

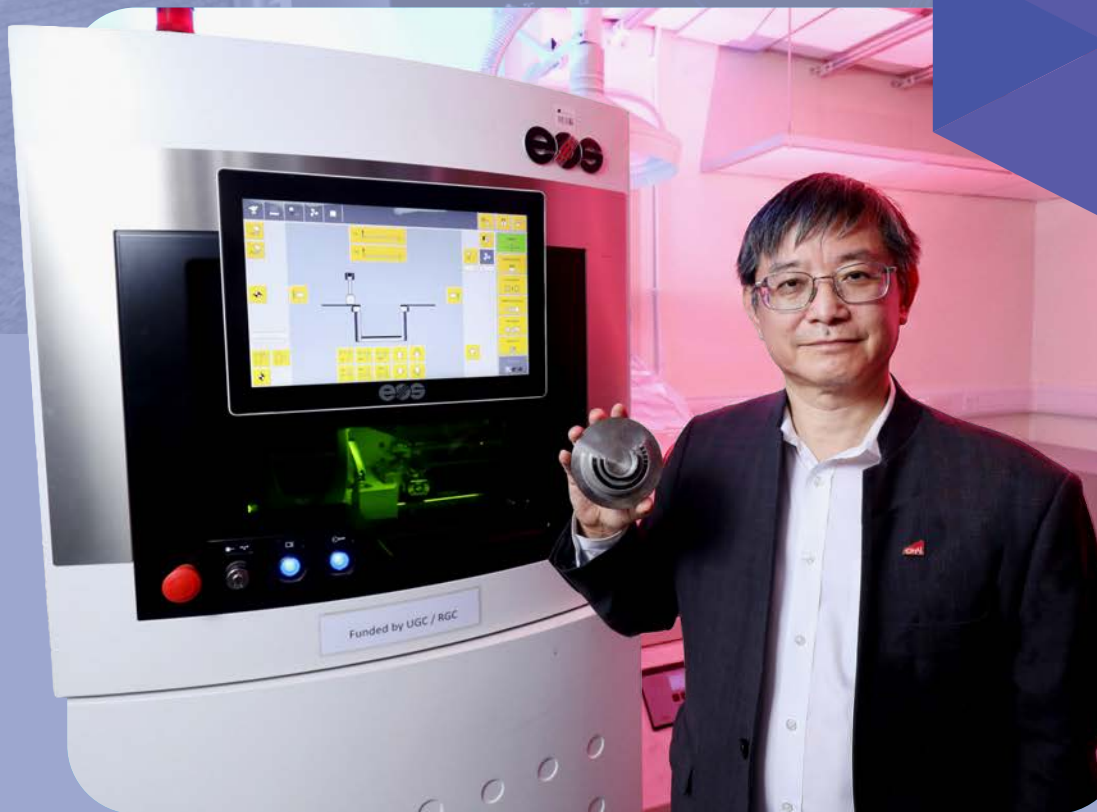
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香港城市大學
City University of Hong Kong

CityUHK Engineering Newsletter

October 2026

CityUHK and University of Cambridge establish Centre for Advanced and Smart Manufacturing to shape Hong Kong's Industry 5.0 future



**CityUHK attains new heights in
global rankings**

**CityUHK ranked No. 1 in Hong Kong in Nature
Index 2026 Nanoscience and Nanotechnology
Supplement**

CityUHK and University of Cambridge establish Centre for Advanced and Smart Manufacturing to shape Hong Kong's Industry 5.0 future

As artificial intelligence (AI) transforms the way products are designed, produced and used, City University of Hong Kong (CityUHK) and the University of Cambridge have established the Centre for Advanced and Smart Manufacturing (CASM) with the vision of positioning Hong Kong as a world-leading Industry 5.0 innovation hub where advanced technologies work alongside people to support more sustainable, resilient and responsible manufacturing.

Based in Hong Kong Science Park, CASM is one of the research centres under the InnoHK initiative of the Government of the Hong Kong Special Administrative – SEAM@InnoHK. The Centre is co-led by **Professor Lu Jian**, Chair Professor in the Department of Mechanical Engineering at CityUHK, and **Professor Colm Durkan** of the University of Cambridge.

CASM brings together researchers from Hong Kong and around the world to advance new materials, manufacturing methods and digital technologies for industries facing urgent challenges. These include addressing the cooling challenges of data centres, developing next-generation environmentally friendly refrigeration technologies, making new energy vehicles lighter and more sustainable, and developing better materials for electronics and everyday products.

The competitiveness of future industries will depend on accelerating the translation of research into real-world applications, enabling innovation to redefine manufacturing. Professor Lu believes that Hong Kong is entering a pivotal stage in its reindustrialisation journey.



Professor Lu shares his vision for CASM and Hong Kong's Industry 5.0 future.

"Hong Kong was once one of Asia's leading manufacturing centres. Looking ahead, our aim is to leverage advanced manufacturing to enable Hong Kong to once again play a key role in the global industrial value chain," said Professor Lu. "The vision of CASM is to establish Hong Kong as a world-leading Industry 5.0 manufacturing innovation hub."

While Industry 4.0 focuses on connected systems, robotics, and data-driven production, Industry 5.0 places greater emphasis on integrating AI with sustainability, human expertise, and social responsibility.

"AI is a key enabler, but environmental protection and social responsibility are equally important," said Professor Lu. "These are the defining principles of Industry 5.0."

One of the Centre's defining features is its use of additive manufacturing (3D printing) as its core technology platform, integrating materials design, digital engineering, manufacturing processes and end-use applications into a single research framework. This interdisciplinary approach enables researchers to design new materials and products with their final purpose in mind, simultaneously optimising performance, cost-effectiveness and sustainability.

The Centre's research focuses on four major application areas: next-generation refrigeration technologies, thermal management for data centres, green manufacturing for new energy vehicles, and innovative materials for consumer electronics.

Take data centres as an example. The rapid growth of AI is creating a global need for more efficient data centres. These facilities require significant amounts of energy, much of which is used to remove heat



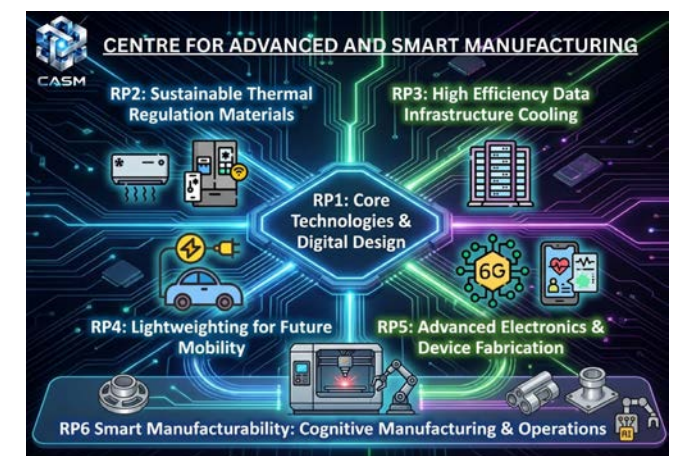
Professor Lu believes that innovation, sustainability and international collaboration will be key to shaping the future of manufacturing.

from computing equipment. CASM researchers are developing novel heat-exchange structures and high-performance metallic materials that could improve cooling efficiency while reducing energy consumption. More efficient cooling can help support the continued growth of AI and digital services in a more sustainable way.

The Centre is also exploring the use of recycled aluminium, also referred to as green aluminium, in the manufacturing of new energy vehicles. By combining AI-assisted design with additive manufacturing, researchers aim to reduce vehicle weight without compromising performance or safety. Since recycled aluminium requires substantially less energy to produce than primary aluminium, this approach also helps reduce carbon emissions, paving a pathway towards more sustainable manufacturing.

Beyond its research and technological innovation, CASM will serve as a training ground for the next generation of researchers, engineers and technology leaders. The Centre plans to recruit PhD students, postdoctoral researchers and undergraduate students to participate in research projects, internships and international collaborations. Young researchers will have opportunities to work across disciplines and gain exposure to world-leading scholars and industry partners. This talent development mission is central to Hong Kong's ambitions to strengthen its innovation and technology ecosystem and support the city's new industrialisation.

Looking ahead, Professor Lu believes that Hong Kong is well positioned to become a major hub for advanced and smart manufacturing because of its international outlook, strong research capabilities and close links with the industrial ecosystem of the Guangdong-Hong Kong-Macao Greater Bay Area.



CASM's six research strategies encompass Core Technologies & Digital Design, Sustainable Thermal Regulation Materials, High Efficiency Data Infrastructure Cooling, Lightweighting for Future Mobility, Advanced Electronics & Device Fabrication, and Cognitive Manufacturing & Operations. The Centre focuses its research on four major application areas forming a comprehensive framework that includes next-generation refrigeration technologies, thermal management for data centres, green manufacturing for new energy vehicles, and innovative materials for consumer electronics.

"Hong Kong is home to a platform that attracts talent from around the world, while also serving as a unique gateway connecting the Greater Bay Area with the international community," said Professor Lu. "Through CASM, we aim to bring more innovative technologies from the laboratory to industry, injecting fresh momentum into Hong Kong's new industrialisation and future economic development."

Source: CityUHK NewsCentre

CityUHK attains new heights in global rankings



This past quarter has been nothing short of extraordinary for the City University of Hong Kong (CityUHK). As the university continues its relentless pursuit of academic and research excellence, recent publications of major international university rankings have firmly cemented its status as a premier global institution.



Soaring global institutional rankings

In the newly released 2026 Academic Ranking of World Universities (ARWU), CityUHK secured its place among the top 100 global institutions for the second consecutive year. Rising four places to rank 95th worldwide, it firmly maintained its 2nd position in Hong Kong.

This success is also reflected in the 2027 Quacquarelli Symonds (QS) World University Rankings published earlier this year, in which CityUHK achieved a remarkable leap of 11 places to rank 52nd globally, placing us in the top 3% of universities worldwide.

A significant driver of these achievements is the faculty's monumental research impact. In the ARWU rankings, CityUHK entered the global top 25 for the first time in the "Highly Cited Researchers by Clarivate" indicator. Furthermore, in the QS rankings, the University achieved an exceptional 2nd place globally—and 1st in Hong Kong—for "Citations per Faculty". These metrics underscore the top-tier academic standard of our research teams and their tangible contributions to global science and societal development.

Subject-specific dominance in GRAS 2026

The University's comprehensive research strengths were further highlighted in ShanghaiRanking's Global Ranking of Academic Subjects (GRAS) 2026. Out of more than 3,000 universities evaluated worldwide, CityUHK had an impressive 44 subjects ranked, with 22 landing in the global Top 50.

Across these top-tier subjects, CityUHK demonstrated exceptional "World Class Output", ranking in the global top 20 for publications in leading journals and prestigious awards. Locally, CityUHK dominated the landscape by claiming the top spot in Hong Kong across 10 distinct subjects, including six engineering subjects:

- Library & Information Science (#3)
- Metallurgical Engineering (#9)
- Automation & Control (#11)
- Environmental Science & Engineering (#14)
- Nanoscience & Nanotechnology (#18)
- Chemical Engineering (#44)

Content adapted from CityUHK NewsCentre

CityUHK ranked No. 1 in Hong Kong in Nature Index 2026 Nanoscience and Nanotechnology Supplement



CityUHK tops Hong Kong in the "Nature Index 2026 Nanoscience and Nanotechnology Supplement".

City University of Hong Kong (CityUHK) has achieved another significant milestone in global research excellence. Following its earlier achievement of ranking 38th globally and 1st in Hong Kong in the "Nature Index 2026 Chemistry Supplement", CityUHK has reached new heights in the Nature Index. It secures a place among the "Leading 200 Institutions" and is ranked 41st worldwide and 1st in Hong Kong in the latest "Nature Index 2026 Nanoscience and Nanotechnology Supplement", demonstrating its strong research performance and growing international influence in nanoscience and nanotechnology.

The ranking evaluates institutions based on their article share in top journals in the nanoscience and nanotechnology fields in 2025. CityUHK achieved an Article Share of 81.19 and an Article Count of 256. These results underscore CityUHK's leadership in producing high-quality research published in the world's most prestigious scientific journals.

The achievement reflects CityUHK's sustained commitment to advancing frontier research and innovation. Through its interdisciplinary research ecosystem, the University has established itself as a leading centre for pioneering research in nanomaterials, advanced manufacturing, energy technologies, biomedical engineering and other emerging areas enabled by nanoscience and nanotechnology. Notably, CityUHK is the only university in Hong Kong ranked among the global top 50 across three reputable international rankings*: ShanghaiRanking's Global Ranking of Academic Subjects (GRAS) 2026, U.S. News & World Report Best Global Universities Subject Rankings 2026–2027, and the Nature Index 2026 Nanoscience and Nanotechnology Supplement.

The Nature Index Nanoscience and Nanotechnology Supplement showcases the world's leading institutions advancing nanoscience and nanotechnology, a field that is driving breakthroughs ranging from programmable RNA architectures to next-generation materials for energy and healthcare applications. As researchers increasingly harness the unique properties of materials at the nanoscale to address some of society's most pressing challenges, the ranking recognises institutions making significant contributions to discoveries that are shaping the future.

Looking ahead, CityUHK will continue to nurture outstanding talent, foster interdisciplinary collaboration and pursue groundbreaking research that drives scientific progress and delivers lasting benefits for the world.

*Note: In the GRAS 2025 and the U.S. News & World Report Best Global Universities Subject Rankings 2026–2027, CityUHK was ranked 16th and 8th in Nanoscience and Nanotechnology globally, respectively, also securing the top position in Hong Kong in both rankings.

Source: CityUHK NewsCentre



CENG celebrates outstanding success in 2026-27 RGC funding results

The College of Engineering have achieved remarkable success in the recently announced 2026-27 Research Grants Council (RGC) funding results. It secured 67 grants across the General Research Fund (GRF) and the Early Career Scheme (ECS), bringing in a total of approximately HK\$58.82M in funding.

Funding scheme	Number of funded proposals	Value of grant (HK\$M)
General Research Fund (GRF)	55	\$49.93M
Early Career Scheme (ECS)	12	\$8.89M
Total	67	\$58.82M

Our College's performance stands out among the eight sister institutions, particularly within the Engineering Panel, where we ranked second overall in both the number of awards and the total funding secured.

Specific disciplinary achievements include:

- Securing the highest number of grants and total funding in the Electrical & Electronic Engineering discipline, ranking first in success rate among all sister institutions.
- Ranking second across all institutions in both the number of awards and total funding. Notably, the ECS success rate in this subject area reached a stellar 60%.



- Ranking third in Civil Engineering, Surveying, Building & Construction in terms of success rate, number of awards, and total funding secured.
- Ranking third in success rate, number of awards, and total funding secured in Computer Science & Information Technology

In addition, seven of our faculty members were specifically listed among the highly-ranked applications, a testament to the exceptional quality and innovative nature of our College's research output.

The GRF and ECS are vital research funding schemes administered by the RGC. While the GRF supports researchers who have achieved or have the potential to achieve excellence, the ECS plays a crucial role in nurturing junior academics and preparing them for lifelong careers in education and research.

Two CityUHK scholars elected to the European Academy of Engineering in recognition of their internationally acclaimed research achievements



Professor Li (right) and Professor So are elected members of the EAE.

Professor Li Wen Jung, Vice-President (Talent and International Strategy) and Chair Professor in the Department of Mechanical Engineering at City University of Hong Kong (CityUHK), and **Professor So Hing Cheung**, from the Department of Electrical Engineering, have both been elected as Members of the European Academy of Engineering (EAE). They have been recognised for their outstanding contributions to artificial intelligence (AI)-enabled micro/nano-sensing technologies and statistical signal processing and intelligent algorithms, respectively.

Professor Li is recognised for his pioneering contributions to AI, micro/nano-systems, robotics and biomedical engineering, with outstanding research achievements. He has published extensively in leading international journals and holds approximately 30 patents. In addition, he has founded start-ups to commercialise intelligent sensing and micro/nano-system technologies. These innovations have been widely applied in robotics, aerospace, sports analytics, education, infrastructure monitoring and industrial Internet of Things (IoT).

Professor So, another newly elected EAE Member, has made sustained contributions to statistical signal processing and intelligent algorithms. His research has advanced the fields of sparse recovery, matrix completion, robust estimation, source localisation and federated learning. In recent years, his work has focused on enhancing the robustness and reliability of AI systems in complex environments. His pioneering research on sparsity-inducing algorithms, robust low-rank matrix recovery, and Byzantine-resilient federated learning has strengthened the theoretical foundations of AI while improving its practical reliability and secure real-world deployment.

Founded in 1992 in Gothenburg, Sweden, the EAE is an international academy. Its members are rigorously elected by their peers across 13 specialised engineering classes and comprise internationally renowned leaders and distinguished scholars from academia and industry, including Nobel Laureates, Turing Award Laureates, Fields Medalists, and recipients of other major international distinctions. Election to the EAE is regarded as one of the highest honours in the international engineering community, recognising sustained excellence in engineering research, technological innovation, education, and industrial leadership. The 2026 elected cohort comprises 147 Members. As of 5 August 2026, Professor Li was one of only four newly elected Members worldwide in the Mechanical Engineering (Materials) class. This year's newly elected Members also include eminent scholars and technology leaders such as Turing Award Laureate **Professor Vinton G Cerf**, and Nobel Laureate **Professor Phillip A Sharp**.

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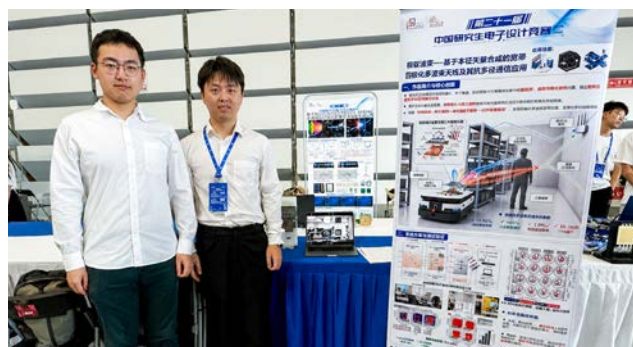
Electrical engineering students win three first prizes at China Graduate Electronics Design Contest; inaugural Hong Kong and Macau division strengthens innovation collaboration

The Department of Electrical Engineering secured three National First Prizes at the 21st China Graduate Electronics Design Contest (GEDC) National Finals, held from 12–14 August in Wuzhen, Zhejiang Province, China.

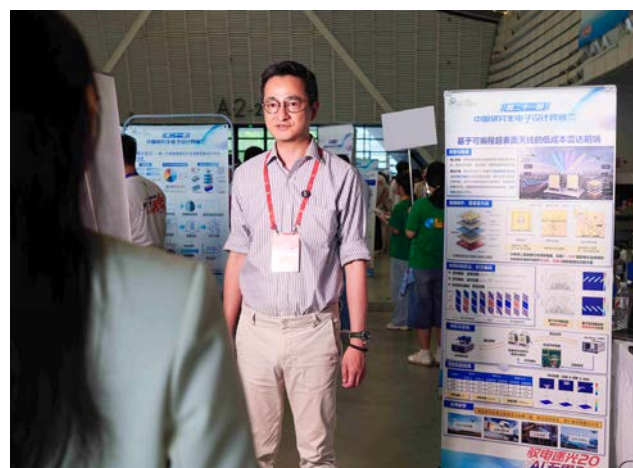


Delegation members from the Hong Kong and Macau Division participate in the National Finals of the 21st China GEDC.

This year's event introduced the inaugural Hong Kong and Macau Division hosted by CityUHK and chaired by **Professor Wong Hang**. The division selected 12 teams from Hong Kong and Macau to compete on the national stage, which drew over 40,000 participants from 379 institutions nationwide.



One of CityUHK's National First Prizes-winning projects: "Broadband Quad-Polarised Multi-Beam Antenna Based on Eigenvector Synthesis and Its Anti-Multipath Communication Applications"



Professor Wong Hang serves as Chairman of the Organising Committee of the Hong Kong and Macau Special Division.



Three CityUHK teams are awarded National First Prizes at the National Finals of the 21st China GEDC.

Award-winning projects

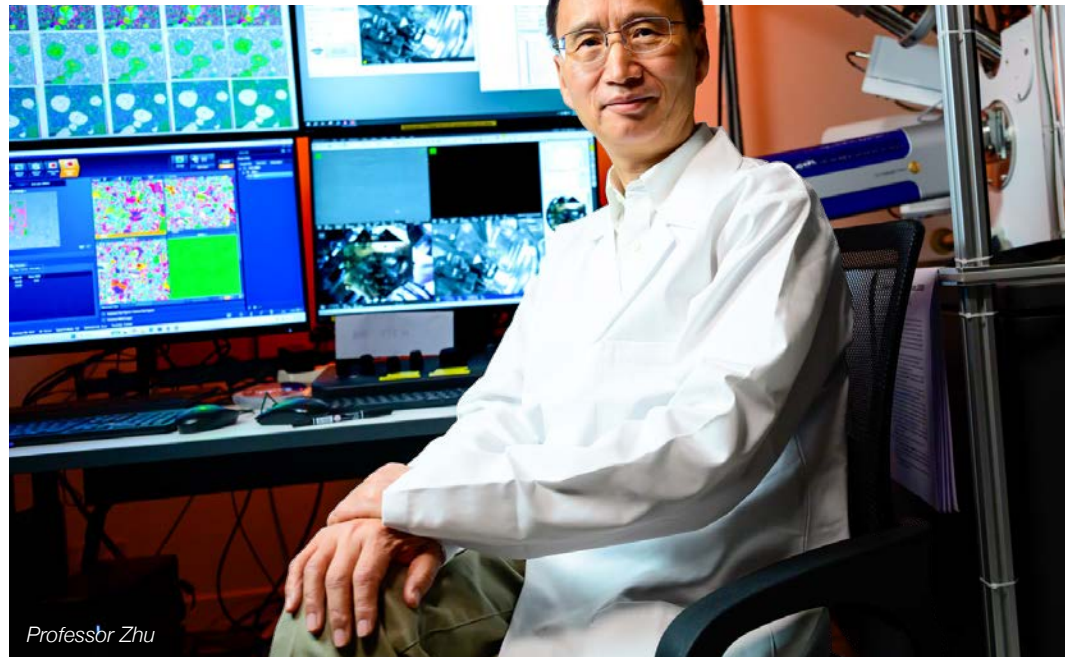
Title	Description	Team composition
252-283GHz Terahertz Chipset Based on 65nm CMOS Technology and Its Dual-Mode Applications in Communications and Imaging	Developed a 65nm CMOS-based chipset enabling both high-speed communications and high-resolution imaging	<u>Supervisors:</u> Professor Chan Chi-hou, Dr Lin Zhicheng <u>Team members:</u> Miss Mo Yingxue, Mr Tam Hiu-lok, Mr Zhang Jingyuan
Broadband Quad-Polarised Multi-Beam Antenna Based on Eigenvector Synthesis and Its Anti-Multipath Communication Applications	Created an anti-multipath antenna system tailored for complex environments, offering critical applications for 6G networks and intelligent robotics	<u>Supervisors:</u> Professor Wong Hang, Dr Yang Ye <u>Team members:</u> Mr Liu Ji, Mr Teng Wenyi, Mr Zhang Yuxin
Low-Noise Terahertz Photonic Integrated Receiver Front-End for 6G Communications	Mitigated signal attenuation and noise in terahertz communications to improve receiver sensitivity. <i>The project was selected for the contest's prestigious "Star of GEDC" public presentation session.</i>	<u>Supervisors:</u> Professor Wang Cheng, Dr Zeng Yuansong <u>Student:</u> Mr Wang Zixi

Professor Wong highlighted that national competitions allow students to experience the full innovation lifecycle—from fundamental research to practical application—while driving cross-regional collaboration and knowledge transfer. Participating students noted that the experience deepened their project management skills, fostered cross-national exchange, and helped them explore paths to commercialise their research.

The debut of the Hong Kong and Macau Division marks a key milestone in integrating local postgraduate talent into the national innovation ecosystem. Moving forward, CityUHK plans to leverage its position as a bridge between the Chinese Mainland and international communities to advance the Guangdong-Hong Kong-Macau Greater Bay Area as an international innovation and technology hub.

Content adapted from CityUHK NewsCentre

Professor Zhu Yuntian honoured with 2025 State Natural Science Award

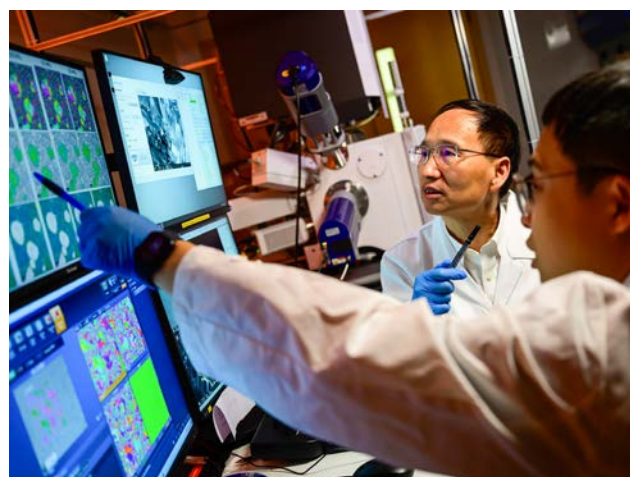


Professor Zhu

Professor Zhu Yuntian, Chair Professor in the Department of Materials Science and Engineering at City University of Hong Kong (CityUHK), has been honoured at the 2025 National Science and Technology Award Conference. His research, titled “Strengthening and Toughening of Heterostructured Metallic Materials”, was awarded Second Prize in the State Natural Science Award. The project involved collaboration between two research teams: one led by **Professor Wu Xiaolei**, at the Institute of Mechanics, Chinese Academy of Sciences, and the other led by Professor Zhu.

Traditionally, it has been difficult to simultaneously improve both the strength and ductility of materials. Heterostructured materials, however, achieve this through the precise design of the size, morphology, proportion, distribution and property differences of different domains within a material, enabling its internal structures to work synergistically and effectively combine “strength and ductility” in a single material.

Professor Zhu noted that in the early stages, the concept of heterostructured materials was not widely understood or accepted by the materials science community. This prompted the team to systematically investigate the fundamental principles behind the strengthening and toughening mechanisms of heterostructured materials, leading to the gradual development of new scientific theories in the field.



Professor Zhu is devoted to advancing the study of heterostructured materials.

Professor Zhu said, “After more than a decade of sustained effort, heterostructured materials have been developed into a major materials research field with broad recognition from the academic community, plus its study has now been honoured with a national-level award, which is tremendously encouraging for us. The new science of heterostructured materials enables metallic materials to achieve both high strength and high ductility simultaneously, providing a theoretical foundation and technological pathway for the design of a new generation of high-performance engineering materials. Looking ahead, we will continue to drive innovation in materials science and technology and make contributions to the sustainable development of the manufacturing industry.”

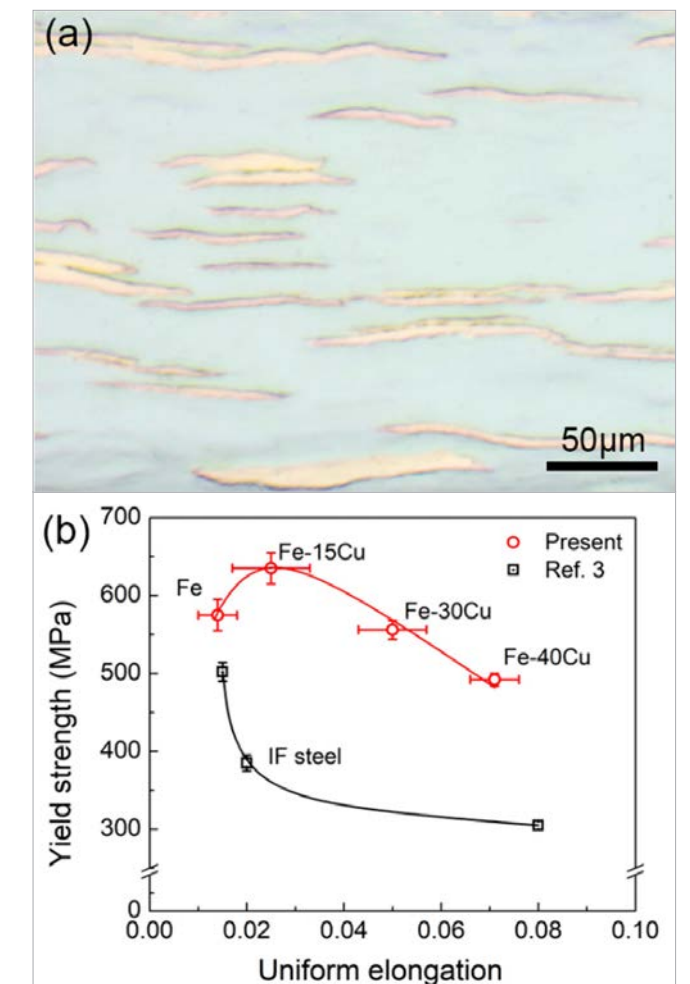
Professor Zhu is an experimentalist whose research focuses on fundamental issues in materials science and the design of advanced materials that combine superior strength and ductility. He joined CityUHK in 2020 and concurrently serves as Chair Professor in the Department of Materials Science and Engineering and the Department of Mechanical Engineering. Prior to joining CityUHK, he was a Distinguished Professor at North Carolina State University and led a research team at Los Alamos National Laboratory in the United States. In recent years, his work has focused on deformation mechanisms at the dislocation level and the mechanical behaviour of heterostructured materials and nano- and ultrafine-grained materials.

An internationally renowned materials scientist, Professor Zhu has been listed among the “World’s Top 2% Scientists” (for both career-long and single-year impact) from 2023 to 2025, as published by Stanford University. He was also elected as a Foreign Member of the Academia Europaea, the European Academy of Sciences, and as a Fellow of the National Academy of Inventors, the Minerals, Metals & Materials Society, the Materials Research Society, the American Physical Society, the ASM International and the American Association for the Advancement of Science. His research, “Cross-scale heterostructure design and strengthening mechanisms in metallic materials”, received Second Prize at the 2025 Outstanding Scientific Research Achievement Award (Natural Sciences and Engineering Technology) from China’s Ministry of Education.

The State Natural Science Award, organised by the State Council of the People’s Republic of China, is China’s most prestigious award in the field of natural science, recognising academic excellence in basic and applied research in natural science.

In addition to Professor Zhu, **Professor Wang Enge**, a Senior Fellow at the CityUHK Hong Kong Institute for Advanced Study and Academician of the Chinese Academy of Sciences, received recognition. The project “Full Quantum Effects on Hydrogen-Bond Strength and Dynamical Processes in Water”, which he led with a research team from Peking University, was awarded First Prize in the State Natural Science Award.

Content adapted from CityUHK NewsCentre



Heterostructured metals exhibit superior strength and ductility beyond the prediction of the rule of mixtures.



From wired to wireless: CityUHK's world-class research transforms wireless charging

Professor Ron Hui Shu-yuen, Chair Professor in the Department of Electrical Engineering, and his team have revolutionised wireless technology. Their pioneering research was adopted as Qi, the world's first international wireless charging standard, firmly establishing the global leadership of City University of Hong Kong (CityUHK) in the field. Building on this success, this CityUHK-originated technology gave rise to the next-generation Qi2 standard, successfully elevating wireless charging from a niche novelty to an everyday global norm.

Professor Hui, an internationally renowned electronics engineering scholar, has played a key role in revolutionising global device charging technology. Recognising the growing e-waste problem caused by incompatible mobile phone chargers in the 1990s, Professor Hui dedicated his research to developing wireless power transfer technologies specifically for portable electronics.

In 2007, his team created an innovative multilayer coil array design. This innovation generated a uniform magnetic flux across a surface, establishing the fundamental concept of "free-positioning" for wireless charging pads. Subsequent breakthroughs by his team included localised charging, compatibility checks, bi-directional communication, and electromagnetic shielding. These advancements culminated in the world's first wireless charging pad, which allowed users to place one or multiple devices anywhere on the surface simultaneously, completely redefining the charging experience.

Professor Hui's pioneering patents quickly caught the attention of major industry players, leading to the formation of the Wireless Power Consortium (WPC) in 2008 by companies like Philips Electronics. In 2010, the WPC launched "Qi" (derived from the Chinese word for "vital force"), the world's first wireless charging standard for portable electronics. Today, the Qi standard dominates the consumer electronics market and has been adopted by over 430 companies, including tech and automotive giants such as

Apple, Samsung, Huawei, and Toyota. Between 2019 and 2025 alone, billions of Qi-compatible devices—ranging from smartphones and earbuds to medical devices—were sold globally.



Professor Hui, an internationally renowned scholar in electronic engineering, develops the wireless power transfer technology with his team. This pioneering work is adopted as the world's first international wireless charging standard, Qi, solidifying CityUHK's global leadership in the field.

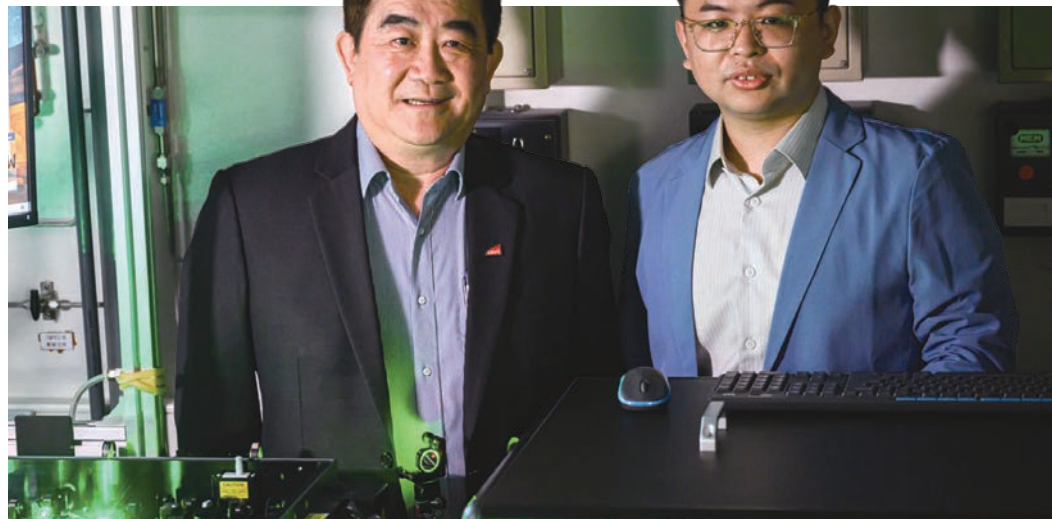
CityUHK has successfully transferred approximately 148 of Professor Hui's patented technologies to industry, with over 60 of them directly related to wireless charging. His foundational work continues to inspire the industry and heavily influence the development of the next-generation Qi2 standard. The Qi2 standard enhances charging efficiency while preserving all of Professor Hui's original key technologies, such as free positioning and handshaking protocols.

The WPC has publicly praised Professor Hui, noting that his innovations remain the core pillars of both the Qi and Qi2 standards, providing convenient and reliable wireless power to billions of people. Professor Hui's monumental achievements highlight CityUHK's commitment to transforming academic research excellence into practical, real-world applications that foster a sustainable future.

Content adapted from CityUHK NewsCentre



Professor Alex Jen Unlocks Record Solar Power Efficiency in Nature



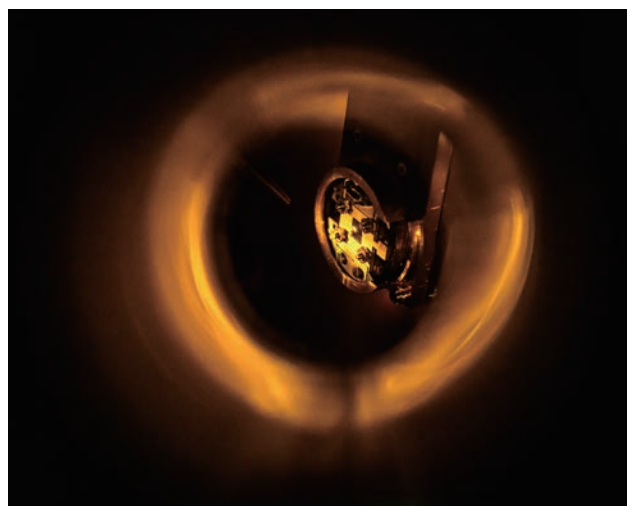
CityUHK researchers achieve first-ever recycling spin-triplet excitons for power generation.
From left: Professor Jen, Dr Li Qian.

A research team led by **Professor Alex Jen Kwan-yue**, Lee Shau Kee Chair Professor of Materials Science at City University of Hong Kong (CityUHK), has successfully overcome a decade-old technological bottleneck in organic photovoltaics (OPV). Their research, which achieved a remarkable power conversion efficiency (PCE) of 20.5%, has been recognised by the global scientific community and published in the highly prestigious and world-renowned journal *Nature*.

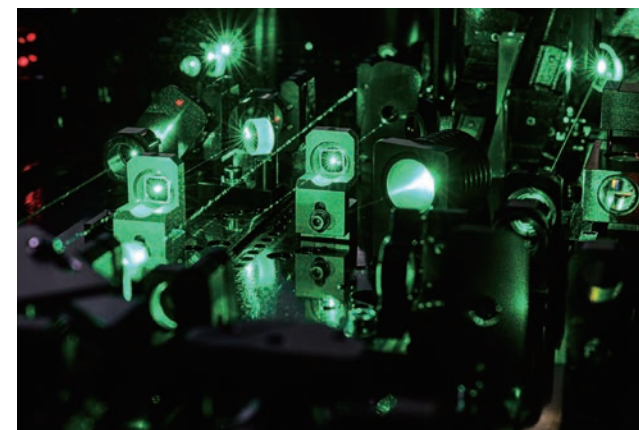
The paper, titled “Recycling of Spin-Triplet Excitons in Organic Photovoltaics,” details a revolutionary method pioneered by Professor Jen and his team—including **Dr Li Qian**—to recycle spin-triplet excitons for power generation.

For years, low-energy spin-triplet excitons (T_1) in OPV systems have been viewed as “energy traps” that typically dissipate energy as heat rather than contributing to light-to-electricity conversion. However, under the expert guidance of Professor Jen, the CityUHK team challenged this conventional understanding.

By studying an organic photovoltaic system incorporating a novel acceptor material known as FTh-4F, Professor Jen’s team observed that the lifetime of free charge carriers in this system was significantly longer than that of the spin-triplet excitons. This revealed that triplet excitons could dissociate back into free charge carriers rather than merely decay into heat.



Δ EST measurements are performed in an ultra-high vacuum photoelectron analyser.



The excited-state dynamics of the samples are resolved by an ultra-fast laser system.

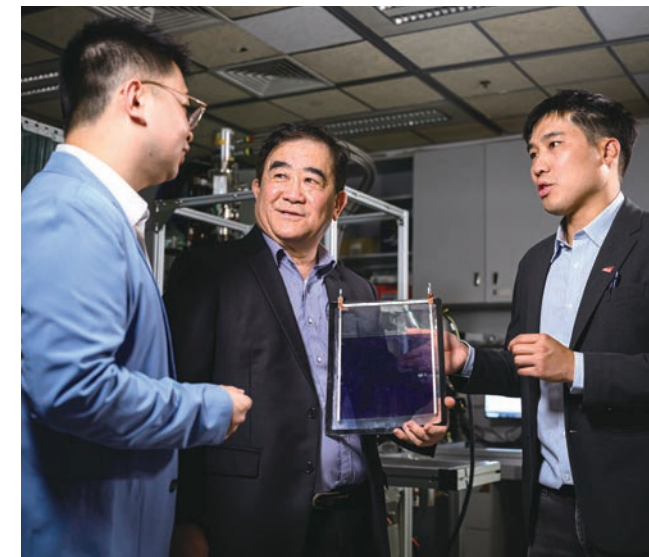
Through meticulous follow-up experiments—utilising ultra-high-vacuum photoelectron analysers for Δ EST measurements and ultra-fast laser systems to resolve excited-state dynamics—the team demonstrated that increasing the concentration of triplet excitons via sensitisation enabled their re-dissociation into extractable free charge carriers. By fine-tuning the side-chain structure and exciton delocalisation in aggregates, the researchers effectively reduced the singlet-triplet band gap (Δ EST). Using FTh-4F as a ternary component, they successfully recycled these triplet excitons, boosting the OPV cell efficiency to an unprecedented 20.5% and earning their place in *Nature*.

This prestigious *Nature* paper crowns years of dedicated effort by Professor Jen and his CityUHK team. In 2022, they developed a novel layer-by-layer engineering strategy to suppress triplet exciton formation, minimising recombination loss and setting a previous efficiency record of over 19%. That foundational work was published in another top-tier journal, *Nature Energy*.

While investigating the excited-state dynamics of the D18:FTh-4F system, the team observed this unique recycling phenomenon. Moving past mainstream assumptions, they spent two years rigorously collecting and validating data to achieve this breakthrough.



This new technology developed by CityUHK can be applied to the new-generation semi-transparent solar cells.



The research team led by Professor Jen (centre) dedicates to improving the efficiency of OPV cells.

Highlighting the importance of this work, Professor Jen stated:

“This study refines the scientific framework regarding the evolution of excitons/charge carriers in organic optoelectronic devices and opens up broad application prospects for systems involving charge separation and charge recombination processes. This breakthrough is expected to significantly enhance energy utilisation efficiency and advance the transition towards a cleaner, more efficient and sustainable future.”

The research was spearheaded by CityUHK under Professor Jen’s leadership, in collaboration with scientists from Soochow University and Nanjing University.

Content adapted from CityUHK NewsCentre



CityUHK team invents novel eDNA membrane to advance understanding of inshore fish diversity



A research team led by Professor Leung (right) and Professor Zeng has successfully developed a novel membrane that significantly improves the efficiency of collecting and detecting marine organisms' eDNA.

Monitoring marine life helps scientists track ecosystem health, improve conservation, and manage fisheries. A promising approach is environmental DNA (eDNA), which refers to tracing genetic material naturally released into the water by organisms, such as skin cells, mucus and excreta. By analysing eDNA in water samples, scientists can determine which species are present in a given body of water without the need to physically capture or observe the organisms. This method is of great significance for monitoring marine ecosystems and conserving biodiversity. In practical applications, however, DNA concentrations in seawater are extremely low, making it difficult for traditional membranes to capture it effectively.



The membrane is coated with an ultrathin layer of MoS₂, enabling it to capture DNA in water samples more effectively.

A research team from City University of Hong Kong (CityUHK), in collaboration with researchers from several other universities, has successfully developed a novel functionalised membrane that significantly improves the efficiency of collecting and detecting marine organisms' eDNA, providing a more sensitive and reliable technical tool for monitoring marine biodiversity.

The CityUHK team was led by **Professor Kenneth Leung Mei-yee**, Vice-President (Research) and Director of the State Key Laboratory of Marine Environmental Health (SKLMEH), and **Professor Zeng Zhiyuan** from the Department of Materials Science and Engineering and the SKLMEH. The study, titled "A tailored MoS₂ membrane with strong DNA-binding capability enhances aquatic biota detection through environmental DNA metabarcoding", was published in the leading international journal *National Science Review*.



The new technology developed by the research team enables scientists to monitor marine biodiversity under challenging environmental conditions.

The research team coated the surface of a common membrane with an ultra-thin layer of 2D material molybdenum disulfide (MoS₂), enabling the membrane to capture DNA in water more effectively. Experimental results show that this novel membrane significantly improves the sensitivity for detecting fish eDNA in both laboratory and field tests.

In controlled experiments, the researchers successfully used the membrane to accurately identify a variety of tropical coral reef fish, including *Acanthurus dussumieri*, *Chrysiptera cyanea*, *Dascyllus trimaculatus*, *Microcanthus strigatus*, and *Paracanthurus hepatus*.

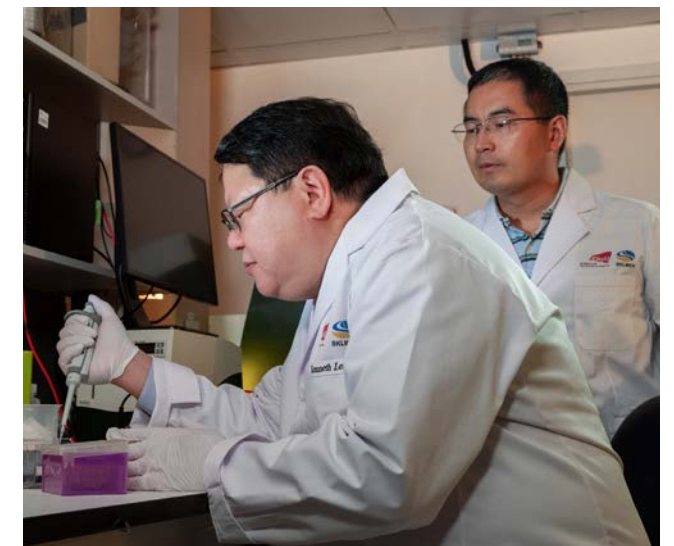
For field testing, the research team conducted on-site sampling tests at the Hoi Ha Wan Marine Park. The results showed that the new filter membrane could detect a greater number of fish species, including anchovies, flathead grey mullet and carangid fish, without affecting the overall assessment of the fish community, demonstrating its potential for applications in practical marine monitoring.

"The membrane is simple to prepare and cost-effective, and can be directly integrated into existing water sampling filtration processes. It is expected to find future applications in marine conservation, ecological surveys and long-term environmental monitoring, and is particularly suitable for use in marine areas rich in biological resources but difficult to survey," noted Professor Leung.

He added that the Ministry of Ecology and Environment is currently promoting the use of eDNA technology in biodiversity surveys, and that the research team's innovative technology will support and drive the development of this technology.



The research team collects DNA in water samples by filtration using the novel membranes.



DNA is immediately extracted from the membranes after filtration for analysis.

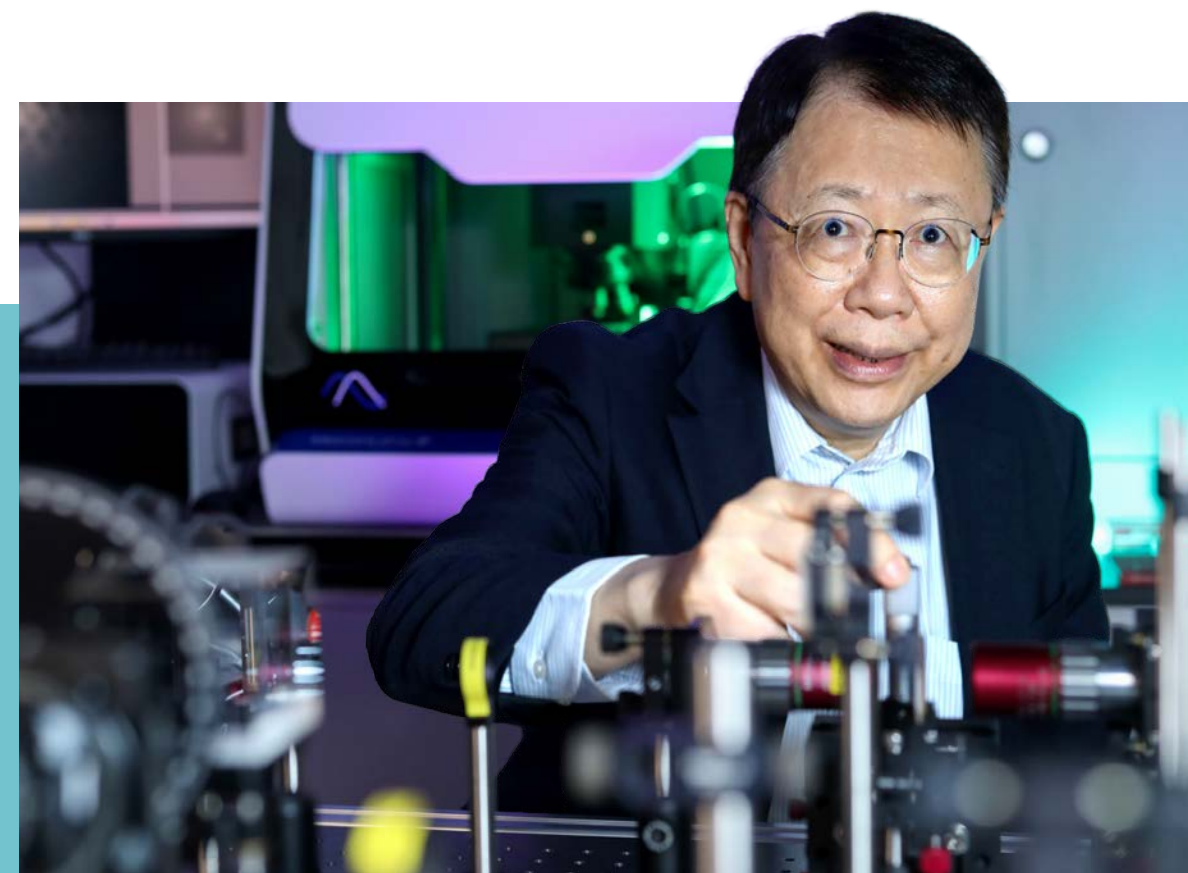
The corresponding authors of this study include Professor Leung, Professor Zeng, **Professor Huang Bolong** from the Department of Chemistry at CityUHK, and **Professor Qiu Jianwen** from the Department of Biology at Hong Kong Baptist University. The findings demonstrate the interdisciplinary integration of advanced materials science and environmental ecology research, creating new avenues for more precise and sensitive marine biological monitoring technologies.

Source: CityUHK NewsCentre



CityUHK researchers develop optical corner detection technology, paving way for efficient motion tracking

A research team led by **Professor Tsai Din-ping**, Chair Professor in the Department of Electrical Engineering at City University of Hong Kong (CityUHK), in collaboration with **Professor Li Tao** from Nanjing University, has developed a new optical corner-detection imaging method using azimuthal Hilbert-transform metasurfaces. Designed as a universal framework, this study marks an important advance in high-speed, low-power optical information processing and demonstrates potential for motion-tracking applications. Titled “Optical corner detection with azimuthal Hilbert transform metasurfaces”, the study was published in the prestigious journal *Science Advances* and selected as a highlighted work on its homepage.



A CityUHK research team, led by Professor Tsai, develops a new optical corner detection imaging method, which demonstrates potential for motion tracking applications.

Inspired by biological vision—where animals like bees and woodpeckers prioritise sharp geometric features to quickly parse complex scenes—researchers have developed an optical corner detection method that mimics this efficiency. While conventional electronic detection faces speed and energy limitations, optical processing offers a faster, lower-power alternative.

The team built a 4f imaging system equipped with a silicon nitride metasurface at the Fourier plane. Using geometric-phase modulation, the metasurface alters the optical field to extract sharp spatial features across the visible spectrum. Experimental tests on various polygon shapes and arrays confirmed that the system highlights corner features with broadband stability and a large field of view. Additionally, the single-metasurface design successfully processes objects with varying amplitude, phase, and angular characteristics. The researchers also derived parity rules governing the formation of bright and dark points, establishing a foundation for efficient, ultra-fast visual processing.

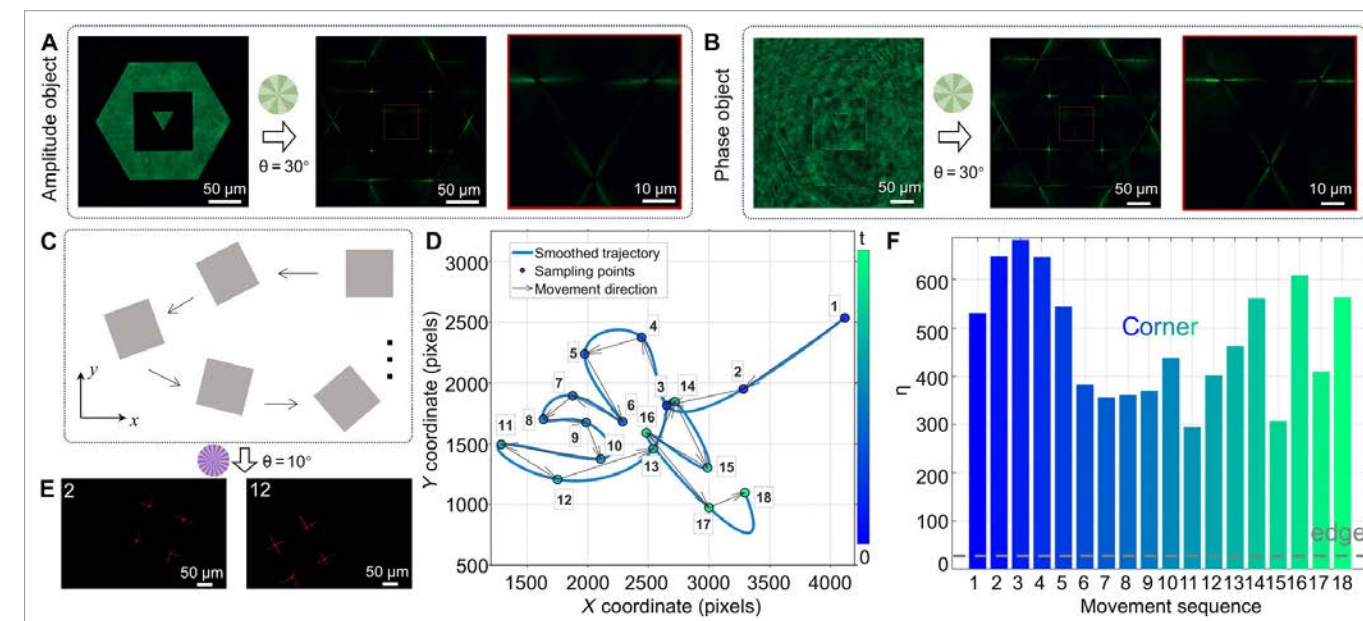
Leveraging corner detection capabilities to extract key information, the research team applied the imaging method to track objects undergoing random rotation and translation. The experiments verified its effectiveness in supporting motion tracking and demonstrated efficient data-compression capability.

“Through this study, we highlight the unique advantages of optical metasurfaces for real-time and efficient information processing,” said Professor Tsai. “By providing a new technical pathway for all-optical corner detection, our goal is to reduce energy consumption and improve processing speed in future computational vision systems and next-generation intelligent sensing technologies.”

Dr Chen Chen, a postdoctoral fellow in the Department of Electrical Engineering at CityUHK, served as a co-first author.

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Content adapted from CityUHK NewsCentre



Experimental results demonstrate that a single metasurface can detect objects with different amplitude, phase, and angular characteristics, verifying the new imaging method's potential for motion tracking and efficient data-compression capability.



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