Appendix

List of awarded CUHK researchers and projects

First-class award in Natural Sciences

- **Professor Yu Jun**, Professor of the Department of Medicine and Therapeutics and Assistant Dean (Mainland Affairs) at the Faculty of Medicine, **Professor Wu Ka-kei**, Associate Professor of the Department of Anaesthesia and Intensive Care and the Institute of Digestive Disease at the Faculty of Medicine, **Professor Liang Qiaoyi**, Research Associate Professor of the Department of Medicine and Therapeutics at the Faculty of Medicine, and **Professor Zhang Xiang**, Research Assistant Professor of the Department of Medicine and Therapeutics at the Faculty of Medicine — **The Composition Characteristics, Mechanisms, Early Diagnosis, and Prevention of Gut Microbiota in Colorectal Cancer**

  Colorectal cancer is one of the most common types of cancer, with an increasing incidence rate and a trend towards affecting younger individuals. Professor Yu Jun and her team have conducted in-depth research for 10 years on the changes, functions and mechanisms of gut microbiota during the occurrence and development of colorectal cancer, as well as non-invasive diagnosis and prevention, and have made significant breakthroughs. The team was the first to discover the abnormality of bacteria, viruses, fungi and archaea in the intestine and their correlation with the occurrence and development of colorectal cancer. They have elucidated the carcinogenic effects and molecular mechanisms of the driving bacteria related to colorectal cancer and revealed that mucosal bacteria related to colorectal cancer can affect host gene mutations and epigenetic changes.

  The team also discovered bacterial biomarkers that can be used for early diagnosis of colorectal cancer and developed a non-invasive diagnostic method based on a combination of targeted quantitative bacterial biomarkers and faecal immunochemical testing. The sensitivity of the diagnosis of colorectal cancer is as high as 93.8%, while the specificity is up to 81.2%. They also pioneered research on the role and mechanism of probiotics in inhibiting colorectal cancer. They were the first to discover that Streptococcus thermophilus and Lactobacillus gallinarum can effectively suppress colorectal cancer, and confirmed that Lysinibacillus sphaericus can degrade aspirin, thereby reducing its preventive effect on colorectal cancer, providing new insights for personalised treatment with aspirin.

  The research results have been granted 11 patents, and the patented technology has successfully developed a colorectal cancer detection kit, which has been applied clinically.

Second-class award in Natural Sciences

- **Professor Heng Pheng-ann**, Director of Institute of Medical Intelligence and XR and Professor of the Department of Computer Science and Engineering, CUHK, **Professor Dou Qi**, Department of Computer Science and Engineering, CUHK, Professor Chen Hao, The Hong Kong University of Science and Technology, Professor Yu Lequan, The University of Hong Kong, and Professor Qin Jing, The Hong Kong Polytechnic University — **Artificial Intelligence for Medical Image Analysis and its Clinical Applications**

  Medical image analysis plays a fundamental and vital role in computer-aided disease diagnosis and surgery in clinical practice. There are still unique challenges in computational methods for complex, multimodal, high-dimensional medical images. The team led by Professor Heng Pheng-ann has developed a series of artificial intelligence (AI) techniques based on deep learning. They have come up with novel strategies for artificial network architecture design and advanced model optimisation mechanisms to extract discriminative and efficient representations from medical data. They have applied this advanced machine intelligence technology to various imaging modalities, including Computed Tomography, Magnetic Resonance Imaging, X-Ray, histology, ultrasound and endoscopic video. Many hospitals in China have deployed clinical applications such as lung cancer screening and breast cancer diagnosis, showing improvements in accuracy and efficiency over the existing clinical workflows. Next-generation AI technology can contribute to trustworthiness in healthcare intelligence, and its commercialisation can accelerate the development of smart hospitals.

- **Professor Jiang Liwen**, Choh-Ming Li Professor of Life Sciences and director of the Centre for Cell and Developmental Biology, CUHK, and his team: **Professor Zhuang Xiaohong**, Assistant Professor of School of Life Sciences, CUHK, Dr Cui Yong, Dr Shen Jinbo, Dr Zhao Qing, Dr Cao Wenhao and Dr He Yilin; Dr Gao Caiji, South China Normal University and his team: Dr Lai Hongbo and Dr Wang Xiaojing — **Molecular mechanisms and physiological functions of vacuolar degradation pathways in plants**

  Selective degradation is crucial for regulating the function of cellular macromolecules and maintaining cellular homeostasis. In addition to the ubiquitin-proteasome degradation system, vacuoles are unique sites for mediating the degradation of proteins and other macromolecules in plant cells. To understand how cargo molecules are selectively transported to vacuoles and what the physiological significance of this process is, the research team led by Professor Jiang Liwen, Choh-Ming Li Professor of Life Sciences and director of the Centre for Cell and Developmental Biology at CUHK, and Dr Gao Caiji from South China Normal University, has been committed to studying the biogenesis of plant vacuoles and the degradation pathways mediated by vacuoles for many years. They were the first to elucidate the molecular mechanism of plant vacuole origin and biogenesis, and revealed the new function of the plant-specific vesicle transport regulatory protein FREE1 – shuttling into the nucleus to regulate plant ABA signalling at the transcriptional level – and elucidated its mechanism of action. They also established

the “lethal mutant rescue system”, a screening system that can identify and analyse two brand-new negative regulatory elements of vacuolar transport, and clarified the mechanism of action of the new element BRAF. The system can screen out new vacuolar transport negative regulatory element RST1, and analyse its mechanism of action in the plant vacuolar degradation pathway. They also illustrated the molecular mechanism of plant ATG9 specifically participating in the origin of autophagosomes from the endoplasmic reticulum.