香港城市大學
City University of Hong Kong

CityUHK Engineering Newsletter

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CityUHK emerges as global engineering and technology powerhouse, rising to 47th in 2026-2027 U.S. News Rankings

CityUHK rises to top 15 in THE Asia rankings, highlighting internationalisation and industry

CityUHK leaps to 52nd globally in QS World University Rankings 2027, surging 11 places; shines as World No. 2 for citations per faculty, second only to Harvard, affirming its world-class research strength

Cover Story

CityUHK emerges as global engineering and technology powerhouse, rising to 47th in 2026-2027 U.S. News Rankings

CityUHK rises to 47th globally in the U.S. News & World Report Best Global Universities Rankings 2026-27, ranks 9th in Asia and 3rd in Hong Kong

City University of Hong Kong (CityUHK) has achieved remarkable success in the 2026-2027 U.S. News & World Report Best Global Universities Rankings. The institution surged 7 places to secure the 47th spot globally among ~2,600 universities across over 100 countries and regions. Furthermore, CityUHK now ranks 9th in Asia and 3rd in Hong Kong, cementing its status as a premier hub for technological advancement and engineering excellence.

The university continues to dominate in engineering and technology, with 10 disciplines ranking 1st in Hong Kong (8 in engineering) and 15 disciplines in the global top 50 (14 in engineering).

Engineering-related subjects	World Rank	Rank within HK
Materials Science	5	1
Physical Chemistry	6	1
Condensed Matter Physics	7	1
Energy and Fuels	8	1
Nanoscience and Nanotechnology	8	1
Optics	9	1
Chemical Engineering	22	1
Electrical and Electronic Engineering	27	1

In the realm of engineering and technology, the impact of research output is a critical metric. Most notably, the university ranked 7th worldwide in the "Percentage of total publications that are among the 10% most cited". This metric strongly reflects the foundational global impact CityUHK's researchers and engineers are having on the broader scientific community.

Professor Lee Chun-Sing, Acting President of CityUHK, contextualised this achievement: "CityUHK's continued rise in international rankings, with multiple disciplines among the world's best, reflects our sustained advancement in teaching and research, as well as our leadership in internationalisation. Looking ahead, the University will continue to drive innovation in higher education, nurture future leaders with a global vision, and contribute to strengthening the 'Study in Hong Kong' brand and Hong Kong's development as an international hub for higher education."

Content adapted from CityUHK NewsCentre

Rankings

CityUHK rises to top 15 in THE Asia rankings, highlighting internationalisation and industry

CityUHK achieves the top ranking in Hong Kong in the "International Outlook" category.

City University of Hong Kong (CityUHK) continued its upward trajectory in the latest 2026 Times Higher Education Asia University Rankings, placing 14th among 929 universities across Asia, up two places from last year. This achievement underscores the University's strong performance in teaching and research and reflects its steadily rising academic standing in the region.

In this year's rankings, CityUHK recorded improvements across several key performance indicators, including "Teaching", "Research Environment" and "Research Quality", demonstrating its ongoing commitment to teaching excellence, to fostering a vibrant research environment, and to advancing high-impact research. In addition, the University ranked first in Hong Kong in the "International Outlook" indicator, further demonstrating its excellence in advancing internationalisation and promoting global academic collaboration.

Notably, CityUHK maintained a perfect score of 100 in the "Industry" indicator, highlighting its outstanding performance in knowledge transfer and industry collaboration, and its success in translating research outcomes into impactful real-world applications that contribute to societal and economic development.

Overall, CityUHK has shown consistent progress across multiple assessment indicators, with notable improvement in "Teaching", while also recording steady gains in both "Research Environment" and "Research Quality", further consolidating its position as a leading research-intensive university in the region.

CityUHK remains committed to advancing innovative research and providing quality education, while actively promoting international collaboration and industry partnerships. The University has also been ranked the "Most International University in the World" by THE for three consecutive years (2024, 2025 and 2026), reflecting its excellence in attracting global talent and fostering cross-border academic exchanges.

The steady rise in this year's rankings further demonstrates CityUHK's strong competitiveness on the international higher education stage.

Source: CityUHK NewsCentre

CityUHK tops the globe for SDG 9 in THE Sustainability Impact Ratings 2026, becoming the first university in Hong Kong with this achievement

City University of Hong Kong (CityUHK) joined the Times Higher Education (THE) Sustainability Impact Ratings 2026 for the first time and ranked 1st globally on Sustainable Development Goal 9 (SDG 9). This excellent result testifies to the fact that CityUHK's dedication to sustainable development has received worldwide recognition.

CityUHK ranks 1st globally on Sustainable Development Goal 9 in the Times Higher Education (THE) Sustainability Impact Ratings 2026.

The result was announced by THE at the Global Sustainable Development Congress (GSDC) 2026 in Jakarta. The ranking, formerly known as the THE Impact Rankings, was rebranded as the THE Sustainability Impact Ratings this year. The rankings cover an overall assessment for all categories, and an individual one specific to each of the 17 United Nations Sustainable Development Goals (SDGs) to assess institutions on each of the SDGs.

Standing out among 826 universities, CityUHK secured the top position in the SDG 9 rating (Industry, Innovation and Infrastructure), together with seven other universities worldwide. CityUHK is the only university in Hong Kong to have achieved this distinction.

The SDG 9 rating is based on the following four metrics:

- Research on industry, innovation, and infrastructure (11.6%)
- Patents (15.4%)
- University spin-offs (34.6%)
- Research income from industry (38.4%)

Notably, CityUHK achieved a perfect score of 100 in the SDG 9 ranking, demonstrating the University's outstanding performance in knowledge transfer and the translation of research outcomes into impactful real-world applications.

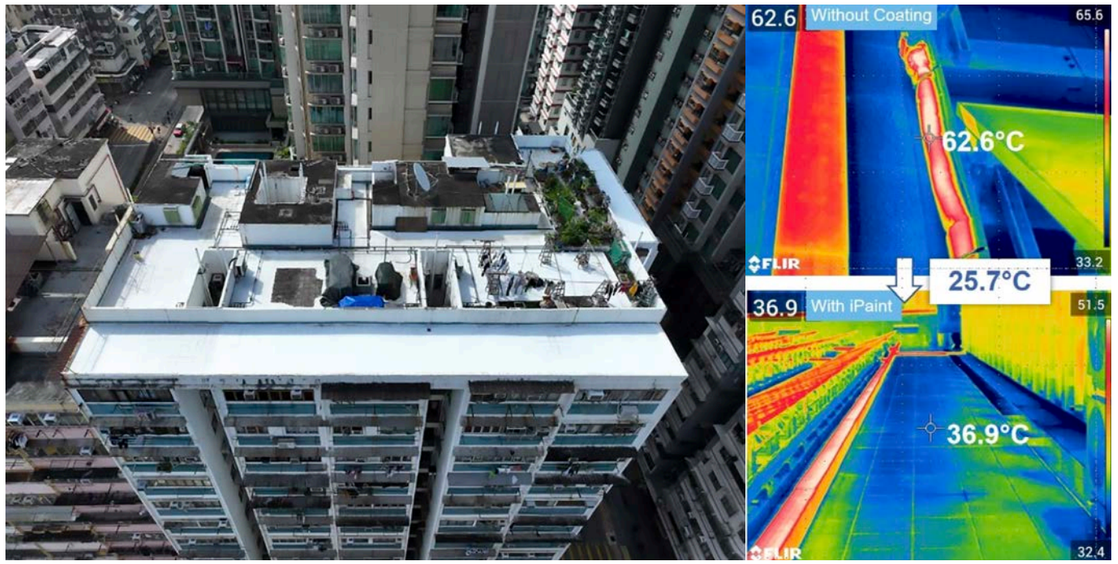
Scientists from CityUHK have achieved a major breakthrough in the field of photovoltaic technology, successfully developing highly efficient and durable perovskite solar cells suitable for outdoor environments. It is expected to contribute to the wider adoption of solar power and advance global carbon neutrality goals.

Additionally, i2Cool, a start-up incubated by CityUHK's HK Tech 300 programme, has developed a passive radiative cooling paint, which can lower the indoor temperature of buildings without consuming any electricity, demonstrating how laboratory technology can be "got off the ground".

Professor Lee Chun-Sing, Acting President of CityUHK, said, "This outstanding ranking reaffirms CityUHK's strong capabilities in innovation, infrastructure, and industry–academia collaboration. Moving forward, CityUHK will continue to promote sustainable development, actively nurture young entrepreneurs, support deep-tech startups, and leverage research outcomes to advance social welfare, thereby maintaining its leading position in innovative education and talent development."

The GSDC 2026 brings together research, business, government and higher education to accelerate sustainable transformation. For the third consecutive year, CityUHK serves as the sole Green Innovation Partner at the Congress, affirming its dedication and commitment to striving towards a greener future.

Source: CityUHK NewsCentre



i2Cool has developed a passive radiative cooling paint, which can lower the indoor temperature of buildings without consuming any electricity. (Photo source: i2Cool)

CityUHK leaps to 52nd globally in QS World University Rankings 2027, surging 11 places; shines as World No. 2 for citations per faculty, second only to Harvard, affirming its world-class research strength

City University of Hong Kong (CityUHK) has achieved outstanding results in the newly released Quacquarelli Symonds (QS) World University Rankings 2027. Rising an impressive 11 places from last year, CityUHK is now ranked 52nd globally among more than 1,500 ranked institutions, placing it firmly within the top 3% of the world's elite universities.

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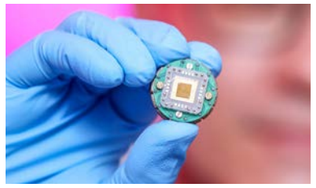


CityUHK has once again excelled in the citations per faculty indicator, securing 2nd place globally and 1st in both Asia and Hong Kong for the second consecutive year (2026 & 2027).

CityUHK is the only university in Hong Kong to rank among the global top three in the core indicator of citations per faculty. CityUHK has once again excelled, securing 2nd place globally and 1st in both Asia and Hong Kong for the second consecutive year. Trailing only Harvard University and outperforming top-tier institutions, this stellar performance underscores CityUHK's exceptional contributions to international scientific research and academic impact.

Mr Ben Sowter, QS Senior Vice President, highlighted CityUHK's outstanding performance in research citations, stating, "Hong Kong's higher education sector is reinforcing its position as one of Asia's most globally competitive and research-intensive systems. Research performance remains a major differentiator, with City University of Hong Kong ranking second globally for citations per faculty and Hong Kong universities significantly outperforming global averages for international faculty and student representation."

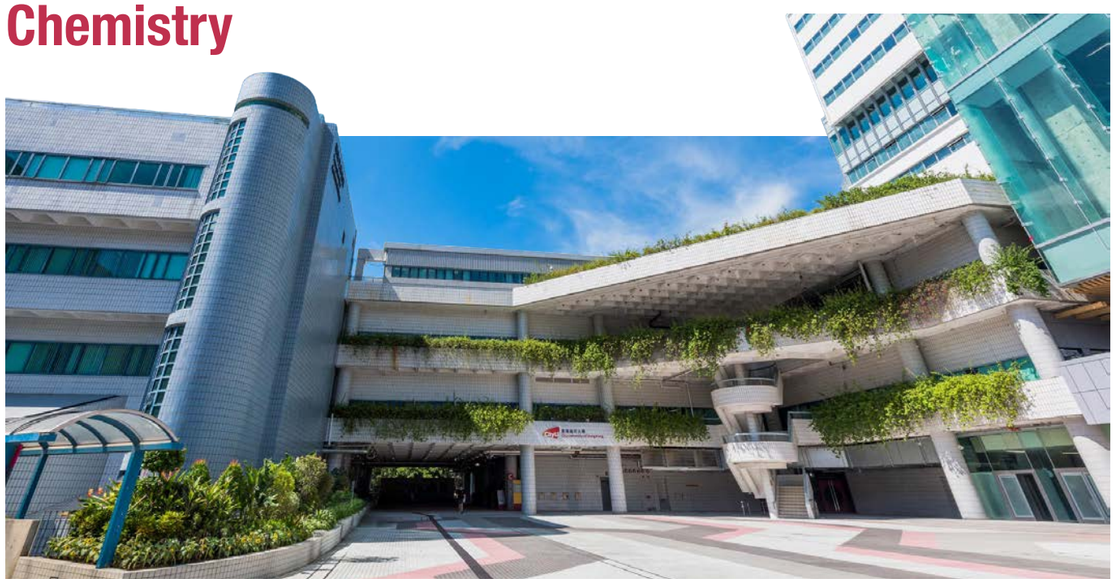
In this year's rankings, CityUHK excelled across multiple assessment indicators, retaining its top spot in Hong Kong for four indicators and standing out as the sole university in Hong Kong to have three indicators ranked in the global top 20, showcasing its leading position in academic research and internationalisation:

Indicator	Rank in Hong Kong	Rank in the world
Citations per Faculty	1	2
International Student Ratio	1	11
International Faculty Ratio	1	16
Faculty Student Ratio	1	84

Professor Lee Chun-Sing, Acting President of CityUHK, was deeply encouraged by the results. "This significant leap validates CityUHK's core strengths in teaching, research, and innovation, particularly in maintaining our 2nd place ranking worldwide and 1st in Asia for citations per faculty," said Professor Lee. "This underscores our world-class academic impact."

Content adapted from CityUHK NewsCentre

CityUHK ranks 67th globally and 2nd in Hong Kong in Nature Index's "2026 Research Leaders: Leading Institutions"; retains top spot locally in Chemistry



In the latest "2026 Research Leaders: Leading Institutions" rankings released by the Nature Index, CityUHK is ranked 67th globally, 2nd in Hong Kong and 41st in Asia.

In the latest "2026 Research Leaders: Leading Institutions" rankings released by the Nature Index, City University of Hong Kong (CityUHK) was ranked 67th globally, 2nd in Hong Kong and 41st in Asia. Notably, its global institutional ranking among academic institutions stands at 62nd, underscoring its prolific research output, strong research capabilities and far-reaching impact in the international academic community.

The "2026 Research Leaders: Leading Institutions" ranked universities, research organisations, government departments and corporations worldwide based on their article count and share in over 170 leading journals and publications in the natural sciences and health sciences over the past year (1 January to 31 December 2025). These prestigious journals include *Nature*, *Science* and *The Lancet*.

Locally, CityUHK secured top-three positions in Hong Kong across five out of the seven subject areas evaluated by the Nature Index, including the newly added Applied Sciences and Social Sciences this year. Among these, Chemistry demonstrated exceptional performance, ranking 51st globally and once again claiming the top spot in Hong Kong.

CityUHK has achieved strong results in various global university subject rankings in recent years, with its excellence in research widely recognised. In the Times Higher Education (THE) Asia University Rankings 2026, CityUHK was ranked 14th. Key performance indicators such as "Research Environment" and "Research Quality" have shown steady improvement, reflecting the University's leading academic and research standing in Asia.

In addition, CityUHK was ranked 38th globally and first in Hong Kong among the "Top 200 Leading Institutions" in the Nature Index 2026 Chemistry Supplement, underscoring its outstanding research strengths in chemistry and interdisciplinary research.

Source: CityUHK NewsCentre

Professor Li Wen Jung elected International Fellow of Canadian Academy of Engineering in recognition of innovative research contributions

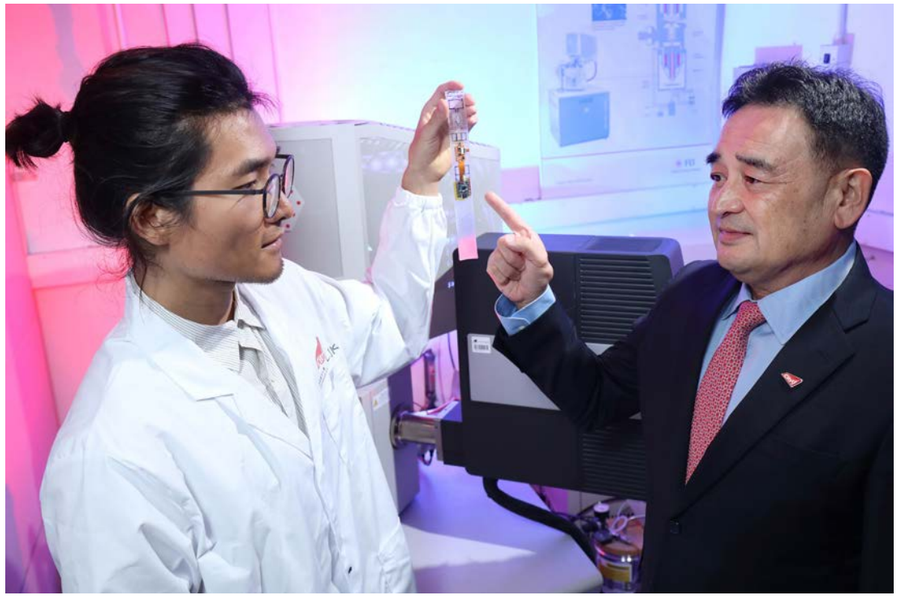
Professor Li

Professor Li Wen Jung, Vice-President (Talent and International Strategy) at City University of Hong Kong (CityUHK) and Chair Professor of Biomedical Engineering in the Department of Mechanical Engineering, has been elected an International Fellow of the Canadian Academy of Engineering (CAE). This prestigious honour recognises his distinguished contributions to micro- and nanotechnology, AI-enabled sensing, and sensor-based motion analytics.

Professor Li is internationally recognised for his interdisciplinary research spanning nanomaterial-based sensors, wearable biomedical devices, AI-driven systems, and sensors for embodied intelligence. By successfully integrating smart sensing, intelligent data analytics and translational engineering, he has facilitated the real-world application of research outcomes, driving engineering technologies from the laboratory to meet societal needs. In its citation, the CAE specifically commended Professor Li's pioneering contributions to micro- and nanotechnology, AI-enabled sensing, and intelligent motion analytics, noting that his research has been widely applied in robotics, healthcare, sports technology and sustainable development, generating far-reaching impact.

Professor Li has achieved distinction in both academia and the professional community. He is a Member of the National Academy of Artificial Intelligence (US), a Distinguished Overseas Scholar of the Chinese Academy of Sciences, a Fellow of several international organisations, including the Institute of Electrical and Electronics Engineers (IEEE) and the American Society of Mechanical Engineers, and previously served as President of the IEEE Nanotechnology Council. He has actively promoted global collaboration and innovation in engineering and emerging technologies. He has published more than 430 academic papers and holds over 25 international patents, with research outputs of significant impact and translational value. Through sustained innovation and outstanding leadership, he has played a pivotal role in advancing engineering research, industrial development, and higher education, exemplifying a strong commitment to applying technology for societal benefit.

Beyond his research achievements, Professor Li is deeply committed to nurturing the next generation of talent. He champions interdisciplinary education and encourages students to integrate engineering, artificial intelligence, and biomedical sciences to address complex real-world challenges. Over the past two decades, he has actively supported student innovation and entrepreneurship, contributing to the establishment of multiple technology start-ups and promoting the commercialisation of research outcomes. Most recently, he and his students at CityUHK received a grant under the Research, Academic and Industry Sectors One-plus Scheme (RAISe+) from the Innovation and Technology Commission of the Government of the Hong Kong Special Administrative Region to commercialise advanced sensors for embodied intelligence.



Professor Li mentors students, fostering innovation in micro- and nanotechnology and AI-enabled sensing.

In response to his election, Professor Li said, "I am deeply honoured and encouraged by this recognition, which affirms the interdisciplinary efforts of my team over the years. Amid the global pursuit of technological innovation, the integration of artificial intelligence and sensing technologies is creating new opportunities in engineering and healthcare. I look forward to continuing to work with the CityUHK community to advance interdisciplinary collaboration internationally and to nurture more young scholars with innovative capabilities, further contributing to society."

Founded in 1987, the Canadian Academy of Engineering is one of Canada's most prestigious national academies. It may elect up to 50 Fellows and no more than 10 International Fellows each year through a rigorous peer-review process. This year, six International Fellows were elected, two of whom are from China, with Professor Li being the only scholar from Hong Kong to receive this honour.

Professor Li's election recognises his outstanding academic and research achievements and has enhanced CityUHK's international reputation in engineering and innovation, reflecting the University's strong commitment to advancing world-class research and nurturing future leaders.

Content adapted from CityUHK NewsCentre

CityUHK scholar honoured at the Fourth National Award for Excellence in Innovation

Professor Ray Cheung Chak-chung

Professor Ray Cheung Chak-chung, Associate Provost (Digital Learning) at City University of Hong Kong (CityUHK), received a Certificate of Merit at the Fourth National Award for Excellence in Innovation in recognition of his outstanding contributions to the field of post-quantum cryptography, as well as his work in science communication and community service. Professor Cheung's research focuses on addressing information security needs for the post-quantum era, conducting algorithmic research on post-quantum cryptographic security chips, and designing hardware architectures and engineering implementations. His research promotes the practical application of post-quantum cryptographic standards in fields such as the Internet of Things and smart cities.

The National Award for Excellence in Innovation is jointly organised by the China Association for Science and Technology, the Ministry of Science and Technology, the Ministry of Human Resources and Social Security, and the State-owned Assets Supervision and Administration Commission of the State Council. It aims to recognise scientific and technological organisations and professionals who have made outstanding contributions in fundamental research and frontier exploration, major equipment and engineering projects, the transformation of research outcomes, innovation and entrepreneurship, and social services. The award is conferred on a triennial basis.

The award is widely recognised within the industry as a top honour. Only 229 scientists and technologists nationwide were selected for the National Innovation and Excellence Award, highlighting Professor Cheung's outstanding academic achievements.

Professor Cheung noted, "I am honoured to receive the Fourth National Innovation and Excellence Award. I would like to express my sincere gratitude to the organisers for their recognition, to CityUHK for its support and to my team members for their collective efforts. Frontier research, such as post-quantum cryptography, is closely linked to future information security and critical infrastructure. I will continue to focus on the deep integration of cryptographic theory and engineering implementation to drive the practical application of related research outcomes."

Professor Cheung is currently the Director of the Institute of Future Learning at CityUHK and a Professor in the Departments of Electrical Engineering and Computer Science. His research interests include post-quantum cryptography, homomorphic encryption, cryptographic hardware design, RISC-V secure processor architectures, and System-on-Chip system design. He is the current Chair (North Asia) of the Institute of Electrical and Electronics Engineers (IEEE) Region 10 Student Activities Committee, and the former Section Chairman of the IEEE Hong Kong Section. He serves on the editorial boards of journals such as the *Journal of Cryptographic Engineering*. He has published over 290 journal and conference papers and has been recognised multiple times as one of the world's Top 2% of Scientists by Stanford University. He also leads several research projects funded by the Hong Kong Innovation and Technology Fund, the Research Grants Council and the Shenzhen Municipal Government.

Source: CityUHK NewsCentre

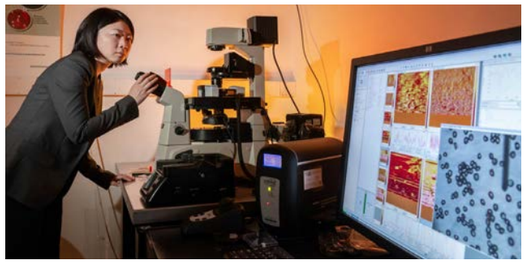
Professor Jin Di honoured at Croucher Innovation Awards 2026

Professor Jin

Professor Jin Di from the Department of Materials Science and Engineering has been honoured at the "Croucher Tak Wah Mak Innovation Awards 2026" in recognition of her outstanding achievements in scientific research. The award includes HKD5.00M in research funding over the next five years.

Professor Jin's research focuses on the natural lubrication systems of human joints to develop new materials and treatments for osteoarthritis. The fatty molecules (lipids) on healthy joint surfaces protect cartilage from wear, and there is evidence that certain mixtures of lipids perform far better than individual lipids alone, suggesting that nature uses finely tuned combinations rather than simple redundancy.

Combining molecular simulations, machine learning, and experimental approaches, Professor Jin seeks to identify highly effective lubricating lipid combinations and apply them to the design of bioinspired materials. Her research promises new possibilities for treating osteoarthritis and developing more effective biomedical lubricants.



Professor Jin's research focuses on the natural lubrication systems of human joints to develop new materials and treatments for osteoarthritis.

Professor Jin said, "With an ageing population, diseases like osteoarthritis affect hundreds of millions of people worldwide, but current treatments are limited. I'm deeply encouraged by this award, as it validates the timeliness and importance of my research direction. We will combine advanced computational tools with precision experiments to expedite the design of relevant materials and lay the foundation for a new generation of bio-inspired treatments for joint diseases."

The Croucher Innovation Awards are one of the Croucher Foundation's most prestigious awards, aiming to nurture emerging local researchers and support the development of education and scientific research in Hong Kong. Winners must be newly appointed or recently hired scholars holding full-time faculty positions at Hong Kong universities and demonstrate outstanding international competitiveness in their research fields.

Content adapted from CityUHK NewsCentre

CityUHK, Bauhinia Culture Group and CAS join forces to advance frontiers in materials science innovation

CityUHK, Bauhinia Culture Group, and CAS join forces to advance the frontiers of materials science innovation.

City University of Hong Kong (CityUHK) co-organised the event "Bauhinia Academician Lecture Series: Innovation Pathways in Materials Science" with Bauhinia Culture Group and the Shenzhen Chinese Academy of Sciences (CAS) Academician Activity Base on 16 April 2026. The event featured **Professor Yu Shuhong**, Academician of the Chinese Academy of Sciences and Professor at the University of Science and Technology of China, and **Professor Zhang Hua**, Herman Hu Chair Professor of Nanomaterials and Director of the Hong Kong Institute for Clean Energy at CityUHK, who shared their insights and expertise.

Professor Yu has devoted many years to research in areas including the biomimetic synthesis, assembly and functional applications of inorganic nanomaterials and composite materials. In his lecture titled "The Joy of Science – Unwrapping Nature's Gifts," he drew on examples of biological materials found in nature—such as nacre from pearl oysters and the skeletal structures of birds—to discuss how learning from nature and applying biomimetic concepts can lead to the development of novel biomimetic materials, thereby accelerating the cultivation of new, quality productive forces.

Professor Zhang is an expert in nanomaterials and clean energy technology innovation, dedicated to advancing breakthroughs in applying materials science to the energy transition. His presentation focused on research outcomes in phase engineering of nanomaterials (PEN), examining how PEN enables precise control over atomic arrangements to alter material crystal phases and endow them with new physicochemical properties. He also highlighted the technology's potential to facilitate highly efficient energy conversion, drive the transition to clean energy, and support the global roadmap toward carbon neutrality.

CityUHK has long been at the forefront of materials science research. The Sustainable Materials & Advanced Renewable Technologies Centre, jointly led by CityUHK and the École Polytechnique Fédérale de Lausanne, has been successfully included in the third InnoHK research cluster. The Centre will develop and build AI/ML-enabled materials design platforms and self-driving laboratories to develop breakthrough materials and renewable energy solutions.

The event not only deepened CityUHK students' and faculty's understanding of innovation in materials science, but also fostered dialogue and collaboration among academia, research institutions and the cultural sector. It injected new momentum into the advancement of materials science and the nurturing of future research talent. CityUHK will continue to work hand in hand with partners from various sectors to expand the social impact of its research and education, contributing to technological and innovation development in Hong Kong and the nation as a whole.

Content adapted from CityUHK NewsCentre

Professor Walid Daoud named RGC's inaugural Overseas Research Fellow

City University of Hong Kong (CityUHK) recently achieved top honours in the inaugural Overseas Research Fellowship Scheme (ORFS), leading all Hong Kong universities in both the number of awardees and total funding received. Among the seven distinguished scholars selected for this prestigious pilot programme is **Professor Walid Daoud** from the Department of Mechanical Engineering.

Joining CityUHK in 2012, Professor Daoud has established himself as a leading researcher in energy harvesting and smart wearable technologies. His innovative work focuses on developing sustainable approaches to capturing free or waste energy, as well as creating advanced associated storage solutions. His exceptional contributions to the field have been internationally recognised, earning his research team three highly coveted Gold Medals at the International Exhibition of Inventions of Geneva.

The ORFS, launched by the Research Grants Council (RGC) to promote the internationalisation of local universities, will provide Professor Daoud with vital resources to expand his global research footprint. Utilising this funding, he will embark on immersive collaborative projects with esteemed scholars from three premier global institutions: the Université de Lorraine, the KTH Royal Institute of Technology, and the University of Technology Sydney.

Through these international partnerships, Professor Daoud aims to significantly advance the development of flexible devices tailored for artificial intelligence and new energy applications. His pioneering research not only highlights CityUHK's global research excellence but also promises to translate academic outcomes into tangible technological advancements, ultimately driving the future of sustainable energy and smart wearable devices.

Content adapted from CityUHK NewsCentre

Professor Steven Wang's research team develops "Liquid Droplet Mops" for solar panel cleaning, saving over 80% of water globally each year

With the rapid expansion of the global solar energy industry, the number of solar panels has surged in recent years. However, dust and pollutants accumulating on panel surfaces can significantly reduce energy conversion efficiency, while traditional cleaning methods are highly water-intensive.

The innovative "Liquid Droplet Mop" technology precisely controls droplet impacts to effectively remove contaminants from solar panel surfaces.

In response to this challenge, an international research team led by the Department of Mechanical Engineering has successfully developed a breakthrough technology, called "Liquid Droplet Mops", which only uses a minimal amount of water to effectively remove dust and pollutants from solar panel surfaces, significantly enhancing cleaning efficiency while conserving water.

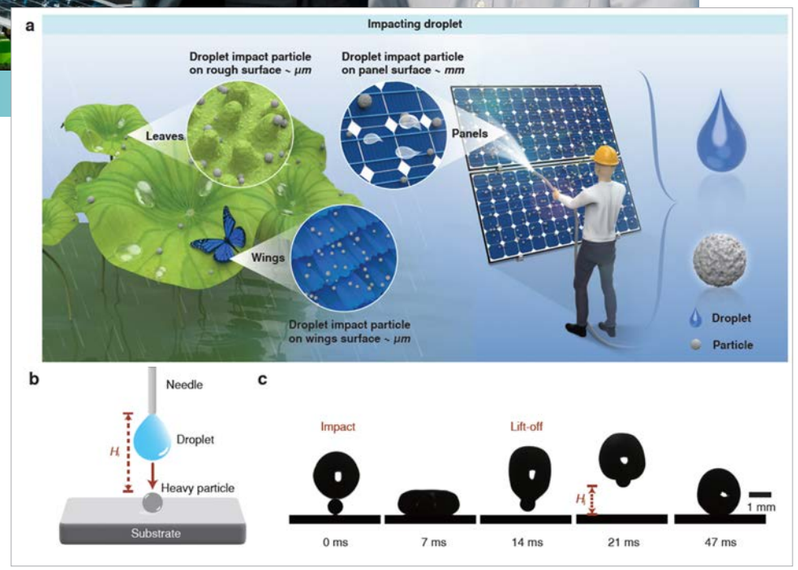
The study was led by **Professor Steven Wang**, Associate Vice-President (Resources Planning) and Professor in the Department of Mechanical Engineering and the School of Energy and Environment. The project was conducted in collaboration with **Professor Omar Matar** from the Department of Chemical Engineering at Imperial College London. The findings were published in the prestigious journal *Nature Sustainability*.

High-pressure liquid jets are commonly used to clean solar panels, but they require an enormous amount of water, with global use exceeding 12 billion gallons per year. The research team discovered that cleaning efficiency depends non-monotonically on droplet energy, meaning that greater impact does not necessarily yield better cleaning efficiency; instead, optimal cleaning performance occurs at moderate energy levels rather than at maximum force.

The innovative "Liquid Droplet Mop" technology precisely controls droplet impacts to effectively remove contaminants from solar panel surfaces, achieving up to 99.9% particle removal efficiency. It successfully addresses the challenge of high-density dust, including heavy particles with densities 6-10 times that of water. Compared to conventional methods, this approach reduces water usage by 6-10 times, potentially reducing the total annual water consumption required for global solar panel cleaning by more than 80%.

The technology leverages the physics of droplet spreading and recoiling upon impact with the panel

Professor Steven Wang's team has invented "Liquid Droplet Mops" that effortlessly strip dust and pollutants from solar panel surfaces, significantly enhancing cleaning efficiency while conserving water.



The technology leverages the physics of droplet spreading and recoiling upon impact with the panel surface, generating targeted hydrodynamic forces that drag and lift pollutants away.

surface, generating targeted hydrodynamic forces that drag and lift pollutants away. This breakthrough is particularly promising for large-scale solar farms in arid desert regions, alleviating water stress and enhancing the sustainability and viability of renewable energy deployment worldwide.

Professor Wang explained that the technology draws inspiration from natural phenomena, such as butterfly wings and plant leaves, which achieve self-cleaning through raindrop impacts. "We hope this groundbreaking technology will help conserve global water resources, improve the efficiency of renewable energy utilisation, and ultimately generate significant economic and environmental benefits," he said.

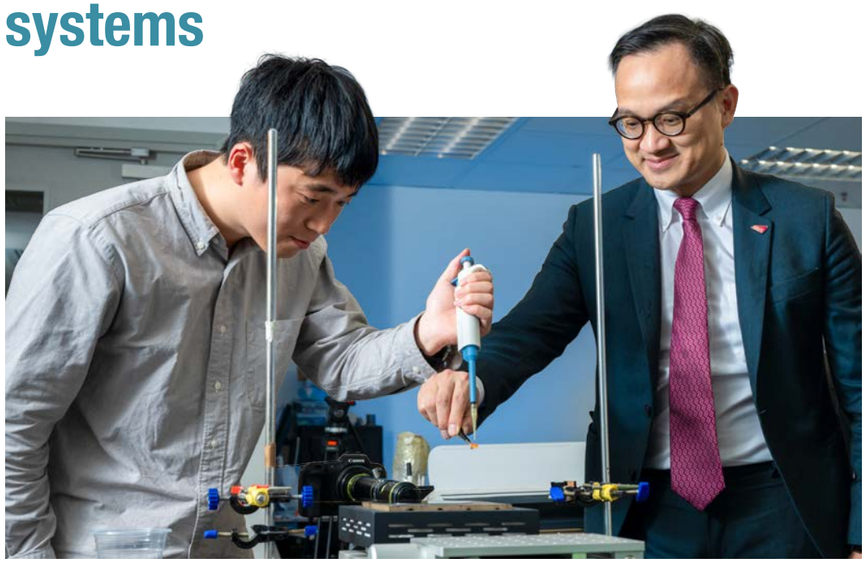
He added that this is a simple yet highly impactful research outcome. It not only validates a new cleaning mechanism but also provides important insights for future engineering design of solar panel cleaning devices.

Mr Lo Wai-kin, a research team member and PhD student in the Department of Mechanical Engineering, explained that they repeatedly tested droplets using sand particles of various sizes to simulate actual desert conditions. The study found that within the typical range of sand particle sizes deposited on solar panels, droplet impact can effectively coalesce and remove particles, enabling each droplet's impact energy to be utilised more efficiently to carry away contaminants, resulting in a highly effective and stable cleaning mechanism.

Amid major global environmental challenges, including the clean energy transition and water scarcity, CityUHK remains committed to developing innovative technologies that provide practical solutions. As this technology advances toward broader promotion and application, it will contribute significantly to achieving more sustainable and efficient use of renewable energy.

Content adapted from CityUHK NewsCentre

Professor Steven Wang's team discovers revolutionary surface design to transform thermal management and enable frictionless systems



CityUHK has designed a revolutionary capillary structure that can trigger the Leidenfrost effect, offering a practical solution for temperature-controlled Leidenfrost without requiring complex surface engineering.

A research team led by **Professor Steven Wang**, Associate Vice-President (Resources Planning) and Professor in the Department of Mechanical Engineering and the School of Energy and Environment, has designed a revolutionary capillary structure that can trigger the Leidenfrost effect, offering a practical solution for temperature-regulated Leidenfrost effect without complex surface engineering. The study, titled "Capillary Leidenfrost Effect", was recently published in the prestigious international journal *Nature Physics*.

The Leidenfrost effect is a physical phenomenon discovered in 1756. It occurs when a liquid droplet touches a surface much hotter than its boiling point, forming a vapour layer that levitates and hovers, slowing evaporation. A simple example is water on a very hot pan: the drops sizzle and evaporate quickly, but once it reaches the Leidenfrost point, they bead up, skate and dance across a steam barrier, and last much longer before evaporating. This effect is ubiquitous in a wide range of laboratory and industrial applications.

Since a thermally insulating vapour layer forms via the Leidenfrost effect, heat transfer performance is significantly reduced, increasing the risk of rendering liquid cooling of high-temperature surfaces ineffective. As a result, since its discovery more than 200 years ago, the Leidenfrost effect has been studied extensively. However, it remains extremely challenging to control the conventional effect due to the complex dynamics of the liquid.

The research team has uncovered a new Leidenfrost behaviour, the Capillary Leidenfrost Effect, providing stable, sustainable solid levitation via liquid evaporation at a temperature threshold of only 110°C, significantly below the Leidenfrost point of its droplet counterpart, yet without the need for specialised surface manufacturing techniques.

The study will help usher in a new era of industrial applications, as the effect has been shown to be robust and achievable across a wide range of inexpensive materials.

The study has reported the lowest Leidenfrost Point (LFP) to date without relying on any specialised surface manufacturing techniques, contrary to existing studies that claim the Leidenfrost effect requires a substrate temperature significantly higher than the substrate's boiling point. In contrast, upon liquid infusion, the capillary structure immediately transitions to the Leidenfrost regime. This levitation state is maintained for approximately two minutes; however, it can be sustained indefinitely through continuous liquid replenishment.

The ultra-low LFP could reduce the critical heat flux required to initiate the Leidenfrost effect by 5.6 times compared with that on a common metallic surface. More importantly, it could significantly reduce energy input for frictionless-motion applications, providing a new way to sustain a stable Leidenfrost heat flux.

"By confining liquid within capillaries, we can achieve precise control over the LFP," Professor Wang said. "Conventionally, the mode of liquid phase change is passively dictated by temperature, but now we demonstrate the ability to customise the LFP using structural parameters based on our practical needs." He emphasised that two possible future applications of this new discovery are advanced heat management and scalable frictionless motion.

"We can control the temperature at which boiling regimes shift, maintaining highly efficient cooling over a much broader range of operating conditions, thus revolutionising the design of heat exchangers and cooling systems for high-performance electronics and power generation," he said.

The study will help usher in a new era of industrial applications, as the effect has been shown to be robust and achievable across a wide range of inexpensive materials. Frictionless motion and drag reduction on an industrial scale hold huge potential for applications such as contactless transportation systems and ultra-low-friction bearings.

Content adapted from CityUHK NewsCentre

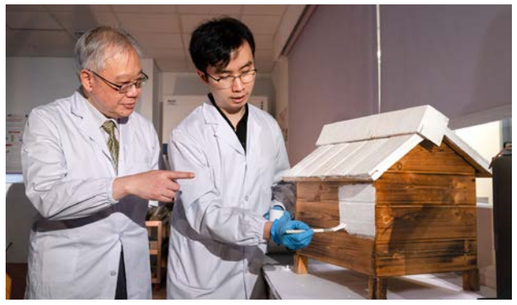
Professor Lee Duu-Jong's JC STEM Lab of Circular Bio-economy showcases research milestones: developing smart building skins and eco-friendly hydrogen production technology

The JC STEM Lab of Circular Bio-economy (the Lab) at City University of Hong Kong (CityUHK) has recently achieved a breakthrough in sustainable development technologies. A research team led by **Professor Lee Duu-Jong**, Director of the Lab and Chair Professor in the Department of Mechanical Engineering (MNE), has successfully developed a bio-inspired "all-weather building skin" that cools in sunlight and harvests energy from rain, alongside a "turbocharged" solar hydrogen system powered by low-cost copper ions. These innovations provide a transformative pathway for urban energy conservation and clean energy production, reinforcing the Lab's commitment to translating cutting-edge research into tangible social benefits.

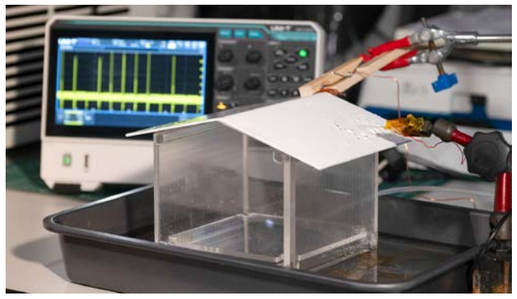
Under Professor Lee's leadership, the Lab is dedicated to shifting the traditional linear "take-make-dispose" model into a circular bioeconomy framework. "The core of a circular bio-economy lies in creating 'closed-loop' systems that enable continuous recycling of resources throughout the production and consumption cycle," said Professor Lee.

Inspired by the layered leaf structure of the Tillandsia air plant, **Mr Zeng Yijun**, a PhD student of the MNE Department, developed "BRIDGE skin", a paintable, all-weather building coating. This technology enables building envelopes, including roofs and walls, to harness free natural resources to achieve both energy savings and electricity generation under changing weather conditions.

In sunny conditions, the coating reflects over 95% of solar energy and emits stored heat as infrared radiation into space. This reduces surface temperatures by up to 9.5°C below ambient levels, significantly reducing air-conditioning electricity demand. When it rains, the impact of falling raindrops triggers electrical pulses. This energy is sufficient to power small liquid-crystal displays or wireless sensors directly.



The all-weather building coating BRIDGE skin has paintable properties, making it significantly easier to apply to existing building retrofits than traditional rigid power-generating devices.



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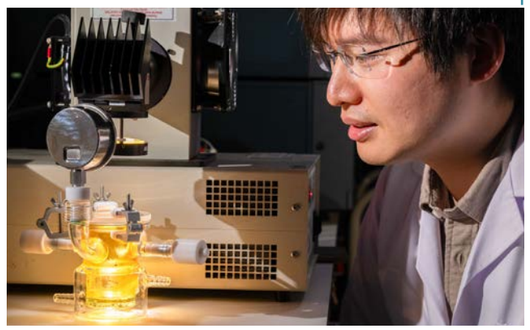
Professor Lee Duu-Jong

Traditionally, integrating electrodes and energy-harvesting layers often compromises a material's ability to reflect sunlight and radiate heat. Inspired by the stratified structure of Tillandsia air plants, the team overcame this limitation. By adopting a stratified design, the outer layer manages droplet contact, accelerating water movement and self-cleaning, while the buried layers are responsible for sunlight reflection, heat dissipation, and charge storage, ensuring maximum efficiency without trade-offs.

Additionally, the paintable nature of the coating makes it significantly easier to apply to existing building retrofits than traditional rigid power-generating devices, demonstrating immense practical value.

Another breakthrough is the closed-loop, round-the-clock, eco-friendly hydrogen production system, developed by postdoctoral fellow **Dr Mak Chun Hong** from MNE. Conventional hydrogen production processes currently rely heavily on costly and rare metals such as platinum, making large-scale production difficult. The research team has successfully replaced platinum with abundant, price-stable, low-cost copper ions. This has unlocked a highly efficient dynamic chemical reaction that can generate hydrogen even under a smartphone's flashlight.

The system introduces copper ions to create a self-regenerating cycle, enabling continuous hydrogen production while recycling its own chemical waste. The key lies in capturing a temporary "copper hydride" state, allowing it to store energy under light and continue releasing hydrogen in the dark, achieving round-the-clock green fuel production.



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Professor Lee likened this system to a "chemical turbocharger" that uses copper as a kinetic booster. This breakthrough paves the way for the mass production of affordable, scalable, round-the-clock zero-emission fuel.

These cost-effective, self-sustaining technologies will provide a critical buffer of clean energy for Hong Kong and the Greater Bay Area, enhancing resilience to global energy market volatility. Professor Lee emphasised that the Lab is dedicated to developing key technologies that promote resource circularity within high-density urban environments, maximising the utility of architectural spaces.

"The JC STEM Lab of Circular Bio-economy will continue to drive the translation of research findings into practical applications," Professor Lee stated. "Through research-academic-industrial collaboration, we aim to establish industrial alliances that leverage CityUHK's research strengths to develop low-carbon, circular smart cities, directly supporting the nation's 15th Five-Year Plan and the carbon neutrality goals of Hong Kong's Climate Action Plan 2050."

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