NEXT-GENERATION TRAILBLAZERS

The leading-edge studies of a trio of young HKUST scientists have been recognized with highly competitive Croucher Innovation Awards from Hong Kong's prestigious independent private funding body

Quantum Stars

The significance of research into quantum materials and information science by two early career HKUST physicists has been moved ahead by funding awards from the Croucher Foundation, a long time champion of research excellence in natural sciences, technology and medicine in Hong Kong.

Prof Gyu Boong Jo, Department of Physics, received a HK$5 million Croucher Innovation Award 2016 for use over five years for his outstanding achievements in the quest to realize synthetic quantum systems using ultracold atoms. Physics colleague Prof Kam Tuen Law received the same award in 2015 for his studies on exotic states of condensed matter, which could have important applications for the quantum computers of the future, among other uses.

The Croucher Foundation, set up in 1979, established the Innovation Awards in 2012 to identify and support a small number of exceptionally talented "rising stars" in science, working at an internationally competitive level.

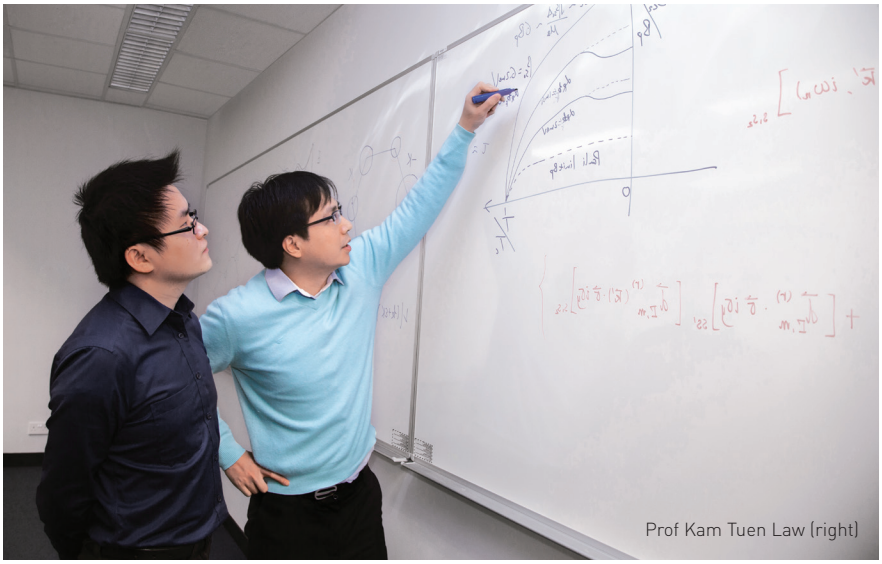
Prof Jo and his team have been focusing on using a dilute gas of ultracold atoms, managing to control atoms at around 100 billionth of 1 Kelvin above absolute zero through techniques adopted from atomic molecular optical (AMO) physics.

He has discovered an unconventional quantum state with minimal loss of coherence within ultracold atoms. In addition, he has created an artificial Kagome crystalline structure – a traditional Japanese woven bamboo pattern – for ultracold atoms with the hope of realizing a new phase of matter.

Prof Jo joined HKUST in 2013, following a postdoctoral fellowship at the University of California, Berkeley, after obtaining his PhD degree at the Massachusetts Institute of Technology (MIT). His findings have already inspired researchers around the world to focus on this quantum effect, which may be applied to create better inertial sensors, gyroscopes, and gravimeters, as well as applications in next-generation information storage and processing systems using ultracold atoms.

Prof Law is a condensed matter theorist, studying the electronic properties of solid-state materials. His research focuses

> "We seek to understand better the many-body system in condensed matter to help discover new materials or systems"
>
> **PROF GYU BOONG JO**
> Assistant Professor of Physics



Prof Kam Tuen Law (right)

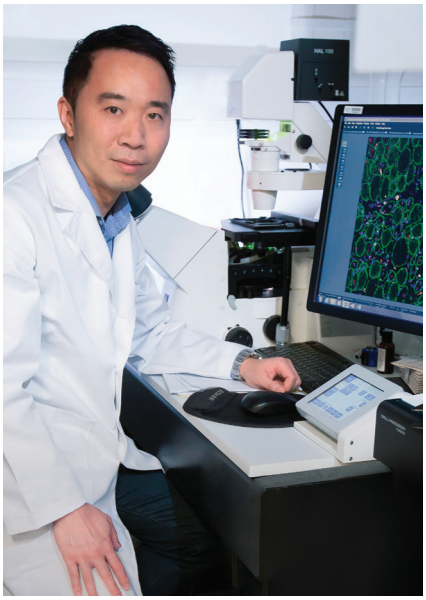
> The award provides funding to form an internationally competitive research group in Hong Kong. Top researchers can also be brought in to share their insights and new discoveries

PROF KAM TUEN LAW
Assistant Professor of Physics

on topological phases, such as fractional quantum Hall states and topological superconductors that host an exotic type of particle called non-Abelian anyons. Such non-Abelian particles can form quantum bits in which quantum information can be encoded and manipulated. The understanding of topological phases could be important for building quantum computers.

He is also interested in novel superconductors. Recently, Prof Law and his experimental collaborators in the Netherlands and the US discovered a new type of superconductor called "Ising superconductor". These superconductors are extremely robust against the detrimental effects of magnetic fields and also have potential applications for realizing topological superconductors and spintronics.

Prof Law obtained his BSc degree at HKUST in 2003. After obtaining his PhD degree at Brown University, he became the first joint postdoctoral fellow of the HKUST Jockey Club Institute for Advanced Study and MIT in 2008. He was a Croucher Postdoctoral Fellow at MIT from 2009-11.



> We try to understand how stem cells are poised for action during tissue regeneration, and why this is impaired during aging

PROF TOM CHEUNG
Assistant Professor of Life Science

Muscling in on Aging

Prof Tom Cheung is among the leading young scientists contributing to global efforts to reduce the challenges of aging for the individual and society, as acknowledged by his Croucher Innovation Award in 2015. The HK$5 million funding is being used to support his team's research into muscle stem cells and how functional decline could be ameliorated as people grow older.

Stem cells have a unique ability to repair tissues. Thorough understanding of how stem cells work could open new ways to future medical intervention, particularly in the area of regenerative medicine.

Prof Cheung's lab is seeking to gain a better understanding of why tissue regeneration is impaired during aging. Surprisingly, stem cell number remains relatively constant during aging. However, its potency gradually declines, resulting in an impairment of tissue regeneration. Recently, the researchers' results suggest that genes are silenced epigenetically during the aging process. Prof Cheung's team is trying to devise an approach for the rejuvenation of stem cells in old tissues.

The results could lead to new regenerative medicine approaches for age-related diseases such as sarcopenia, an age-related muscle disease that is involved in the degenerative loss of skeletal muscle mass and strength.

"Increased lifespan in developed countries creates a number of issues with regard to healthcare and social assistance provided to elderly people," said Prof Cheung, who joined HKUST in 2013 from Stanford University School of Medicine. "We need to better understand the process of biological aging to improve health and longevity. This would then help to reduce social and economic needs as the population ages."