Faculty of
Applied Science & Textiles
應用科學及紡織學院

NEWSLETTER

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THE HONG KONG POLYTECHNIC UNIVERSITY
香港理工大學

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

Contents

Editorial Board

Welcome to the fifth issue of the newsletter!

With the immense support from the Central Government of China over the last few years, development of the Greater Bay Area is progressing at an incredible pace. In response, the Faculty of Applied Science and Textiles (FAST) is proud to have implemented various initiatives, including the signing of a Memorandum of Understanding between the United States and the Guangdong-Hong Kong-Macau Greater Bay Area on the first biotechnology and translational medicine research platform, and establishing the PolyU-Axis Therapeutics Joint Centre for Immunotherapy.

Moreover, FAST is pleased to have hosted numerous biotech summits, cross-border visits, and conferences. For more details on the development of the Greater Bay Area, please visit the FAST website:
https://www.polyu.edu.hk/fast/research/fast_gba/index.html

We are thrilled by the great news that PolyU has received 18 awards at the 47th International Exhibition of Inventions of Geneva this year. Among them, the Institute of Textiles and Clothing took home seven awards. Prof. Calvin Wong's WiseEye, an AI-based textile material inspection system, received two Grand Awards (Prize of the Italian Delegation of the Exhibition; Prize of the Technical University of Cluj-Napoca of Romania), a Gold Medal with the Congratulations of Jury, and the Special Merit Award.

Prof. Zijian Zheng through his research into flexible, stable, high-energy textile lithium batteries received a Gold Medal and two Special Merit Awards. Consonant with PolyU's motto of "Opening Minds · Shaping the Future", FAST strives to advance the frontiers of technological innovation with a view to having a positive impact on society and fulfilling people's lives.

I am also delighted that Prof. Jianhua Hao of the Department of Applied Physics and Prof. Xiaoqi Yang of the Department of Applied Mathematics received individual President's Awards for Excellent Performance/Achievement 2017/18 in research and scholarly activities.

My warmest congratulations to the aforementioned award winners. I wish them all the best in scaling new heights in their future research endeavours!

Prof. Wong Wing-tak,
Chair Professor of Chemical Technology
Dean, Faculty of Applied Science and Textiles

歡迎閱讀應用科學及紡織學院第五期學院通訊！

近年，在內地政府的大力推動下，粵港澳大灣區內的城市發展一日千里。同時，本院積極著手在區內進行多項新合作，包括聯同粵港澳大灣區與美國簽署合作備忘錄，共同建構區內首個生物科技和轉化醫學合作研究平台，以及建立理大—Axis Therapeutics免疫治療合作研究中心。

此外，本院很榮幸能夠主辦多場生物科技峰會、跨境考察和會議。有關學院於大灣區發展的詳情，請瀏覽本院網站：
https://www.polyu.edu.hk/fast/research/fast_gba/index.html

今年，理大在瑞士日內瓦舉行的「第47屆國際發明展」榮獲驕人成績，囊括18項大獎。當中，本院紡織及服裝學系勇奪七項殊榮。黃偉強教授發明以人工智能作為基礎的紡織品檢測系統「聰明眼」，獲得兩項特別大獎（意大利代表團特別大獎及羅馬尼亞克盧日納波卡工業大學特別大獎）、評判特別嘉許金獎和優異獎。

另外，鄭子劍教授憑藉其研究的高能量密度柔性織物鋰電池，獲得金獎和兩項優異獎。如同和應理大的教研承諾「啟迪思維．成就未來」，本院致力推動科技創新，對社會發揮積極影響，造福人類生活。

最後，我很高興應用物理系的郝建華教授和應用數學系的楊曉琪教授，分別獲頒發校長特設卓越表現 / 成就獎2017/18研究及學術活動的個人獎項。

我向各位得獎者表達熱烈的祝賀，並祝願他們在未來的研究工作中再創新高！

應用科學及紡織學院院長
化學科技講座教授
黃永德教授

Multifunctional nanomaterials for biomedicine

*– Interview with **Prof. Li Pei**,*
Professor, Department of Applied Biology and Chemical Technology

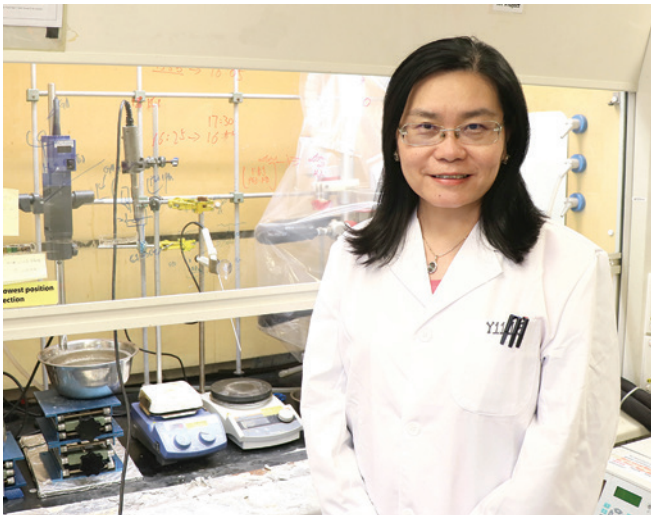
In medicine, to have an early and accurate diagnosis, followed by an efficient treatment with less secondary effects, has always been the aim. Currently, although still in its nascent stage, recent advances in nanotechnology have provided new and more powerful tools for imaging, diagnosis, and treatment, meaning that we are closer than ever before to achieving this goal.

With this in mind, **Prof. Li Pei** from the Department of Applied Biology and Chemical Technology has been working extensively to create smart, multifunctional nanocarriers that will be able to image, be imaged, target, and deliver molecules to a specific area for gene and drug therapy.

Prof. Li sees the huge potential her nanocarriers could have in the advancement of imaging-guided therapy. Diagnostic technologies such as MRIs and CT scans, which require the use of different contrast agents, are routine procedures in hospitals. Nano-scale manipulation is bringing about significant development in contrast materials. “Imagine if we could develop a nanocarrier that can be used for imaging with all of them, thereby removing the need for multiple contrast agents and making the whole process much more efficient and cost-effective”, says Prof. Li.

Unsurprisingly, her work has attracted a great deal of interest—particularly from a leading global pharmaceutical company. Although further testing is still required before Prof. Li’s multifunctional nanocarriers can be fully licensed, her research has already been used in studies into liver cancer treatment and gene delivery for insulin resistance.

Describing herself as a “molecular engineer”, Prof. Li finds the process of designing and assembling molecules to specific structures and functions allows her to be very creative. Always looking ahead, she explains that her next goal is to make an auto-fluorescent nanocarrier to obtain a better understanding about the delivery system, from where they go, how they are distributed, and how they are cleared from the body.



多功能納米物料的生物醫藥價值

*— **李蓓教授**專訪*
應用生物及化學科技學系教授

早期的精準診斷和少副作用的治療一直是醫療行業的目標。儘管納米技術今日仍處於萌芽階段，近年的技術發展為造影、診斷和治療提供了新的發展，意味著我們比以往更接近目標。

有見及此，應用生物及化學科技學系**李蓓教授**一直致力發展智能和多功能的納米載體，用於造影、被造影和定位，並將藥物分子傳遞到特定區域作基因和藥物治療。

李教授覺得納米載體在推動造影輔助治療方面有巨大潛力。因為在醫院日常診斷用到的磁力共振掃描和電腦斷層掃描都需要不同造影劑。納米技術的發展可為造影劑技術帶來重大發展。李教授表示：「想像一下，如果我們能夠開發一種可以用於各種造影技術的納米載體，無需使用不同造影劑，使整個過程更加有效率、更具成本效益。」

李教授的研究成果吸引了一家國際領先的製藥公司。雖然李教授的多功能納米載體在獲得授權之前，仍需要進一步測試，但她的研究已經被應用於肝癌治療和胰島素抵抗性基因傳遞的研究。

李教授形容自己是一名「分子工程師」，她覺得分子設計和組合形成特定結構和功能，能發揮她的創造力。她的下個研發目標是自發熒光的納米載體，以便更深入了解藥物在體內的輸送途徑，從何處開始、如何分配，以及如何從體內清除它們。

Mathematics is the Foundation for Big Data Analytics

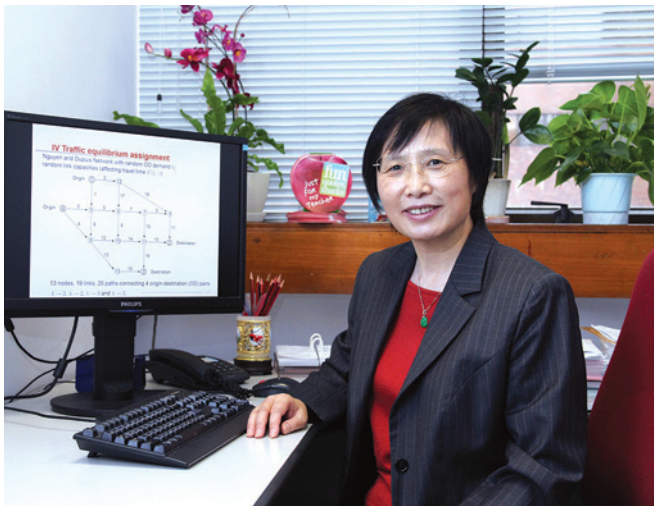
*– Interview with **Prof. Chen Xiaojun**,*
Head and Chair Professor, Department of Applied Mathematics

Big data is very much integrated into our everyday lives and mathematics is the foundation for data science. Prof. Chen Xiaojun, Head of the Department of Applied Mathematics and Associate Director of the University Research Facility in Big Data Analytics explains, “with a vast amount of uncertain data affecting our decision making, finding valuable information and making the right decisions from large and complex data sets require mathematical models and numerical analytics”.

Through cross-disciplinary research collaborations with other departments and schools, Prof. Chen has participated in several research projects related to big data, including smart cities, finance technology, and life science.

Recently, Prof. Chen has demonstrated the effectiveness of a two-stage stochastic Nash equilibrium in describing the market share of oil producing agents in the crude oil market. The Nash equilibrium—named after the mathematician, Nobel Laureate John Nash—is a concept within game theory that describes the stable state of a system involving the interaction of different participants.

In this era of big data, blockchain technology—in which Nash equilibrium plays a crucial role—is able to create permanent, unchangeable, and extremely secure databases. With this in mind, and building upon her previous research, Prof. Chen and her team are currently developing two-stage stochastic Nash equilibrium models to improve the practices and prospects of blockchain technology in finance and healthcare.



The overall response from her peers and industry has been extremely positive and the outcomes are expected to provide significant advances in innovation and technology development. As Co-director of the Chinese Academy of Sciences (CAS) Academy of Mathematics and Systems Science – Hong Kong Polytechnic University Joint Laboratory of Applied Mathematics, Prof. Chen plans to develop efficient optimization algorithms and software that can be used in various cross-disciplinary applications and industries with collaboration from CAS, PolyU, the Greater Bay Area, and the world.

數學 — 大數據分析的基礎

— 陳小君教授專訪
應用數學系講座教授兼系主任

大數據在我們的日常生活中無處不在，而數學正是數據科學的基礎。香港理工大學應用數學系主任兼大數據分析中心實驗室副總監陳小君教授指：「我們的決策受著大量不確定的數據影響，因此從大量複雜的數據中找出有價值的信息並作出正確的決定，需要數學模型和數值分析。」

陳教授與不同部門和學院跨學科領域的合作，參與多個與大數據相關的研究，包括智慧城市、金融技術和生命科學的項目。

最近，陳教授解說使用二階段隨機拿殊均衡理論，可以描述原油市場內石油生產商市佔率的有效性。以獲得諾貝爾經濟學獎的數學家約翰拿殊命名的拿殊均衡是博弈論中的一個概念，描述系統內不同參與者互動時的穩定狀態。

在大數據時代，運用拿殊均衡理論，可以令區塊鏈技術創建永久、不可更改且極其安全的數據庫。建基於這理論基礎和陳教授之前的研究，她和團隊目前正開發二階段隨機拿殊均衡模型，令區塊鏈技術更有效地在金融和醫療保健領域中應用。

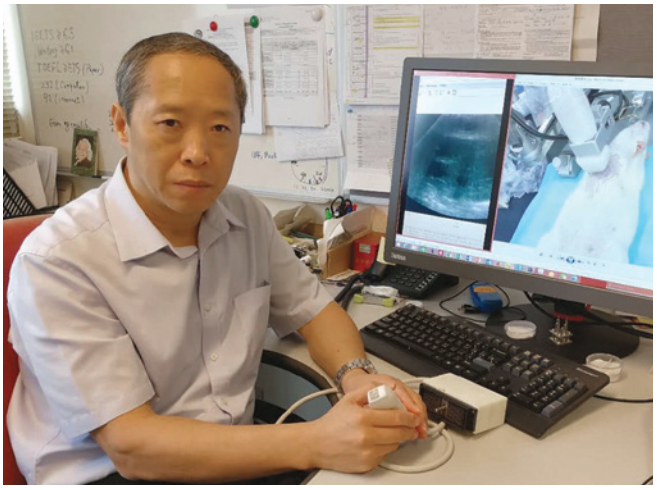
數學界的同業對大數據分析的創新和改善表現積極，預計加速創新和技術發展。同時作為中國科學院數學與系統科學研究院—香港理工大學應用數學聯合實驗室主任，陳教授計劃開發適用於跨學科的有效優化算法和軟件，促進與中國科學院、香港理工大學、大灣區以至全球合作。

Searching for Clarity

*– Interview with **Prof. Dai Jiyan**, Professor, Department of Applied Physics*

Often associated with pregnancy, medical ultrasound uses high-frequency sound waves to create an image of internal body structures such as muscles, tendons, and joints. As ultrasound images are captured in real-time, they also show blood flow and the movement of internal organs. How it works is that these soundwaves travel through the body and reflect off internal structures, which creates an image. The quality of an image depends on acoustic wave strength, pulse width and ability of focus.

With the aim of improving the image quality of medical ultrasound, for the past 10 years **Prof. Dai Jiyan** from the Department of Applied Physics has been working on developing the world's most advanced high-frequency ultrasound transducers. A transducer is a probe that is used with a thin gel so that ultrasound waves can be transmitted from the transducer through the gel and into the body.



Prof. Dai and his team have been making giant leaps in developing high-performance ultrasound transducers including phase-array, annular-array, high-frequency transducers, as well as endoscopic and intravascular ultrasound transducers for medical imaging.

After successfully completing two Innovation Technology Fund (ITF) projects in ultrasound transducer development, he is now undertaking a new project into high-frequency phase-array transducers in the clinical diagnosing of heart disease and eye problems, which will also have additional medical research applications.

He also led a team for the highly regarded National Basic Research Program of China (973 Program), developing high-performance ultrasound transducers. Impressively, some of these inventions have already been implemented and licensed to the medical industry.

Prof. Dai, who has received a great deal of international recognition for his research, is highly motivated to commercialize this ground-breaking technology. He explained, "medical ultrasound transducers integrate components of material science, physics, and applications which has massive potential in the field of health science." These studies have greatly accelerated the progress of China's medical ultrasound imaging technology and is set to pave the way for further medical advancements.

尋找清晰度

*— **戴吉岩教授**專訪*
應用物理學系教授

醫學超聲波是以高頻率聲波得到身體內部結構的圖像，例如肌肉，肌腱和關節，比如用於孕婦產前相關的檢查。由於超聲波圖像是實時拍攝，它可以即時呈現身體內血液流動和器官活動。超聲波成像的基本原理是利用聲波穿透身體並被內部組織反射以形成器官結構圖像。因此圖像質素取決於聲波信號的強度，脈衝寬度和聚集能力。

為提高醫學超聲波的圖像質素，應用物理學系**戴吉岩教授**過去十年致力開發全球最先進的高頻率超聲波成像傳感器。與一層薄凝膠一併使用，該儀器能夠使超聲波像探針一樣通過傳感器和凝膠層穿梭於身體之中。

戴教授和團隊的超聲波醫學成像的研究取得進展，包括研製相位陣列、環形陣列、高頻率傳感器，以及內窺鏡和血管內超聲波傳感器。

他在完成創新及科技基金（ITF）資助的兩個超聲波傳感器開發項目後，現在開展另一項研究用於臨床診斷心臟病和眼部問題的相位陣列式高頻超音波傳感器項目，及其應用於其他醫學領域研究。

此外，他亦帶領團隊參與備受重視的「國家重點基礎研究發展計劃」（973計劃），開發高性能超聲波傳感器，部份發明已經授權並應用於醫療行業。

戴教授的研究屢獲國際認可，他亦積極地推動這項突破性醫療技術的應用。他解釋說：「醫學超聲傳感器集合材料科學、物理學與應用的元素，這些元素的結合在健康科學領域中具有發展潛力。」這些研究亦加快中國在醫學超聲波成像技術的發展，並為未來的技術進步打好基礎。

A Common Thread: Fashion and Technology

*– Interview with **Dr Lilly Li***
Associate Professor, Institute of Textiles and Clothing

Fashion design is the art of problem solving. It is an art for the betterment of human's everyday life. It combines design, aesthetics, and beauty with clothing and accessories. Furthermore, the encounter of fashion design and innovative technology has brought new insights and potential to the subject.

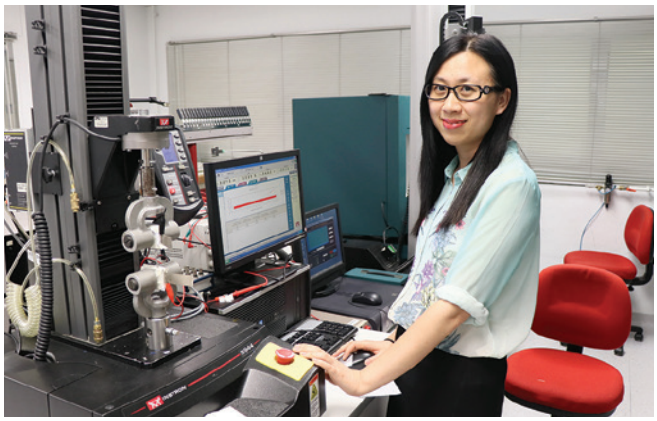
Dr Lilly Li, an Associate Professor at PolyU's Institute of Textiles and Clothing, is currently focusing on the development of design thinking driven research in functional clothing. She is researching on the development of functional textiles by integrating design and technology, which includes fashion design and textile engineering, a cross-disciplinary research. "Fashion design is a fascinating subject that incorporates both industrial chains (materials science, spinning, fabrication, finishing, and production) and the commercial world. Design is the fusion of practical solutions and emotional satisfaction. A new way of design research unites sense and sensibility in the development of experimental design, which has led us to new perspectives and results", Dr Li explained.

Her team is currently studying modern fabrics such as chemical-free moisture-wicking yarn, which draws moisture away from the body. In addition, she has been looking into chemical-free far infrared fibre, which has been shown to improve circulation, relieve pain, and promote healthy skin, among other things. This invention has recently received a gold medal and special merit award in The 47th International Exhibition of Inventions (Geneva).

Dr Li is also researching a number of other fashion related topics including medical textiles, and functional sportswear. One area includes the development of wearable electronics, which she hopes will be used by athletes at the 2022 Beijing Winter Olympics.

Dr Li also mentioned the coupled challenges and opportunities in cross-disciplinary research collaboration, such as, striking a balance among different disciplines, constructing an effective collaboration community across the industry and academia. A lot of development are still in an experimental stage. It is hoped that a design thinking driven research system can be formed through continuous research work and the active participation of all parties.

Finally, Dr Li explained, "my team's research utilizes design ideas to drive the development of commercial textile production—design comes first, but using cutting edge technology for packaging allows it to run through the production chain".



一「縷」相承：時尚與科技

*— **李鸝博士**專訪*
紡織及服裝學系副教授

時裝設計是一門解決問題的藝術，因為這門藝術同時能夠改善人類的日常生活。時裝設計揉合材料、色彩、造型、結構、層次等設計理念；與此同時，創新科技的融入，賦予時裝更多可能性。

香港理工大學紡織及服裝學系副教授**李鸝博士**目前專注研究以時裝設計為基礎的功能性紡織品研發（design thinking driven research），探討結合設計和應用於時裝和紡織品製造的科技。李博士說：「時裝設計是引人入勝的主題，它融合產業鏈，包含材料科學、紡紗、製造、整理和生產，與商業世界。設計，既是解決問題，又是滿足情感；而新設計方式，則是用感性去設計理性的實驗設計，往往會帶來特別的觀點和結果。」

她的團隊正在進行現代服裝布料產品開發，例如無化學添加纖維技術，包括吸濕排汗紗線，有效吸收身體水份。此外，她所研究不含化學物質的遠紅外線纖維，已被證實有效改善血液循環、減輕疼痛及促進皮膚健康等。此項研究更在瑞士日內瓦「第47屆國際發明展」獲得金獎和特別獎。

李博士的研究亦覆蓋其他與時尚相關的話題，包括醫療用紡織品和功能性運動紡織品，其中一個領域包括開發可穿戴的電子紡織產品，她期望參與2022年北京冬季奧林匹克運動會的運動員能夠上場使用。

李博士特別提到跨領域研究的挑戰和機會。在設計思維的基礎下，各學科間如何平衡發展、工業和學界如何建立有效合作生態環境、如何同時管理多項任務，很多問題還在實驗中。她希望透過不斷試驗和各方的參與，可以形成一個設計研究體系。

最後，李博士說：「我的研究團隊利用設計理念以推動商業紡織品生產發展。我們以設計為首，繼而使用尖端技術作為包裝使設計貫穿生產鏈」。

Love@FAST Knitting Graffiti Exhibition

The Faculty of Applied Science and Textiles launched the "Love@FAST Knitting Graffiti Exhibition" during 25-29 March to decorate PolyU campus through knitting graffiti. What is knitting graffiti? Also known as yarn bombing, it is the art of using items handmade from yarn to create street art. With the support of the Institute of Textiles and Clothing, FAST students joined the Knitting Graffiti Workshops in February 2019. Using a needle and yarn, they stitched a colored hooded vest for our lovely campus! During the exhibition, students and staff were invited to write their loving messages to their friends and families, and took photos with the funny knitting props, capturing the happy moments.

Love@FAST針織塗鴉展覽

應用科學及紡織學院於3月25至29日舉行Love@FAST針織塗鴉展覽，以針織塗鴉的作品裝飾校園，旨為校園增添色彩和暖意。Knitting Graffiti針織塗鴉 (又稱 yarn bombing) 是近年新興街頭藝術活動，以色彩繽紛的毛線織成不同圖案。應用科學及紡織學院的同學們於2月份參加了「針織塗鴉工作坊」，在紡織及服裝學系老師悉心教導下，同學們精心製作出一件又一件針織作品，送給我們所喜歡的理大! 展覽期間，同學和教職員反應踴躍，於心型卡片上寫上對親友的祝福，並與富創意的針織道具留影，以記下開心一刻。

Loving Message Card 自製心意卡

Take a moment to write your own loving message!

齊來送上祝福吧！

PolyU collaborates with the Royal College of Art to establish the Artificial Intelligence Design Laboratory

PolyU and the world's top institute in art and design, Royal College of Art (RCA), United Kingdom, signed a Memorandum of Understanding (MoU) on 26 February to confirm their intention to establish the PolyU|RCA Artificial Intelligence Design Laboratory (AIDL). The Hon Mrs Carrie Lam, the Chief Executive of the HKSAR attended the ceremony and witnessed the signing of MOU by Prof. Philip Chan, Interim President and Provost of PolyU and Dr Paul Thompson, Vice-Chancellor of RCA. The AI Design Laboratory will be the world's first research facility to advance the integration of AI into the design of products and service. FAST's Institute of Textiles and Clothing, and Department of Applied Mathematics would take the lead to work together with RCA, combining art and design research expertise with insights from science.

理大與皇家藝術學院合作 成立人工智能設計實驗室

香港理工大學與英國皇家藝術學院於二月二十六日簽署諒解備忘錄，成立理大|RCA人工智能設計實驗室。香港特別行政區行政長官林鄭月娥女士出席諒解備忘錄簽署儀式，並見證理大暫任校長及常務及學務副校長陳正豪教授與皇家藝術學院校長Paul Thompson博士簽署合作協議。人工智能設計實驗室將是全球首創以推動把人工智能的技術融入產品及服務設計過程的研究設施。應用科學及紡織學院的紡織及服裝學系與應用數學系將與英國皇家藝術學院建立跨領域合作，將科學知識結合藝術設計。

Teaching philosophy :

Adopting different teaching approaches to suit students' academic needs

"There is nothing more satisfying than seeing how my work changes another life for the better."

Dr Gary Cheung Kwong-chak,
Teaching Fellow, Department of Applied Biology and Chemical Technology
Awardee, Faculty Award for Outstanding Performance/ Achievement in Services 2017/2018

Over the past 15 years of my teaching career, I have had opportunities to teach different cohorts of students (undergraduates ranging from Year 1 to 4). Knowing that students at each stage have different academic needs, I adopt various teaching approaches to facilitate their learning. For Year 1 and 2 students, my teaching aims to prepare them for more advanced studies in later years by introducing foundation knowledge. I also believe that students should develop their academic skills (e.g., note-taking in class, reading, and problem-solving skills) during the first two years of study, so that they can be successful when progressing towards graduation. In this regard, I often raise open-ended questions to inspire them to think beyond the class content. In doing so, junior undergraduates get to experience how the fundamental principles learned in the classroom are relevant to solving real-world problems. This approach motivates students to become self-learners, rather than just passive recipients of facts. For Year 3 and 4 undergraduates, most of the subjects are at the advanced-level, which means they are more demanding and require handling of more challenging concepts. To make learning more effective, I employ interactive methods such as animation, group discussion, and daily-life examples to help illustrate the various concepts in a more succinct manner. This inspires students to connect current concepts with previous ones, and effectively enhances their academic skills in learning chemistry and related disciplines.

Since becoming a teaching instructor at the Department of Applied Biology and Chemical Technology, I have met so many smart and talented students. Certainly, we all love to teach the more capable students, since they learn faster and achieve more. However, it is the weaker students who really need our help and guidance, since no student should be left behind. Under the new Hong Kong Diploma of Secondary Education (HKDSE) curriculum, students are admitted to university with disparate science backgrounds. To help the "less prepared" students catch up, I teamed up with some like-minded colleagues in the Faculty to work on teaching projects to develop various e-learning resources. These include online exercises, a remote laboratory, supplementary notes, and tutorial video series. I am pleased to say that these

resources have been well received by everyone, not just the target audience. While preparing the materials, I was able to get a better appreciation of the students' needs. Overall, this e-learning project has been very fruitful. In addition to helping students acquire the necessary study skills and knowledge, my teaching pedagogy has also improved.

During my time at PolyU, I have gained countless unforgettable memories. I am so glad to have been part of my students' university lives, from Year 1 through to Year 4. Every year when I attend the Congregation, I realize that time flies so fast. The students, who first came to PolyU as freshmen, are now leaving as graduates and are ready to write a new chapter of their lives. Students get to share their happiest moments with us, take photos, and tell us about their new upcoming jobs. I remember once, a former student came up to me and introduced his parents who wanted to thank me. More recently, one of our graduates led a group of secondary school students on a campus visit. She told me that my teaching had inspired her so much and that my lectures were her favourite ones at PolyU. She explained that after graduation, she had decided to devote her career to education, and that I was her role model. She wanted to become a teacher and nurture our young generation, just like myself. This instance touched me deeply and proved that students look to us, their teachers, for direction and guidance. Indeed, there is nothing more satisfying than seeing how my work changes another life for the better! These priceless memories are what motivates me to keep teaching.

教學理念：

多元教學 因材施教

— 張光澤博士，
應用生物及化學科技學系專任導師
學院傑出表現/ 成就獎(服務)2017/2018得獎者

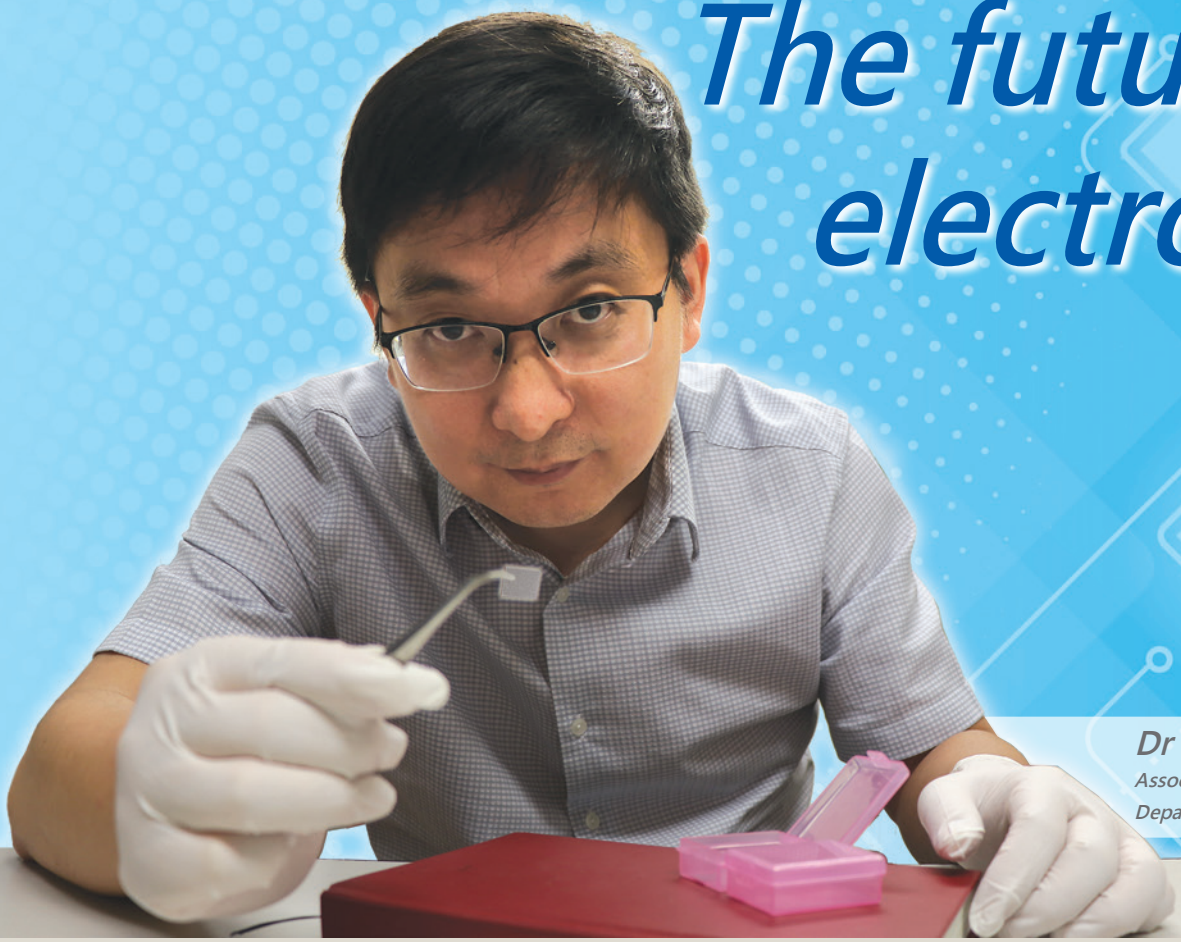
> *「看到自己的工作足以改變另一個人的一生給予我無比的滿足感。」*

在過去15年的教學生涯中，我曾教授不同年級的本科生，明白到處於每個階段的學生對學術皆有不同需求，因此採用多種教學方式以達致因材施教。對於入學首兩年的學生，我的主要教學目的是傳授基礎知識，為他們在往後兩年進行深造學習做好準備。我亦相信學生應在首兩年培養學術技能，例如課堂上摘要筆記的技巧、閱讀和解決問題的能力，令日後的學習歷程事半功倍。在課堂上，我經常提出開放式問題，以鼓勵學生思考不應被書本內容限制。透過這種思維訓練，初級本科生可以體驗如何將課堂學習的基本理論與現實問題掛鈎。這種方法激勵學生積極自學，捨棄被動的學習態度。對於高年級生，大多數課堂都處於進階水平，學術上的要求更高，需要處理更難的概念。為了使學習更有效，我採用互動形式，比如動畫、小組討論和日常生活示例，以更簡潔的方式去呈現深奧的概念，目的是協助學生把在不同學習階段學到的概念聯繫起來，提高他們學習化學和相關學科的技能。

自從成為應用生物及化學科技學系的教學導師以來，我遇到許多優秀的學生，亦有為數不少能力稍遜的學生。當然老師都偏好指導有能力的學生，因為他們總是學習較快，學術成就亦更多。然而，能力較弱的學生才是真正需要我們幫助和指導的一群，令他們不會在學習過程中落後。在香港中學文憑考試課程中，學生在入讀大學前對科學的涉獵大相徑庭。為了幫助「準備不足」的學生趕上學習進度，我與應用科學及紡織學院一些志同道合的同事合作，開發電子學習資源的教學項目。電子資源包括線上練習、遠程實驗室、補充筆記和教程影片。我很高興這套教材不僅受一群受惠的學生喜歡，更看到電子學習深受很多人歡迎。而且，在準備電子教學材料期間，我更了解學生的需求。總括而言，電子學習發展項目富有成效，除了幫助同學們獲得學習技能和知識外，我的教學方法亦同時大有改進。

我在理大的日子有數不盡的難忘回憶。我很高興能成為學生們大學生涯的一部分。每年參加學位頒授典禮時，目睹不久以前來到理大的新生，現在畢業並離開母校，準備開啟他們生活的新篇章，我每每意識到光陰似箭、日月如梭。雖然學生們離開母校，會和我分享照片，告訴我他們工作和生活中的快樂時光。曾經有一位舊生向我介紹他的父母，他們對我的教學工作表示讚賞。最近，另一位畢業生帶著一群中學生參觀理大校園，她告訴我，我的教學給她很多啟發，我的課堂更是她在理大最喜歡的課程。畢業後，她決定將自己的職業生涯奉獻給教育，並以我作為榜樣。她希望成為一名老師，像我這樣培養年輕一代，這件事深深地感動了我。這亦證明學生們一直在他們的老師和教授身上尋找人生方向。看到自己的工作足以改變另一個人的一生給予我無比的滿足感！這些無價的回憶是我將教學視為終身事業的動力。

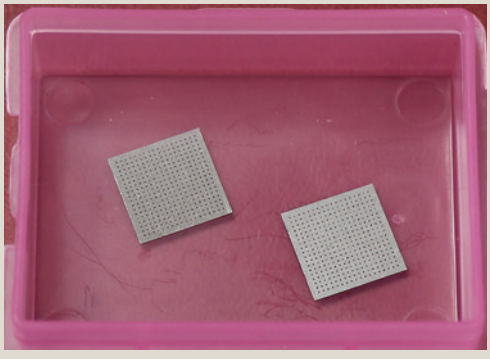
Getting smaller and more capable: The future of electronics



Dr Chai Yang,
Associate Professor,
Department of Applied Physics

> *"To discover, understand, and engineer low-dimensional materials and devices with new functionalities and unprecedented performance"*

In the past few decades, electronic devices have become smaller, device density has become higher, and the speeds have become faster. As Moore's law reaches its physical limit, heterogeneous integration is required to enable "More Moore" and "More than Moore". Based on the projection of the International Technology Roadmap for Semiconductors (ITRS) 2.0, my research team and I aim to discover, understand, and engineer low-dimensional materials and devices with new functionalities and unprecedented performance, which will enable the continuous development of future electronics.



Two-dimensional (2D) materials have atomic-scale thicknesses, dangling bond–free surfaces, and reasonably high mobility, all of which attracts considerable international attention and boosts the development of 2D research at an incredible pace. Atomic-scale thickness makes 2D layered materials immune to the short-channel effect, which provides the potential for future scaling. The ultra-high large surface-to-volume ratio of 2D materials allows them to respond to external stimulation with high sensitivity, not only to electronic signals but also optical, electrochemical, thermal, and even biological ones. Due to the semi-metal nature of graphene, transition metal dichalcogenides (TMDCs) with a sizable bandgap have taken the place of graphene as model 2D materials in recent years. In addition, these 2D semiconductors show the possibility of scaling down the channel thickness to the sub-nanometre level. They also exhibit superior device performance with regard to excellent electrostatic control and low power consumption. My research team has investigated a new type of group-10 TMDCs (PtS2 and PtSe2), which exhibit high air-stability and high carrier mobility.

尺寸變小 性能更強：迎接未來電子裝置

— 柴揚博士
應用物理學系副教授

「發掘和設計具有新功能和高性能的低維材料及器件」

過去的幾十年來，電子產品日新月異，體積變小、速度變快，使用率有增無減。摩爾定律已經達到其物理極限，需要引入新材料進行異質集成去達到「更多摩爾」和「超越摩爾」。基於國際半導體技術發展藍圖 2.0（ITRS 2.0）所提出的框架，我和研究團隊希望發掘和設計具有新功能和高性能的低維材料及器件，並以持續發展未來電子產品為目標。

二維層狀材料的厚度僅以原子單位來計算，其表面沒有懸掛鍵，並有相對高的載流子遷移率。二維層狀材料的優點吸引國際關注，研究發展一日千里。原子般的厚度使二維層狀材料免受短通道效應的影響，使得其可以應用在納米電子器件中。 二維材料的表面積與體積比例高，使它能夠以高敏感度回應外部刺激。不僅能夠響應電子信號，還有對光學、電化學、温度，甚至生物刺激作出反應。由於石墨烯屬於半金屬性質，近年來，較大能隙的過渡金屬二硫化物（TMDCs）已經取代石墨烯作為二維材料半導體。此外，這類二維材料半導體的通道厚度有可能縮小至亞納米級別，亦展現優秀的靜電控制和低能量耗損的性能。我的研究小組已研發一種新型的第十族過渡金屬二硫化物（TMDCs）（二硫化鉑和二硒化鉑），它們具有在空氣中高穩定性和高載流子遷移率。

半導體銅導線製備技術在集成電路中尤其重要，其製造成本已經在十年前超越了集成電路中矽基晶體管的成本。銅導線的可靠性和性能會受尺寸減小影響。通常在銅金屬和介電質之間，會加入鉭/氮化鉭（Ta/TaN）作為阻隔層，目的是要阻擋銅原子遷移。當阻隔層厚度超過5納米，銅物質的移動會被完全阻止。而增加的電阻會造成大幅度的電阻—電容時間延遲。儘管阻擋層厚度處於納米級別，仍減少了銅導線的體積，體積縮小使時間延遲問題更顯突出。根據國際半導體技術發展藍圖（ITRS）要求，半導體銅導線製備技術的阻擋層厚度應該少於1納米。不過，通過氣相沉積法製造的鉭/氮化鉭阻隔膜會因為過薄而出現斷層。為了滿足ITRS的要求，我們的團隊正在開發不滲透和高導電的超薄阻隔材料，目前已經找出石墨烯納米片能夠阻礙體積最小的原子或分子遷移。

除了引入新材料外，運算架構方面亦需要進行創新。傳統的馮紐曼架構的運算模式受到數據處理和儲存單元之間數據傳輸的限制。為了克服這個問題，我們的團隊採用光電子學的儲存結構，它能夠感應光學信號、以非揮發性的記憶體形式儲存信息和執行邏輯和类神經形態運算。這種新設備簡化了電路架構，並提升整體運算結構的功能。

Cu interconnects occupy a large volume in integrated circuits (ICs). Furthermore, their fabrication costs are already outstripping that of Si CMOS in ICs from 10 years ago. Cu interconnects suffer greatly from size reduction in terms of both reliability and performance. A Ta/TaN barrier is usually adopted between the Cu and the dielectrics in order to block migration. Its thickness of over 5 nm is to completely block the migration of Cu species, which occupy the volume reserved for the Cu conductor. The increased resistance results in a large resistance-capacitance time delay. Although the barrier thickness is at the nanoscale, continuous downward scaling makes this issue stand out. According to the ITRS projection, the thickness of the barrier for the Cu interconnects should be less than 1 nm. However, the Ta/TaN film fabricated by the vapor deposition method is discontinuous at such a small thickness. To meet the ITRS requirement, our team is developing ultra-thin but highly impermeable and conductive barrier materials. A hexagonal graphene nanosheet has been demonstrated to impede the mass transport of the smallest atom or molecule.

In addition to the introduction of new materials, innovation in computing architecture is required. Conventional von Neumann computing architecture is limited by the data transfer between the data processing and storage unit. To overcome this, our team has adopted an optoelectronic memory structure, which can sense the optical signal, store the information in a non-volatile form, and perform logic and neuromorphic computing. This new device structure simplifies the architecture and increases the functionalities of the computing structure.

PolyU and Chinese Academy of Sciences launch Joint Laboratory for collaborative study in Applied Mathematics

On 28 January 2019, PolyU and the Academy of Mathematics and Systems Science (AMSS) of the Chinese Academy of Sciences (CAS) hosted an opening ceremony for the 'CAS AMSS-PolyU Joint Laboratory of Applied Mathematics', marking the official launch of their research collaboration in applied mathematics. Prof. Philip C. H. Chan, Interim President of PolyU; Prof. Jing-hua Cao, Director General of the CAS Bureau of International Cooperation; Prof. Gao Xiao-shan, Executive Vice-President of the CAS Academy of Mathematics and Systems Science; Mr Zheng Xiao-nian, Director General of the CAS Bureau of Facility Support and Budget; Ms Li Fang-fang, Director of the Office of Hong Kong, Macao, and Taiwan Affairs, CAS Bureau of International Cooperation; Ms Luo Wen, Director of the CAS Division of Budget System; Ir Prof. Alexander Wai, Vice President (Research Development), PolyU; Prof. Wong Wing-tak, Dean of the Faculty of Science and Textiles, PolyU; and senior members of CAS, AMSS, PolyU, and AMA attended and officiated at the ceremony.

The joint laboratory is co-directed by Prof. Xiao-jun Chen, Head and Chair Professor of the Department of Applied Mathematics, and Prof. Ya-xiang Yuan, Academician of CAS. The laboratory will focus on developing basic algorithms studies, research in applied statistics and financial mathematics, and further studies in the fields of big data and artificial intelligence.

As one of the 22 joint laboratories with universities in Hong Kong approved by CAS, the collaboration denotes CAS's recognition of PolyU's research excellence in applied mathematics. By combining the strengths and expertise of PolyU and the CAS research institute, the joint laboratory will cultivate the synergies of CAS and PolyU and set the stage for advancing knowledge transfer and applications, as well as nurture talents in applied mathematics in mainland China and Hong Kong. These collaborations will ultimately benefit the development of the Greater Bay Area and contribute to the economic development of society.

理大與中國科學院合辦「應用數學聯合實驗室」

理大與中國科學院（中科院）轄下研究機構數學與系統科學研究院合作成立「中國科學院數學與系統科學研究院–香港理工大學應用數學聯合實驗室」。聯合實驗室於今年1月28日舉辦開幕典禮，並在典禮上正式宣佈應用數學研究相關的合作。一眾主禮嘉賓包括理大暫任校長陳正豪教授、中科院國際合作局局長曹京華先生、中科院數學與系統科學研究院常務副院長高小山教授、中科院條件保障與財務局局長鄭曉年先生、中科院港澳台事務辦公室主任李芳芳女士、中科院預算制度處處長羅雯女士、理大副校長（科研發展）衞炳江教授、理大應用科學及紡織學院院長黃永德教授，以及中科院數學與系統科學研究院與理大院系的要員蒞臨主持開幕典禮。

MA Graduation Fashion Show 2019
碩士畢業生時裝展2019

The MA Graduation Fashion Show 2019 will take place on the 9 July at D2 Place ONE – The Space in Lai Chi Kok, showcasing a unique selection of graduate collections from the Master of Arts in Fashion and Textile Design Programme at ITC. There is a lot of white noise all across the fashion industry right now, and this show will disrupt, engage and prove that Hong Kong is where it is at.

紡織及服裝學系將於7月9日在D2 Place舉行「碩士畢業生時裝展2019」。屆時將會展出服裝及紡織品設計文學碩士學位課程應屆畢業生的精選作品，展現他們獨特的風格及創意。

9 Jul 2019
7:00 pm
The Space, D2 Place ONE

Symposium on Emerging Innovations and Evaluation of Technology Enhanced Active Learning (TEAL) Pedagogies in Tertiary Education
高等教育中的尖端創新與科技促進主動學習教學法評鑑座談會

Academics, experts and advocates of active learning pedagogies from a wide range of disciplines will explore various approaches to technology enhanced active learning in tertiary education and share insights. The highlight of the symposium will be a keynote address by prominent specialist in assessment and evaluation, Dr. Jenny Bergeron, Director of Educational Research & Evaluation at Harvard's Derek Bok Centre for Teaching and Learning.

來自各學科的教員、專家和主動學習教學法的倡議者，一同探索融合了科技的主動學習教學法在高等教育的發展。是次研討會的主題講者為哈佛大學Jenny Bergeron博士。

10 Jul 2019
9:30am - 5:15pm
TU201, Podium Level, PolyU Campus

CT Homecoming Dinner
化學科技課程成立三十週年慶祝晚宴

ABCT launched the first Chemical Technology (CT) Programme in 1989 and has been nurturing top cadres of chemists and entrepreneurs throughout all these years. In celebrating her 30th anniversary, the Department will host a Homecoming Dinner on 18 October 2019 at Hotel ICON. All CT alumni, current and former faculty members, students and friends of CT would be invited to join this meaningful event to mark the important milestones and share the precious memories of the Department.

為慶祝化學科技課程成立三十週年，應用生物及化學科技學系（ABCT）將於2019年10月18日舉辦盛大的晚宴，誠意邀請歷屆校友、師長及業界賢達，蒞臨盛會，一同回顧多年來學系的發展和師生校友的卓越成就。

18 Oct 2019
8pm
Silverbox Ballroom, Hotel ICON

The 13th International Workshop on Principles and Applications for Control of Quantum Systems
第13屆量子系統控制原理與應用國際研討會

The development of technologies for the 21st century is driving new theoretical and experimental research on control in quantum systems. Quantum control theory leads to significant improvements in technologies ranging from magnetic resonance to prototype quantum computers. The 13th International Workshop on Principles and Applications for Control of Quantum Systems (PRACQSYS) will be held at PolyU on 14-18 December 2019.

21世紀的技術發展正在推動量子系統控制的新理論和實驗研究。量子控制理論直接促進了磁共振和原型量子計算機等各多方面的技術進步。第13屆量子系統控制原理與應用國際研討會（PRACQSYS）將於2019年12月14日至18日在理大舉行。

14-18 Dec 2019
9:00am - 5:40pm
Venue: To be announced

Lau Wing Yan Iris, 劉詠恩

– BSc (Hons) in Food Safety and Technology

Four years of university life has gone by so quickly and it is an honour to share my experiences of my time here in the FAST newsletter. In the Food Safety and Technology programme, our lecturers were so friendly that we were able to treat them as mentors not only in academia but also in life.

In addition to the theory we learnt in lectures and laboratory lessons, the department also encouraged us to apply for intern positions to enrich our experience. It was my pleasure to be a hygiene intern at The Ritz-Carlton, Hong Kong. I am glad to have been given so many opportunities, such as providing food safety training to my colleagues. Although it was challenging, it was a good chance for me to apply what I learnt to real life and get a taste for a career in food safety.

四年大學生涯轉瞬即逝，慶幸得到這個機會為學院通訊撰寫分享，好讓我回顧過去的點滴。在食物安全及科技學科，教授與同學們建立了亦師亦友的關係，教授不只傳授我們學術上的知識，更成為我們的人生導師。除了理論學習和實驗課堂外，學系更鼓勵我們到外面實習，豐富學生的經歷。去年暑假，我有幸到香港麗思卡爾頓酒店實習，既充滿挑戰性亦令我獲益良多。

Shi Yun, 施韻

– PhD in Applied Mathematics

Few have the luxury of exploring the deepest desires within themselves, but I consider myself among the lucky few. Having an academic background in fundamental theoretical physics, I am always curious and fascinated by the questions and disciplines of many other research fields. During the course of my postgraduate research, I have transformed into a deeper thinker than I would have been otherwise. My extensive research has made me appreciate that, although an open mind can present itself with numerous ideas, it is the hard work invested in finding their realizations that promises the ultimate glory. The Department of Applied Mathematics presented itself with diversified opportunities, especially for communicating and collaborating with researchers throughout the world. The experience that I gained from the department's internationally interactive environment motivated me to set up an innovative company to explore the potentials of commercializing applied mathematical research.

能夠追尋自我內心深處渴望的人不多，我確實非常慶幸屬於這一小撮的幸運兒。從最初物理學的學術背景，我一直對不同領域的研究有著濃厚的興趣。修讀學位的過程中，我成為一個對學科知識抱有孜孜不倦態度的人。誠然，開放的思想可以誘發豐富的靈感，但當中努力不懈、尋根究底的經歷才是最終的碩果。應用數學系給我無窮的啟發、多元化的學術交流和與來自世界各地的研究人員合作的平台。攻讀博士學位期間，我有機會與許多不同領域的學術界翹楚交流想法和意見。正是種種國際化的經驗鼓勵我創立自己的科技創新公司，並致力發展商業化的應用數學研究。

Huang Ziru, 黃紫如

– BSc (Hons) in Engineering Physics

During my four years studying engineering physics, I was able to take advantage of a number of resources at PolyU to explore what I really wanted out of life. Through my exchange studies at the University of Technology and Science of China, and at Swinburne University of Technology, I enhanced my domain knowledge and lab techniques, learned about different study techniques, lifestyles, and cultures, and immersed myself in the research environment. I also participated in various summer internships, through which I found out that I still have a long way to go. Taking into account my successes and failures, I decided to pursue a postgraduate study and dedicate myself to conducting meaningful research. I am extremely grateful for various opportunities and continuous support from PolyU, which has helped me shape my plan for life.

讀工程物理學系的四年間，理大提供各種各樣的機會讓我探索目標。而中國科學技術大學和澳洲斯威本科技大學的交換生計劃尤其助我提升學科上的知識和實驗技巧。我還體會到不同地方的學習和生活氛圍，也接觸到當地的科研環境。此外，我亦參與暑期實習，在過程中發現自己的不足。將這些經驗綜合起來，我最終決定攻讀碩士學位，以從事研究為目標。在此衷心感謝理大給我充足的資源和教授耐心的指導，讓我能夠探索並規劃自己的人生。

Zheng Birong Jessica, 鄭碧蓉

– MA in Fashion and Textile Design (2018 Graduate)

During my one-year study as a PolyU MA Fashion and Textile Design student, my design skills and understanding of the global fashion business improved greatly. I was also very fortunate to win the Fashion Asia 2018 Best of Best Fashion Graduate Award and be able to exhibit my collection at PMQ in Soho. The programme provided students with advanced technical facilities and guidance, so that we could actually put theory into practice. The programme also collaborates closely with the fashion industry. For example, I was able to work on a sustainability project with H&M, work with the KTC factory to produce garment samples, and take part in a wonderfully creative project with the Estonian Academy of Arts. All of these valuable experiences will help me to achieve my fashion goals in the future.

為期一年的理大服裝設計碩士課程，不但讓我開拓視野和認識全球時裝行業，亦大大提升我的服裝設計技巧。我更有幸憑畢業設計獲Fashion Asia Hong Kong 2018 頒發Best of Best Fashion Graduate Award，並在上環元創方展示獲獎作品。感謝理大在過去一年為學生提供專業和先進的服裝生產設備和資源，讓我們將書本理論實踐，從而激發我們構思創新意念。除了基礎的理論知識，學院方面亦和業界有著緊密聯繫，例如與時裝品牌H&M有關可持續發展的合作、參觀服裝代工公司KTC工廠和與愛沙尼亞藝術學院合作的創意項目等，都帶給我們許多實用的經驗。

FAST Student Awards Ceremony 2018/19

To recognize students who excel in both academic and non-academic pursuits, the Faculty organized the 2nd FAST Student Awards Ceremony on 25 January 2019. Awardees of Dean's Honours List, FAST Entry Scholarships and FAST Sponsorship for Internship Enhancement Programme were honored by our Faculty Dean and Associate Deans at the ceremony. This year, the internship sponsorships of over HKD620,000 were offered to 71 students from the four departments. Taking this opportunity, we extend our congratulations to all awardees and wish them all the best in their future endeavors.

應用科學及紡織學院傑出學生頒獎典禮2018/19

為表揚成績卓越以及於實習方面有優秀表現的學生，應用科學及紡織學院於1月25日舉行第二屆「傑出學生頒獎典禮2018/19」。學院院長及副院長於典禮頒授獎項予院長嘉許名單、學院入學獎學金及獲得學院實習資助的得獎者。今年，學院共為來自四個學系71名學生提供了超過港幣62萬元的實習資助金額，以鼓勵學生擴闊眼界和發揮潛能。謹此祝賀各位得獎同學，希望大家繼續努力，不斷進步!

Recipients of Faculty Awards 2017/18:

Category of Award – Teaching

Dr Wong Man-kin 黃文健副教授

Associate Professor, Department of Applied Biology and Chemical Technology

Category of Award – Research & Scholarly Activities

Prof. Jianhua Hao 郝建華教授

Professor, Department of Applied Physics

Category of Award – Services

Dr Cheung Kwong-chak 張光澤博士

Teaching Fellow, Department of Applied Biology and Chemical Technology

2018-19 Hong Kong Mathematical Society – Young Scholar Award

Dr Wang Zhian 王治安博士

Associate Professor, Department of Applied Mathematics

2018-19 Hong Kong Mathematical Society – Best Thesis Award

Dr Yang Lei 楊磊博士

PhD Graduate, Department of Applied Mathematics

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