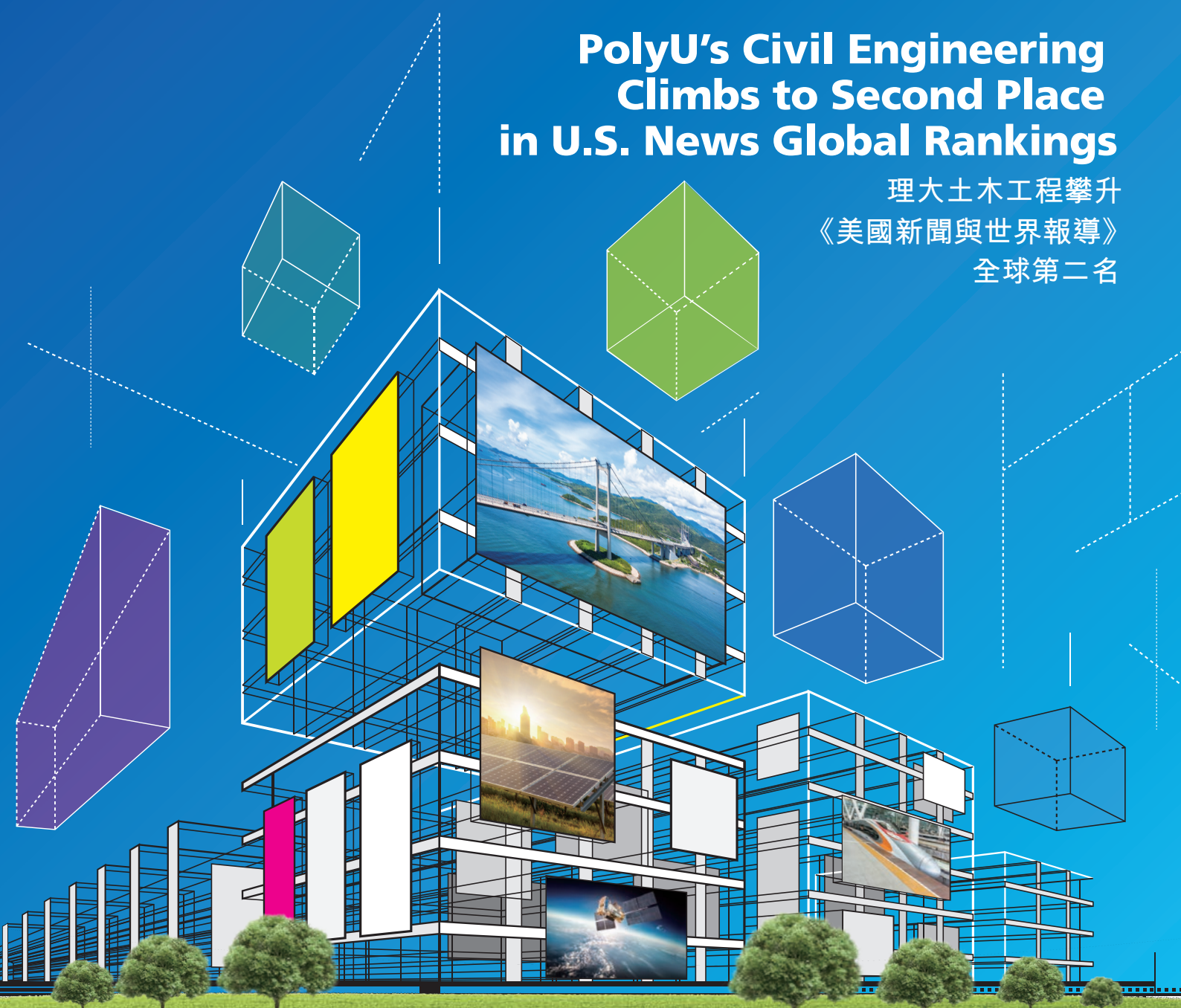
建設與環境
CONSTRUCTION & ENVIRONMENT

The Hong Kong Polytechnic University
香港理工大學
FACULTY OF CONSTRUCTION AND ENVIRONMENT
建設及環境學院

The Magazine of the Faculty of Construction and Environment
建設及環境學院院刊

PolyU's Civil Engineering Climbs to Second Place in U.S. News Global Rankings

理大土木工程攀升
《美國新聞與世界報導》
全球第二名



Issue No. 21

Opening Minds • Shaping the Future
啟迪思維 • 成就未來

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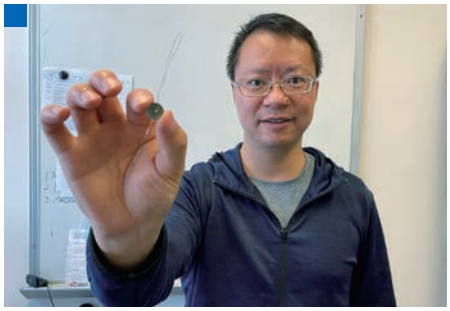
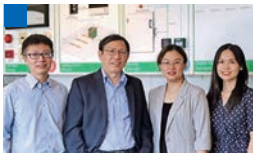



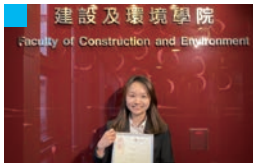


Dean's Message

院長的話

It is my pleasure to introduce some new sections to the magazine for the Faculty of Construction and Environment (FCE). We have aimed the spotlight on our leading researchers, innovation and technology/knowledge transfer, teaching excellence, FCE activities, and the community of FCE, in addition to our usual coverage of our awards and achievements. Among the features you will find the ground-breaking research of our new Associate Dean (Research) Prof. Meng Ni and Prof. Shengwei Wang, whose respective work on energy conversion and smart optimization technologies has contributed to sustainable development and the long-term goal of carbon-neutrality.

In the section on innovation and technology, we focused on the award-winning work of Prof. William Lam, whose new mechanisms for investing in transportation infrastructure have resulted in a Natural Science Award Second Prize from the Chinese Ministry of Education for him. Other innovations by Prof. Bo Wu in topographic and geomorphological mapping and analysis have facilitated China's first landing on Mars. The nation's progress in space exploration is nothing short of inspirational for our students and staff. We sure look forward to more opportunities to participate in its future development.

Our teaching excellence is highlighted in an interview with the new Associate Dean (Teaching), Prof. Charles Wong, who has championed the use of educational technology in teaching and learning even before the pandemic. We have adapted to the pandemic's lingering presence by moving many activities online, including our 25th and 26th Congregations. We will also adopt departmental scheme-based admission for our 4-year undergraduate degree programmes with effect from the 2022/23 intake cohort, whereby prospective students will apply to a departmental scheme for specializing in one of its programmes starting from Year 2.

In 2021, we are pleased to have continued our steady ascent in many world university rankings. Our discipline of civil engineering is now ranked second by US News, while our discipline of architecture is ranked third according to the University Ranking by Academic Performance 2020-21. This is no doubt due to the efforts of many of our researchers, who occupy leading positions in their respective fields, and are listed among the top 2% of the world's most highly cited scientists. Our performance in the Research Assessment Exercise 2020 has also shown an improvement from the previous round. Other achievements of note include a few medals awarded to three of our scholars by the Geneva Inventions Expo, the support of Google for our colour-enhancing research, and the first prize for the best scientific paper in geographic information systems.

Another new section showcases the make-up of the FCE community, from recent recruits to our outstanding student and alumni. Our new Associate Dean (Partnership) Prof. Linda Xiao has led our efforts in connecting the FCE community and its stakeholders, including our students, alumni and partners. As PolyU celebrates its 85th anniversary in 2022, we anticipate seeing many of our alumni on campus next year. We take pride in the achievements of everyone in the FCE community, including those of our academic staff who have been promoted. Last, but not least, special thanks go to our dedicated alumni for their generous donations to support the pursuit of academic excellence by our leading scholars. I hope their research efforts will be fruitful and will lead to more discoveries in the years ahead.

Prof. Xiang-dong Li
Dean of Faculty of Construction and Environment
Ko Jan Ming Professor in Sustainable Urban Development
Chair Professor of Environmental Science and Technology
The Hong Kong Polytechnic University

新一期的《建設及環境學院院刊》引入多個新章節，除了報導學院獲得的獎項和佳績，還重點介紹學院的頂尖科研人員、創新發明和科技/知識轉移、教學成就、各項活動和學院社群近況。院刊內其中兩篇特寫，分別報導了新任副院長(科研)倪萌教授和王盛衛教授各自在能源轉換及智能優化技術的突破性研究，兩者均有助促進可持續發展並達致碳中和的長遠目標。

有關創新和科技的章節，我們聚焦報導林興強教授的得獎研究，他提出的嶄新交通運輸基建投資決策機制，為他贏得國家教育部的「自然科學獎二等獎」。吳波教授在地形測量與地貌分析上的創新方法，促成中國首次登陸火星的任務。國家在航天探索方面取得重大進展，為我院師生帶來莫大啟迪。我們衷心期盼未來有更多機會參與推進國家航天發展。

今期院刊訪問了新任副院長(教務)黃文聲教授，談及優質教育。早於疫症爆發前，黃教授已率先引入嶄新教學科技。而疫情下，好些活動如第25及26屆畢業典禮都在線上進行。另外，本院亦將於2022/23起全面推行新的「學系為本」組合課程。申請2022/23入讀四年制本科課程的同學報讀理大時會先選擇一個學系的組合課程，由二年級開始專攻其中一個主修學科。

踏入2021年，我們在多項世界大學排名均穩步上升，成績令人欣慰。除土木工程學獲《美國新聞與世界報導》評為全球第二，建築學亦在2020-21《URAP世界大學排名榜》位冠全球首三名。這實有賴學院科研人員共同努力，當中不少均屬各自專長領域的翹楚，位列全球首2%最常獲引文的科學家。教資會2020年「研究評審工作」結果顯示，學院的表現亦較上一輪評審明顯進步。其他值得關注的成就，包括學院三位學者在日內瓦發明展勇奪獎項；本院研究提升顏色效果獲谷歌支持，以及學院研究團隊獲最佳地理資訊系統論文一等獎等。

另一個新添章節介紹學院社群，報導同事、傑出學生和校友等的新動向。每位學院成員取得的成就都讓我們引以為榮，例如迎來晉升之喜的各教學人員。在此亦特別鳴謝慷慨解囊的熱心校友，支持學院在學術科研上力臻卓越，祝願各研究團隊取得豐碩的成果，為香港及世界的可持續發展出一分力。新任副院長(協作)肖賦教授已展開增強與各持份者的聯繫工作，致力加強與學生、校友及業界等社群的聯繫。 2022年是理大創校85週年紀念，我們歡迎一眾校友回歸母校，共慶盛事。

李向東教授
香港理工大學建設及環境學院院長
高贊明可持續城市發展教授
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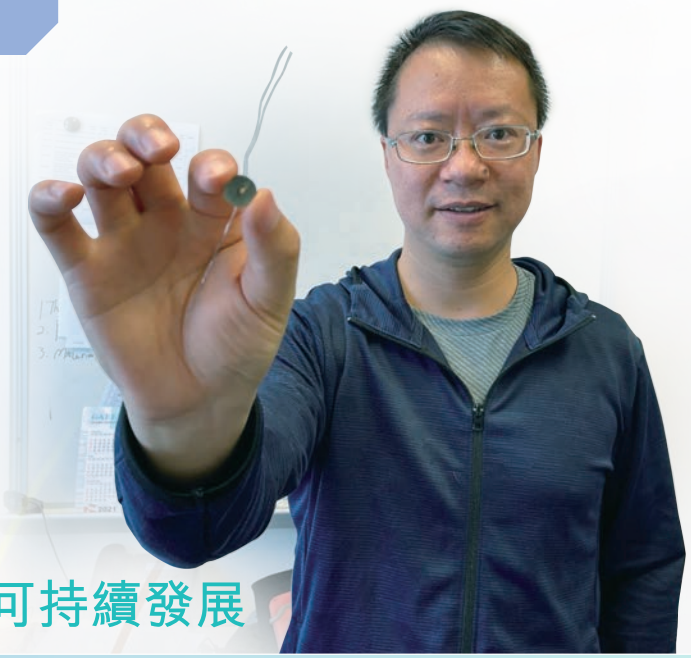


Efficient Energy Conversion and Storage for Sustainable Development

高效能源轉換及儲存 成就可持續發展

Prof. Meng Ni
Associate Dean (Research)

建設及環境學院副院長(科研)
倪萌教授

Conventional power plants using fossil fuels have long been polluting the environment and causing global warming with their emissions of various pollutants and greenhouse gases. The use of renewable energy and cleaner fuel to generate power efficiently is vital for achieving energy sustainability. Electrochemical systems such as solid oxide fuel cells (SOFCs) are very promising to replace conventional thermal power plants due to their high efficiency and low emissions. In addition, fluctuating and intermittent renewable power such as solar and wind requires efficient electrical energy storage for its wide application. Among various possible technologies, Zn-air batteries appear to be a promising candidate for energy storage on various scales. Over the past 17 years, Prof. Meng NI of the Department of Building and Real Estate (BRE) has focused his research on electrochemical systems for energy conversion and storage, including SOFCs, Zn-air batteries, and low-grade waste heat utilization.

Systematically studying SOFCs at various levels, from atomic to electrode to single cells and SOFC systems, to understand how the material properties, electrode microstructure, cell design, stack design and system integration can affect the SOFC performance, Prof. Ni has developed a series of new perovskite oxide materials for use as SOFC electrodes, enhancing the performance and durability of lab-scale button cells significantly. The next goal of Prof. Ni's research is to develop Hong Kong's first kW-scale SOFC system for practical power generation using cleaner natural gas or renewable biogas, based on which the second and third generations of SOFC systems will be developed for wider applications.

Since 2017, Prof. Ni has expanded his research from fuel cells to Zn-air batteries and low-grade waste heat utilization. Compared with the commonly used lithium-ion batteries, Zn-air batteries are cheaper, safer, and have higher energy capacity. They are suitable for various applications, from small-scale portable electronics to large-scale electrical energy storage. In addition, flexible Zn-air batteries were developed, which have shown stable performance when the battery is under bending or twisting. The flexible batteries are very promising power sources for flexible electronics, such as wearable sensors for health monitoring, flexible mobile phones, etc.

傳統發電廠使用化石燃料，排放各類污染物及溫室氣體，長期污染環境，導致全球暖化。因此，使用可再生能源及潔淨燃料達致高效能發電，對於實現能源可持續性至關重要。固態氧化物燃料電池(SOFCs)等電化學系統具備高效益、低排放的特點，可望取代傳統的熱力發電廠。至於可再生能源如太陽能、風能等則因供應存在不穩定因素，須依賴高效儲電設備才可廣泛應用。以應對不同儲能規模，鋅空氣電池似乎是芸芸技術中極具潛質的候選方案。過去十七年來，建築及房地產學系的倪萌教授一直專注研究利用電化學系統轉換及儲存能源，包括固態氧化物燃料電池、鋅空氣電池，以及低階廢熱回收。

倪教授從不同層面(由原子、電極、單電池到SOFC系統)對SOFC進行系統化研究，以瞭解材料特性、電極微結構、單電池設計、電堆設計及系統整合如何影響SOFC的性能，並研發出一系列可用作SOFC電極的新鈣鈦礦氧化物材料，顯著提升實驗室規模鈕扣電池組的性能和耐用程度。他的團隊下一個目標是研發香港首個使用千瓦級(kW-scale) SOFC系統，利用較潔淨天然氣或可再生生物燃氣發電，並在這個基礎上發展可廣泛應用的第二及第三代SOFC系統。

2017年起，倪教授開始擴大研究範圍，從燃料電池拓展至鋅空氣電池和低階餘熱的回收。相比常用的鋰電池，鋅空氣電池不但較廉價和安全，容量亦較高，而且用途廣泛，可應用於小型便攜式電子產品，甚至大型儲存電力設備。另外，團隊也研發了柔性鋅空氣電池，即使在彎曲或扭曲狀態下仍保持穩定性能。柔性電池潛力無限，為柔性電子設備例如監察健康狀況的穿載式感應器、摺疊式流動電話等提供電源。

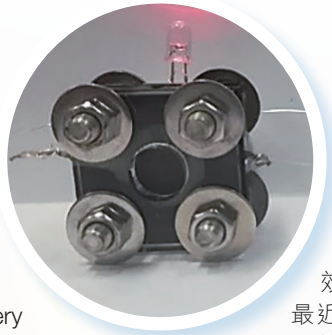


Fig.1 圖1

Prof. Ni's team have developed a hybrid Zn-air battery by introducing metal/metal oxide redox reactions into the air electrode, which successfully increased the discharge voltage from about 1.2V to about 1.7V (Fig. 1), and the efficiency of the battery from 60% to 70%. In their recent research, Zn-air batteries with flowing electrolytes have demonstrated very stable operation over 18,000 charge-discharge cycles (Fig. 2). The Zn-air flow batteries can be scaled up with good performance and high durability. Facilitating the wide application of intermittent and fluctuating renewable power such as solar and wind, Zn-air batteries are expected to have applications in various electronics and grid-scale electrical energy storage.

倪教授的團隊透過將金屬／金屬氧化物氧化還原反應引入空氣電極，研發出混合式鋅空氣電池，成功把放電電壓從約1.2伏特增至約1.7伏特(圖1)，電池的效率亦從60% 上升至70%。團隊最近的研究顯示，在超過一萬八千個充電和放電週期中(圖2)，鋅空氣液流電池的操作非常穩定，在提升容量情況下，仍然可保耐用及性能良好。因此，鋅空氣液流電池可配合和促進太陽能、風能等不穩定可再生能源的廣泛使用，並應用於各類電子產品以至電網層面儲存電能。

Besides his research on energy storage, Prof. Ni's research on energy conversion and low-grade waste heat utilization can also contribute to sustainable energy systems for sustainable urban development. It is inevitable that power plants, various industries and electrical appliances like air conditioners all generate a huge amount of waste heat, the majority of which is low-grade with a temperature of below 150 degrees Celsius. This waste heat is usually directly expelled into the environment without being utilized due to the difficulty in converting them into useful power. The expulsion of waste heat not only leads to energy loss, but also thermal pollution. In urban areas, the waste heat from air conditioners can create an urban heat island effect. Therefore, the development of efficient technology to convert the low-grade waste heat into useful energy is of great importance for energy sustainability.

除了鑽研儲能，倪教授有關能源轉換及回收使用低階廢熱的研究，亦有助研發可持續的能源系統，促進可持續的城市發展。無論發電廠、工業以至空調機等各類電器，無可避免地釋出大量廢熱，當中大部分屬於溫度低於攝氏150度的低階廢熱。由於不容易轉換成有用的能源，這些廢熱通常會直接排放到環境中，不但損耗能源，更會造成熱污染。在城市裡，空調機排出的廢熱可以造成熱島效應。因此，研發能有效將低階廢熱轉換成可用能源的技術，對確保能源的可持續供應十分重要。

Compared with semiconductor-based devices or thermodynamic cycles for low-grade heat utilization, the electrochemical systems developed by Prof. Ni's team are both cost-effective and have the potential to use lower-temperature waste heat well. For example, the thermally regenerative electrochemical cycle (TREC) requires a lower charging voltage when heating the electrode to a higher temperature while the discharging voltage can be higher when cooling down the electrode to room temperature. As the electrical energy for charging is lower than the discharging electrical energy, heat is converted into electricity, which demonstrated the feasibility of utilizing the low-grade waste heat for power generation, thus contributing to waste utilization and energy saving.

相比半導體設備或回收低階廢熱的熱循環，倪教授團隊研發的電化學系統既符合成本效益，而且具備善用更低溫廢熱的潛力。舉例說，進行熱再生電化學循環(TREC)時，加熱電極至較高溫度需要較低的充電電壓；將電極冷卻至室溫時，放電電壓則有可能較高。由於充電所耗用的電能低於放電電能，熱便會轉換為電力，證明了使用低階廢熱發電的可行性，從而達致轉廢為能及儲能的目標。

Future development of these emerging energy technologies can potentially revolutionalize the energy structure by replacing conventional thermal power plants, facilitating renewable power application with efficient energy storage, effectively recycling huge amounts of waste heat, and enabling the development of portable and flexible electronics.

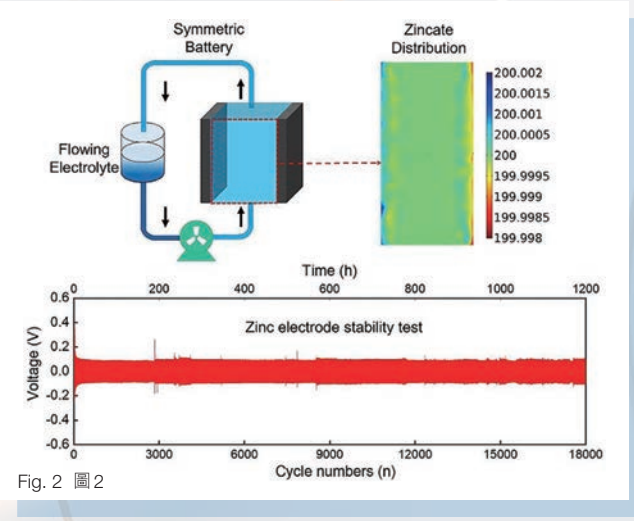


Fig. 2 圖2

這些新興能源技術發展下去，透過取代傳統的熱力發電廠，高效儲能以促進可再生能源的應用、有效回收大量廢熱再用，以及推動便攜式及柔性電子產品的發展等，有望革新能源結構。

Smart Optimization Technologies for Enhancing the Energy Efficiency and Flexibility of Buildings towards Carbon-Neutrality

提升建築能源效益及靈活性 智能優化技術助邁向碳中和目標

Prof. Shengwei Wang
Chair Professor of Building Energy and Automation

建築能源與自動化講座教授
王盛衛教授

The goal of carbon-neutrality by 2050 has been adopted by the HKSAR government to address the pressing challenges of energy and environment sustainability, while China aims to achieve the same goal by 2060. To reach this target, it is necessary for a three-pronged approach that includes the following:

i. Effective use of renewable energy resources,

ii. Minimize the energy demands of consumers, and

iii. Effective coordination of multiple generations and power supply/demands, which is increasingly challenging along with the penetration of more intermittent renewable generations in power grids that requires the contributions of different participants, including consumers on the demand side.

為解決迫在眉睫的能源問題，建構可持續發展的環境，中國訂下在2060年前達到碳中和的目標，香港特別行政區亦期望於2050年前達致同一目標。為此，有必要採取如下三管齊下的方法：

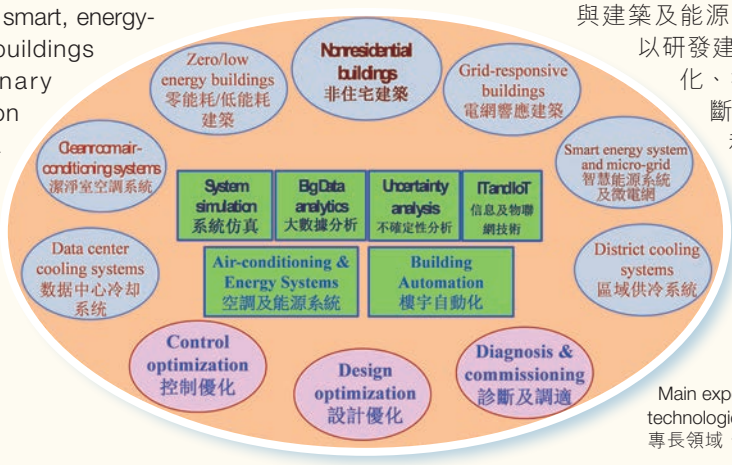
i. 善用可再生能源；

ii. 盡量減少能源需求；及

iii. 有效的能源互補及供需協調。(隨著電網內包含更多的間歇性可再生能源供應，達致此目標的難度增加，有賴包括能源消費者在內的不同參與者共同努力。)

As major consumers of electricity (over 90% in Hong Kong), buildings need to play a major role in any response to these challenges. The Building Energy and Automation Research Laboratory (BEAR), led by Prof. Shengwei Wang and Prof. Linda Fu Xiao of the Department of Building Environment and Energy Engineering (BEEE), has been developing various innovative methodologies and technologies of building system design optimization, control optimization, diagnosis and commissioning for smart, energy-efficient and grid-responsive buildings by adopting a multidisciplinary approach integrating information and IoT technologies, big-data analytics, machine learning (AI), uncertainty analysis, etc., with building and energy system domain knowledge. Following are three innovative technologies developed by BEAR recently.

建築物作為最主要電力用戶(佔香港電力總用量超過 90%)，在應對以上挑戰時，擔當的角色可謂舉足輕重。在建築環境及能源工程學系 (BEEE) 王盛衛教授及肖賦教授帶領下，建築能源與自動化研究室(BEAR)一直致力於通過跨學科方式，將信息及物聯網技術、大數據分析、人工智能(AI)、不確定性分析等工具與建築及能源系統知識融合，藉以研發建築物系統的設計優化、控制優化、以及診斷和調適等創新方案和技術，以營造智能、高效及具有電網響應能力的建築物。下文簡介BEAR最近研發的三項嶄新科技。



Main expertise, methodologies, technologies and target applications
專長領域、方法、技術及應用目標

An innovative and effective design optimization approach and methods to facilitate the insurance of the post-occupancy performance of zero/low energy buildings

A robust optimal design method was proposed by Prof. Wang and his team to coordinate the design optimizations of the building envelopes and energy systems, which were usually done by different teams in separate stages. Interactions between envelopes and systems are considered by coordinating design variables in the new method, which evaluates each design option of envelope/system based on an estimated post-occupancy performance in connection with the uncertainties in construction and operation. The proposed method effectively optimizes the overall design to achieve zero/low energy after building occupancy, without adding much complexity to the building and energy system design processes.

創新高效的設計優化方案助零/低能耗建築啟用後達到預期表現

建築圍護結構及能源系統，一般是由不同團隊分階段設計。王教授團隊研發了協同魯棒優化設計方法，可協同建築圍護結構及能源系統的設計優化。新方法透過協同設計變量，在設計中考慮了圍護結構與系統之間的相互作用，並考慮了施工和運行中的不確定性，評估各種建築圍護結構/系統的設計選項在啟用後的預期能效表現。這個新方法能有效優化整體設計，使建築物於啟用後實現零/低能耗目標，卻不會令建築物及能源系統的設計過程變得過於複雜。

Distributed optimization technologies for implementing distributed intelligence and optimization on smart IoT sensor/devices adopted in new-generation building automation platforms

A complex optimization problem is decomposed into several simpler problems to be deployed on individual IoT-enabled smart sensors/devices, which are widely implemented in buildings today due to the convenience and low cost of information provision. The optimization problem is addressed by field IoT smart sensors/devices based on the local measurements in coordination with one another. With these distributed technologies, a large number of local system optimizations can be performed locally and effectively, independently from cloud servers or central stations. Additionally, the mesh connection topology and plug-in-play feature of IoT-enabled smart sensing networks enhance the robustness and the flexibility even further.

面向新一代建築自動化平台的分佈式優化技術，可於智能物聯網傳感器/裝置上實施分佈式智能及優化

由於信息獲取方便，成本低廉，基於物聯網技術的智能傳感器/裝置在現今的建築物內被廣泛應用，提供了實施分佈式智能及優化的硬件環境。一個複雜的優化難題可以被分拆成數個較簡單的問題，並分別在現場智能傳感器/裝置上基於本地測量值解決，然後通過智能傳感器/裝置互相協調最終解決整個優化問題，實現現場優化。採用這項分佈式技術，可以大量和高效地實施本地系統現場優化，無需依賴雲端伺服器或中央服務器控制站。此外，基於物聯網技術的智能傳感網絡具備網狀拓撲和「即插即用」的功能，進一步提升了分佈式智能及優化穩健性及靈活性。

Advanced building energy flexibility technologies for buildings to contribute to grid power balance and coordinate multiple generations and demands, facilitating the penetration of renewable energy generations in power grids with enhanced reliability

A series of strategies have been developed for building energy systems to achieve multiple demand responses, such as a supply-based feedback control strategy for HVAC systems to achieve emergency load shedding request, and a disturbance compensation enhanced control strategy to provide continuous power grid frequency regulation. Prof. Wang and his team also proposed a comprehensive methodology to categorize and quantify the energy flexibility for buildings and assess the performance of bidirectional interactions between buildings and power grids, according to the response speed, duration and direction, facilitating the cost-effective design optimization of building energy systems considering the potential contributions and incentives in electricity markets.

In summary, these building energy-flexibility management technologies and technologies for optimizing the energy flexibility of buildings provide a promising and cost-effective means to enhance the reliability and resilience of power grids with high penetration of renewable energy generations. Furthermore, the wide implementation of distributed intelligences and IoT in building automation would also contribute to the carbon goal of low/zero energy in practical applications.

先進建築能源柔性技術，有助建築為平衡電網及協調多種能源的供需平衡做出貢獻，不僅有利與大量可再生能源並入電網，亦可提升電網的可靠性

王教授的研究團隊針對建築能源系統，以實現多種電網需求響應服務目標，研發了一系列策略，例如：基於供應反饋的暖通空調系統(HVAC)控制策略，可滿足電網緊急減載要求；而基於擾動補償強化的空調系統控制策略，則可提供連續的電網頻率調節服務。他們亦提出了一套綜合評估體系，對建築的能源柔性加以分類和量化，並根據響應速度、持續時間和方向，評估建築物與電網之間的雙向交互能力，為設計具備響應電力市場潛在激勵措施能力的建築能源系統提供高效的優化技術。

總括來說，這些建築能源柔性管理技術和建築能源柔性優化技術，為提升可再生能源在電網的滲透率，和電網的可靠性及柔性提供了既具前景、又符合成本效益的解決方案。此外，在建築自動化平台廣泛採用分佈式智能系統和物聯網，將有助在實際應用中實現零/低能耗的減碳目標。

New Mechanisms for Investment Decisions of Transportation Infrastructure

運輸基建投資決策新機制

Ir Prof. William Lam
Chair Professor of Civil and Transportation Engineering

土木及交通運輸工程講座教授
林興強教授工程師

Conducted in collaboration with Prof. Zhi-chun Li of Huazhong University of Science and Technology from 2009 to 2016, the research to facilitate investment decisions on transportation infrastructure consists of several sub-projects funded by the National Natural Science Foundation of China, the Program for New Century Excellent Talents in University, the Research Foundation for the Author of National Excellent Doctoral Dissertation of China, the Research Grants Council of the Hong Kong Special Administrative Region of China, and the Research Committee of the Hong Kong Polytechnic University.

是項與華中科技大學的李志純教授合作的研究跨越2009至2016年，協助交通運輸基建上的投資決定，當中數個子項目獲國家自然科學基金、教育部「新世紀優秀人才支持計劃」、全國優秀博士學位論文作者專項基金、香港特別行政區研究資助局，以及香港理工大學研究委員會資助。

To investigate the mechanism of morning-peak and evening-peak traffic congestion interaction, a daily activity-chain bottleneck model was proposed. An integrated urban transportation and land use model was also established to reveal the interactions between infrastructure investment decisions and urban spatial structures for strategic planning. Finally, new models have been developed to assess the effects of the new mechanisms on inter-city transportation networks and externalities due to airport expansion and high-speed rail projects in China.

研究人員除了提出「每日活動鏈瓶頸模型」，藉此探討早、晚繁忙時間交通擠塞的互動情況，也建立了「綜合都市交通及土地用途模型」，以反映基建投資決定與都市空間結構的相互影響，作為策略性規劃時的參考。最後，團隊還研發了新模型，用以評估國家拓展機場及高鐵項目，考慮新機制對城際交通網絡及外部成本所產生的影響。

Applications to real life

(1) Commuters' daily time allocations among various activities and journeys, and their trip departure-time choices could be captured by an activity chain bottleneck model, which could be used to

在日常生活上的應用

(1) 「活動鏈瓶頸模型」可以捕捉通勤者每天進行不同活動及行程的時間分配模式，及他們如何選擇啟程時間。這可以為新

provide new insights on new infrastructure projects, particularly on the effects of changes of activity duration and travel itineraries. As a result, a robust economic evaluation can be carried out on the basis of the proposed model results regarding how the time savings due to new infrastructure could be allocated for different activities (e.g. work or leisure) and modes of transport.

(2) The inter-relationships among the urban rail transit services, housing market, and households' choices of residential location have been investigated by an integrated rail and property (R + P) development model. The effects of various rail transit operation strategies, real estate policies, and rail infrastructure improvements at the strategic level have been consistently evaluated by this model.

(3) Empirical models developed by Prof. Lam have forecasted the market share of air and high-speed rail services. Key factors affecting passengers' transport choices have been identified and the modal split of passenger travel demand for some inter-city transportation markets of China estimated. The allocation of additional routes in an open airline market, in which airport capacity constraints are explicitly considered, has been optimized. Interactions among aviation authorities, airlines, and air passengers in a multi-level hierarchical system could be captured, which may be used to evaluate alternative deregulation scenarios and optimize route allocation policy in a free market.

In summary, the new mechanisms explored decision-making issues for transport infrastructure investment, and promoted the interdisciplinary study of transportation science, management science and operations research. The findings have already been published in several top journals in the field of transportation (e.g. Transportation Research Part A and Part B) with high citations. The research outputs have also been adopted for strategic planning of transportation infrastructure in China. The work led to a Natural Science Award Second Prize for Prof. Lam in the 2020 Higher Education Scientific Research Outstanding Achievement Award (Science and Technology) from the Ministry of Education of China.

基建項目提供新的視野，尤其是活動持續時間和行程轉變所帶來的影響。當局可根據模型分析得出的結果，針對新基建下通勤者如何利用節省的時間進行不同活動(如工作或消閒)及運輸工具等，從而進行全面的經濟效益評估。

(2) 團隊通過「綜合鐵路與物業(R + P)發展模型」，探究都市軌道交通服務、房產市場，以及家庭選擇居住地點的關係。此模型持續評估了不同的軌道交通營運策略、房地產政策，以及策略性鐵路基建改善工程所帶來的影響。

(3) 林教授研發的實證模型，預測了空運及高鐵服務所佔的市場份額，確定了旅客選擇交通工具時的關鍵因素，並估算了國內部分城際交通客運需求的運具分配模式，同時考慮在開放航空公司市場中機場的容量限制，優化分配新增的般線。模型反映多層級機制內的航空管理機構、航空公司及航機乘客的互動情況，藉以用於評估放鬆規管下及情景優化自由市場的航線分配政策。

簡要來說，新機制探討交通基建投資決策涉及的因素，促進了運輸科學、管理學及運籌學的跨學科研究。研究結果已於運輸學的一些頂級學報(如Transportation Research Part A 及 Part B)發表，學術界引用者眾，而國家進行運輸基建的策略性規劃時，亦已採納了有關研究成果。此外，林教授亦憑著該研究，獲國家教育部頒發「2020年度高等學校科學研究優秀成果獎(科學技術)」的「自然科學獎二等獎」。

China's First Landing on Mars Supported by Research of LSGI Academic

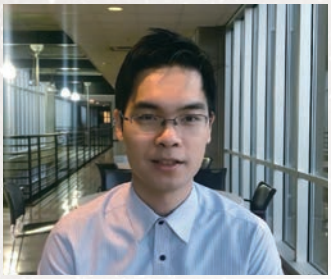
LSGI 學者研究支援國家完成首次登陸火星任務

The landing of Chinese spacecraft Tianwen-1 on Mars in mid-May 2021 has made aerospace history. It was the first time in the world that a spacecraft has completed orbiting, landing and roving in one single mission to Mars. Two PolyU research teams had supported the successful mission. One was led by Prof. Bo Wu of the Department of Land Surveying and Geo-informatics (LSGI). From 2016 to 2020, his team had shortlisted three potential landing regions on Mars, one of which was the southern Utopia Planitia, the largest recognised impact basin in the northern hemisphere of Mars. It was eventually chosen as the target landing region after detailed topographic and geomorphological mapping and analysis. Using the high-resolution images sent from Tianwen-1 of the target landing region covering an area of about 11 times larger than the size of Hong Kong's territory, Prof. Wu and his team generated high-resolution and high-precision 3D topographic models of the target landing region using the integrated 3D mapping model developed by them to analyse the detailed topography and identify large slopes hazardous for landing. They also developed AI-based techniques for automated and robust analysis of geomorphological features like craters and rocks from the high-resolution images in a short period of time. More than 670,000 craters, over two million rocks, and hundreds of volcanic cones distributed over the target landing region were analyzed in 1.5 months, achieving much higher efficiency in the automatic extraction of rocks and craters with an accuracy of about 85%.

The spacecraft for the Tianwen-1 probe comprises an orbiter, a lander and the Zhurong rover. In collaboration with the China Academy of Space Technology (CAST), the latest mission aims to obtain scientific exploration data on the Red Planet. With orbiting and landing completed, the Mars rover Zhurong is set to begin its exploration of the landing site. What wonders lay there remain to be seen.

中國「天問一號」探測器於2021年5月中成功登陸火星，是全球首次有航天儀一次過完成環繞、著陸、巡視三大任務，屬航天史上的創舉。理大兩支研究隊伍在過程中均發揮重要支援作用。在2016至2020年間，以土地測量及地理資訊學系(LSGI)吳波教授為首的團隊，就遠征火星提出了三個候選著陸地點，經過詳盡的地形及地貌分析後，最終選出火星北部已知的最大撞擊盆地 — 烏托邦平原南部區域為目標著陸地點。吳教授和團隊成員根據「天問一號」在目標著陸區(面積約較香港大十一倍)拍攝傳回的高解像度圖像，以自行研發的「三維集成測量模型」，為目標著陸區製作出高解像度、高精度的三維地形模型，從而深入分析地形特徵，辨識不利著陸安全的大型斜坡。團隊亦研發了人工智能技術，能於較短時間內從高解像度圖像自動提取和詳盡分析撞擊坑、岩石等地貌特徵。在一個半月裡，團隊識別分析了目標著陸區內的67萬多個撞擊坑、200多萬塊岩石，以及數以百計的火山錐，不僅效率卓著，準確度更高達約85%。

「天問一號」探測器由環繞器、著陸器及「祝融號」巡視器組成。理大人員與中國空間技術研究院合作完成是次任務，旨在取得對「紅色星球」進行科學探索所需的數據。完成環繞及登陸後，「祝融號」火星車正執行其火星表面的探索任務。全球正拭目以待！



FCE 25th and 26th Virtual Congregations

建設及環境學院第 25 及 26 屆虛擬畢業典禮

The 26th Congregation and the 25th Congregation Make-up sessions were held for the Faculty of Construction and Environment online on 27 March 2021, celebrating the accomplishments of our graduates. They had been postponed due to the ongoing pandemic and the need to maintain social distancing. Graduates were able to watch the broadcasted ceremonies with their families and friends in the comfort of their homes.

Valedictory speeches were also delivered by Mr Kaixin Chen, Bachelor of Engineering in Civil Engineering (Structural Engineering), at the 25th Congregation, and Mr Wai Pong Yuen, Bachelor of Science in Surveying, at the 26th Congregation.

"Graduation is not an end, but a new starting point in our lives. The education we have received here at PolyU will serve as a platform from which to launch our futures. Definitely, there will be a lot of challenges ahead no matter what we do, because life is never simple. Our mission as graduates is to meet each challenge with our full potential. My wish for everyone here is that you all feel fulfilled in whatever you do in society, and, as PolyU's motto goes, *to learn and to apply, for the benefit of mankind*. We have shared many precious memories at PolyU, and I will truly miss them." Mr Kaixin Chen, valedictorian of the 25th Congregation

"Life is hard but we all have a choice. You can focus on what's wrong with your life or you can focus on what's right with it. And wherever you put your energies, wherever you focus and whatever you focus on will grow. That was something I learnt from my past. If I had given up, I would never have the chance to enjoy what I have now." Mr Wai Pong Yuen, valedictorian of the 26th Congregation

2021年3月27日，建設及環境學院於網上分別舉辦及補辦第26屆與第25屆畢業禮，一同慶祝畢業生學業成果。典禮因為疫情持續有必要保持社交距離而延遲並改於網上進行。通過熒光幕，畢業生與家人和朋友安坐家中共賞盛事。

在第25及26屆畢業典禮代表畢業生致辭的分別是獲授土木工程學(結構工程)工學士陳凱欣先生和地產及建設測量學理學士袁瑋邦先生。

「畢業並非終點，反而是生命中另一個新階段的起點。在理大接受的教育，將成為我們奔向未來的堅實基礎。人生不會一帆風順，無論如何抉擇，前路障礙難免。身為大學生，我們的任務就是竭盡全力，應對人生的每個挑戰。我衷心祝願各位不論以甚麼方式服務社會，都能實踐理想，並如理大校訓所言，做到「開物成務、勵學利民」。在理大校園的無數珍貴回憶，都會叫我懷念不已。」陳凱欣先生，第25屆畢業生代表

「人生波折，自難避免，無論對與錯都是一種選擇。專注用心，必有所成。這是過去教曉我的道理。假如我當日選擇放棄，肯定不會有今天的收穫。」袁瑋邦先生，第26屆畢業生代表

Academic Programmes

學術課程

New Admission Scheme for FCE 4-year Undergraduate Programmes

建設及環境學院四年制本科課程新收生制度

Departmental scheme-based admission will be implemented in the 2022-25 triennium. Starting in 2022/23, prospective first-year students of 4-year undergraduate programmes will be admitted to the departmental schemes offered respectively by the four departments of the Faculty of Construction and Environment (FCE). Schemes with more than one 4-year undergraduate programme will give students in their second year a choice of which programme to specialize in, subject to the specific requirements stipulated by the departments concerned, if any.

自2022/23起連續三個學年，建設及環境學院將採用「學系為本」組合課程收生。四年制本科課程首年的新生會被取錄入讀其組合課程，個別學系的組合課程提供多於一個四年制本科課程供學生於二年級時選擇主修，視乎學生有否達到有關學系規定的具體要求（如有）而定。

In addition to an existing major, students meeting the stipulated selection criteria can choose to take a secondary major in "Artificial Intelligence and Data Analysis (AIDA)" or "Innovation and Entrepreneurship (IE)" if it is available.

此外，個別組合課程可讓合乎入讀要求的學生自由選擇以「人工智能及數據分析」或「創新及創業」作為副主修。

Following are the various programmes of each department:

以下是各學系提供的課程：

Department 學系	Name of Scheme 組合課程	Programme Title 課程	Secondary Major Available 可選修之副主修
Building Environment and Energy Engineering (BEEE) **建築環境及能源工程**	BEng(Hons) Scheme in Building Sciences and Engineering 建築科學及工程學（榮譽）工學士組合課程	BEng(Hons) in Building Sciences and Engineering (with a specialism of Building Services Engineering) 建築科學及工程學（榮譽）工學士（設有屋宇設備工程學專業） *[Retitled from BEng(Hons) in Building Services Engineering* *原名屋宇設備工程學（榮譽）工學士]*	AI and Data Analytics 人工智能及數據分析 Innovation and Entrepreneurship 創新及創業
Building and Real Estate (BRE) **建築及房地產**	BSc(Hons) Scheme in Building and Real Estate 建築及房地產（榮譽）理學士組合課程	BSc(Hons) in Building Engineering and Management 建築工程及管理學（榮譽）理學士	AI and Data Analytics 人工智能及數據分析
		BSc(Hons) in Property Management 物業管理學（榮譽）理學士	Innovation and Entrepreneurship 創新及創業
		BSc(Hons) in Surveying 地產及建設測量學（榮譽）理學士	NIL 不設副主修

Department 學系	Name of Scheme 組合課程	Programme Title 課程	Secondary Major Available 可選修之副主修
Civil and Environmental Engineering (CEE) **土木及環境工程**	BEng(Hons) Scheme in Civil Engineering and Sustainable Development 土木工程及可持續發展學(榮譽)工學士組合課程	BEng(Hons) in Civil Engineering 土木工程學(榮譽)工學士	NIL 不設副主修
		BEng(Hons) in Environmental Engineering and Sustainable Development 環境工程及可持續發展學(榮譽)工學士	NIL 不設副主修
		BEng(Hons) in Civil Engineering (Structural and Fire Safety Engineering) 土木工程學(榮譽)工學士(結構及消防安全工程) *[Retitled from BEng(Hons) in Structural and Fire Safety Engineering* *原名結構及消防安全工程學(榮譽)工學士]*	NIL 不設副主修
		BEng (Hons) in Civil Engineering (Smart Mobility) 土木工程學(智能運輸)(榮譽)工學士 (Only offered in conjunction with secondary major) (必須同時修讀相關副主修)	AI and Data Analytics 人工智能及數據分析
	N/A 不適用 (2-year full-time articulation degree) (兩年全日制銜接課程)	BSc(Hons) in Environmental and Occupational Safety and Health 環境及職業安全與健康(榮譽)理學士	NIL 不設副主修
Land Surveying and Geo-Informatics (LSGI) **土地測量及地理資訊**	BSc(Hons) Scheme in Spatial Data Science and Smart Cities 空間數據科學及智慧城市(榮譽)理學士組合課程	BSc(Hons) in Land Surveying and Geo-Informatics 土地測量及地理資訊學(榮譽)理學士	AI and Data Analytics 人工智能及數據分析

An Interview with the New Associate Dean (Teaching) Prof. Charles Wong

專訪新任副院長(教務)黃文聲教授

Prof. Charles Man Sing Wong of the Department of Land Surveying and Geo-Informatics (LSGI) began his academic career at PolyU after receiving his PhD from the same department. He was encouraged in his efforts to nurture future talents when he received an Excellence in Teaching Award from LSGI and a Team Award for Outstanding Performance/Achievement in Teaching from the Faculty, both in 2015. Since then, he has received another Team Award and an Individual Award from the Faculty in 2017 and 2020 respectively for his teaching achievements. He was nominated by PolyU for a Teaching Award from the University Grants Committee in 2021.

理大土地測量及地理資訊學系(LSGI)不僅是黃文聲教授取得博士學位的地方，也是他開展學術事業的起點。黃教授春風化雨，屢獲獎項：早於2015年，他已分別獲學系及學院頒發「卓越教學獎」及「卓越教學表現/成就(團隊)獎」；2017及2020年再接再厲，憑教學成就獲學院分別再次頒授個人及團隊的獎項；在2021年，他更獲理大提名競逐大學教育資助委員會的「教資會傑出教學獎」。

What responsibilities do you see for yourself in your new role as Associate Dean (Teaching)?
你對自己出任副院長(教務)一職有甚麼期許？

My top priority is to ensure high-quality teaching and facilitate students' effective learning, which are particularly important for university education. The purpose of tertiary education, as intrinsically nurturing students for a profession, is to benefit society. Ideally, education should be border less and equal. Even though not all my students had brilliant academic results or came from a privileged background, I believe students can excel in their university studies if they have appropriate supervision and support from their teachers.

首要任務當然是確保能提供優質教學，協助學生有效學習。這點在大學教育特別重要。專上教育的本質，就是培育學生為發展專業打好基礎，進而貢獻社會。教育理應做到平等、無分疆界。我的學生雖然並非每一個都學業表現出眾或背景優厚，但我堅信只要獲得老師適當的支援和指導，學生在大學裏學習自然能做到精益求精。

How do you motivate your students to excel in their studies?
你怎樣鼓勵學生學習？

To unleash the potential of students, I try to motivate them according to their cognitive abilities and guide them to use their prior knowledge in associating various ideas to think wider and deeper. However, that is not enough. Over the years, I have studied the relationships between different learning spaces and their impact on academic performance in different academic disciplines. While maximizing the students' learning experience in every classroom is a huge challenge, we are not alone as this is a prevalent problem in education worldwide. As far as I have discovered, the students' performance is significantly varied according to the settings of learning space across a range of subjects. Furthermore, I see the potential of futuristic planning to be integrated with virtual reality and augmented reality technology into the physical learning space. Recently, we have been interviewed by the Times Higher Education about our observations of students' academic performance and learning spaces.

我希望啟發學生的潛能。給予適當支持和鼓勵，引導他們把知識與不同想法結合，開拓思維。不過，光是這樣並不足夠。多年來，我也在研究不同學習環境與學科的關係，以及這對學生成績的影響。怎樣使學生在課室獲得最佳學習體驗，是一項重大的挑戰，也是全球教育界面對的難題。據我觀察所得，學生在不同學科的表現，均受學習地點的佈置和環境影響。我認為規劃未來教與學時，可結合虛擬實境及擴增實境技術與實際學習環境。最近，我們便接受了《泰晤士高等教育》的訪問，談到有關學生學業成績與學習地點/環境的觀察結果。

How do you see the effects of technology on teaching and learning?
你認為科技對教學有甚麼影響？

Around seven years ago, when the goals and standards of technology had not yet been developed at PolyU, I made up my mind to do something based upon location-based service with a focus on learning that requires more engagement from students. I am aware of the advantages of technology to enable high-quality teaching and effective learning. Beyond developing the technology, without reference, strategy or previous experience, making the change is not easy. A sustained and coordinated effort by many people is required to facilitate this initiative. Although the development of learning and teaching using innovative technology is unexpectedly formidable, I have the confidence and commitment to influence other colleagues in the university. This has also helped me to inspire students to learn, to strive to excel in their potential to create a better society.

大約七年前，在理大還未開展教學科技的目標及標準，我已決心善用室內定位服務(LBS) 去增強學生的課堂參與度，從而提升學習成效。科技能促進優質教學和提升學習效果，這一點毋庸置疑。研發教學科技之外，在欠缺參考、策略及前人經驗的情況下要推動創新，實不容易。 這需要大家群策群力，持之以恆。研發運用創新科技教學的過程中，雖然遇上一些難題，但我有信心亦有責任為大學同仁帶來正面影響。這也有助我啟發學生學習，讓他們盡情發揮潛能，建立更美好的社會。

What changes have you seen in your students over the years?
這幾年來，你從學生身上看到甚麼轉變？

I must say it is very gratifying to see students grow intellectually over their years of study. They have become more creative in their problem-solving and adaptable to a harmonious and collaborative learning culture. I was very pleased to see students assuming significant roles in international companies and tertiary institutions, such as Alibaba Group, MIT Senseable City Lab, and the Centre for Agriculture and Bioscience International Pakistan, performing duties related to geomatics after graduation.

我很高興能在學生的學習旅途上見證他們知識增長。他們比以往運用更多創意解決問題，也更融合和諧互助的學習文化裏。我的學生在畢業後晉身阿里巴巴、麻省理工可感知城市實驗室、巴基斯坦國際農業及生物科學中心等國際機構和學府，從事與地理信息學有關的工作，使我感到非常欣慰。

Are there any technologies for teaching and learning that you'd like to recommend?
有值得推薦的教學科技嗎？

My research team has developed an Augmented Teaching and Learning Advancement System (ATLAS) to support those all-important functions and activities. For more details, please visit https://www.atlas-learn.com/#/home

我的研究團隊開發了「Augmented Teaching and Learning Advancement System」(ATLAS)，可以支援各類教學活動。有興趣查閱細節的話，可以瀏覽這個網頁 https://www.atlas-learn.com/#/home。

Awards & Achievements

優秀教研　成績斐然

PolyU Climbs University Rankings

理工大學排名節節上升

The efforts of PolyU to provide quality education to students and strive for excellence in research have been recognized by many rankings of universities. The disciplines ranked are covered by some of the construction-related programmes offered by the Faculty of Construction and Environment (FCE), which consists of the Department of Building Environment and Energy Engineering (BEEE), the Department of Building and Real Estate (BRE), the Department of Civil and Environmental Engineering (CEE), and the Department of Land Surveying and Geo-Informatics (LSGI). Together, they offer more than 30 degree programmes in various modes and levels related to construction and environment.

理大矢志為學生提供優質教育，在科研上力求卓越。各個大學排名皆可印證我們的努力和成果。躋身世界前列的理大學科，當中不少由本學院開辦的建設相關課程所涵蓋。現時，建築環境及能源工程學系、建築及房地產學系、土木及環境工程學系及土地測量及地理資訊學系，共提供逾三十個不同修課模式及級別、與建設及環境相關的學位課程。

Following are some of the disciplines in FCE and their rankings by various organizations:
以下是本學院部分學術領域在不同機構的排名：

	Discipline 學術領域	World Ranking 世界排名
Best Global Universities Rankings 2022 by the U.S. News and World Report **2022《美國新聞與世界報導》全球最佳大學排名**	Civil Engineering 土木工程學	2nd
University Ranking by Academic Performance (URAP) 2020-21 **2020-21《URAP 世界大學學術表現排名》**	Architecture 建築學	3rd
	Civil Engineering 土木工程學	5th
QS World University Rankings by Subject 2021 **2021《QS 世界大學分科排名》**	Architecture & Built Environment 建築及建造環境	18th
	Civil and Structural Engineering 土木及結構工程	21st
ShanghaiRanking's Global Ranking of Academic Subjects 2021 **上海軟科教育 2021《世界大學學術排名》**	Civil Engineering 土木工程學	5th
	Remote Sensing 遙感學	36th
Nature Index 2021 **2021《自然指數》**	Earth and Environmental Sciences 地球及環境科學	33rd

FCE Shines in Research Assessment Exercise 2020

「2020年研究評審工作」學院成績令人鼓舞

The long-awaited results of the Research Assessment Exercise 2020 are out! The Faculty of Construction and Environment (FCE) is pleased that its submissions to the panel of Built Environment have been favorably assessed by the University Grants Committee (UGC) according to their research outputs, impact, and environment. The FCE submissions were assessed under two Units of Assessment (UoA), namely (i) civil engineering (including construction engineering and management) and building technology, as well as (ii) planning and surveying (land and other).

期待已久的「2020年研究評審工作」結果終於揭曉，建設及環境學院提交給教資會建造環境評審小組審核的項目獲高度評價！教資會將本院的送審項目歸屬於兩個評審單位(UoA)：(一) 土木工程學(包括建造工程及管理)及建造技術，以及(二)規劃及測量(土地及其他)，並就「研究成果」、「研究影響」及「研究環境」三方面進行評審。

Overall, 73% of the research by FCE's 91 eligible staff were deemed "world-leading" (4*) or "internationally excellent" (3*), compared to the sector-wide average of 71%. Among the UGC-funded universities in this field, PolyU is within the top three. In particular, 93% of our research environment and 83% of our research impact were rated "world-leading" (4*) or "internationally excellent" (3*), higher than the respective sector-wide averages of 70% and 74%. The percentages of FCE research judged "world-leading" (4*) in both the Built Environment panel and the two UoAs are also higher than the sector-wide averages.

總體來說，本院91名合資格人員所進行的研究中，73%獲評為「世界領先水平」(4*)或「國際卓越水平」(3*)，高於該界別的平均數71%。在這個領域獲教資會資助的大學裡，理大位列三甲；值得一提的是，在「研究環境」及「研究影響」這兩個評審項目中，我們分別有93%及83% 送審項目達到「世界領先」(4*)或「國際卓越」(3*)的水平，較整個界別的平均數70% 及74%優勝。另外，按建造環境評審小組及兩個評審單位劃分，獲評為「世界領先」的研究項目百分率，亦較整個界別的平均數為高。

		Percentage judged to be "world leading" (4*) 項目獲「世界領先」(4*)評級的百分率	
		FCE **建設及環境學院**	**Sector-wide average** **界別平均數**
Built Environment Panel **建造環境評審小組**		26%	20%
Unit of Assessment (UoA) **評審單位**	**Civil Engineering and Building Technology** **土木工程學及建造技術**	24%	18%
	Planning and Surveying (Land and Other) **規劃及測量 (土地及其他)**	32%	28%

With respect to the two UoAs, FCE achieved 75% of 4* and 3* ratings in research outputs in the UoA of planning and surveying (land and other). Its research impact and environment with these ratings in the same UoA were 50% and 85% respectively. In the UoA of civil engineering and building technology, the research outputs of FCE rated 4* and 3* were 65%, while 100% of its research impact and environment achieved these high ratings.

兩個評審單位的評審結果顯示，在「規劃及測量(土地及其他)」範疇，本院75%「研究成果」取得 4* 或 3*評級，獲相同評級的「研究影響」及「研究環境」則分別有50%及85%；至於「土木工程學及建造技術」範疇，本院的「研究成果」有65%獲4*或 3*評級，而「研究影響」及「研究環境」達相同評級的更高達100%。

FCE Scholars Among World's Top 2% of Scientists

建設及環境學院學者躋身全球最頂尖2%科學家

A total of 163 scholars from PolyU have been ranked among the world's top 2% most-cited scientists in a recent list compiled by Stanford University. 44 of them are in the Faculty of Construction and Environment (FCE), with 12 in the field of Civil Engineering, 11 in the field of Building and Construction, and the rest in various fields. Among local universities, PolyU had the second most scientists in the list of top 2%.

根據史丹福大學最近公佈的名單，理大共有163學者入選全球首2%最常獲引文的科學家，當中44人來自建設及環境學院，包括12人屬於土木工程領域，11人屬於建築及建造範疇，其餘學者分佈於不同學科。整體而言，理大是擁有第二多學者晉身上述名單的本地學府。

The other fields where FCE academics are listed are Geological and Geomatics Engineering, Energy, Logistics and Transportation, Environmental Sciences, Acoustics, Meteorology & Atmospheric Sciences, Environmental Engineering, Nanoscience and Nanotechnology, Urban & Regional Planning and Strategic, Defence & Security Studies.

本院其他入選學者從事的研究範疇，包括地質及地理資訊工程學、能源、物流運輸、環境科學、聲學、氣象及大氣科學、環境工程學、納米科學及科技、市區及區域規劃，以及策略、防衛與保安研究。

The database of close to 160,000 top scientists in the world is created on the basis of standardized citation indicators such as information on citations, an individual's scientific research output, co-authorship and a composite indicator for career-long citation impact up to the end of 2019.

該數據庫是根據專門的引文指標編製，例如引文資料、學者本人的科研成果、合著，以及截至2019年底的學者長期引文影響力綜合指標，當中包含全球接近16萬位頂級科研人員的資料。

The following 9 FCE scholars have been ranked among the top 50 scientists in the world in their respective fields:
以下建設及環境學院學者在其學術領域內躋身世界前 50 名科學家之列：

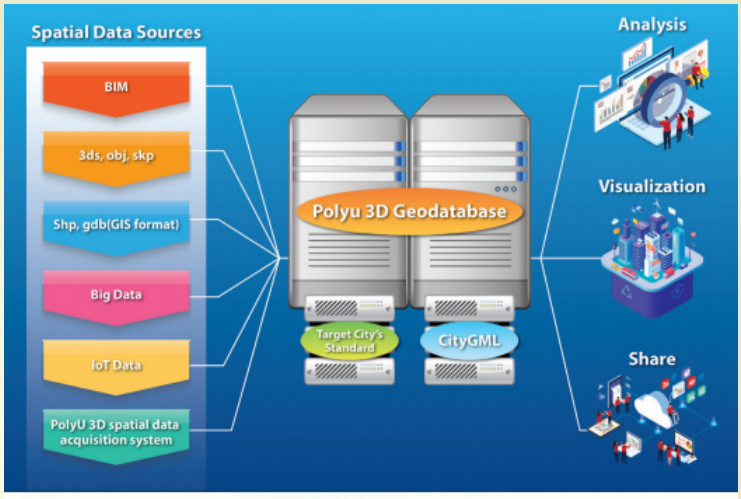
Subject Field 學科領域	Rank in Field (Field Size) 領域排名 (領域人數)	FCE Scholars 建設及環境學院學者
Building & Construction 建築及建造	5 (27,014)	 Prof. Chi-Sun Poon Chair Professor of Sustainable Construction Materials CEE 潘智生教授 土木及環境工程學系 環保建材講座教授
Civil Engineering 土木工程	8 (42,054)	 Prof. Jin-Guang Teng Chair Professor of Structural Engineering CEE 滕錦光教授 土木及環境工程學系 結構工程講座教授
Environmental Engineering 環境工程	16 (42,482)	 Prof. Kwok-Wing Chau Professor CEE 周國榮教授 土木及環境工程學系

Subject Field 學科領域	Rank in Field (Field Size) 領域排名 (領域人數)	FCE Scholars 建設及環境學院學者
Strategic, Defence & Security Studies 策略、防衛與保安研究	22 (17,157)	 Prof. Wan-Ki Chow Emeritus Professor of Architectural Science and Fire Engineering BEEE 周允基教授 建築環境及能源工程學系 榮休教授 (建築科學與消防工程)
Building & Construction 建築及建造	22 (27,014)	 Prof. Shengwei Wang Chair Professor of Building Energy and Automation BEEE 王盛衛教授 建築環境及能源工程學系 建築能源與自動化講座教授
Civil Engineering 土木工程	27 (42,054)	 Prof. You-lin Xu Emeritus Professor of Structural Engineering CEE 徐幼麟教授 土木及環境工程學系 榮休教授 (結構工程)
Building & Construction 建築及建造	28 (27,014)	 Prof. Albert Chan Chair Professor of Construction Engineering and Management BRE 陳炳泉教授 建築及房地產學系 建築工程及管理講座教授
Building & Construction 建築及建造	30 (27,014)	 Prof. Heng Li Chair Professor of Construction Informatics BRE 李恆教授 建築及房地產學系 建築資訊講座教授
Civil Engineering 土木工程	43 (42,054)	 Prof. Ben Young Chair Professor of Steel Structures CEE 楊立偉教授 土木及環境工程學系 鋼結構講座教授

FCE Scholars Win Medals at Geneva Inventions Expo

In a special virtual edition of the 48th International Exhibition of Inventions of Geneva, the Inventions Geneva Evaluation Days were held from 10 to 14 March 2021. Gold Medals have been awarded to Prof. John Wenzhong Shi and Prof. Charles Man-sing Wong of the Department of Land Surveying and Geo-Informatics (LSGI) for their smart city platform and smart monitoring system for urban tree management respectively. They were among the six PolyU awardees honoured at the virtual event, winning two of the three gold medals received by PolyU scholars.

The smart city platform can be used to create digital city replicas for acquiring insights into urban situations, testing solutions and conducting technological research. Incorporating 3D city modelling, AI-based urban object cognition, web-based visualisation and analytics technologies, it enables seamless fusion of massive geometrical information, 3D LiDAR data, image data and spatial big data from various sources, including public and private agencies, to provide a realistic and accurate representation of a city. A 3D spatial data acquisition system has been specially developed to enhance both outdoor and indoor 3D environment of buildings. It can identify indoor objects and automatically reconstruct a digital model (Building Information Model) of the indoor environment from raw LiDAR data.



Framework of the smart city platform
智慧城市平台

The smart monitoring system for urban tree management makes use of smart sensing technology and geographic information systems to monitor the stability of local trees. Tailor-made sensors are installed on the lower trunks of selected urban trees to monitor their tilting angles. The data collected has facilitated timely mitigation measures for sustaining longer tree lives.

In addition, a research project led by Prof. Wu Chen, Head of Department of Land Surveying and Geo-Informatics, and funded by the Innovation and Technology Fund and the Logistics and Supply Chain MultiTech R&D Centre (LSCM) was awarded a Silver Medal in the Special Edition 2021 Inventions Geneva Evaluation Days.

建設及環境學院學者於日內瓦國際發明展摘金

在2021年3月10至14日舉行的第48屆日內瓦國際發明展(網上特別版)上，土地測量及地理資訊學系的史文中教授和黃文聲教授分別憑智慧城市平台及城市樹木智能監察管理系統榮獲金獎。在這次網上盛事裡，理大共有六位學者獲得嘉許，奪金者(包括史、黃兩位教授)則有三人。

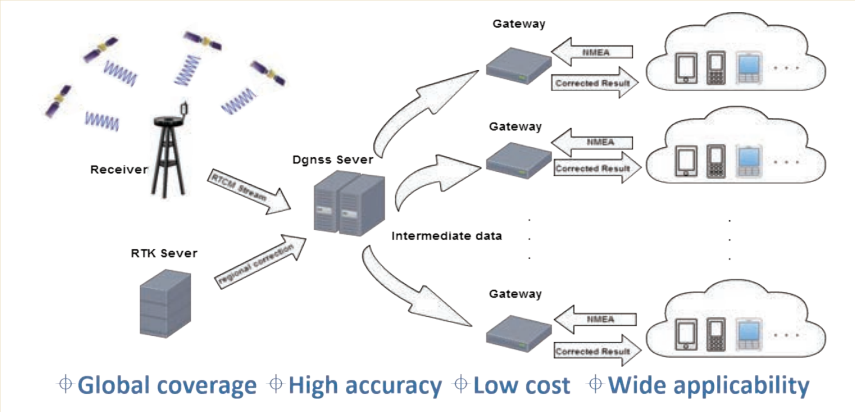
由史教授領頭研發的智慧城市平台，可用於模擬數碼城市，從中瞭解都市狀況，測試方案從而進行技術研究。它糅合了三維城市建模、人工智能城市對象認知、網絡可視化及分析技術，可以無縫融合來自公、私營機構的大量城市空間信息、三維激光雷達數據、影像數據及空間大數據，從而真實準確地反映城市現況。另外，平台還特地開發了一個三維空間數據收集系統，同時優化建築物的室外及室內三維環境。此系統可辨識室內物件，根據原始激光雷達數據自動重新建構室內環境的數碼模型(建築信息模型)。

黃文聲教授的城市樹木智能監察管理系統，則應用智能傳感技術和地理資訊系統來監察樹木的穩定性。科研人員會在選定樹木的下截樹幹安裝量身訂造的傳感器，以監察其傾斜角度，所得數據有助管理者適時採取補救措施，延長樹木生命。

另外，由土地測量及地理資訊學系(LSGI)系主任陳武教授領導、獲創新及科技基金和物流及供應鏈多元技術研發中心(LSCM)資助的一個研究項目，獲2021年日內瓦發明展頒發銀獎。

Entitled “Seamless Navigation in Urban Environment,” the research developed a new technology to improve mobile phone positioning accuracy with reasonable cost. It uses a position-domain DGNSS (Differential Global Navigation Satellite System) platform with an accuracy of 2 metres, a multipath mitigation engine with the integration of GNSS observation, Microelectromechanical Systems (MEMS) inertial sensors and a 3D map for greater positioning accuracy.

該得獎項目名為「城市無縫定位系統」，以合理成本研發出一項可以改善手機定位準確度的新技術，新技術採用精度達兩公尺的差分全球導航衛星系統(DGNSS)為平台，整合微機電系統(MEMS)的慣性傳感器及街道三維地圖，改善了全球衛星導航系統(GNSS)的多路徑誤差，因而使定位更加準確。



Colour-Enhancing Research of BEEE Academic Supported by Google

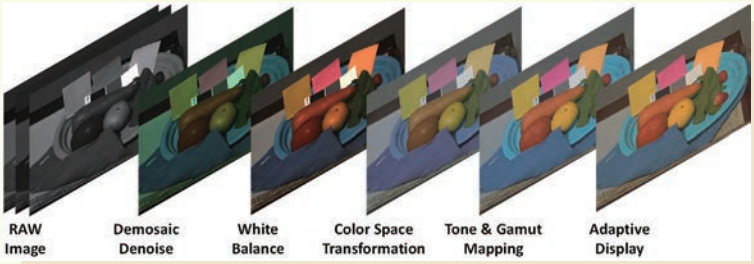
建築環境及能源工程學系學者研究提升顏色效果獲谷歌支持

Dr Minchen (Tommy) Wei, an Associate Professor in Department of Building Environment and Energy Engineering (BEEE), has received a Google Research Scholar Award 2021 to support his research in developing algorithms for cameras and displays that would facilitate better capture and reproduction of the colours seen in the real world. His research has sought to understand the underlying mechanisms of human perception, and to apply that knowledge in developing solutions for cameras, displays, and lighting systems. In his Colour and Illumination Laboratory at PolyU, Dr Wei and his students have developed various solutions and algorithms for world-leading companies, such as Facebook, DJI, etc.

建築環境及能源工程學系副教授魏敏晨博士最近榮獲「2021年谷歌研究學者獎」支援其研發有助攝影機和顯示器更有效地捕捉和重現現實世界色彩的演算方法。魏博士研究旨在瞭解人類感觀的深層機制，並應用有關知識研發攝影機、顯示器及照明系統。魏博士的理大顏色及照明實驗室率領學生為Facebook、大疆等世界知名公司研發出各種方案及演算方法。

「谷歌研究學者計劃」始於2020年3月，以鼓勵學術界合作為宗旨，該公司對計算機科學及相關領域進行的尖端研究尤其重視。在計劃推行的第一年，谷歌已資助逾十五個國家、分別來自五十多家大學的七十七位學者，而魏博士則是在東亞唯一獲此殊榮的學者。

The Google Research Scholar Programme was established in March 2020 to encourage collaborations with the academic community, particularly those who are pursuing cutting-edge research in computer science and related fields that are of interest to the technology company. In its first year, Google supported 77 scholars in over 50 universities of more than 15 countries. Dr Wei is the only scholar in East Asia to receive the award.



LSGI Researchers Awarded First Prize for Best Scientific Paper in GIS

Prof. Bo Wu of the Department of Land Surveying and Geo-Informatics (LSGI) and his research team have won first place in the 2021 ESRI Award for Best Scientific Paper in Geographic Information Systems (GIS) from the American Society for Photogrammetry and Remote Sensing (ASPRS). Co-authored with He Zhang, the chief designer of the Chang'E-4 probe, partners from the China Academy of Space Technology, as well as some postgraduate students of Prof. Wu and research staff at LSGI, the paper describes the innovative lunar topographic mapping and geomorphological analysis that contributed to identifying the best landing site of Chang'E-4 on the far side of the Moon in 2019. Entitled "Topographic and Geomorphological Mapping and Analysis of the Chang'E-4 Landing Site on the Far Side of the Moon," the paper was published in the April 2020 issue of *Photogrammetric Engineering & Remote Sensing (PE&RS)*.

The ESRI Award was established in 1991 to honour individuals who publish papers of scientific merit that advance knowledge about GIS technology. ESRI is the world's largest company specializing in GIS and mapping solutions. Presentation of the award was held on 29 March 2021 in a ceremony at the ASPRS 2021 annual conference held online.

LSGI研究團隊獲最佳地理資訊系統論文一等獎

以吳波教授為首的土地測量及地理資訊學系(LSGI)研究團隊，最近喜獲美國攝影測量及遙感學會(ASPRS)頒發2021年ESRI最佳地理資訊系統(GIS)論文一等獎。得獎論文題為《嫦娥四號月背著陸點地形地貌測繪及分析》，除吳波教授外，合著者還包括嫦娥四號探測器項目執行總監張熇、中國空間技術研究院的夥伴，幾位師承吳教授的研究生，以及LSGI的科研人員。該文於2020年四月號的《攝影測量工程與遙感》學報發表，主要闡述科研人員如何應用創新的月表地形測繪及地貌分析技術，在2019年成功為嫦娥四號探測器於月球背面找出最佳著陸地點。

始於1991年的ESRI獎，旨在嘉許透過發表優秀論文提升GIS科技知識的傑出人員。ESRI專注研發地理資訊系統及測繪方案，企業規模是全球之冠。有關頒獎禮已於2021年3月29日在ASPRS 2021年度網上研討會中舉行。

FCE Community

學院社群

Outstanding Student Award 2020

2020 卓越學生獎

Miss Maggie Tsin-tung Ng, a surveying student in the Department of Building and Real Estate (BRE), has been selected as the Outstanding Student of the Faculty of Construction and Environment (FCE) 2020, among the 4 outstanding students of FCE departments. According to her, "PolyU not only equipped me with professional knowledge as a future surveyor, but also broadened my horizons and unleashed my potential." She received the Outstanding Student Awards of both FCE and BRE in a ceremony on 12 March 2021.

Her success in obtaining the awards is attributable to her active participation in a series of extra-curricular activities such as the YMCA Volunteer Service, the Global Youth Leadership Summit, the PolyU Student Ambassador Scheme and many other well deserved recognitions during her studies. Her passion for volunteering was triggered by a service-learning trip to Kyrgyzstan, where she served as a volunteer teaching nutrition to school children. That experience has given her the impetus to serve others, shaping her into the mature and responsible person that she is today.

Spending just two weeks in a less developed country has made Maggie more appreciative of her life in Hong Kong, where she has the support of her family to pursue her studies at PolyU. She seizes every opportunity to give back to the local community, sharing her university experiences with secondary school students on Information Day to help them make informed choices about their future. Not only did she gain a sense of satisfaction from serving others as a student ambassador, her sense of belonging at PolyU was also strengthened as a result.

Looking back on her time at PolyU, Maggie reflected on all the challenges she had to overcome in order to graduate. "It has been an incredible journey, but all the hard work was totally worth it. I hope that I can continue my commitment in serving the community and keep pursuing excellence in the future."

Each year, the Outstanding Students Award Scheme of PolyU recognizes the achievements of full-time final-year students who have excelled in their academic and non-academic endeavours, rewarding students at three different levels. Outstanding students selected for the award at the departmental level go on to compete for a similar award at the Faculty/School level. The Most Outstanding PolyU Student of the Year is then selected from those who have received the Outstanding Student Award of their Faculty/School.

於建築及房地產學系修讀測量學的吳仟彤，在四位學系卓越學生中脫穎而出，榮膺「2020建設及環境學院卓越學生獎」得主。她說：「理大不僅讓我學習專業知識，為成為測量師打好基礎 ，更助我擴闊視野，啟發潛能。」她已於2021年三月十二日的頒獎禮上，領取分別獲由學院及學系頒發的兩個卓越學生獎項。

連奪兩獎，除了因為仟彤在學期間奪獎無數，亦與她熱心參與課外活動有關。基督教男青年會義工服務、全球青年領袖高峰會、理大學生大使計劃，全都承載著她的足跡。仟彤對投身義工的熱情，其實始於一次遠赴吉爾吉斯斯坦的服務學習之旅。她在當地義教，向學童講解營養學知識。這次體驗點燃了她為人服務的熱誠，造就今日成熟和負責的仟彤。

吉爾吉斯斯坦的發展程度不如香港，雖然逗留當地只有短短兩週，但已使仟彤更懂珍惜在香港的生活 ，更得到家人支持於理大升學。她重視所有回饋社會的機會，如在「理大教育資訊日」與中學生分享自己的大學體驗，幫助他們作出明智的升學選擇。身為學生大使，她在服務他人的過程中不僅獲得莫大滿足感，也同時增加對理大的歸屬感。

回顧理大歲月，仟彤直言克服了不少挑戰，方可完成學業。「這就像一次不平凡的旅程，當中無論經歷多少艱辛，都是值得！展望未來，我希望能繼續服務社會，創造卓越成就。」

理大每年均舉辦「卓越學生獎」，嘉許在學業及其他範疇上出類拔萃的全日制畢業生。此獎勵計劃分三個階段進行：由學系選出的卓越學生，會競逐所屬學院獎項；而大學就會從各學院的「卓越學生獎」得主中，選出那一年的理大「最卓越學生獎」得主。

Outstanding PolyU Alumni Awards for Surveying Graduates

Two graduates of the erstwhile Hong Kong Polytechnic in surveying have recently been honoured with the Outstanding PolyU Alumni Awards 2021. They are the Hon. Tony Wai-chuen Tse, who received a Higher Diploma in Surveying in 1976, and Sr Augustine Ho-ming Wong, who received a Diploma in Building Studies in 1980, a Higher Diploma in Surveying in 1982, an Advanced Higher Diploma in General Practice Surveying in 1983 and MSc in e-commerce for executives in 2002 from PolyU.

The Hon. Tse is currently Legislative Councillor representing the architectural, surveying, planning and landscaping sectors. As a bridge between practitioners and the government, he has successfully lobbied the government on policies that benefited the industry, including over HK$110 million of subsidies amid the recent pandemic. Mr Tse serves in various advisory committees under the HKSAR government, playing key roles in shaping critical policies. A Lifetime Achiever of the Royal Institution of Chartered Surveyors, he is concerned about young professionals and enthusiastically supports the mentorship programmes of PolyU and its Department of Building and Real Estate, serving as a student mentor.

Sr Wong, Executive Director and General Manager of the Property Development Department, Henderson Land Development Company Limited (HLDCL), has made tremendous contribution to real estate and housing development in Hong Kong. Under his leadership, HLDCL has become one of the most active players in urban renewal. He has worked closely with the government and NGOs to turn residential units pending redevelopment into affordable temporary housing and is helping the implementation of the largest transitional housing project in the New Territories using modular integrated construction. Sr Wong served in various advisory committees under the HKSAR government, giving advices on government policies regarding housing and real estate. He was a member of the Advisory Committee of the Department of Building and Real Estate (BRE) and was honoured with an Outstanding Alumni Award of BRE in 2018.

測量學畢業生榮膺「傑出理大校友」

理大前身香港理工學院的兩位測量學畢業生，最近雙雙獲理大頒發2021年傑出校友榮銜。他們分別是1976年測量學高級文憑畢業生謝偉銓議員，以及於1980年取得建築學文憑的黃浩明測量師。黃校友持續於理大進修，繼建築學文憑後，於1982及1983年先後修畢測量學高級文憑及地產實務學深造高級文憑，2002年更取得行政人員電子商貿理學碩士學位。

謝偉銓校友現任立法會議員，代表建築、測量、都市規劃及園境界別。他是業界與政府之間的橋樑，成功爭取有利業界的政策，如因應新冠肺炎疫情發放逾一億一千萬港元資助，又出任政府轄下多個諮詢委員會的成員，在制訂重大政策上擔當重要角色。身為皇家特許測量師學會的終身成就獎得主，謝議員熱心扶掖後輩，身兼理大與建築及房地產學系的「師友計劃」導師。

黃浩明測量師現任恒基兆業地產有限公司(恆地)執行董事兼地產發展部總經理，對香港的房地產發展貢獻良多。他帶領恆地成為其中一家最熱心參與市區重建的發展商，並與政府及非牟利組織緊密合作，將有待重新發展的住宅改裝為廉價臨時房屋，應用組裝合成建築法協助政府在新界落實歷來規模最大的過渡房屋建造計劃。黃校友是政府多個諮詢委員會的委員，就當局的房地產政策提供意見。他不忘母校，曾任理大建築及房地產學系顧問委員會成員，於2018年獲該系頒發傑出校友榮譽，以資表揚。

Call for Alumni to Celebrate 85th Anniversary of PolyU

2022 marks the 85th Anniversary of The Hong Kong Polytechnic University (PolyU). Alumni from PolyU and any of its predecessor's, including the erstwhile Government Trade School, the Hong Kong Technical College, and the Hong Kong Polytechnic, are welcome to update their profile and contact information online. They could also get the newly introduced PolyU Alumni eCard for campus access and various privileges. Furthermore, they are invited to rediscover their alma mater and join in the celebration of PolyU's 85th Anniversary next year. More details will be announced in due course.

召集校友同慶理大創校八十五周年

2022年是香港理工大學創校八十五周年的大日子。歡迎理大及其前身院校(包括香港官立高級工業學院、香港工業專門學院及香港理工學院)的校友到大學網站更新個人和聯絡資料，並申請新設立的理大校友eCard，以進入校園和享用各種優惠。另外，校方亦誠邀校友重新認識母校，並參與明年的八十五周年校慶活動。有關詳情將適時公佈。

Donations to Support Pursuit of Excellence in FCE

善舉成就卓越科研

The Endowed Professorship Scheme of PolyU was established in 2012 to honour distinguished scholars for their outstanding academic and research achievements. Ir Prof. Chi Sun Poon was recently appointed as Michael Anson Professor in Civil Engineering under this scheme. He is also Head of the Department of Civil and Environmental Engineering (CEE) and Chair Professor of Sustainable Construction Materials. Supported by a donation from Able Engineering Co. Ltd., which has been a strong supporter of the Endowed Professorship Scheme, this endowed professorship was named after the founding dean of the predecessor of the Faculty of Construction and Environment, Prof. Michael Anson, to honour him for his enormous contributions to the Faculty since he became the Head of the Department of Civil and Structural Engineering in 1988. Guiding the Faculty's research development in its early days, Prof. Anson continued to be an inspiration even after his retirement in 2003 as an Emeritus Professor. A fitting tribute to his pioneering spirit, the creation of an endowed professorship in his name adds one more to FCE, bringing the total of such professorships in FCE to six.

為表揚傑出學者的非凡學術和研究成就，理大於2012年設立「勵學教授冠名計劃」；最近，潘智生教授工程師出任該計劃的「安禮信土木工程教授席」。潘教授現為土木及環境工程學系系主任兼環保建材講座教授，而捐款設立此勵學教授席的安保工程有限公司，一向大力支持「勵學教授冠名計劃」。這次新設的勵學教授席，是以建設及環境學院前身的創院院長安禮信教授冠名，以表揚他於1988年出任土木及結構工程學系系主任後對學院的重大貢獻。安教授於學院成立初期已致力建立科研發展方向，2003年退休後，依然以榮休教授的身份啟迪後輩。以他的名字設立勵學教授席，正是向其創新精神致敬，至今建設及環境學院的「勵學教授席」增至六個。

To support early-career academics and nurture the nascent development of innovative ideas with huge untapped potential, the University has launched the Endowed Young Scholars Scheme. Dr Chao Zhou of CEE was appointed as Tsui Tack Kong Young Scholar in Civil Engineering. An outstanding alumnus of PolyU, Ir Tsui has been a staunch supporter of his alma mater for many years. He has contributed to numerous past initiatives of the university, and wishes to further the advancement of FCE as a leading entity for world-class research and education with his donation to the Endowed Young Scholars Scheme.

另外，為支援青年學者、孕育發展潛質優厚的創新意念，理大還推出「勵學青年學者冠名計劃」，土木及環境工程學系的周超博士出任該計劃的「崔德剛土木工程青年學者席」。崔德剛工程師是理大傑出校友，多年來不遺餘力支持母校，參與的理大活動多不勝數，今次慷慨捐款設立「勵學青年學者席」，希望建設及環境學院再接再厲，鞏固其世界級教研先驅的領導地位。

The Schemes provide philanthropists with the unique opportunity to partner with the University to advance research and academic activities in a discipline of their choice for the benefits of the wider community.

有關「冠名計劃」讓善長可選擇屬意的學術領域，與理大攜手進動教研發展，造福社群。

Dean of FCE Meets Recent Recruits

In a series of informal meetings in May 2021, Prof. Xiang-dong Li, Dean of the Faculty of Construction and Environment (FCE), met in small groups with over 30 new faculty members of FCE departments who shared their research interests and focuses. They learnt from Prof. Li different aspects of the Faculty, including teaching and research as well as potential funding opportunities. Prof. Li also shared his own experience of developing a career in academia and encouraged the new colleagues to expand their network and identify collaborators both inside and outside the university, as well as across disciplines.

院長與新入職同事會面

2021年5月，建設及環境學院院長李向東教授以小組形式跟三十多位各學系新入職的人員見面，透過一連串非正式會面討論他們研究興趣和範疇。李教授又向新同事講解有關學院的不同資訊，包括教學、研究及申領資助的機會，又分享他本人從事學術研究的經驗，鼓勵各人拓展人脈，在大學內外和不同學科/領域物色合作夥伴。

Staff Promotions

The following academics of the Faculty of Construction and Environment have recently been promoted as of 1 July 2021:

晉升之喜

以下幾位建設及環境學院學術人員於 2021年七月晉升新職：

Promotions to Chair Professor 晉升講座教授

Prof. Asif Usmani
Chair Professor of Building Sciences and Fire Safety Engineering (BEEE)
Asif Usmani 教授
建築科學及消防安全工程講座教授
(建築環境及能源工程學系)

Prof. Ben Young
Chair Professor of Steel Structures (CEE)
楊立偉教授
鋼結構講座教授(土木及環境工程學系)

Promotions to Professor 晉升教授

Prof. Daniel Tsang (CEE)
曾超華教授(土木及環境工程學系)

Prof. Charles Wong (LSGI)
黃文聲教授(土地測量及地理資訊學系)

Promotions to Associate Professor 晉升副教授

Dr Joonoh Seo (BRE)
徐準昕博士 (建築及房地產學系)

Dr Siu Kai Lai (CEE)
黎紹佳博士 (土木及環境工程學系)

Dr Ivy Wong (BRE)
黃小慧博士 (建築及房地產學系)

Dr Robert Tenzer (LSGI)
Robert Tenzer 博士
(土地測量及地理資訊學系)

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歡迎投稿，所有稿件請交

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