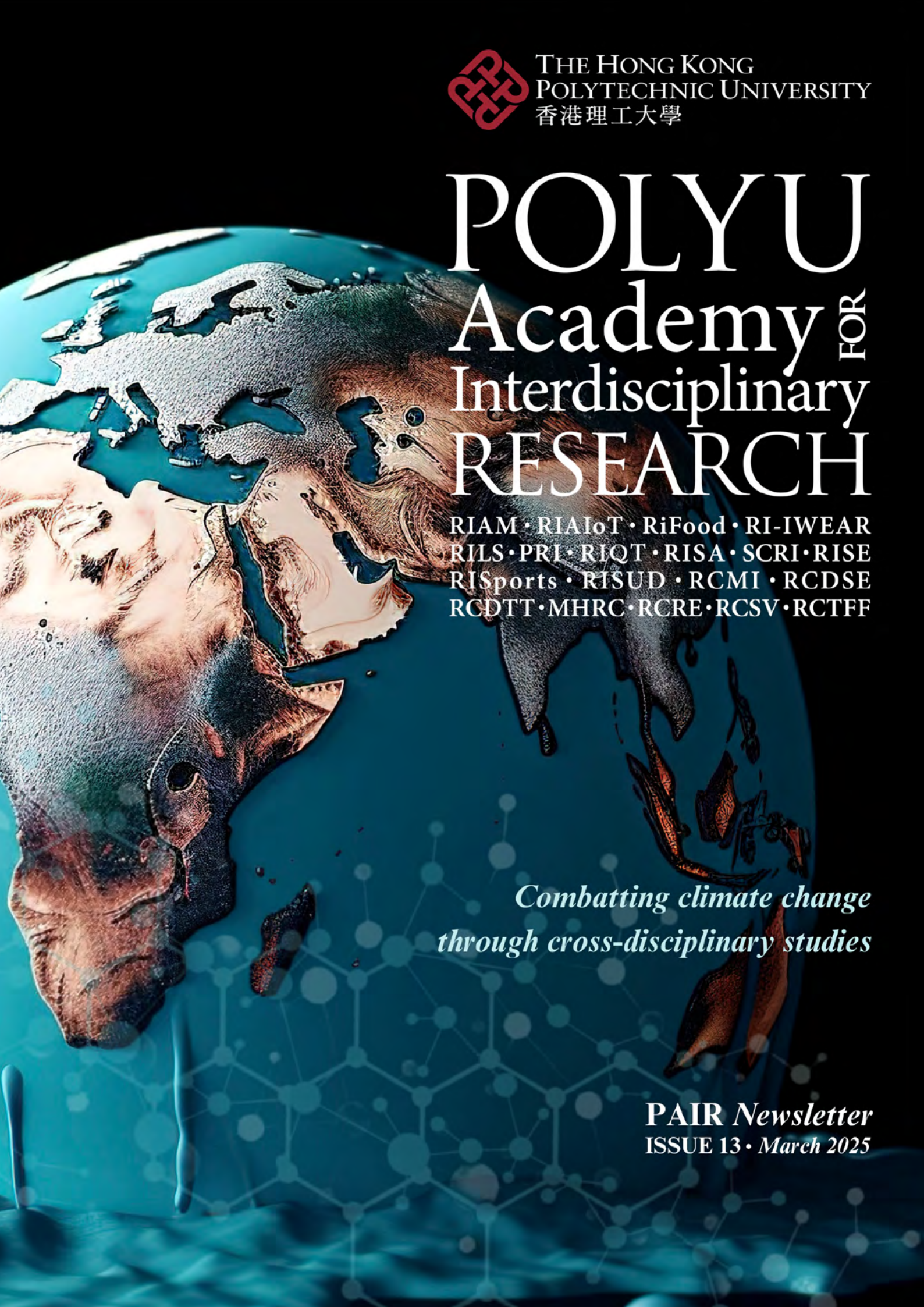

THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

POLYU Academy FOR Interdisciplinary RESEARCH

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Combatting climate change through cross-disciplinary studies

PAIR *Newsletter*
ISSUE 13 · *March 2025*

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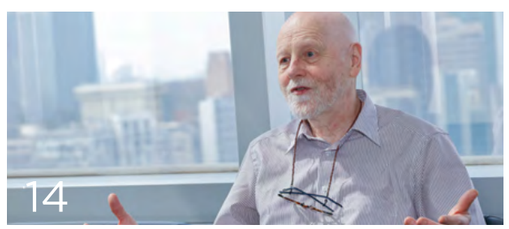

Chief Editor: Prof. CHEN Qingyan
Editor: Ms Linda GUDEMAN
Assistant Editors: Ms Florence CHAN, Ms Sara CHEUK and Ms Mavis FAN
Feature Writer: Ms Mavis FAN
Designers: Ms Sara CHEUK and Ms Linda LOONG

PolyU Academy for Interdisciplinary Research

Telephone: (852) 3400 3036
Email: info.pair@polyu.edu.hk
Website: www.polyu.edu.hk/pair/
Address: HJ201, P/F, Stanley Ho Building, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong

PAIR *Newsletter* · Issue 13 · *March 2025*

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Welcome to Issue 13 of the PAIR Newsletter. I hope you had a good start to the new year. A fresh beginning offers excitement and opportunities to move forward with new perspectives and goals. There is equal value in acknowledging and reflecting on the past. In this issue, we include a special report on PAIR's operations from 2021/22 to 2023/24, summarising the major developments and achievements at the Academy during the first three-year operating cycle.

When I first reported for duty as the Founding Director of PAIR in August 2021, the Academy had a small temporary office borrowed from the Faculty of Science. Since then, more colleagues were joining the PAIR Central Office, one after another, and research institutes (RIs) and research centres (RCs) were being put into operation in batches. We have finished the first cycle with great achievements. Currently, PAIR has a total of 19 constituent research units bringing together over 600 researchers, and runs a wide array of research development programmes with the support of the PAIR Central Office. The Academy has a fully-furnished and equipped office space for the central administrative team, and a state-of-the-art seminar room for hosting events. The RIs and RCs have generated significant outcomes in scientific research, funding schemes, knowledge transfer and collaborations. Further details are included in the summary report. I would like to thank all management, researchers and support staff at PAIR for their collaborative efforts that have made possible these many incredible developments.

Another highlight in this issue is the Feature Story section, which covers insights by PAIR Senior Fellow Prof. Philip RUSSELL on the development and application of "photonic crystal fibre" (PCF), a hollow-core fibre which he proposed in 1991 and which has revolutionised the way that light travels in glass fibre. This section also presents the research work of Prof. WENG Qihao, Associate Director of the Research Institute for Land and Space (RILS) and Chair Professor of Geomatics and Artificial Intelligence, which integrates geospatial artificial intelligence to provide important insights into urbanisation and the mitigation of impacts.

The Research Achievements section describes some of the latest discoveries at PAIR, including evidence that an ocean was present on Mars a billion years ago. The People section highlights PAIR scholars who have recently been recognised for their research excellence, elected to prestigious academies, or appointed to important positions in external organisations. The News & Events section provides a brief review of the many scholarly exchange activities at PAIR over the last few months, including lectures, symposia and conferences, media coverage of work by PAIR scholars, and new partnerships in conducting research and setting up laboratories.

PAIR is now in its second operating cycle, and the Academy will enhance some of the existing initiatives that are driving PAIR's interdisciplinary research and collaborations. Thank you for your continued support of PAIR. We look forward to sharing more updates with you in upcoming issues.

Looking back while moving forward: A retrospective look at PAIR's three-year development

The year 2024/25 marks PAIR's entrance into the next three-year operating cycle. The Academy commenced formal operations in October 2021, and has expanded over the years. As PAIR embarks on the next chapter, it is important to take a retrospective look at the many developments and achievements at PAIR in the past three years (2021/22–2023/24), acknowledging and celebrating the collective efforts that have propelled the Academy thus far.

Official launch of PAIR at PolyU InnoTech Day 2022

Diversifying PAIR research for greater impact

PAIR began operating in October 2021 and was officially inaugurated in July 2022. As one of the core pillars of PolyU's strategic research development, PAIR is dedicated to bringing solutions to major societal challenges through interdisciplinary research. Under PAIR, constituent research institutes (RIs) and research centre (RCs) have been established. These units, joined by PolyU researchers across faculties, schools and departments, focus on specific research areas that fall under PAIR's three research themes: advanced technologies and manufacturing, good health and well-being, and smart and sustainable cities.

Over the past three years, the Academy scaled up from 16 constituent units at the time of launching to 19 units at the end of year 2023/24. New units covering emerging research areas, including textiles for future fashion, digital transformation of tourism, and quantum technology, were established. PAIR and its 19 constituent units bring together over 600 researchers for interdisciplinary research.

Succeeding in securing massive funding

Funding is essential to the many research-related projects, activities and schemes at PAIR. In addition to PolyU's internal funding injections into the Academy and its units, PAIR constituent units have been awarded external funding from various sources, including the Research Grants Council (RGC) funding schemes, HKSAR Government funding schemes, industrial contracts, donations and mainland funding agencies/organisations.

During the three-year period, PAIR constituent units received a total of HK$1.698 billion in

external funding. PAIR researchers have exhibited amazing accomplishments in prominent funding schemes, including the Research, Academic and Industry Sectors One-plus (RAISe+) Scheme launched in 2023 by the HKSAR. Two projects led by PAIR researchers are among the first batch of approved projects in the RAISe+ scheme. The scheme provides individual approved projects with funding of up to HK$100 million on a matching basis, supporting research teams from universities funded by the University Grants Committee that have good potential to become successful start-ups to transform and commercialise their research and development outcomes.

Generating voluminous publications and building research reputation

Scientific publications help disseminate the results, discoveries and insights of PAIR scholars, contributing to further scientific advances and building the reputations of PAIR and PolyU.

In the first operating cycle, PAIR constituent research units generated a total of 3,251 affiliated publications. A number of papers were published in prestigious journals such as *Nature* and *Science*. For three consecutive years, over a hundred PAIR scholars have been named among the world's top 2% most-cited scientists by Stanford University.

Moving ideas from lab to real-word use and amplifying research impacts

PAIR pursues applied research that generates solutions to real-world problems, with a direct, positive impact on society. PAIR researchers collaborate closely with PolyU units for the patenting and licensing of solutions, so that these proprietary technologies can be adopted or used by individuals, industries and communities, and can be made commercially viable.

In the past three years, PAIR researchers contributed to a total of 57 patents granted and 11 start-ups. The Academy witnessed the successful translation of innovations by PAIR scholars into real-world applications. These inventions—the world's first integrated optical fibre-based railway monitoring system adopted by railway operators in Hong Kong and Singapore, space instruments and mapping techniques for national space missions, ultrasound imaging systems for the assessment of liver fibrosis and scoliosis, a spectacle lens for slowing down myopia progression, a low-carbon reclamation technique, a real-time prediction and early warning system to aid in pandemic control, smart building technologies, environmentally friendly bricks made from recycled materials and construction waste, and many more—represent tangible contributions to various aspects of society.

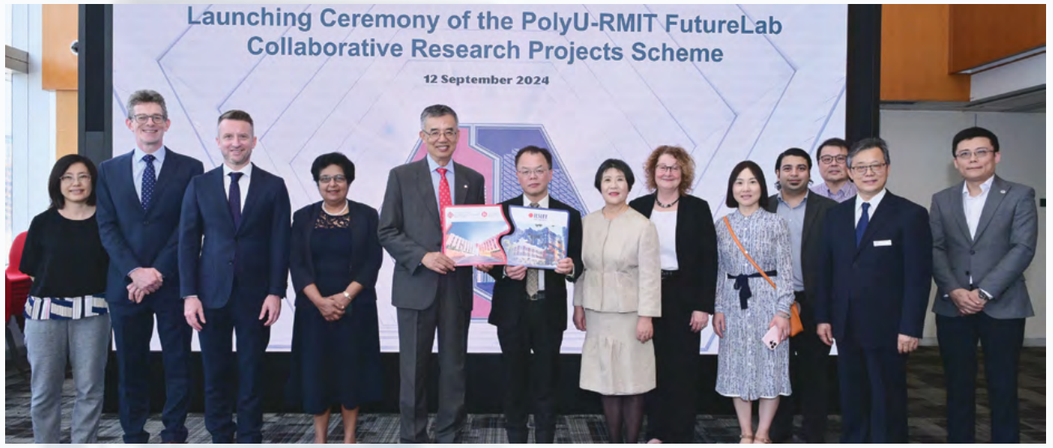
Shining in the international arena

PAIR scholars' staunch efforts in research, scholarship and knowledge transfer have received high commendation, with a total of 915 awards and recognitions recorded for the past three years.

At prestigious competitions including the International Exhibition of Inventions Geneva, the world's largest annual event devoted exclusively to inventions, PAIR-led innovations have demonstrated shining achievements, with a total of 41 award-winning projects garnering 44 prizes during the 2022, 2023 and 2024 exhibitions. Individual PAIR scholars have been elected to prestigious national academies of engineering and sciences, promoted to fellow status of professional societies, and have received medals and prizes for their outstanding contributions to knowledge and society. Several PolyU-supported startups founded by PAIR researchers have been named on the *Forbes Asia 100 to Watch* list, which spotlights the 100 most promising small companies and start-ups in the Asia Pacific region.

Home to world-class scholars and research talents

PAIR brings together some of the brightest



Official launch of PolyU–RMIT FutureLab in September 2024

minds, seasoned professionals and pioneering researchers from around the world to drive PolyU's interdisciplinary research. The Academy has implemented several strategic initiatives aimed at appointing renowned scholars and outstanding PhD graduates from top academic institutions worldwide to contribute to PAIR's research and developments.

Under the PAIR Fellowship scheme, a total of 21 renowned scholars have been appointed as PAIR Distinguished Fellow / Senior Fellow / Fellow, and they provide valuable input to PAIR and RI/RCs through activities such as delivering public lecture(s)/seminar(s), providing advice, conducting research, co-supervising PolyU young researchers, and participating in dialogues. Under the PAIR Young Fellowship for Research Assistant Professors scheme, one candidate has been appointed with a competitive package and start-up grant, to conduct impactful interdisciplinary research at one or more RI/RCs under mentorship. Under the PAIR Research Assistant Professor (RAP) scheme, 8 RAPs have been recruited to conduct interdisciplinary research at RI/RCs.

Growing networks for cross-institutional, cross-sectoral collaborations

PAIR and its constituent research units actively build strategic partnerships with other universities and external organisations across sectors, including government bodies, industries, healthcare providers and many more, to collaborate in research, knowledge transfer and related initiatives.

Over the past three years, a total of 27 Memoranda of Understanding (MoUs) or agreements have been signed jointly by PAIR constituent units and their collaborators. Some of the collaborations involve the establishment of new joint research entities. In September 2024, PAIR and the STEM College of RMIT University, Australia launched the PolyU–RMIT FutureLab, an initiative to support and connect members from the two universities as they undertake collaborative, interdisciplinary research projects in strategic areas (e.g., energy, smart cities, carbon neutrality, artificial intelligence and internet of things) that contribute to the advancement and application of cutting-edge technologies while promoting urban and environmental sustainability.

Frequent professional exchanges and engagement activities at PAIR

To foster a vibrant and dynamic research culture that spurs intellectual curiosity and innovation, catalyses collaborations and encourages continuous learning, PAIR and its constituent research units organise a wide range of activities

for professional exchange, and participate in large-scale university events and external events to disseminate and showcase PAIR achievements.

During the past three years, PAIR's signature events included 27 PAIR Distinguished Lectures, 6 PAIR Seminars, 2 PAIR Salons and 30 sessions of Researchers Corner. PAIR constituent units have held a total of 274 different activities. The Academy and its units also organised the PAIR Conference 2023 themed "Research Excellence for Societal Impacts", as well as 15 other international conferences. Higher education leaders, eminent scientists including Nobel laureates and academicians, and renowned scholars are among the featured speakers.

Furthermore, PAIR scholars often met with external members from local, mainland and overseas universities, organisations and agencies during incoming and outgoing visits that took place throughout the three years.

The way forward

The Academy foresees the establishment of even more constituent units. Currently, units covering areas such as environmental, social and governance, and stem cell engineering and immunotherapy are in the pipeline.

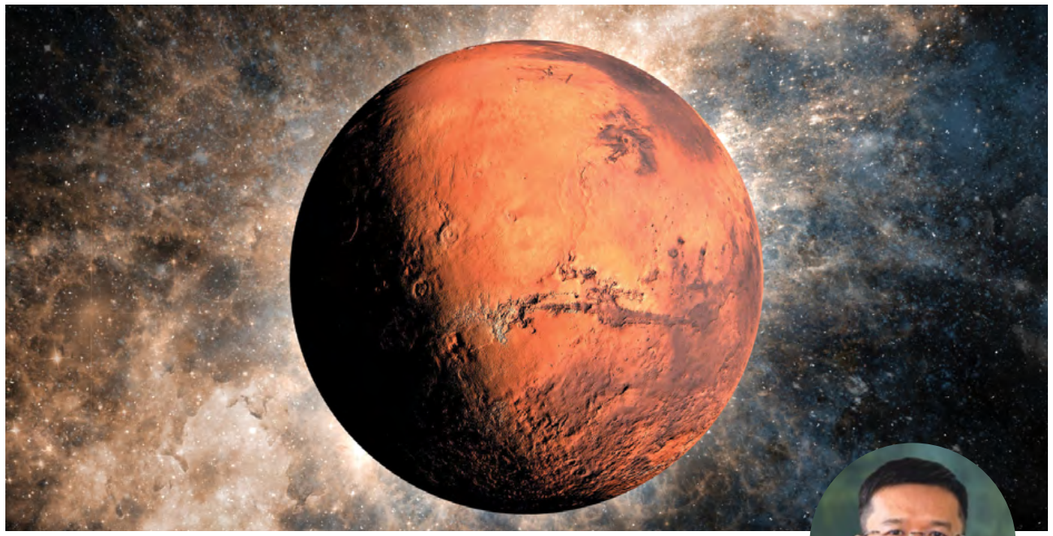
A series of professional exchange and development activities will be held in early 2025, including the PAIR Workshop on Interdisciplinary Research; PAIR's flagship events such as lectures, seminars, conferences and more; and the many activities hosted by constituent research units.

PAIR will also seek to enhance existing initiatives including the Fellowship and Young Fellow schemes, so that these programmes can contribute more effectively to the realisation of PAIR's strategic goals.

PAIR's premier interdisciplinary research conference in May 2023

Research Achievements

Prof. WU Bo studies data from Zhurong and uncovers evidence of ancient ocean on Mars



A team led by Prof. WU Bo, Associate Director of the Research Centre for Deep Space Explorations (RCDSE), Fiona Cheung Professor in Spatial Science and Associate Head (Research) of the Department of Land Surveying and Geo-Informatics, studied data from China's Zhurong rover and orbiting satellites and gathered fresh evidence that Mars was home to an ocean billions of years ago. Prof. Wu said these findings not only provide further evidence to support the theory of a Martian ocean but have also generated, for the first time, a discussion of the ocean's probable evolutionary scenario. The findings were recently published in *Scientific Reports* (https://doi.org/10.1038/s41598-024-75507-w).

Prof. BU Siqi develops real-time assessment method for addressing multiple stability problems in power systems

Prof. BU Siqi, Member of the Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE), Associate Professor and Associate Head of the Department of Electrical and Electronic Engineering, and his colleagues recently published a research paper titled "Real-time Multi-stability Risk Assessment and Visualization of Power Systems: A Graph Neural Network-based Method" in IEEE *Transactions on Power Systems*.

The paper proposed a real-time multi-stability risk assessment (MSRA) method based on a graph neural network (GNN) for addressing multiple stability problems in renewable energy-integrated power systems in an effective manner, including rotor angle (small-disturbance and transient), voltage (short-term and long-term), frequency and converter-driven stability. The team employed a GraphNorm method to tackle over-smoothing problems and improve the generalisability of the GNN. The method proposed by the team can simultaneously and continuously predict the risks of multiple types of stability based on real-time data, and visualise stable and unstable operation regions (SURs) based on alpha shapes. The effectiveness of the proposed method has been verified in the IEEE 39-bus system, the 179-bus Western Electricity Coordinating Council (WECC) system, and the Great Britain (GB) system.

Full paper: https://ieeexplore.ieee.org/document/10819251/metrics#metrics

Prof. Vivien LU integrates green radiative cooling coating with photovoltaics for energy saving in buildings

With support from the PolyU Carbon Neutrality Funding Scheme, Prof. Vivien LU Lin, Member of the Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE), Research Institute for Sustainable Urban Development (RISUD) and Research Centre for Resources Engineering towards Carbon Neutrality (RCRE), and Professor in the Department of Building Environment and Energy Engineering, and her research team have integrated the solar-driven adaptive radiative cooling (SARC) coating they developed, with bifacial solar photovoltaics (PV) to achieve synergistic enhancement of thermal management and power generation, transforming buildings from energy consumers into energy harvesters. The team is planning to install bifacial PV panels on the rooftops of the PolyU Kowloon Tong Student Hostel, which is currently under construction. The new coating will be applied to the corresponding area under the rooftop panels, to enhance power generation while radiatively cooling the buildings.

The carbon dots (CDs)-driven photoluminescent radiative cooling nanocoating can be applied not only to building rooftops but also to exterior walls. This novel coating can automatically adjust its absorption and emission of solar and thermal radiation in response to changes in environmental temperature or light conditions, helping to mitigate the heat island effect created by building materials. It uses photoluminescence technology to convert ultraviolet light into visible light, thereby improving the absorption and utilisation of light by PV and increasing PV conversion efficiency.

Compared to traditional coatings, the novel coating can improve effective daytime solar reflectance from 92.5% to 95%, increase the cooling effect by 10% to 20%, and reduce the temperature by up to 25°C when applied to concrete rooftops. This nanocoating is environmentally friendly, water-soluble, free of volatile organic compounds (VOCs), and can be produced in various colours, thus demonstrating significant application potential.

Feature Stories

A dialogue with Prof. Philip RUSSELL: Playing with light — Scientific curiosity leads to breakthroughs

When a ray of light shines at a particular angle from water to air, as it hits the surface of water—which is denser than air—the ray is reflected back into the water instead of entering the air. This physical phenomenon, known as total internal reflection, forms the basis of the transmission of light in optical fibre. In a glass fibre, which consists of a denser core and less-dense cladding, light moves forward from one end of the fibre to the other as a result of total internal reflection.

The development of optical fibre communications has made possible many developments in the Information Age. For decades, optical engineers have been working to reduce the signal loss in fibre transmission. In 1991, Prof. Philip RUSSELL proposed the development of a kind of hollow-core fibre, which is now known "photonic crystal fibre" (PCF), and which offered the potential to reduce the loss even further. Unlike standard optical fibre, PCF has a periodic array of microscopic hollow channels running along its length. This microstructure enables properties that are unachievable in standard optical fibre. Three decades later, PCF is being studied in laboratories all over the world, and it has found applications in telecommunications, structural and environmental sensing, spectroscopy, biomedicine, and endoscopy, to name just a few.

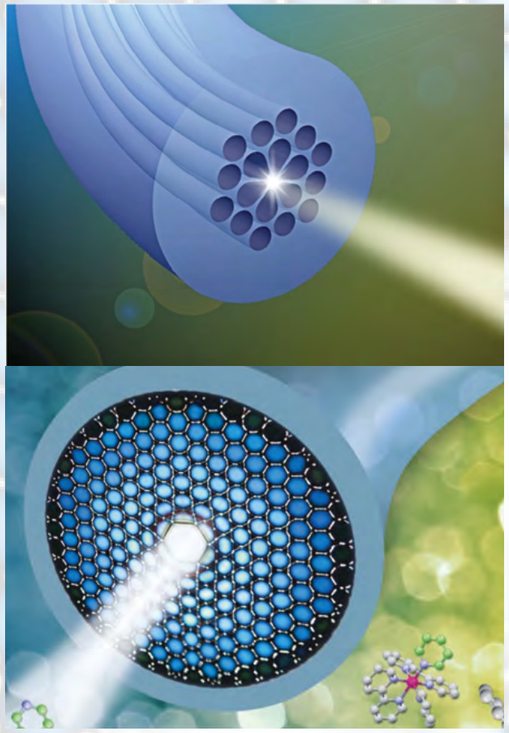
In this issue, PAIR talks to Prof. Russell, PAIR Senior Fellow, on his three-decade-long journey of "riding the PCF wave". Prof. Russell is now the Scientific Director of the Russell Centre for Advanced Lightwave Science (RCALS) in Hangzhou, China, having retired as the Director of the Max Planck Institute for the Science of Light in Erlangen, Germany. When asked what drove his venture into PCF, the scientist explained that it was simple curiosity. "Give academics freedom," Prof. Russell said. He shared with PAIR his views on freedom in university research, the lack of which is, in his words, "a perennial problem".

Light travels in a new way: Photonic crystal fibre

The unique structure of PCF enables light to be guided in a way that is unachievable in conventional optical fibre. How is this made possible?

The refractive index determines how fast light travels. If the refractive index is higher, light travels more slowly. Guiding light requires two different refractive indices. In conventional fibre, the difference between the two indices is just a few percent, and this small difference restricts the extent to which light can be controlled.

In PCF, the index difference is much greater, approaching 50%. As a result, when light hits the interface between silica and vacuum, it reflects more, and thus light scattering is stronger compared to conventional fibre. This greatly enhances our ability to control the flow of light. As a result, PCF has made possible all kinds of novel experiments on light-matter interactions at a fundamental level, mostly outside the purview of optical telecommunications.



Depictions of photonic crystal fibres guiding white light. Top: PCF with solid glass core. Bottom: Hollow-core PCF used in chemical sensing (Max Planck Institute for the Science of Light).

PCF represents a revolutionary step forward in optical science, in which two different materials are put together in a novel way, resulting in a new substance with entirely new optical properties not observable in the materials alone.

PCF finds application in many areas. How is PCF used in real-world applications?

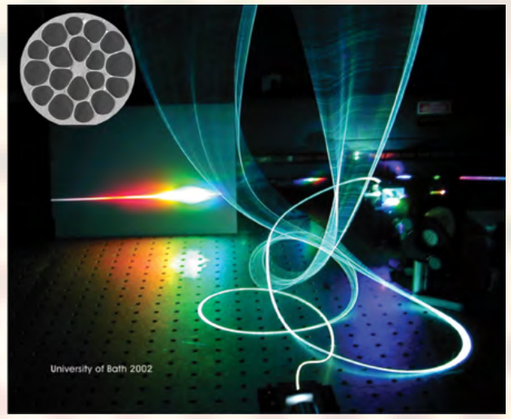
The applications of PCF are many and varied. A key example is the use of solid-core PCF to realise a light source some 10,000 times brighter than the sun, containing all the colours of the rainbow—and more besides. This "white light laser" is known as a supercontinuum light source.

In solid core PCF, the large index contrast enables better control of the propagation of light guided in the core. When invisible ultrashort pulses of near-infrared light are launched into the core, nonlinear optical phenomena in the glass create new colours. A useful analogy is an audio system in which the volume is turned up to the point at which the sound becomes distorted and very unpleasant. This distortion is caused by the creation of new audio frequencies, as a result of the nonlinear response of the amplifier. At the current time, commercial supercontinuum sources based on solid core PCF are in use in almost every laboratory in the world, across many fields, for example, in medicine, microscopy and spectroscopy.

In conventional fibre, light travels entirely in glass, which causes Rayleigh scattering and absorption, resulting in signal loss and impairing the performance of telecommunications systems. Hollow core PCF, in contrast, operates in an "engineering sweet spot" where light spends almost no time in the glass, greatly reducing material-related loss. This is highly desirable in fibre communications, as it opens up the possibility of using shorter wavelengths, because Rayleigh scattering (which increases with the fourth power of the wavelength) is greatly reduced in the hollow core.

Another application of hollow-core PCF is extreme temporal compression of short pulses. Light is a wave, and one pulse normally contains many oscillations. In gas-filled hollow core PCF, pulses can be temporally compressed to a single cycle, with a duration of about 1 fs (a thousand-million-millionth of a second). By launching a short pulse of light into an argon-filled hollow PCF and controlling the pressure, we were able to adjust the chromatic dispersion so that all the colours travelled at the same group velocity. Not only could we compress pulses to very short durations, but we were able to generate pulses of very bright deep and vacuum-ultraviolet light. The ability to pressure-

tune the dispersion has turned out to be a game-changer in the field of nonlinear fibre optics. These breakthroughs were the result of curiosity-driven exploration of nonlinear phenomena in gas-filled hollow-core PCF, and not a carefully planned research project.



One of the first experiments on supercontinuum generation in small-core PCF (inset), carried out at the University of Bath.

What are some of the challenges or future directions for PCF development?

Since the emergence of hollow PCF, there has been quite remarkable progress in reducing transmission loss. As a result, telecom engineers, who were initially highly sceptical, are now increasingly interested in using hollow-core PCF, given its advantages over conventional fibre. It is possible that, with more research, even lower transmission losses might be achieved in the future, making hollow-core PCF very attractive for reducing the complexity and cost of long-haul telecom systems.

The wall between conservatism and innovation

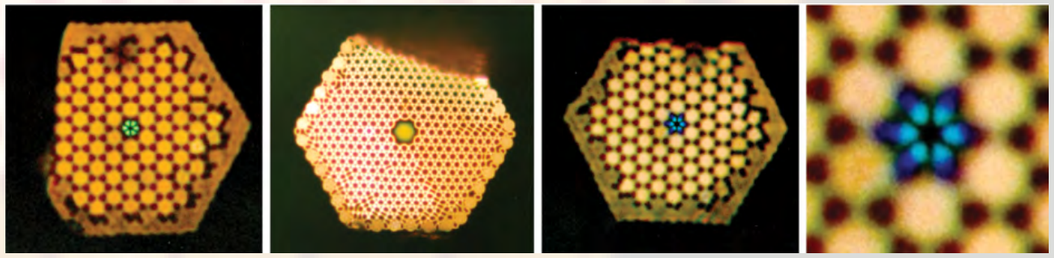
A start-up you founded was acquired by ASML, the world's largest supplier of lithography systems for the semiconductor industry. Lithography systems incorporate light sources based on hollow core PCF to build electronic chips. From your experience, what are some important factors in achieving successful scientific applications?

Most of my research over the years has been curiosity-driven. By bringing together disparate, apparently unconnected ideas, we dream up novel experiments, and then set about testing them in the laboratory. Sometimes they lead to potential commercial applications, and if they are sufficiently promising, we explore further by talking to a patent attorney.

Transferring ideas from basic research to commercial application is challenging. We might have what we think is a wonderful idea for a novel application, but it is often difficult to convince the university patent office that it is worth pursuing. This can be very frustrating. In contrast, in a company the barriers to filing a patent are much lower, and funds are available to defend it. Perhaps governments should consider setting up some form of national fund to support research institutions, pooling money from entrepreneurs, angel investors and individuals, to support patenting and related activities.

More universities are including scientific commercialisation (e.g., establishing start-ups of spin-offs) in their criteria for evaluating research performance. What are your views on this research management model?

Forcing creative people to think commercially can be a very bad idea, and can stifle



Optical micrographs of the light guided in the first PCFs by photonic band gaps. The experiments were carried out at the University of Bath.

innovation and result in an over-emphasis on incremental short-term research. Although some researchers are natural entrepreneurs, many are altruistically focused on extending scientific knowledge, not making money, and they need freedom to think, be creative and use their imagination. By indulging in "management consultancy" and focusing too tightly on commercialisation, universities risk killing off exploratory curiosity-driven research: the science of the future.

When scientists face pressure

There is growing expectation placed on university researchers to conduct research and deliver practical solutions. How can universities better support scholars in managing their teaching, research and administrative duties and pressure?

Give them as much freedom as possible, and try to balance teaching, research and administration according to each individual's skills and interests.

Give freedom, step out and disrupt the status quo: Scientific collaboration and international mobility

Collaboration is one way to spur innovation in research. Universities encourage academics to pursue various forms of collaboration, be it interdisciplinary, intersectoral or interinstitutional. What are your thoughts on this trend?

Collaborations between research institutions can be really beneficial, provided that there is genuine complementarity among the cooperating groups, and that the benefits outweigh the costs of all the additional travelling and report writing. If these conditions are not met, collaborations can be more trouble than they are worth.

The best kind of collaboration is often spontaneous, bottom-up. One might meet someone at a conference, start talking, and together come up with an idea for a novel scientific experiment or a ground-breaking application. This underscores the importance of networking, conference travel and face-to-face discussions in research. Although online interactions are better than nothing, they cannot replace in-person meetings.

After completing my PhD, I was able to work at universities and research centres in the UK, France, Germany and the USA, expanding my horizons and my scientific knowledge, gaining fresh experience, and building a network of friends and colleagues. Sadly, in the current international climate, it is much less easy for many to travel freely abroad due to confrontational politics and the related visa restrictions. This is a great pity, as science is one of the few things that brings the world-wide community together, since it is one of the few things we can all agree on.

What are your recommendations to young researchers?

Aim to work on something else after your PhD, preferably in a different group; make the most of the opportunities as a researcher to travel the world; and never stop expanding your experience and your knowledge. Furthermore, work on building a network of fellow scientists by participating in conferences, workshops and summer schools.

Geomatics for sustainability: Blending science and technology in addressing urbanisation challenges

Geomatics, an interdisciplinary field blending geography and informatics, leverages advanced techniques and methods in data analysis, modelling and visualisation to provide wide-ranging geographic information about the environment and the physical world we are living in.

Geospatial data and analyses provide invaluable insights that help guide urban planning and development, from improving urban infrastructure and predicting traffic flow, to optimising land use and many more actions that make our cities more liveable, functional, sustainable and resilient to the impact of climate change.

At PAIR, Prof. WENG Qihao, Chair Professor of Geomatics and Artificial Intelligence, is leading studies that integrate geospatial artificial intelligence (GeoAI) to obtain important insights about urbanisation and mitigate the impact of urbanisation. He is the Associate Director of the Research Institute for Land and Space (RILS), Director of the JC STEM Lab of Earth Observations, Director of the Research Centre for Artificial Intelligence in Geomatics, and Member of the Otto Poon Charitable Foundation Smart Cities Research Institute (SCRI).

Deep learning: An artificial brain that maps the horizontal and vertical perspectives of landscapes

Deep learning is an AI technique that mimics the way in which human brains function. The human brain includes billions of interconnected neurons. In a similar manner, deep learning, a biologically inspired technology, constitutes numerous multi-layered artificial neural networks, called "deep neural networks". Deep learning models are capable of recognising and processing vast amounts of data, such as images, texts, sounds and patterns, to generate knowledge and make predictions without human intervention. In geomatics, deep learning serves as a powerful tool for analysing a wide range of spatial data, such as aerial photos, satellite imagery, video and terrain data. Prof. Weng has been utilising deep learning-driven methods to generate maps and insights which provide us with an accurate understanding of the vertical and horizontal landscapes.

"In geomatics, deep learning serves as a powerful tool for analysing a wide range of spatial data, such as aerial photos, satellite imagery, video and terrain data."

In one study, Prof. Weng's team generated building height maps using a deep learning-based method that they developed. Building height is an important indicator of the level of urban development along the vertical dimension. The accuracy and precision of building height estimation are important. However, existing large-scale building height estimation studies are based on coarse spatial resolution (e.g., 10 m, 500 m, 1,000 m), and cannot show the fine-scale height variation among buildings in urban areas. Furthermore, the high-resolution images (e.g., < 5 m resolution) available for building-scale height estimation studies often have small spatial coverage and are not openly accessible.

To address the issues of resolution and accessibility, the team developed a deep learning-based super-resolution method for predicting building height at a spatial resolution of 2.5 m from 10-m Sentinel-1/2 images and created an open building height dataset. This repository contains 45,000 samples covering 301 cities in the Northern Hemisphere, including China, the conterminous United States, and Europe. These research outcomes have great application potential in high-resolution database updating, urban planning, and natural disaster assessment.

Automatising the generation of maps from images

Land use land cover (LULC) maps gives a clear indication of the ways in which different categories of land are distributed, as well as the various purposes and manners of land use. For example, the blue colour on an LULC map refers to "water" (e.g., lakes, rivers and streams), while the red colour refers to "built-up area" (e.g., residential, industrial, commercial activities). LULC mapping works by categorising a large quantity of remotely sensed images obtained from different sources. In cloud-prone areas, LULC mapping becomes less accurate due to cloud cover. Prof. Weng's team integrates deep learning models to address this technological bottleneck.

The team developed an integrated time series mapping method to enhance LULC mapping accuracy and frequency in cloud-prone areas. The researchers applied this novel method to the cloud- and rain-prone Pearl River Delta, China, and achieved an overall mapping accuracy of up to 87.01%, which is higher than that of existing major LULC products around the world. They demonstrated the deep learning-based method's capacity to provide high-quality LULC data sets at shorter time intervals for various land and water dynamics in cloud- and rain-prone regions.

The urbanisation paradox: What the past tells us about climate change

"Geomatics not only looks at spatial objects and interactions, landscapes and terrains, but also other measurements including human and natural activities on Earth."

Geomatics not only looks at spatial objects and interactions, landscapes and terrains, but also other measurements including human and natural activities on Earth. By pinpointing the connections between human activities and the environment, we can better understand the causes, progression and impact of climate change, make predictions about future climate, and take sustainability actions.

Prof. Weng's team probes into longitudinal data related to carbon emission and energy use, and attains critical insights about climate change and its links with human activities. In one study, the team developed a method for mapping urban industrial land (IND) areas in ten countries around the world from the year 2000 to 2019. They explored the way in which IND expansion during the period was correlated with the economic growth and carbon emissions observed in the subnational regions of these countries. According to their findings, the impact of IND expansion on economic growth and carbon emissions varies among regions. Industrial land expansion was found to be a leading factor in economic growth and emissions in developing regions (contributing 31% and 55%, respectively), but not in developed regions (contributing only 8% and 3%, respectively). Education emerged as the primary driver of economic growth in developed regions. These results hold profound implications: the rapid expansion of industrial land accelerates climate change, and the engines for economic growth shift and evolve at different development stages.

Cooling without heating the planet

Cooling is increasingly important in a rapidly warming climate. Cooling the world without heating the planet has become a major scientific endeavour. Developers are now looking for passive cooling solutions that enable more effective dissipation of building heat and prevent heat gain, thus reducing the energy and electricity consumption in buildings.

Green and cool roofs, i.e., building roofs coated with light-reflecting coating materials or plants, are popular cooling solutions. To ascertain the effectiveness of green and cool roofs in reducing energy use in buildings under current and future climate conditions, Prof. Weng's team evaluated the green and cool roof strategies in six global

cities located in different climate zones. The team projected that, by the year 2100, the implementation of green roofs and cool roofs at the city level would lead to substantially lower annual energy use, with reductions of up to 65.51% and 71.72%, respectively, in the energy consumed for heating, ventilation and air conditioning (HVAC) purposes. The study also revealed that the energy saving potentials of cool roofs and green roofs are influenced by local climate conditions. These findings provide useful references for choosing and designing roof strategies suitable to specific urban contexts.

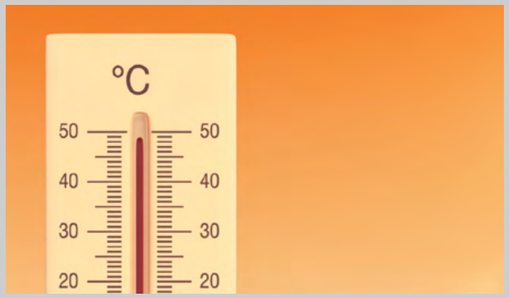
Gearing up for the era of global boiling

"The era of global warming has ended; the era of global boiling has arrived," United Nations Secretary-General António Guterres warned at press conference in July 2023, the hottest month on record at that time. The record was broken a year later, as July 2024 was 0.03 °C warmer than the record set the previous year.

"Heatwave predictions and projections are crucial for enhancing our preparedness for the hazards and reducing adverse impacts."

Heatwaves can kill. Heatwave predictions and projections are crucial for enhancing our preparedness for the hazards and reducing adverse impacts. Nevertheless, existing standards for identifying "dangerous" heatwaves have been unsuccessful in capturing these heatwaves in certain climate conditions. The same temperature can feel warmer or cooler in different places. In humid conditions, our body temperature rises faster, and heat dissipation becomes more difficult, thus increasing the risk of heat stroke. This hazard is deadlier in Asia than in other parts of the world. A recent paper suggested that 45% of heat-related deaths each year occur in Asia, and 36% in Europe.

Current heatwave indices need to be more precise and context-specific. Prof. Weng's team suggests the inclusion of two additional factors—humidity and indoor environment—into existing assessments. The group examined six existing heatwave indices (i.e., maximum daily air temperature, humidity index, humidex, wet bulb globe temperature, lethal heat stress index and universal thermal climate index), all of which are based on outdoor environment conditions. Five of the indices studied were not effective in identifying dangerous heatwave conditions in diverse geographical regions and climate conditions. Furthermore, the team points to the occurrence of heat-related deaths indoors, which have been overlooked by existing outdoor data-based indices. These gaps highlight the need for society to take a retrospective look, re-examine the current system's ability to assess the severity of heatwaves, and demand further enhancements.



Closing the methodological gap to bring science solutions to wider issues

From building maps and geospatial technologies to studying the impacts of urbanisation, Prof. Weng uses geospatial artificial intelligence to derive insights from data and to design holistic solutions to many environmental, ecological, and climatic issues. He is one of the earliest researchers in the area of urban remote sensing. Previously, Prof. Weng developed a method for estimating land surface temperature from satellite-derived measures of vegetation, and this approach has become a core technique in urban climate studies. His research has now expanded to urban studies on human-environment interactions during the urbanisation process in different geographical settings and stages, from a local to a global scope, with the use of geospatial analytics, GeoAI and big data methods.

"The ultimate goal of my research is to obtain better knowledge about urban environments and global urbanisation processes through remote sensing and geospatial methods for sustainable development."

"I see myself as an environmental geographer who uses GeoAI, remote sensing, geographic information systems, and spatial modelling methods and techniques to study urban environmental issues and ecosystem dynamics," said Prof. Weng. "The ultimate goal of my research is to obtain better knowledge about urban environments and global urbanisation processes through remote sensing and geospatial methods for sustainable development," he added.

Prof. Weng considers GeoAI to be an important interdisciplinary tool that closes the methodological gaps among geography, urban science, landscape ecology and environmental science. "GeoAI represents a powerful convergence of geospatial technology, artificial intelligence, and geographical and environmental studies. In my view, this interdisciplinary integration is crucial because no single discipline can adequately address today's complex environmental challenges. The global challenges we are facing, such as climate change, urbanisation impacts, and biodiversity loss, are inherently interconnected. Understanding these issues requires us to bridge theoretical frameworks with real-world applications. For instance, GeoAI helps us analyse vast amounts of geospatial data while incorporating physical and ecological principles to develop practical environmental management strategies. To work across disciplines, scholars must cultivate intellectual humility and curiosity. We need to be open to learning new methods, embracing unfamiliar perspectives, and stepping outside our comfort zones. This means being willing to learn new technical skills while also appreciating the theoretical foundations and methods of other fields. Interdisciplinary collaborations are crucial. I believe that dramatic breakthroughs in science and technology and practical solutions for society come from synergistic collaborations. Without collaboration with diverse groups of people, time is lost, and shared insights never emerge. Looking ahead, I believe higher education must evolve to better support interdisciplinary research. This includes developing integrated curricula, creating collaborative research spaces, and training students to think across traditional academic boundaries," he said.

Advancing the field of urban remote sensing

In the past year, Prof. Weng received the 2024 American Association of Geographers (AAG) Wilbanks Prize for Transformational Research in Geography and the 2024 AAG Remote Sensing Specialty Group Lifetime Achievement Honor Award for his ground-breaking contributions in geography. He is the first Chinese scholar to receive both AAG awards at the same time. Over the years, the pioneer and leader in urban remote sensing has not only conducted research that opened a critical new frontier, but has also authored educational resources adopted widely by universities worldwide and has served the scientific communities (e.g., journals, societies, committees) with his leadership. Prof. Weng is an elected member of many prestigious academic societies, including Academia Europaea (The Academy of Europe).

When asked about his upcoming plans in research, Prof. Weng describes several scientific questions and developments that he is eagerly pursuing. "We have successfully established interdisciplinary research centres at The Hong Kong Polytechnic University, namely, the Research Centre for Artificial Intelligence in Geomatics and JC STEM Lab of Earth Observations. These establishments will not only facilitate interdisciplinary collaboration for impactful research within PolyU to address key societal and environmental challenges in areas of GeoAI applications; they will also fully utilise and expand PolyU's research capital, fostering Hong Kong's status as a global research and development (R&D) centre. These research facilities allow us to work strategically with various industries, governments and the public and to translate our research to address critical challenges in society, as well as educating and training tomorrow's talents with state-of-the-art science and technology," Prof. Weng explains. In the future, he will continue his research in the field of urban remote sensing. He is particularly motivated by the following key issues and questions, which are crucial to furthering our understanding of urban environments and urbanisation processes worldwide:

- In the twenty-first century there have been significant advances in geospatial technology and GeoAI capacity; however, these techniques have not been well integrated with more established fields, such as geography, urban science, and earth and environmental sciences, to serve as the catalyst for research development and applications. How can all these technologies be integrated for better detection, interpretation, characterisation, and modelling of urban structures and environments?
- Urban landscapes are extremely heterogeneous, temporally dynamic, and spectrally diverse. Can a global model be developed for urban landscape space-time analysis that can account for urban morphologies in different geographical settings to support climate modelling and to benefit the Sustainable Development Goals?
- Human economic and social activities, energy use, and demographic characteristics in cities in the nighttime are distinct from those in the daytime. What is the relationship between the daytime and nighttime urban environments and ecosystems?
- Advances in artificial intelligence (AI) and Earth observation (EO) have transformed urban studies. AI will provide a deeper interpretation and autonomous identification of urban issues and the creation of customised urban designs. Open issues remain, especially in integrating diverse geospatial big data, ensuring data security, and developing a general analytical framework. To explore research directions and emerging trends, new and directed research questions should be considered to address the following questions: How will AI transform urban observing, sensing, imaging, and mapping? How can urban landscapes, phenomena, and events be better perceived and recognised with AI models using EO and geospatial big data?

People

Eleven PAIR members recognised amongst world's most highly cited researchers in 2024

Eleven scholars from PAIR have been named on the list of "Highly Cited Researchers 2024" by Clarivate Analytics. This recognition is a testament to PolyU's research and academic excellence, and its dedication to making a broad positive societal impact.

This annual list recognises researchers who have demonstrated significant impact in their respective fields. Each of the selected researchers has authored multiple highly-cited papers that have ranked in the top 1% by citations for their field and publication year in the Web of Science over the past 11 years. This year, a total of 6,636 researchers from 59 countries and regions in diverse fields have been named as Highly Cited Researchers.

PAIR researchers named on the Clarivate Analytics Highly Cited Researchers 2024 list (in alphabetical order):

Name and Title	Affiliated PAIR Constituent Research Unit(s)
Cross-Field	
Prof. CHAI Yang **Associate Dean (Research), Faculty of Science** **Professor, Department of Applied Physics**	Research Institute for Intelligent Wearable Systems (RI-IWEAR), Photonics Research Institute (PRI), Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE), Research Institute for Artificial Intelligence of Things (RIAIoT)
Prof. HUANG Haitao **Professor, Department of Applied Physics**	Photonics Research Institute (PRI), Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE), Research Institute for Sustainable Urban Development (RISUD), Research Institute for Advanced Manufacturing (RIAM), Research Centre for Resources Engineering towards Carbon Neutrality (RCRE)
Prof. LI Gang **Sir Sze-yuen Chung Endowed Professor in Renewable Energy** **Chair Professor, Department of Electrical and Electronic Engineering**	Photonics Research Institute (PRI), Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE), Research Institute for Intelligent Wearable Systems (RI-IWEAR), Research Institute for Sustainable Urban Development (RISUD)
Prof. Kian Ping LOH# **Chair Professor, Department of Applied Physics**	Photonics Research Institute (PRI)
Prof. Geoffrey Q. P. SHEN **Associate Vice President (Global Partnerships)** **Chair Professor, Department of Building and Real Estate**	Research Institute for Sustainable Urban Development (RISUD), Research Institute for Land and Space (RILS), Otto Poon Charitable Foundation Smart Cities Research Institute (SCRI)
Prof. WANG Zuankai **Associate Vice President (Research and Innovation)** **Kuok Group Professor in Nature-Inspired Engineering** **Chair Professor, Department of Mechanical Engineering**	Research Institute for Sports Science and Technology (RISports), Research Institute for Intelligent Wearable Systems (RI-IWEAR)
Prof. Tom Tao WU **Chair Professor, Department of Applied Physics**	Photonics Research Institute (PRI), Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE)
Prof. YAN Feng **Chair Professor, Department of Applied Physics**	Research Institute for Intelligent Wearable Systems (RI-IWEAR), Photonics Research Institute (PRI), Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE), Research Institute for Sustainable Urban Development (RISUD), Research Institute for Sports Science and Technology (RISports)
Dr ZHANG Xiao **Assistant Professor, Department of Mechanical Engineering**	Research Institute for Advanced Manufacturing (RIAM), Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE), Research Centre for Resources Engineering towards Carbon Neutrality (RCRE)
Engineering	
Prof. YAN Jinyue Jerry **Chair Professor, Department of Building Environment and Energy Engineering**	Research Institute for Sustainable Urban Development (RISUD), Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE)
Chemistry	
Dr HUANG Bolong **Associate Professor, Department of Applied Biology and Chemical Technology**	Research Institute for Intelligent Wearable Systems (RI-IWEAR), Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE), Research Institute for Future Food (RiFood)

Primary affiliation is with National University of Singapore

Prof. CHEN Jianli elected as American Geophysical Union Fellow

Prof. CHEN Jianli, Member of the Research Institute for Land and Space (RILS) and Professor in the Department of Land Surveying and Geo-Informatics, has been elected to the 2024 Class of American Geophysical Union (AGU) Fellows, in recognition of his outstanding leadership and scientific achievements in the field of space geodesy and climate change.

The AGU is the world's largest Earth and space science association. The AGU fellowship is bestowed annually on a select number of individuals who have made exceptional contributions to their fields. Since its inception in 1962, less than 0.1% of AGU members have been selected as fellows every year. This year, a total of 53 outstanding individuals were selected.

Prof. Benny C.F. CHEUNG elected to College of Fellows of American Society for Precision Engineering

Congratulations to Prof. Benny C. F. CHEUNG, Associate Director of the Research Centre for SHARP Vision (RCSV) and Chair Professor of Ultra-precision Machining and Metrology in the Department of Industrial and Systems Engineering, on his election as a member of the College of Fellows of the American Society for Precision Engineering (ASPE) during the 39th ASPE Annual Meeting held in Houston, Texas, USA, on 7 November 2024.

Prof. Cheung is the first Chinese scholar elected to the ASPE College of Fellows. This prestigious honour recognises his sustained and ongoing advancements in cutting mechanics and surface generation mechanisms, modelling and simulation of ultra-precision machining processes, ultra-precision surface measurement, and the design and development of innovative ultra-precision machining processes and instrumentation.

The ASPE strives to advance the art, science, and technology of precision engineering. The Society elects exceptional members to the College of Fellows in recognition of their outstanding contributions to the art and practice of precision engineering through original research, significant innovations, education and outreach, or service to the profession.

Prof. CHEN Changwen honoured with SIGMM Outstanding Technical Achievement Award

Congratulations to Prof. CHEN Changwen, Management Committee Member of PAIR and Chair Professor of Visual Computing, on receiving the SIGMM Outstanding Technical Achievement Award from the Association for Computing Machinery (ACM), the world's largest computing society.

The award is the highest honour of the ACM Special Interest Group on Multimedia Systems (SIGMM) and one of the most important awards in the international computer community. It is given annually to researchers who have made significant and lasting contributions to multimedia computing, communications, and applications. The award ceremony took place during the 32nd ACM International Conference on Multimedia, held from 28 October to 1 November 2024 in Melbourne, Australia.

Prof. CHAI Yang elected as IEEE fellow and awarded innovation prize

Congratulations to Prof. CHAI Yang, Associate Dean (Research) of the Faculty of Science and Professor in the Department of Applied Physics, on being elected to the Institute of Electrical and Electronic Engineers (IEEE) Fellow Class of 2025 for his contributions to bioinspired in-sensor computing. The Institute is the world's largest technical professional organisation dedicated to advancing technology for the benefit of humanity. The IEEE Fellow grade recognises unusual distinction in the profession and is awarded to persons with an outstanding record of accomplishments in any of the IEEE fields of interest.

Prof. Chai was also awarded the BOCHK Science and Technology Innovation Prize 2024 (Artificial Intelligence and Robotics) earlier this year for his contribution to disruptive in-sensor computing paradigms for artificial vision sensors, which enables information processing directly within the sensors. The BOCHK Science and Technology Innovation Prize recognises outstanding scientists and research teams in Hong Kong, or research-related institutions set up by Hong Kong higher education institutions and located in the Guangdong-Hong Kong-Macao Greater Bay Area, for their significant achievements in scientific and technological innovation and transformation. Each awardee will receive a HK$2 million cash prize.

Prof. Chai is currently a Management Committee Member of the Research Institute for Intelligent Wearable Systems (RI-IWEAR), and a Member of the Photonics Research Institute (PRI), the Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE) and the Research Institute for Artificial Intelligence of Internet of Things (RIAIoT).

PolyU-invented mobile ankle-foot exoneuromusculoskeleton wins CES 2025 Innovation Award in US

The mobile ankle-foot exoneuromusculoskeleton developed by Prof. HU Xiaoling, Associate Professor in the Department of Biomedical Engineering and Co-founder of PolyU startup Thecon Technology (HK) Limited, and her research team received the Consumer Electronics Show (CES) 2025 Innovation Award in the Accessibility and AgeTech category at the CES 2025 event held in Las Vegas, United States. Prof. Hu is a Member of the Research Institute for Smart Ageing (RISA) and the Research Institute for Sports Science and Technology (RISports). Her team's award-winning innovation is a multimodal robot designed for ankle-foot rehabilitation, specifically aimed at improving the motor function and walking ability of stroke patients.

Organised by the Consumer Technology Association, CES is the world's largest and most influential consumer electronics technology exhibition. This year's event featured over 4,500 global exhibitors, showcasing innovations that integrate cutting-edge electronic technology with modern living.

RIAIoT member Dr ZHANG Shuowen recognised as "N²Women Rising Star"

Congratulations to Dr ZHANG Shuowen, Member of the Research Institute for Artificial Intelligence of Things (RIAIoT), on being recognised by N2Women (Networking Networking Women) as one of the ten "N²Women 2024 Rising Stars in Computer Networking and Communications", for her outstanding contributions to solving difficult beamforming and resource allocation optimisation problems in various wireless communication systems.

N²Women is a discipline-specific community of researchers in the fields of networking and communications. It encourages diversity and fosters connections among under-represented women in the computing sub-field. Its annual list of rising stars recognises women who have outstanding research outcomes and/or service contributions in the field.

Three PAIR academics honoured as Fellows of Hong Kong Academy of Engineering

Congratulations to Prof. TAO Xiaoming, Management Committee Member of PolyU Academy for Interdisciplinary Research (PAIR) and Director of the Research Institute for Intelligent Wearable Systems (RI-IWEAR), Ir Prof. YIN Jian Hua, Management Committee Member of the Research Institute for Land and Space (RILS), and Ir Prof ZHAO Xiao Lin, Associate Director of RILS, on their election as Fellows of the Hong Kong Academy of Engineering (HKAE). An induction ceremony was held on 20 January 2025 at Hotel ICON.

The HKAE is a prestigious organisation dedicated to promoting and advancing the engineering field in Hong Kong. The Academy aims to foster collaboration, innovation, and excellence in engineering, contributing to the advancement of society and the development of Hong Kong and the Nation. It comprises a distinguished group of Fellows from various disciplines who are recognised as leaders in their profession, with remarkable achievements in engineering sciences and applications.

Full list of new Fellows: https://hkae.hk/en/hong-kong-academy-engineering-welcomes-eleven-new-fellows

Prof. XIA Yong awarded ASCE Greater China Distinguished Leadership Medal 2025

Congratulations to Prof. XIA Yong, Member of the Research Institute for Sustainable Urban Development (RISUD) and the Research Centre for Deep Space Explorations (RCDSE), and Professor in the Department of Civil and Environmental Engineering, on receiving the American Society of Civil Engineers (ASCE) Greater China Distinguished Leadership Medal at the 3rd ASCE Greater China Conference held at Guangxi University from 10 to 12 January 2025.

This award recognises Prof. Xia's exceptional innovative contributions and outstanding leadership in advancing the ASCE Greater China Section and the civil engineering profession in the region. The selection process for this award involved a comprehensive evaluation of candidates' professional contributions, academic influence and international engagement.

The ASCE Greater China Section serves as a vital platform for fostering the growth of civil engineering in Greater China. It facilitates knowledge exchange, networking opportunities and professional development among its members, uniting engineers across diverse disciplines within civil engineering, including structural, geotechnical, construction, environmental, materials and water resources.

News & Events

Inspiring exchanges with Northwestern University scholars

PAIR had the pleasure of hosting the 35th PAIR Distinguished Lecture and the PAIR Workshop on Interdisciplinary Research on 19 February 2025, both featuring renowned scholars from Northwestern University, USA.

The day started with an enlightening lecture titled "Bioelectronics – Frontiers in the Integration of Technology with Biology" held in the morning. In the lecture, Prof. John A. ROGERS, Louis Simpson and Kimberly Querrey Professor of Materials Science and Engineering, Biomedical Engineering and Neurological Surgery (and by courtesy Electrical and Computer Engineering, Mechanical Engineering, Chemistry and Dermatology), shared the core concepts in materials science, circuit design and manufacturing that underpin advanced electronic/optoelectronic technologies for healthcare applications.

This was followed by the PAIR Workshop featuring three speakers from Northwestern University held in the afternoon. Prof. Rogers and his long-time collaborator Prof. HUANG Yonggang, Jan and Marcia Achenbach Professorship in Mechanical Engineering, Civil and Environmental Engineering (and by courtesy Materials Science and Engineering) shared on their success stories in interdisciplinary research collaborations, while Prof. WANG Dashun, Kellogg Chair of Technology presented key findings about successful collaboration strategies.

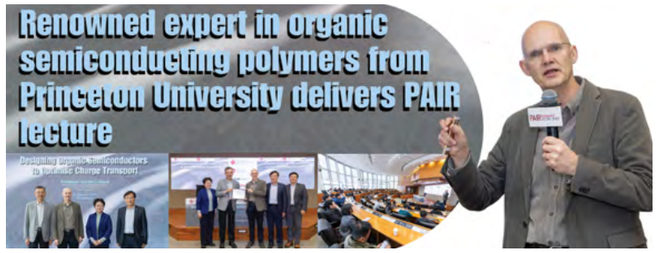
The successful events provided a platform for fruitful deliberations and knowledge sharing, further reinforcing PolyU's interdisciplinary research culture.

PolyU start-up offers free liver disease screening for disadvantaged areas

The development and launch of Liverscan® by Eieling Technology Limited, a PolyU start-up led by Ir Prof. ZHENG Yongping, Director of the Research Institute for Smart Ageing (RISA), Henry G. Leong Professor in Biomedical Engineering and Chair Professor of Biomedical Engineering, has revolutionised screening technologies for liver diseases and is giving patients more hope for early diagnosis and treatment, particularly in disadvantaged areas.

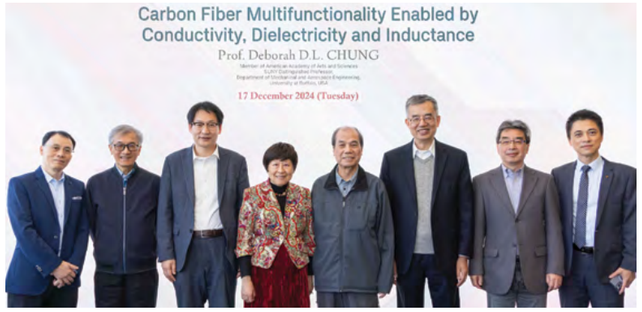
In response to the healthcare resource shortages in poverty-stricken areas, Eieling Technology collaborates proactively with local governments and district health centres in conducting charity activities and providing free screenings for fatty liver disease and liver fibrosis in neighbourhoods. Liverscan® has already obtained registration approval from the US Food and Drug Administration (FDA510K) and NMPA medical device registration in mainland China in 2024. Currently, around 30 sets of Liverscan® have been installed for clinical use in Hong Kong, Macao, and different cities in Mainland China. The company plans to install 100,000 devices worldwide in the next five years, especially in developing countries and poor areas, and this will significantly promote the adoption of liver disease screening to reduce severe liver problems, such as cirrhosis or liver cancer. In addition, Eieling Technology launched its five-year "LiverCare—Hong Kong 10 Million Liver Scans" program at the Asia Summit on Global Health in May 2024, together with PolyU and a number of local partners. PolyU formally launched its screening program for liver health for all full-time staff in December 2024.

Renowned expert in organic semiconducting polymers from Princeton University delivers PAIR lecture



Prof. Iain McCULLOCH from Princeton University, United States, delivered the 34th PAIR Distinguished Lecture titled "Designing Organic Semiconductors to Optimise Charge Transport" on 14 January 2025 on the PolyU campus. The lecture attracted over 100 participants to join in person and captivated an online audience of over 12,700 from different countries and regions who watched the live broadcast on multiple social media platforms, including Bilibili, WeChat, Weibo and YouTube.

Prof. Deborah CHUNG of SUNY University at Buffalo delivers lecture on multifunctional carbon fiber



Prof. Deborah D.L. CHUNG of The State University of New York (SUNY) at Buffalo delivered the 33rd PAIR Distinguished Lecture titled "Carbon Fiber Multifunctionality Enabled by Conductivity, Dielectricity and Inductance" on 17 December 2024 on the PolyU campus. The lecture attracted about 100 participants to join in person. It also captured an online viewing audience of over 12,800 from different countries and regions who watched the live broadcast on multiple social media platforms, including Bilibili, WeChat, Weibo and YouTube.

Prof. ZHENG Quanshui shares reflections on interdisciplinary innovative research

Prof. ZHENG Quanshui, Academician of the Chinese Academy of Sciences, Founding Principal of X-Institute and Professor at Tsinghua Shenzhen International Graduate School, China, delivered the 31st PAIR Distinguished Lecture titled "Reflections and suggestions from 20 years' interdisciplinary innovative research" on 21 November 2024 on the PolyU campus. Approximately 100 participants attended the lecture in person. Meanwhile, an online viewing audience of over 11,800 from different countries and regions watched the live broadcast on multiple social media platforms, including Bilibili, WeChat, Weibo and YouTube.

PAIR scholars showcase research impact at InnoCarnival 2024

InnoCarnival 2024, organised by the Innovation and Technology Commission of the Hong Kong Special Administrative Region Government, was held from 26 October to 3 November 2024 at the Hong Kong Science Park. This year's theme, "Let's Sail with Innovation and Technology", aligned with the celebrations for the 75th anniversary of the founding of the People's Republic of China.

Seven projects led by PAIR members were showcased at the event. These projects span various application areas, including space exploration, life sciences and healthcare, artificial intelligence of things (AIoT) and sensing technology, civil engineering, and vision and eye health.

First International Conference on Digital Intelligence for Energy Systems successfully held

The First International Conference on Digital Intelligence for Energy Systems, co-organised by The Hong Kong Polytechnic University (PolyU) and Zhejiang University, was successfully held from 5 to 8 January 2025 on the PolyU campus. The opening ceremony was graced by distinguished guests including Ir Dr Otto POON Lok-to, BBS, OBE, and Ir Raymond POON Kwok-ying, JP, Director of Electrical and Mechanical Services Department (EMSD).

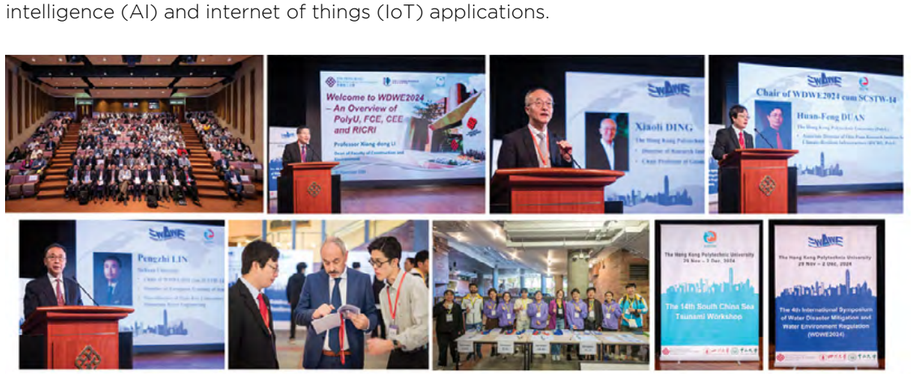
The Conference attracted over 200 experts from academia, industry and government across various countries. Participants shared valuable insights and innovative ideas on various topics related to smart energy, such as artificial intelligence of things (AIoT) in energy system planning, building-grid interaction, carbon neutrality transformation, energy storage, renewable energy, power transmission, smart grid and microgrid operation, energy sustainability, and energy policies.

RILS co-organises the 4th World Conference on Floating Solutions

The 4th International Conference on Floating Solutions (WCFS 2024), themed around "Floating solutions for sustainable ocean development and blue economy", was held successfully from 2 to 4 December 2024. More than 220 participants from 18 countries presented recent research and developments in floating solutions. The Conference was organised by the Research Institute for Land and Space (RILS), together with the Department of Civil and Environmental Engineering (CEE), Research Institute for Sustainable Urban Development (RISUD), and Research Institute for Future Food (RiFood) of PolyU, and the Society of Floating Solutions (Singapore).

PolyU co-organises international symposium and workshop to explore boosting coastal and urban resilience under climate change

The 4th International Symposium of Water Disaster Mitigation and Water Environment Regulation was successfully held from 29 November to 2 December 2024, with the 14th South China Sea Tsunami Workshop as a special session. The four-day event, themed "Coastal and Urban Resilience under Climate Change", was co-organised by PolyU, Sichuan University, Sun Yat-sen University, the Research Institute for Sustainable Urban Development (RISUD) and the Research Institute for Land and Space (RILS), with support from the International Association for Hydro-Environment Engineering-Hong Kong Chapter (IAHR-HK Chapter), IAHR-China Chapter and relevant government departments of the Hong Kong SAR. It brought together 208 participants from 21 countries and regions to explore five key topics: extreme weather under climate change, water-related disasters, infrastructure resilience, hydro-environment and eco-hydraulics, and artificial intelligence (AI) and internet of things (IoT) applications.



Symposium on Sports Science and Technology 2024 successfully held

The Research Institute for Sports Science and Technology (RISports) organised the Symposium on Sports Science and Technology 2024 from 30 November to 2 December 2024 on the PolyU campus, attracting more than 200 students, researchers and industry professionals. The three-day Symposium was co-organised with the Department of Biomedical Engineering at PolyU, AquaBloom International Sports Technology Group and the Samaranch Foundation, and it brought together former Olympic and world champion athletes, scholars and industry leaders to share experiences and the latest research outcomes in sports technology.

On the first day of the Symposium, six former Olympic or world champion athletes from the Hong Kong, China team and various national teams shared their experiences with sports technology applications as well as their personal development and careers after retirement. In the following two days, scholars and industry experts presented the latest research outcomes and products in sports science and technology, discussing ways to integrate innovative technologies, such as sports biomechanics, intelligent wearable systems and artificial intelligence, in order to enhance training effectiveness. Additionally, representatives from the national swimming team shared the training regimes followed by elite swimmers.

At the Symposium, Prof. ZHANG Ming, Director of RISports, announced the establishment of the International Society of Sports Science and Technology, which aims to promote international exchange and collaboration between academic and industry institutions in sports science and technology. Moreover, in the coming year PolyU will launch a new programme, "Master of Science in Sports Technology and Management", to cultivate talent in sports technology.

PolyU establishes eight JC STEM Labs to drive Hong Kong's I&T developments

PolyU has received a generous donation of over HK$74 million from The Hong Kong Jockey Club Charities Trust to establish eight Jockey Club (JC) STEM Labs. Spearheaded by distinguished PolyU scholars selected for the HKSAR Government-initiated Global STEM Professorship Scheme, the JC STEM Labs aspire to advance innovative research in the fields of machine learning and computer vision, healthy built environment, innovative light therapy for eye diseases, quantum technology, 2D quantum materials, Earth observations, digital oncology care enhancement, and genomics in healthcare. An inauguration ceremony for the new labs was held on 13 November 2024 at PolyU.

Among the eight new labs, five are led by scholars at PAIR, including Prof. CHEN Qingyan, Director of PAIR; Prof. ZHANG Weixiong, Associate Director of PAIR; Prof. LIU Ai-qun, Director of the Research Institute for Quantum Technology (RIQT); Prof. WENG Qihao, Associate Director of the Research Institute for Land and Space (RILS); and Prof. HE Mingguang, Director of the Research Centre for SHARP Vision (RCSV).

RCSV partners with industry to explore Naked-Eye 3-Dimensional Vision Training for myopia control

The Research Centre for SHARP Vision (RCSV) has forged a partnership with Holo See Medical Technology (Shenzhen) Co. Ltd. to explore the potential applications of Naked-Eye 3-Dimensional Vision Training in myopia prevention and control, as well as other visual health areas.

A collaboration agreement signing and inauguration ceremony were held on 9 December 2024 on the PolyU campus. The event was graced by the presence of Prof. CHEN Qingyan, Director of PAIR; Prof. HE Mingguang, Director of RCSV and Chair Professor of Ophthalmology and Optometry; Mr YANG Keqing, Director of Holo See Medical Technology (Shenzhen) Co. Ltd.; Ms HONG Wanjun, Managing Director of Holo See Medical Technology (Shenzhen) Co. Ltd.; Mr LIU Xiao, Director of Doctorglasses Chain Co., Ltd.; Mr ZHU Hui, Director of Shenzhen Jinghu Investment Consulting Co., Ltd.; and other industry experts and partners.

Naked-Eye 3-Dimensional Vision Training is an emerging method for controlling the progression of myopia. The two parties will collaborate to develop next-generation technologies that further improve the efficacy of the training and its compliance. They will also conduct multiregional studies and trials to verify the improvement in efficacy and its translation into community benefits.

RiFood co-organises scientific meeting on turning "Healthy China 2030" vision into action

The Research Institute for Future Food (RiFood), in collaboration with the Department of Food Science and Nutrition (FSN) and the Hong Kong Nutrition Association (HKNA), co-organised the HKNA 45th Anniversary Scientific Meeting on the PolyU campus on 14 December 2024, attracting over 120 participants including students, researchers, industry experts and medical professionals from Hong Kong, Macao and mainland China.

The meeting, on the theme of "Healthy China 2030—From vision to action", featured presentations by three distinguished scholars from the Chinese Nutrition Society. They provided an in-depth overview of the latest developments in the nutrition profession and the national nutrition plan in mainland China, and explained the plan's role in realising the "Healthy China 2030" vision. Prof. YANG Yuexin, President of the Chinese Nutrition Society, explained in detail the registration system for dietitians and its current status in mainland China. She encouraged medical professionals in Hong Kong to equip themselves by applying to become registered dietitians in China and embracing lifelong learning in the field of nutrition.

Prof. WU Bo gives public lecture on lunar exploration and base construction

Prof. WU Bo, Associate Director of the Research Centre for Deep Space Explorations (RCDSE), Fiona Cheung Professor in Spatial Science and Associate Head (Research) of the Department of Land Surveying and Geo-Informatics, delivered a public lecture on 7 December 2024, giving secondary school students an in-depth look at of lunar exploration achievements and potential strategies for lunar base development. The lecture attracted students from 94 secondary schools and international schools in Hong Kong and the Greater Bay Area. The students participated enthusiastically in the interactive question-and-answer session, demonstrating their keen interest in space exploration.

The lecture is one of the activities under the PolyU space-themed programme "Pioneering the Moon: From Exploration to Base Construction", which includes thematic lectures and a Lunar Base Design Competition. Launched in the 2024/25 academic year, the programme is organised by PolyU and sponsored by the Bank of China (Hong Kong), with the support of the Chinese Society of Astronautics and the Hong Kong Society of Astronautics.

RCDTT Associate Director Dr WANG Dan shares research insights on ESG development of hotels in China

Dr WANG Dan, Associate Director of the Research Centre for Digital Transformation of Tourism (RCDTT) and Associate Professor in the School of Hotel and Tourism Management, was interviewed by CCTV on the green development of China's hospitality industry. She explained that the PolyU research team has developed the "China hospitality industry green development index", a comprehensive evaluation system with 9 dimensions and over 80 indicators to assess the green development level of hotels in areas such as energy use, water resource management and waste management.

According to Dr Wang, the need for capital investment is the biggest challenge to the green transition in the hospitality industry, especially for small- and medium-sized hotels. She suggested that the government provide targeted support such as subsidies and tax incentives, and establish green awards to enhance the public's recognition of green hotels. Industry associations can also help the sector to adopt green technologies and management methods through training and experience sharing. She believes that consumer participation must be promoted in tandem with the overall enhancement of public environmental awareness, and that the government, businesses and consumers should work together to gradually promote sustainable development.

Prof. WONG Ka-hing on RiFood's sustainable hydroponics research and its applications

Prof. WONG Ka-hing, Management Committee Member of PAIR, Director of the Research Institute for Future Food (RiFood) and Professor in the Department of Food Science and Nutrition, penned a bylined article in *Sing Tao Daily*, introducing the Institute's research and applications in hydroponics.

In the article, Prof. Wong mentioned that his research team received funding from the Sustainable Agriculture Development Fund of the Agriculture, Fisheries and Conservation Department this year. The funding will enable further development of bio-fortification technology for precision hydroponics based on existing patented technologies to increase the mineral or micronutrient content of vegetables during the planting process. The team specifically addressed the common inadequate intake of calcium, iron and iodine among Hong Kong residents by adding these micronutrients to commonly eaten vegetables, thus allowing the public to meet their nutritional needs easily and affordably through their daily diet, and providing targeted solutions for natural nutritional supplementation. Prof. Wong believes that although hydroponic vegetables are not yet popular in Hong Kong, hydroponic farming has significant environmental benefits and is regarded as an important step in sustainable agriculture development.

Prof. Raymond WONG discusses enhancement of organic solar cells for carbon reduction on RTHK Programme *Infinite Future*

Prof. Raymond WONG Wai-yeung—Executive Committee Member of the Research Institute for Sustainable Urban Development (RISUD), Associate Director of the Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE), Member of the Research Institute for Intelligent Wearable Systems (RI-IWEAR) and the Research Institute for Sports Science and Technology (RISports), and Dean of the Faculty of Science—was featured on the RTHK programme *Infinite Future*, where he explained how enhancing the photovoltaic (PV) efficiency of organic solar cells can help reduce carbon emissions.

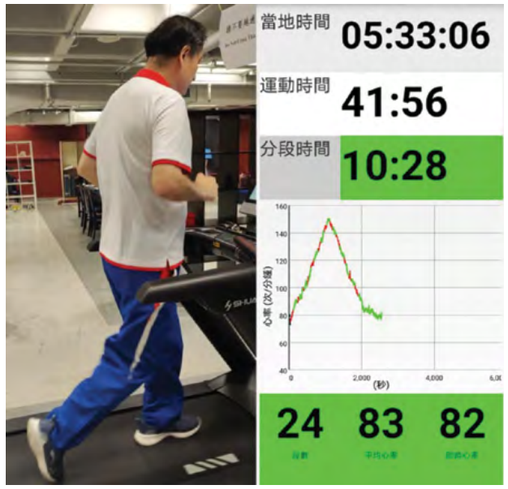
Prof. Wong's current research focus is on the design and preparation of novel high-performance photofunctional materials and on optoelectronic applications, particularly the luminescence and stability of these materials. His team has developed high-performance organic light-emitting diodes (OLEDs) with various colour emissions. Through molecular design, the team has developed a type of novel high-performance deep-blue thermally activated delayed fluorescence (TADF) materials. OLEDs made with this deep-blue material have achieved an external quantum efficiency of over 35%, which is one of the highest in the world.

In addition, the team has achieved a PV conversion efficiency of over 19% in organic solar cells using transition metal complexes. The ultra-thin and highly flexible characteristics of organic solar cells can be integrated with wearable electronic devices, enabling these wearable electronics to be self-powered using sunlight.

Prof. Wong also mentioned that the future research directions for these two types of optoelectronic devices are mainly the further improvement of energy conversion efficiency through the molecular design of high-performance active materials and the structural design of devices; enhancement of stability and lifespan; and the development of organic semiconductor electronic technologies and applications. He believes that achieving low-toxicity or non-toxic active materials in the future will help reduce environmental pollution and achieve sustainable development.

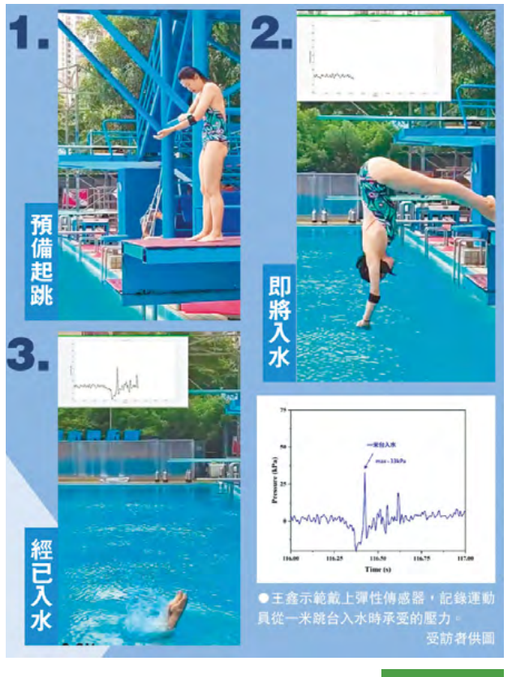
Prof. ZHANG Ming shares sports science technologies in local newspapers

Prof. ZHANG Ming, Director of the Research Institute for Sports Science and Technology (RISports), was featured in local newspapers including *Sing Tao Daily* and *Wen Wei Po*, introducing RISports' studies on "Taichi-Run" and enhancing diving techniques, respectively.



Taichi-Run is an adaptive jogging style, with an exercise load starting at a lower speed and heart rate ("Yin" state), followed by a gradual increase to a higher speed and heart rate ("Yang" state), and then returning to the "Yin" state, allowing joggers to maintain a comfortable target heart rate. Prof. Zhang shared with *Sing Tao Daily* that RISports hopes to establish a database of human body data in the long term, using quick scan technology to obtain human characteristics and identify potential health issues for further follow-up. He further stated that the idea of "exercise prescription", which aims at addressing heath issues through exercise rather than medication, has already been implemented in mainland China and overseas. RISports is now studying the effects of different exercises on humans, investigating whether appropriate exercise can alleviate chronic diseases, and identifying exercises suitable for prescription.

Prof. Zhang also gave an exclusive interview to *Wen Wei Po*, in which he described the use of research in sports science and technologies to improve diving techniques, thereby enhancing the safety and success rate of diving. He and his PhD student Ms WANG Xin, former member of the national diving team and the gold medallist in the women's synchronised 10-metre platform at the 2008 Beijing Olympics, are utilising waterproof, wireless, flexible body sensors, cameras, etc., to record data on the impact and pressure experienced by various body parts, including joints and muscles, during the take-off, aerial phase, and entry of a dive. Their aim is to determine whether the force can cause injuries, so as to find methods for preventing injuries, and to enhance the difficulty and performance of the divers' moves. Prof. Zhang explained that this research is still in its preliminary stage, and the team needs to conduct further basic research to ensure its accuracy. He hopes to eventually establish a digital model of the human body, which can be used to analyse the pressure on various body parts of athletes during the diving process.



Sixteen PolyU projects receive support from Health and Medical Research Fund, recognising the University's interdisciplinary research achievements

Sixteen PolyU projects have received a total of HK$14.3 million in the latest funding exercise of the Health and Medical Research Fund (HMRF). These projects cover various research areas related to health technology and biomedical engineering, showcasing PolyU's interdisciplinary proficiency in medical and healthcare research. Among them, ten projects are led by PAIR researchers:

* In alphabetical order by faculty and surname

Principal Investigator	Affiliation with PAIR	Project Title	Amount
Faculty of Engineering			
Dr James CHEUNG Chung-wai Research Assistant Professor in the Department of Biomedical Engineering	Member of Research Institute for Sports Science and Technology (RISports) and Research Institute for Smart Ageing (RISA)	Integrated acoustic and carbon nanotube biosensors with deep-learning algorithms for dysphagia screening: a pilot study	$495,900
Faculty of Health and Social Sciences			
Prof. CHENG King-yip Associate Professor in the Department of Health Technology and Informatics	Member of Research Institute for Future Food (RiFood) and Research Centre for Chinese Medicine Innovation (RCMI)	Circulating plasmalogens and their metabolism as biomarkers and therapeutic targets for pancreatic β-cell dysfunction in type 2 diabetes	$1,499,000
Prof. Justina LIU Yat-wa Associate Head (Postgraduate Education) and Professor in the School of Nursing	Member of Research Institute for Smart Ageing (RISA)	The effects of music-with-movement (simultaneous cognitive-motor dual-task training) on cognitive and physical performance of people with potentially reversible cognitive frailty: a randomized controlled trial	$1,478,766
Dr REN Ge Research Assistant Professor in the Department of Health Technology and Informatics	Member of Research Institute for Intelligent Wearable Systems (RI-IWEAR)	Investigation of a novel AI-empowered pulmonary perfusion imaging technique based on cone beam computed tomography for functional image-guided adaptive radiotherapy of lung cancer	$1,500,000
Prof. Gilman SIU Kit-hang Professor in the Department of Health Technology and Informatics	Member of Otto Poon Charitable Foundation Smart Cities Research Institute (SCRI)	Risk assessment and surveillance of the transmission of foodborne antimicrobial resistance in Hong Kong	$1,499,500
Prof. Arnold WONG Yu-lok Associate Professor in the Department of Rehabilitation Sciences	Associate Director of Research Institute for Smart Ageing (RISA), Member of Research Institute for Intelligent Wearable Systems (RI-IWEAR) and Research Institute for Sports Science and Technology (RISports)	Feasibility, effectiveness, and patient experience of an online acceptance and commitment therapy plus exercises versus online education plus exercises for older people with chronic low back pain: a pilot randomized controlled trial	$499,530
Prof. Thomson WONG Wai-lung Associate Professor in the Department of Rehabilitation Sciences	Member of Research Centre for Chinese Medicine Innovation (RCMI)	The efficacy of a specific dance intervention to improve the balance and reduce the risks of falls (SDIIBRF) in older adults: a randomised controlled trial	$892,214
Prof. XIN Meiqi Assistant Professor in the Department of Rehabilitation Sciences	Member of Mental Health Research Centre (MHRC)	Understanding professional help-seeking behaviors for insomnia and the associated factors in the community-dwelling older population having insomnia symptoms	$499,512
Prof. Ivy ZHAO Yan Assistant Professor in the School of Nursing	Member of Research Institute for Smart Ageing (RISA) Faculty of Science	Supporting current home care services with a robot-mediated interactive intervention (RMII) to reduce loneliness in older adults: a feasibility and pilot randomized controlled trial	$500,000
Faculty of Science			
Prof. CHUA Song-lin Assistant Professor in the Department of Applied Biology and Chemical Technology	Management Committee Member of Research Centre for Deep Space Explorations (RCDSE), Member of Research Institute for Future Food (RiFood)	Developing Juglone as a novel antivirulence agent to eliminate biofilm infections	$500,000

Fourteen research projects led by PAIR members awarded RGC funding

The Research Grants Council (RGC) announced the results of its 2024/25 funding schemes, and 18 PolyU projects have received total funding of approximately HK$91.76 million from the Collaborative Research Fund (CRF) and Research Impact Fund (RIF), the highest amount among the UGC-funded universities.

Among the projects, 14 are led by PAIR members:

Project Title	Project Coordinator	Affiliation with PAIR Constituent Research Unit
Collaborative Research Project Grant		
Unraveling the Mechanisms of Targeted Therapy Resistance as a Novel Therapeutic Strategy for Hepatocellular Carcinoma	Prof. LEE Kin-wah Terence Associate Head and Professor in Department of Applied Biology and Chemical Technology (in collaboration with HKU)	Member of Research Institute for Future Food (RiFood) and Research Centre for Chinese Medicine Innovation (RCMI)
Seeing like Dragonflies: Optical-fiber-based Artificial Compound Eyes for 3D Vision	Prof. ZHANG Xuming Associate Head and Professor in Department of Applied Physics (in collaboration with HKU)	Associate Director of Research Institute for Quantum Technology (RIQT), Management Committee Member of Photonics Research Institute (PRI), Member of Research Institute for Advanced Manufacturing (RIAM) and Research Centre for Resources Engineering towards Carbon Neutrality (RCRE)
Next-generation AI-XR Empowered Surgical Planning and Intraoperative Guidance System via Effective Fusion of Empirical Knowledge, Human Interaction, and Machine Inference	Prof. QIN Jing Harry Professor in School of Nursing (in collaboration with CUHK and HKU)	Member of Photonics Research Institute (PRI) and Mental Health Research Centre (MHRC)
Optimising Spinal Curvature Corrective Outcomes in Adolescent Idiopathic Scoliosis: An Investigation into Spinal Flexibility, Biomechanical Behavior and Predictive Modeling	Prof. YIP Yiu-wan Joanne Associate Dean (Industrial Partnership) and Professor in School of Fashion and Textiles (in collaboration with CUHK and HKU)	Management Committee Member of Research Institute for Future Food (RiFood), Member of Photonics Research Institute (PRI), Research Institute for Sports Science and Technology (RISports) and Research Centre of Textiles for Future Fashion (RCTFF)
Ultrahigh-resolution Optical Vector Analysis for Broadband Photonic Devices	Prof. YU Changyuan Professor in Department of Electrical and Electronic Engineering (in collaboration with CityU and CUHK)	Management Committee Member of Photonics Research Institute (PRI), Member of Research Institute for Intelligent Wearable Systems (RI-IWEAR), Research Institute for Sports Science and Technology (RISports), Research Institute for Sustainable Urban Development (RISUD) and Research Centre for Deep Space Explorations (RCDSE)
Advancing Compound Hazard Resilience and Adaptation for Urban Building Community in a Changing Climate	Prof. DONG You Associate Professor in Department of Civil and Environmental Engineering (in collaboration with CityU, HKUST and HKU)	Member of Research Institute for Land and Space (RILS), Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE), Research Institute for Sustainable Urban Development (RISUD), Research Centre for Resources Engineering towards Carbon Neutrality (RCRE) and Research Centre for Digital Transformation of Tourism (RCDTT)
Collaborative Research Equipment Grant		
A Multifunctional Time-space-energy-helicity Resolved Transient Absorption Microscopy Imaging System for Advanced Materials and Devices Research	Dr LI Mingjie Assistant Professor in Department of Applied Physics (in collaboration with CityU, CUHK, HKUST, HKU)	Member of Photonics Research Institute (PRI)

Project Title	Project Coordinator	Affiliation with PAIR Constituent Research Unit
Collaborative Research Equipment Grant		
State-of-the-art Dynamic Nuclear Polarisation Enhanced Solid-State NMR Spectroscopy	Prof. YUNG Ka Fu Associate Dean of Faculty of Science, and Professor in Department of Applied Biology and Chemical Technology (in collaboration with CityU, HKBU, CUHK, HKUST, HKU and EdUHK)	Member of Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE) and Research Centre for SHARP Vision (RCSV)
Development of a Colorimetric and Photometric Characterisation Platform for Binocular VR/AR Headsets	Prof. WEI Minchen Tommy Professor in Department of Building Environment and Energy Engineering (in collaboration with CityU and HKUST)	Management Committee Member of Photonics Research Institute (PRI), Member of Otto Poon Charitable Foundation Smart Cities Research Institute (SCRI), Research Institute for Sustainable Urban Development (RISUD), Research Centre for Digital Transformation of Tourism (RCDTT) and Research Centre for SHARP Vision (RCSV)
Young Collaborative Research Grant		
Design of Ultrastrong, Ductile, and Thermally Stable Nanocrystalline Dual-phase Alloys via Coherent Nano-honeycomb Architectures	Dr JIAO Zengbao Associate Professor in Department of Mechanical Engineering (in collaboration with CityU and HKUST)	Member of Research Institute for Advanced Manufacturing (RIAM)
AI-empowered Wind Field Simulation for Sustainable Urban Microclimate Design **Research Impact Fund**	Dr YOU Ruoyu Assistant Professor in Department of Building Environment and Energy Engineering (in collaboration with HKU) Research Impact Fund	Member of Otto Poon Charitable Foundation Smart Cities Research Institute (SCRI) and Research Institute for Sustainable Urban Development (RISUD) Research Impact Fund
Research Impact Fund		
WASTES to WINGS – Constructing a High-throughput Sustainable Aviation Fuel Research Platform to Facilitate Zero Carbon Air Travel in Hong Kong	Dr Shao-Yuan LEU Associate Professor in Department of Civil and Environmental Engineering	Management Committee Member of Research Centre for Resources Engineering towards Carbon Neutrality (RCRE), Member of Research Institute for Future Food (RiFood), Otto Poon Charitable Foundation Research Institute for Smart Energy (RISE) and Research Institute for Sustainable Urban Development (RISUD)
Development of Modular Integrated 3D-printed Concrete Construction (MI3DC)	Prof. POON Chi-sun Michael Anson Professor in Civil Engineering, Chair Professor and Head of Department of Civil and Environmental Engineering	Director of Research Centre for Resources Engineering towards Carbon Neutrality (RCRE), Member of Research Institute for Land and Space (RILS) and Research Institute for Sustainable Urban Development (RISUD)
Creating Delightful Experience in Virtual Reality and Augmented Reality **Headset through Optimal Optical Design**	Prof. WEI Minchen Tommy Professor in Department of Building Environment and Energy Engineering	Management Committee Member of Photonics Research Institute (PRI), Member of Otto Poon Charitable Foundation Smart Cities Research Institute (SCRI), Research Institute for Sustainable Urban Development (RISUD), Research Centre for Digital Transformation of Tourism (RCDTT) and Research Centre for SHARP Vision (RCSV)

PolyU extends partnership with PATA for Asia Pacific Visitor Forecasts

PolyU has extended its partnership with the Pacific Asia Travel Association (PATA) for another three years (2024–2027) to continue the publication of the Asia Pacific Visitor Forecasts reports. Under the partnership, the Research Centre for Digital Transformation of Tourism (RCDTT) will collaborate with PATA on a project titled "Further Development of the Tourism Demand Forecasting for Asia Pacific Region (Phase 4)".

The project aims to leverage advanced statistical forecasting techniques, scenario analyses, artificial intelligence (AI) algorithms and stakeholder insights to produce comprehensive Asia Pacific Visitor Forecasts reports. These reports cover inbound visitors, tourism receipts and departures, providing tourism professionals, businesses and destinations with crucial insights for policymaking, strategic planning and operational management, thus enabling them to navigate evolving demand patterns and make informed decisions in the face of current and future global challenges.

PolyU awarded Green Tech funding to develop low-carbon marine self-healing concrete for achieving carbon neutrality

The project titled "Marine self-healing concrete with biomineralization-enhanced construction waste for long-term decarbonization" led by Prof. LI Xiangdong, Director of the Research Institute for Sustainable Urban Development (RISUD), Dean of the Faculty of Construction and Environment (FCE), Chair Professor of Environmental Science and Technology, and Ko Jan Ming Professor in Sustainable Urban Development, has been awarded approximately HK$6.03 million from the Green Tech Fund for a duration of 24 months.

This project focuses on designing and developing low-carbon marine self-healing concrete by incorporating biomineralization-enhanced recycled aggregates (RAs). Marine carbon-capturing bacteria will utilise carbon dioxide (CO_2) to accelerate carbonisation and improve RAs, thereby addressing the issue of scarce natural aggregates, reducing CO_2 emissions, and achieving the recycling of construction waste. In addition, this microbial concrete structure possesses self-healing properties that enhance its durability, providing a significant advantage in achieving long-term decarbonization and sustainability objectives.

Marine self-healing concrete

PolyU University Gallery is now open!

PolyU unveiled its new University Gallery on 1 January 2025 on campus. Through engaging profiles and exhibits, the Gallery illustrates the University's evolution and rich history in the past eight decades. It highlights the University's endeavours over the years to offer quality education and nurture future leaders to meet the needs of social and economic development. The Gallery also shares stories of distinguished PolyU researchers, including PAIR scholars, and their efforts in translating research outcomes into innovative solutions that address global challenges. Come visit now to discover the stories of PAIR researchers!

Inaugural issue of *Innovation Digest* is now available

We are pleased to announce the launch of PolyU's brand-new research newsletter, *Innovation Digest*!

The inaugural issue showcases the ground-breaking research work undertaken by PolyU's academics in the field of artificial intelligence (AI), and highlights eight cutting-edge research studies, including projects led by PAIR researchers. These studies exhibit the breadth and depth of AI research at our university, reflecting our dedication to addressing real-world challenges through technological advancement.

Studies by PAIR researchers are featured in Research Highlight articles:

- Collaborative Edge Computing Enabled AIoT by Prof. CAO Jiannong (https://polyu.hk/IbIXJ)
- Bioinspired In-sensor Computing Architectures and Optimisation in Sensory AI Systems by Prof. CHAI Yang (https://polyu.hk/TgpPO)
- AI-Driven Topographic Analysis of Asteroids to Support Future Asteroid Exploration and Sampling Missions by Prof. WU Bo (https://polyu.hk/mgIkD)
- Smart Adaptation: The Fusion of AI and Robotics for Dynamic Environments by Prof. ZHANG Dan (https://polyu.hk/odVdn)
- Machine Learning Accelerates the Synthesis of Novel Catalyst for Green Energy by Prof. NI Meng (https://polyu.hk/apQEc)
- Integrating Machine Learning with Total Network Controllability Analysis to Identify Therapeutic Targets for Cancer Treatment by Prof. ZHANG Weixiong (https://polyu.hk/qCulR)

Full e-version: https://www.polyu.edu.hk/publications/innovationdigest/