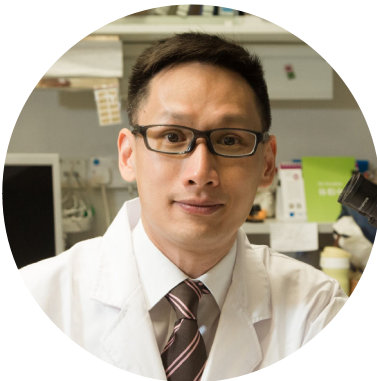
Nexus of Rare Neurodegenerative Diseases – Enabling Research without Boundaries

Professor CHAN Ho Yin Edwin

Professor, School of Life Sciences

In the U.S., rare diseases are defined as illnesses that affect fewer than 200,000 individuals. The U.S. Orphan Drug Act grants special “orphan status” designation to drugs, either a previously unapproved drug or a new use of an already marketed drug, as incentives to encourage rare disease therapeutic development. Incentives include a tax credit of 50% for the costs of clinical research and a seven-year period of market exclusivity. More than 400 therapeutics have already been developed under the orphan drug designation program. To date, basic science and pre-clinical early phase drug discovery research are routinely conducted at academic institutions. A strong and full-spectrum cross-disciplinary research infrastructure is key to the success in any subsequent technology transfer from academia to industry. Our previous and ongoing investigations already gathered the essential novel clinical neurology findings on select rare neurodegenerative and neuromuscular diseases. A comprehensive research team has been built within the Faculty which fully supports multi-disciplinary and cross-platform research (from cell & molecular biology, chemical biology, biophysical, structural biology, computational biology & bioinformatics to drug development). We are also capable of translating our basic science findings to the bed-side in the area of genetic diagnostics. All our team members work together in a concerted and synergistic way to achieve three objectives: 1) identification of novel disease gene mutations, 2) disease mechanistic studies and 3) therapeutic development. Collaborations have already been established among individual group members, and certain inter-faculty and overseas research partnerships have also been established. Our goal is to become a leading global rare neurological and neuromuscular disease research network.

Speaker's Introduction:



Prof. Chan is a Professor in the School of Life Sciences, CUHK. He received undergraduate training in biochemistry from CUHK, doctoral training at The University of Cambridge (UK), and postdoctoral training at The University of Pennsylvania (US). Since 1999, Prof. Chan has been investigating the pathogenic pathways of rare neuronal diseases. His contribution to this field has been recognised by academia through the various research prizes he has received, including the CUHK Young Researcher Award and the Genetics Society of China 13th Ju-Chi Li Animal Genetics Prize. Prof. Chan is a Founding Member and Executive Committee member of the Hong Kong Young Academy of Sciences. He is an advisor to the Hong Kong Spinocerebellar Ataxia Association and the Hong Kong Alliance for Rare Diseases.

Since 1998, Prof. Chan has devoted himself to the study of rare neurological and neuromuscular diseases. He established a research collaboration network, and has been running a multi-disciplinary research programme with inter-continental collaborative partners from Denmark, France, Italy, Poland, the UK and the US. Areas of Prof. Chan research include animal disease modeling, basic functional studies of genes/proteins, biochemical and biophysical analysis of protein/RNA actions, biomarker development, cell-based analysis of disease mechanisms (including stem cells), drug delivery, gene testing, novel human disease gene identification, structure biology studies of drug-target interactions, pharmacological investigations of drug actions, and public health.

Statistical Platform for Common Bioinformatics Analyses

Professor FAN Xiaodan

Associate Professor, Department of Statistics

Department of Statistics has multiple PIs working on methodology development specifically for Bioinformatics problems. Many methods are for general biomedical purposes, such as meta-analyses, association screening, variable selection, interaction detection, network inference, differential gene expression or epigenetic test, etc. I will introduce several of such methods resulted from our collaborative works. Our mission is to help biomedical collaborators to make better use of their data and draw more accurate conclusions efficiently. As a next step, we propose to build a statistical platform by combining these current tools as well as future developments, such that biomedical data owners can come to try these general methods for finding key players in their datasets or building classical models.

Speaker's Introduction:

Prof. Fan is currently an Associate Professor from Department of Statistics, CUHK. He received his bachelor's degree in Automation and master's degree in Pattern Recognition & Intelligent Systems from Tsinghua University, and his Ph.D. degree in Statistics from Harvard University. Since he joined CUHK, he has joined multiple collaborative research projects as Co-I or Co-PI, including one Areas of Excellence project, one Innovation and Technology Fund, and two Theme-based Research Scheme projects. Except for these grants, he also actively collaborates with many local or overseas researchers. His major research interest is to develop new statistical models and efficient computing algorithms for solving bioinformatics problems.



Integrated Earth System Modeling to Tackle Food-water-energy Nexus and Sustain Planetary Health in the 21st Century

Professor TAI Pui Kuen Amos &

Professor TAM Chi Yung Francis

Assistant Professor, Earth System Science Programme

Humanity's footprint on the earth's natural systems have never before been greater, with food-water-energy resources being exploited and the environment being degraded at unprecedented rates. Not only individual human health but also planetary health, defined to be "health of human civilization and the state of the natural system on which it depends", is very much at stake under global environmental change. Solutions to ensure planetary health and sustainable provision of food-water-energy resources require deep understanding of the functioning of different earth system components and the intricate biophysical interactions and feedbacks between them. Here we will introduce how we address such complexity and find practical solutions using an earth system modeling framework, and how such work can be made more impactful with interdisciplinary collaboration across disciplines. We will demonstrate how we: (1) simulate complex interactions and feedbacks between physical climate, atmospheric composition, and the underlying land surface and ecosystems; (2) project the future climate state, air quality and ecosystem services, including agriculture and forestry, under anthropogenic influence; and (3) map the future climatic, biogeochemical and ecosystem changes, under various socioeconomic scenarios, to inform and develop sustainable agricultural practices, water management plans and energy policies. In addition, we will present a vision to focus on the food-water-energy nexus in the Greater Bay Area (GBA), which consists of a dense network of cities interspersed among croplands and heavily forested landscapes, and neighboring one of the world's most resourceful but polluted oceanic regions. An integrated earth system model, tailor-made for this region and crystallizing research efforts of local experts, will advance our understanding of the biophysical systems and their connections that are locally relevant for this globally influential powerhouse, and provide crucial information for sustaining planetary health in the 21st century.



Speakers' Introduction:

Prof. Tai specializes in atmospheric chemistry and physics, ecological climatology, and biosphere-atmosphere interactions. His research combines high-performance earth system modeling with multivariate statistical analysis of global observations to examine the interactions between terrestrial ecosystems and the atmosphere, addressing societally relevant issues such as how air pollution and climatic hazards impact ecosystem services and food security, and how better land-use, forest and agricultural management may help improve air quality and mitigate climate change. His work has been published in top-ranking journals in the atmospheric, climate and environmental sciences, and earned him the World Meteorological Organization (WMO) Research Award for Young Scientists (2015) and Research Grants Council (RGC) Early Career Award (2014). He was selected as a Founding Member of the Hong Kong Young Academy of Sciences (YASHK) in 2018. Prof. Tai is also devoted to education, and has received the prestigious Vice-Chancellor Exemplary Teaching Award (2015). He obtained his B.Sc. in Environmental Engineering Science from MIT, and his Ph.D. in Environmental Science and Engineering from Harvard.

Prof. Tam is a Research Fellow at the Institute of Environment, Energy and Sustainability (IEES), CUHK. A climate scientist by training, his research interests include tropical and Asian monsoon circulation, their inter-annual variations and predictability, and future behavior under global warming. He also specialises in using numerical models for studying the physics governing extreme climate and weather (including intense precipitation, tropical cyclones, storm surges), and their impacts on highly urbanized megacity environments. In addition, through the support from IEES, he studies how land use/land cover changes might influence regional air quality and heat wave occurrence, in collaboration with IEES postdocs and other research fellows. He got his B.Sc. and M.Phil. in Physics from CUHK, and Ph.D. in Atmospheric and Oceanic Sciences from Princeton.



How to Become Highly Cited

Professor YU Chai Mei Jimmy

Choh-Ming Li Professor of Chemistry, Department of Chemistry

We all have the experience of publishing our scientific findings in reputable journals. However, you may not be aware that a few percent of our papers are uncited a couple of years after publication. How to avoid this situation is a true concern of young investigators. Even for experienced researchers, increasing citation counts or becoming a highly cited researcher can only be helpful in their career advancement. Highly cited researchers are those who have published the greatest number of highly cited papers (top 1% in citation) in their fields. According to Clarivate Analytics, the odds of being named highly cited researchers are 1 in 1,000. CUHK is well above average because we have 9 colleagues (2 from the Faculty of Science) on the 2018 list. There are simple strategies to make a publication more citable. These include careful selection of article titles, publication venues, and timing. There are even tricks to make a paper highly cited. Details will be discussed in this presentation. About becoming a highly cited researcher, the truth is “if I can do it, you can do a better job”.



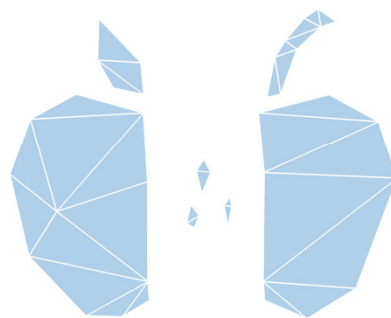
Speaker's Introduction:

Prof. Yu is a Choh-Ming Li Professor of Chemistry, Head of United College and Associate Director of the Institute of Environment, Energy and Sustainability of CUHK. He graduated from St. Martin's College in 1980, and received a Ph.D. from the University of Idaho in 1985. He joined the Department of Chemistry at CUHK in 1995 as an Associate Professor, and was promoted to Professor in 2002.

Prof. Yu is a prolific writer who has published over 300 journal articles. As a leading scientist in the multidisciplinary field of catalysis, he is listed in the cross-field category of Highly Cited Researchers 2018. He received many honors including the 2005 National Natural Science Award of China. He was named Chang Jiang Scholar Chair Professor by the Ministry of Education in 2009. Besides teaching and research, Prof. Yu is also active in knowledge transfer. He holds several patents for the fabrication and application of photocatalytic nanomaterials. Air and water treatment systems based on his inventions are commercially available.



卓越研究



Excellence in Research

The Faculty of Science is proud to be home of over 100 dedicated scientists conducting cutting-edge research in various areas of science. Our staff and students remain committed to our Faculty's Mission in expanding the frontiers of human knowledge, aiming to build a better world for the future.

理學院擁有一支充滿熱誠的科研隊伍，逾百名科學家在多個領域進行尖端研究。我們的教職員與學生將秉承一貫的宗旨，擴展人類知識領域，為未來建立一個更美好的世界。



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