

# UGC Knowledge Transfer Annual Report 2020–21

Venture Beyond Boundaries

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#### **Executive Summary**

Recurrent funding for knowledge transfer (KT) has been provided by the University Grants Committee since 2009 to build up universities' capability in KT. City University of Hong Kong (CityU) is pleased to report significant progress in various KT aspects during the reporting period from July 2020 to June 2021.

To broaden our KT impact and build a more sustainable model for intellectual property (IP) licensing, CityU launched HK Tech 300<sup>TM</sup>, a new KT focus, that aspires to become the largest university-based entrepreneurship programme in Asia. Leveraging on the infrastructural support of the programme's strategic partners like Hong Kong Science and Technology Parks Corporation and Hong Kong Cyberport Management Co. Ltd., HK Tech 300<sup>TM</sup> strives to create 300 start-ups in three years. As a result of the Programme, CityU's inno-preneurship infrastructure has been consolidated under HK Tech 300<sup>TM</sup>. Since its launch in March 2021, the Programme received overwhelming response, details of which are given in section 1 and 2 of this report.

As anticipated, the adverse impact of COVID-19 pandemic on licensing activities gradually unveiled and lingered, as evidenced in the suspension of some business discussions and termination of some licensing agreements. Despite this, efforts have been made to further enhance our technology transfer infrastructure in order to be well prepared for a recovery, e.g. revamping our homepage, reviewing key legal instruments for technology transfer, etc. Furthermore, with the launch of HK Tech 300<sup>TM</sup>, it is anticipated that a more sustainable model for IP licensing will be resulted.

With 54 US patents granted in calendar year 2020, CityU has risen from 54<sup>th</sup> to 51<sup>st</sup> in The Top 100 Worldwide Universities Granted US Utility Patents, and topped in Hong Kong for five consecutive years receiving the highest number of US utility patents. The University will make our best effort to sustain this leading position and continue to excel in this area.

In research, CityU has been approved (pending the Government's official announcement) to establish three research centres in collaboration with world renowned universities under Innovation and Technology Commission's InnoHK Research Clusters initiative, each receiving funding support of a few hundred million Hong Kong dollars. These centres will add further strength and impetus to our research development.

Last but not least, in the virtual edition 2021 of the renowned International Exhibition of Inventions of Geneva which is one of the biggest global events showcasing innovations and inventions from around the world, CityU won the highest number of awards among all universities in Hong Kong, including a prestigious Gold Medal with Congratulations of the Jury, five Gold Medals, three Silver Medals and three Bronze Medals, demonstrating the excellence of the research carried out at CityU.

#### 1. A New Knowledge Transfer Focus

Establishing spin-off and start-up companies is one of the channels through which knowledge is transferred from universities to industries and community at large apart from intellectual property (IP) licensing. In March 2021, City University of Hong Kong (CityU) launched a large-scale  $300^{\text{TM}}$ flagship innovation and entrepreneurship programme, ΗK Tech (www.cityu.edu.hk/hktech300), that encourages our students, alumni, and researchers to establish spin-offs/start-ups to commercialize the University's IP, a new knowledge transfer (KT) focus, thereby broadening our KT impact as well as building a more sustainable model for IP licensing. More importantly, the Programme provides opportunities for our young generation to create their own businesses for career development.

Themed "Venture Beyond Boundaries", HK Tech 300<sup>TM</sup> aspires to become the largest university-based entrepreneurship programme in Asia. With strong support from the Innovation and Technology Commission of the HKSAR Government, InvestHK, Hong Kong Science and

Technology Parks Corporation, Hong Kong Cyberport Management Co. Ltd., and the four major chambers in Hong Kong as our strategic partners, HK Tech  $300^{TM}$  aims at establishing 300 start-ups/spin-offs in three years. Officiated by Mr Alfred Sit, Secretary for Innovation and Technology, Chairmen/Presidents of our strategic partners and our Council Chairman and President, a ceremony was held in March 2021 to mark the official launch of the Programme which attracted widespread media coverage and public attention.





HK Tech 300<sup>TM</sup> involves a specially designed four-stage programme, including **Recruitment & Training**, **Seeding**, **Incubating** and **Launching**.

Massive **Recruitment** campaigns were held and on-line platforms are in place to facilitate networking and team formation. The participants' entrepreneurial journey begins with an eight-week **Training** programme with a curriculum customized to equip them with the

knowledge, experience and tools to launch successful businesses. After the intensive **Training**, the participants will compete for a seed fund of HK\$100,000 for each successful application on a project basis for early-stage idea validation, feasibility and marketing studies. After **Seeding**, successful teams will move on to **Incubating** to receive an angel investment fund of up to HK\$1 million for developing a minimum viable product/service and business model validation. During this stage, incubation support including provision of co-working space, mentorship, business mix and match opportunities, guidance on accounting/finance and legal consultation, etc. will be provided. Leveraging on the entrepreneurial resources and infrastructural support of our strategic partners such as the Innovation and Technology Commission, Hong Kong Science Park, Cyberport, and other venture capital funds, the University will continue to nurture these technology ventures until successful take off – **Launching**.

#### 2. Inno-preneurship Ecosystem

With the launch of the HK Tech  $300^{\text{TM}}$ , the University's inno-preneurship infrastructure has been consolidated under the Programme.

# 2.1 Training

To equip our Programme participants with necessary knowledge and skill sets to kick-start their entrepreneurial journey, a customized training programme consisting of two sessions per week for eight weeks has been designed. Topics that contribute to start-up success are included such as market desirability, financial viability, technical feasibility, pitching, presence, marketing, fundraising and mentoring, etc. The first cohort of training was held from April to June 2021 with an enrolment of around 110 students, alumni and others. Due to overwhelming response as a result of massive promotion, the second and third cohort of training to commence in July and August 2021 attracted an enrolment of around 280 participants.

# 2.2 Funding

With the launch of the HK Tech 300<sup>TM</sup>, the Student Early Entrepreneurship Development Scheme (SEEDS) has been subsumed under the Programme to become HK Tech 300<sup>TM</sup> Seed Fund with a funding of HK\$100,000 for early stage idea validation, feasibility and marketing studies on a project basis. Applications are invited four times a year. As of June 2021, 123 applications were received involving about 370 participants including undergraduate and postgraduate students, alumni, and others, of which 65 applications were approved of funding support totaling HK\$6,500,000 after stringent panel reviews.

HK Tech 300<sup>TM</sup> Angel Fund is an investment fund to support early stage start-ups to develop a minimum viable product/service and business model validation. As of June 2021, 22 applications were received involving about 130 participants including undergraduate and postgraduate students, alumni, and others, of which 17 start-ups were selected for consideration of investment after stringent panel reviews.





Further to the above new funding schemes, the Technology Start-up Support Scheme for Universities (TSSSU) and CityUE Investment Fund continue to offer funding support to CityU start-ups/spin-offs seamlessly at different stages of their life cycle.

TSSSU helps commercializing business ideas at start-up stage, moved into its eighth year of operation. Thirty-eight applications were received in the 2021-22 round of application, of which 12 start-ups were selected to receive a total funding of HK\$8 million. After eight rounds of application since 2014, TSSSU has granted funding support totaling HK\$44 million to 47 start-ups/spin-offs.

CityUE Investment Fund, a venture-capital-style investment fund, supports CityU start-up/spin-off companies in exchange for stock ownership. During the reporting period, funding investment has been made in one CityU venture – Prenetics Limited (Prenetics). Prenetics was co-founded by a CityU professor excelling in biochip technology and nanomedicine and his PhD student. Prenetics has grown to become a global leader in digital health and genetic testing, and operates its own ISO-15189 Internationally Accredited Laboratories in Hong Kong. It is the only Hong Kong-based company appointed by the HKSAR Government for the government-sponsored

COVID-19 testing programme, and has helped 200,000 staff across 16,000 restaurants, supermarkets, wet markets and more get tested.

#### 2.3 Co-working Space

To support the University's start-ups/spin-offs development, and especially to cater for the increasing demand from start-ups/spin-offs of HK Tech 300<sup>TM</sup>, enhanced co-working space has been provided in Hong Kong for the purpose, one on campus and the other off campus. The former with modest renovation has been in use since June 2021. The latter, which is a new venue occupying a floor space of 1,600sqm in Admiralty on Hong Kong Island, the city centre, will put into operation in late 2021.

The CityU Shenzhen Research Institute Building, which is the University's research and professional education establishment in Shenzhen, PRC, continues to provide co-working space for the start-ups/spin-offs incubated in Shenzhen and the Greater Bay Area.

The total floor space of all three venues added together for incubation will be around 2,500sqm.



Co-working space on campus (top and middle) and in Shenzhen (bottom)

# 2.4 Mentorship Scheme

The HK Tech 300<sup>TM</sup> Mentorship Scheme has been established to serve as a platform whereby seasoned industrialists and senior executives (mentors) use their valuable and professional knowledge, and understanding of real-life business environment to support the development of the HK Tech 300<sup>TM</sup> project teams/start-ups (mentees) through guidance and advice. The Mentorship Scheme aims to facilitate the sharing of knowledge, expertise, skills, insights and experiences through dialogue and learning.

Each Seed team, Angel team and TSSSU company will be assigned a mentor in a relevant field for a normal period of one year upon their successful participation in HK Tech  $300^{\text{TM}}$ . Observing the minimum requirement for mentor-mentee meet-up sessions, mentors and mentees are at liberty to arrange for the mentoring sessions to cater for their specific needs. Mentor-mentee gatherings of HK Tech  $300^{\text{TM}}$  may also be arranged by the University to facilitate mutual interaction and communication.

#### 2.5 Co-development Programmes with Partners

The launch of HK Tech 300<sup>TM</sup> has been enthusiastically welcomed and supported by relevant sectors of the society. Our strategic collaboration with the Hong Kong Science Park, Cyberport, the four major chambers in Hong Kong, as well as the partnership with more than 20 supporting organisations has contributed to the launching of co-development programmes which as a result benefit the HK Tech 300<sup>TM</sup> entrepreneurship ecosystem. For instance, the University has set up joint selection panels with the Hong Kong Science Park for screening teams to enter the various pre-incubation and incubation programmes such as STEP, IncuApp, IncuTech, IncuBio; synergies have been worked out with the major chambers to nurture CityU's start-up teams for growth and development; start-up teams are encouraged to participate in the competitions, events and activities organised by HK Tech 300<sup>TM</sup> and its partners to gain as much relevant exposure and experience as possible.

#### 2.6 New Venture Creation Platform

As a precursor to training under HK Tech 300<sup>TM</sup>, New Venture Creation Platform is a cradle for **Ideas** generation, collaboration, **Learning** and sharing to team formation, and evolving ideas into potential value proposition through the sandbox as a new tech venture.



On this platform, ideas are explored with sustainable commerce or utility as core objective by looking into designing or developing commercialisation pathways. Participants, even not aspiring to be entrepreneurs can gain insights of methodologies through the sandbox, useful regardless of their ultimate chosen career.

#### 2.7 Other Innovation and Entrepreneurial Support

Professional support for start-ups is also available at the beginning of the Programme, e.g. free consultation and services are provided by HK Tech 300<sup>TM</sup> partners including accounting and legal firms, and benefits are offered by the banks in Hong Kong.

The Talent and Education Development Office (TED), formerly known as the Office of Education and Gateway Education, continues to provide consultation and face-to-face coaching services through its Entrepreneurship and Innovation Clinic, thereby generating more student teams for entrepreneurial training and innovative projects for start-ups formation. It also runs several laboratories to support student innovation and entrepreneurship including the Active Learning Classroom (ALC), Makerspace for rapid prototyping, Green Screen Chromakey Studio and Panopto Self-recording Studio for digital media production.

#### 2.8 Innovation and Start-up Competitions

Cyberport University Partnership Programme (CUPP) 2020-21 is a FinTech-focused entrepreneurial programme for local university students to unleash their potential, gain insights into the global market, receive a unique chance to participate in an Entrepreneurship Boot Camp at overseas university and receive mentorship from industry elites. Four CityU teams were shortlisted and eventually two teams, "Intersect" and "ConNest" were awarded the Cyberport Creative Micro Fund of HK\$100,000 each to develop their start-up projects. Besides, another CityU team, "inFINityfuture", also received the "Most Engaged Team Award" for CUPP.

Organised by Blue Insurance Limited and supported by partner MIT Hong Kong Innovation Node, the Blue Innovation Challenge 2020 Fintech Competition aims to create a platform where start-ups and social enterprises can demonstrate their creative ideas and solutions to challenge the status quo of the financial industry. Albacastor Technology Limited, a start-up under CityU's Student Early Entrepreneurship Development Scheme, won the Community Engagement Award by public poll.

Climate Action Recognition Scheme (CARS) is an entrepreneurship programme initiated by Hong Kong SDG Hub, co-organised by the Environment Bureau and sponsored by The Hongkong and Shanghai Banking Corporate (HSBC) to recognise and invest in innovative and outstanding start-up ideas which take actions in combating SDG (Sustainable Development Goals)-related climate change problems. CityU's "A Novel Energy-free and Environment-friendly Cooling Paint for Building Applications" is one of the two winners under the Idea Stage Category, winning an award of HK\$120,000. "Open Ocean Camera", a turn-key solution for real-time water quality monitoring and long term video/image capturing, championed by a CityU alumni, is another winner under the Scale-up Team Category with an award of HK\$180,000. Two out of five winning teams are affiliated with CityU.

Four students from CityU won the Innovation and Technology Scholarship 2021, each receiving HK\$150,000 for activities including overseas exchange, local internship and mentorship programmes. The students study veterinary medicine, computer science and global business systems management respectively. The Scholarship will broaden their horizons, enhance their professional knowledge about science and technology, and help them succeed in the fields of innovation and technology.

### 2.9 Conflict of Interest Relating to Start-ups/Spin-offs

As start-ups/spin-offs are separate legal entities, faculty members should exercise extreme caution to avoid potential conflict of interest as they are encouraged to participate in the start-up/spin-off activities as well. In this regard, a guideline has been promulgated to address issues such as engaging students in start-up/spin-off- commissioned research projects; collaborating with start-ups/spin-offs to develop research into technology for commercial use; applying jointly with start-ups/spin-offs for research grants, etc. Having the conflict of interest guideline well in place is of crucial importance before technology venturing activities flourish.

# 3. Technology Transfer

# 3.1 Technology Licensing Results

As anticipated last year, the adverse impact of COVID-19 pandemic on licensing activities gradually unveiled and lingered, as evidenced in the suspension of some business discussions and termination of some licensing agreements.

FY2020-21 closed with a total licensing income of HK\$2.19 million on cash basis. Three new licensing agreements were signed during the year under review, making the total number of active licensing agreements standing at 38.

With the launch of HK Tech 300<sup>TM</sup>, it is anticipated that a more sustainable model for IP licensing will be resulted. With our grant of affordable evaluation licences, HK Tech 300<sup>TM</sup> programme participants are able to establish new ventures using CityU IP more easily. It is hoped that many of these evaluation licences will eventually turn into commercial technology licences, thereby giving impetus to more licensing activities, both in terms of number and revenue, in the years to come.

#### 3.2 Strengthening IP Management

The University has in place a well-established administrative framework and policy protecting the intellectual property generated from research activities. After a stringent vetting process, inventions of high commercialisation value are pursued for patent filing. In the year under review, 166 new patent applications were filed in Hong Kong, US, Mainland and other jurisdictions in various fields of technologies with 77 patents granted during the same period. By June 2021, CityU's IP portfolio consists of 622 patents granted with a further 488 patents pending.

After years of cultivation, our patenting work begins to bear fruits. With 54 US patents granted in calendar year 2020, CityU has risen from 54<sup>th</sup> to 51<sup>st</sup> in The Top 100 Worldwide Universities Granted US Utility Patents, and topped in Hong Kong for five consecutive years receiving the highest number of US utility patents. The University will make our best effort to sustain this leading position and continue to excel in this area.

# 3.3 Legal Instruments for Technology Transfer

Key legal instruments have been critically reviewed or newly developed with the help of lawyers to

better support technology transfer. These include Joint Ownership Agreement, Technology Development Agreement, Materials Transfer Agreement, Data Access Agreement, Non-disclosure Agreement, Evaluation License Agreement and Technology License Agreement.

# 3.4 Web Marketing

CityU's Knowledge Transfer Office (KTO) website hosts a list of IP to broaden marketing channels for licensing. In order for online access to be more user friendly, the website has been revamped with a new design and a customer centric user interface. To help promote CityU's technologies, technology briefs with technology readiness level indicated and embedded drawings/videos are added. It's hoped that the revamped website will serve as an effective channel for technology licensing.



#### 3.5 Roadshows to Colleges and Schools

To provide better support to faculty members in knowledge transfer and enhance their understanding and communication with the knowledge transfer arm of the University, Knowledge Transfer Office organised a series of roadshows reaching out to all Schools and Colleges. The roadshows also served to promote the new KT initiatives and provide updates on KT infrastructural support including the HK Tech 300<sup>TM</sup> programme, the revamped KTO website, the guideline on conflict of interest relating to start-ups/spin-offs, etc.

# 3.6 Outreach

Through the CityU Business and Industrial Club (CUBIC), CityU has forged close ties with senior business executives and industrialists. CUBIC regularly organises events (e.g. Emerging Technologies Forums (ETFs), Technology Transfer Forums (TTFs), Special Interest Group Gatherings, etc.) for its members, and aligns industrialists and academics from the University and other institutions to build a platform to advance technological development and promote cross-institution collaboration. Due to COVID-19 pandemic, CUBIC's operation was affected. We hope that CUBIC activities could resume back to normal very soon.

Through participating in technology transfer or innovation exhibitions, CityU aims to showcase its latest inventions for commercialization and expand its client base. Three exhibitions were participated during the year under review, all went virtual due to the pandemic.

- InnoCarnival organised by the Innovation and Technology Commission of the HKSAR Government
- SWITCH (Singapore Week of Innovation and Technology) organised by Enterprise Singapore (ESG) and supported by National Research Foundation (NRF)
- Inventions Geneva Evaluation Days 2021 (details given in section 5.3)

#### 4. Knowledge Transfer beyond Science and Engineering Disciplines

#### 4.1 Knowledge Transfer Award for Non-technology Disciplines

To broaden KT beyond science and engineering disciplines, funding has been provided since 2011 to support quality knowledge transfer initiatives proposed by non-science Colleges/School, including the College of Liberal Arts and Social Sciences, College of Business and School of Law.

Every year, each College/School holds an internal competition to prioritise the applications before submitting the proposals to the Knowledge Transfer Office. Six projects were approved in this reporting year to receive up to HK\$0.2 million each as below:

- Design Thinking and the Public Awareness in Social Entrepreneurship
- Public Health Measures, Risk Perception and Social Attitudes under COVID-19: A Panel Study for Hong Kong
- Developing Effective Clinical Communication: Applying Research Findings to Improve Patient Safety, Experiences and Outcomes
- Monitoring Virtual Asset Trading Market through Blockchain and Internet Data
- Registration of Exonerations in China
- CityU-Hong Kong Consumer Confidence Index (CityU-HKCCI)

#### 4.2 Recognition of Excellence in Knowledge Transfer

To encourage KT and nurture a KT culture in non-science disciplines, Excellence in Knowledge Transfer Award was launched since 2011. The Award gives recognition to faculty members in the College of Liberal Arts and Social Sciences (CLASS) who have made outstanding achievement in applying their knowledge for creating high social impacts. The 2020-21 Excellence in Knowledge Transfer Award went to:

Project Title	Department	Recipient	
Excellence in Knowledge Transfer Award			
Rethinking and Shaping Knowledge and Practice on Aging: Forging Close Ties among Universities, Industries, and the Wider Public	Department of Social and Behavioural Sciences	Dr Chow Oi Wah Esther	
Certificate of Merit			
A Chinese-English Glossary of Terms Commonly Used in the Teaching of Junior Secondary Chinese History to Support Non-Chinese Speaking Students Learning Chinese History and Culture in Secondary Schools	Department of Chinese and History	Dr Tsui Lik Hang	
Multimodal English Language Learning	Department of English	Professor Diane Pecorari	

#### 5. Research Excellence

# 5.1 Contract and Collaborative Research

Part of the University's mission is to anticipate and respond to the needs of industry, commerce and the community by engaging in applied research with its results used for direct benefit to Hong Kong and beyond. The University continues to maintain its close ties with local and overseas industries through various forms of collaboration including contract research. Highlights of some contract research projects (including projects from government and ITF) are development of materials or systems in a wide spectrum of disciplines as set out below:

- A System-Level and Multidimensional Quantification and Prediction of SARS-CoV-2 Infection in Animals: Are There Implications for Control of Human Infections?
- Surveillance of SARS-CoV-2 in Grey Waste Water from Residential Areas, Toilet Waste from Airplanes and Waste Water from Hong Kong International Airport
- In-Vitro and In-Vivo Assay Platforms for Assessing Drug Efficacy for Brain Disorders
- Large-scale Neural Oscillations Play a Primary Role in Fundamental Cognitive Functions
- Development of Immunoassays to Diagnose and Stage Domestic Cat Hepadnavirus Infection
- Active Phased Arrays for Navigation, Surveillance and SatCom
- Study of High Efficiency Video Coding Technologies for Cloud Gaming
- Surface Engineering of Large-Size 3D Porous Micro-Nanostructures for Synergistic Solar-Driven Seawater Evaporation and Hydrogen Production
- Political Effects of Social Media on Social Incidents in Hong Kong
- A Policy Study along the Life-cycle of Hong Kong Youth Entrepreneurship
- Whole School Positive Education Project to Nurture Flourishing Secondary Schools

City University of Hong Kong places strong emphasis on application-oriented research that not only brings true benefits to the community but also facilitates knowledge transfer that is conducive to the needs of industries and social bodies. To this end, faculty members are encouraged to engage in contract and collaborative research to contribute to the University's pursuit in knowledge transfer.

# 5.2 InnoHK World-class Research Clusters

InnoHK is a major initiative of the HKSAR Government to develop Hong Kong as the hub for global research collaboration. This involves the establishment of world-class research clusters at the Hong Kong Science Park with research laboratories converging top-notch researchers from all over the world to conduct world-class and impactful collaborative researches. CityU has been approved (pending the Government's official announcement) to establish three research centres in collaboration with world renowned universities, each receiving funding support of a few hundred million Hong Kong dollars. These centres will add further strength and impetus to our research development. The centres include:

- Hong Kong Centre for Cerebro-Cardiovascular Health Engineering (COCHE) leading scientists in biomedical engineering and data science are brought together to develop innovative technologies for solving real-world healthcare problems and address the pressing need for cardiovascular disease prevention.
- Laboratory for AI-powered Financial Technology (AIFT) AIFT is committed to providing the best business solutions for future financial services through application of artificial intelligence, big data and blockchain technology combined with modern financial tools in micro-lending, production and supply chain financing, capital markets, banking, and regulatory technology. AIFT is committed to leading the future technological development of financial services in the Asia-Pacific region.
- Centre for Intelligent Multidimensional Data Analysis (CIMDA) CIMDA provides world-class research and product development in AI and big data analysis for a wide range of applications to image, video and biomedical data analysis, and computer graphics and animation.

# **5.3** Inventions Geneva Evaluation Days

Researchers from CityU shone at the Inventions Geneva Evaluation Days 2021, a special virtual edition of the renowned International Exhibition of Inventions of Geneva which is one of the biggest global events showcasing innovations and inventions from around the world. CityU won the highest number of awards among all universities in Hong Kong, including a prestigious Gold Medal with



Congratulations of the Jury, five Gold Medals, three Silver Medals and three Bronze Medals, demonstrating the excellence of the research carried out at CityU.

# Gold Medal with Congratulations of the Jury:

• *"Energy-Free, Low-Cost and High Cooling Performance Passive Radiative Cooling Technology for Building Applications"* developed by Dr Edwin Tso, School of Energy and Environment (more details are given in section 7.3 under Impact Cases)

# Gold Medal projects:

- *"Aquatic Animal Postmortem Multimedia Analysis Platform"* developed by Dr Brian Kot Chin-wing, Department of Veterinary Clinical Sciences
- "Super Bamboo Sustainable Structural Bamboo Materials with High Strength and Multi-function" developed by Dr Lu Yang, Dr Fan Rong and Ms Pu Yiru, Department of Mechanical Engineering
- *"Youth Sports Education and Management SaaS Platform Based on AI & IoT"* developed by AI Motion Sports, a start-up of CityU founded by a PhD graduate from the former Department of Mechanical and Biomedical Engineering
- *"Damage-healable Antimicrobial Coating Made from Natural Materials"* developed by Dr Yao Xi, Department of Biomedical Sciences
- "Development of New Generation Anti-metastasis Drugs Based on Endosomal Trafficking" developed by Dr Yue Jianbo, Department of Biomedical Sciences

#### Silver Medal projects:

- "Neural Motor Prosthesis Prototype for the Restoration of Motor Function in Spinocerebellar Ataxia" developed by Dr Eddie Ma Chi-him and Dr Gajendra Kumar, Department of Neuroscience, and Dr Tin Chung, Department of Biomedical Engineering
- *"Magnetic Microrobotic System for Precise Cell Delivery in Vivo"* developed by Professor Sun Dong, Department of Biomedical Engineering
- *"IPA Guide for Visually Impaired Learners"* developed by Dr Jackie Yan Xiu, Department of Linguistics and Translation (more details are given in section 7.5 under Impact Cases)

# Bronze Medal projects:

- "The Golden Calf" developed by Professor Jeffrey Shaw, School of Creative Media
- *"A Microfluidic Biosensing System for Effective Cancer Diagnostic and Screening"* developed by Dr Zhu Shuyan and Professor Stella Pang, Department of Electrical Engineering
- *"Electronic Cane Grip Instrumented with Thermal Haptic Feedback"* developed by Dr Zhu Kening and Mr Arshad Nasser, School of Creative Media

#### 6. Research Platform and Technology Transfer on the Mainland

City University of Hong Kong Shenzhen Research Institute and City University of Hong Kong Chengdu Research Institute are established to expand our research platform and technology transfer to the Mainland.

#### 6.1 CityU Shenzhen Research Institute

Mainland research development recorded a steady growth in FY2020-21. A total of 77 new research projects were obtained via the research platform in Shenzhen, CityU Shenzhen Research Institute (CityUSRI). These included 42 projects funded by the National Natural Science Foundation of China (NSFC), 11 funded by the Shenzhen Science, Technology and Innovation Commission, one project funded under the Major Programme of the Ministry of Science and Technology of the People's Republic of China, and two funded by the Department of Science and Technology of Guangdong Province. During the NSFC centralized application period in 2020, 103 NSFC applications were submitted. As in the past, the success rate of CityUSRI in NSFC application is above the national average.

	2018-19	2019-20	2020-21
Number of Active Research	265	293	328
Projects			
Total Grants of the Active	RMB212.36M	RMB252.59M	RMB278.22M
Research Projects			

# 6.2 City University of Hong Kong Chengdu Research Institute

City University of Hong Kong Chengdu Research Institute (CityUCRI) continues to serve as the second strategic platform of the University after Shenzhen for research and development, incubation and innovation, as well as professional education and training. Research activity at CityUCRI is gaining momentum and five research projects are ongoing.

# 7. Impact Cases

Knowledge transfer is not necessarily restricted to science and engineering disciplines. Faculty members from arts and humanities do equally well in making an impact on the society. Highlighted below are examples of significant knowledge transfer endeavors of the University carried out during the year under review which include an award-winning project from the Department of Linguistics and Translation. Apart from the examples quoted below, our faculty members also responded actively to the society need of combating COVID-19 which includes a new method for making anti-bacterial graphene masks quickly and cost effectively that has been licensed to an SME in Hong Kong; a new ventilation system to protect healthcare workers from COVID-19 infection; and a mathematical model to project the spread of COVID-19 pandemic.

#### 7.1 New MRI Approach for Earlier Detection of Alzheimer's Disease

Collaborative research by CityU and Johns Hopkins University has developed a new, non-invasive way to identify Alzheimer's disease even before any symptoms appear. This breakthrough will definitely bring good news to mankind as Alzheimer's Disease is commonly regarded as an age-related disease and has recorded an upward trend as a result of global ageing population.

Dr Kannie Chan from the Department of Biomedical Engineering and her team collaborated with scientists from the US, Sweden and Hong Kong in pioneering this pre-clinical study. They have developed a molecular imaging approach, based on Magnetic Resonance Imaging (MRI), to dynamically measure glucose level changes in the brain's lymphatic system, which can provide early cues about the disease. Their findings were published in the scientific journal *Science Advances* in May, 2020.

The tricky part of fighting Alzheimer's disease is that early symptoms, such as the emergence of protein plaques in the human brain, which hamper the cognitive function, are similar to normal

ageing. Even more challenging, patients diagnosed with symptoms are most likely in the middle or late stage of the disease. Overlooked pathologies in the brain could have happened 15 or 20 years before the symptoms appear.

Dr Chan's new imaging approach can assess glucose uptake and clearance in the lymphatic system of the brains of mice in a non-invasive way. By using glucose as a natural 'tracer', Dr Chan's imaging method can sensitively detect the distinctive changes in the lymphatic system function at the molecular level at the early stage of Alzheimer's disease, helping doctors to differentiate it from normal ageing.

The new imaging approach is compatible with the MRI machines commonly used in clinics and hospitals, which means low set-up cost and technically easy transfer to clinical applications.

# 7.2 Global Estuaries Monitoring Programme for Formulating Long-term Policy of Promoting Clean Estuaries

Marine pollution is one of the pressing problems of environmental pollution. CityU's State Key Laboratory of Marine Pollution (SKLMP) leads a ten-year global initiative, Global Estuaries Monitoring (GEM) Programme, with a view to developing a worldwide monitoring network to monitor environmental contaminants (e.g. pharmaceutical residues, emerging pollutants of concern, microplastics, pathogens, etc.) in major urbanised estuaries worldwide so as to formulate a long-term policy of promoting clean estuaries. This is the only proposal from Hong Kong and one of two from China endorsed by the United Nations (UN) as "Ocean Decade Actions" under the "UN Decade of Ocean Science for Sustainable Development (2021-2030)".

The GEM Programme is led by Professor Kenneth Leung from the Department of Chemistry in collaboration with researchers from around the world including the University of York, US; Sydney Institute of Marine Science (SIMS), Australia; Baylor University, US; and the State Key Laboratory of Marine Environmental Science in Xiamen University, China.

At present, over 100,000 chemical substances are being used in our daily life and industries, and many of them will eventually be released into the estuaries through different pathways. There is a lack of information available around the globe concerning the occurrence and environmental risks of chemical contaminants in urbanised estuaries. To support marine water quality management, the GEM Programme endeavours to scientifically derive water quality criteria (WQC) for chemical contaminants that represent safe environmental concentrations at or below which the marine ecosystem is safeguarded. Results of the Programme will reveal the pollution situation around the globe, identify the estuaries that require attention and improvement, recommend priority contaminants for control, and promote best practices to combat the pollution problems.

#### 7.3 A Sustainable and Energy-saving Solution to Reduce Electricity Consumption

Scientists from around the world have been working hard to slow down global warming. Here is an innovative solution offered by Dr Edwin Tso from the School of Environment and Energy. To provide a sustainable and energy-saving solution to the consumption of electricity in buildings, Dr Tso has developed a passive radiative cooling paint, using the universe as a cooling source. Unlike traditional air-conditioning systems, the passive radiative cooling paint is an energy-free and refrigerant-free cooling technology that reflects incoming solar irradiance, while emitting thermal radiation to the cold universe and achieving sub-ambient cooling.

This self-cooling technology possesses many advantages, such as a simple structure, easy manufacturing, and low cost. Directly coating this paint on a building's roof or exterior walls will reduce its surface temperature and save on air-conditioning energy. The technology can be used for cooling automobile, in self-cooling textiles and painting roads to mitigate heat from land.

Dr Tso's technology won the Gold Medal with Congratulations of the Jury at the Inventions Geneva Evaluation Days 2021.

### 7.4 Next-generation Batteries: Safe and Comfortable to Wear

With the rapid development of wearable devices including wearable living devices such as smart watches; wearable medical devices such as body temperature patches and electrocardiogram suits; intelligent packaging; luminous/electric heating clothing, etc., there emerges an enormous demand for flexible batteries. Professor Zhi Chunyi from the Department of Materials Science and Engineering specialises in developing next-generation flexible batteries with strong emphasis on structural capability, safety and comfort to wear even on close contact with our skin.

Professor Zhi puts great emphasis on the core technology of flexible battery. More than 20 patents have been applied, covering electrode materials, electrolytes, packaging materials, flexible structure design, flexible battery application, and flexible battery test equipment, etc. The technology has led to the establishment of a spin-off company, Amazinc Energy Ltd. (AmaZinc), for commercialization of the flexible batteries.

AmaZinc operates a research and development laboratory in Shek Mun, Hong Kong, whereas in Dongguan it has a small development centre cum assembling plant for production. The company has been sponsored by the Hong Kong Science and Technology Park through "Technology Incubation Programme" with a total investment of more than HK\$2 million. It has also secured funding support from Dongguan government. Its clients range from local companies looking for reliable battery solutions to multinationals that wish to stay on top of their game with innovative, next-generation flexible batteries. For example, the company has been developing watch strap batteries for a Guangdong-based company, a leading smart watch brand targeting kids in the global market. It has also worked with fashion brands for electronically illuminated clothing and accessories, in addition to military supplies manufacturers for heated wearables.

#### 7.5 International Phonetic Alphabet (IPA) Guide for Visually Impaired Learners

The International Phonetic Alphabet (IPA), a set of standardized symbols for the representation of all the possible sounds in the world's languages, serves as the foundation for people to study phonetics and languages. Dr Jackie Yan from the Department of Linguistics and Translation developed a new IPA Guide for Visually Impaired Learners which is developed by both visually impaired (VI) and sighted people, facilitated by various technologies. Through collaboration, this Guide is intended to remove, to a great extent, the first obstacle for people who are visually impaired to learn IPA.

Various technologies were used in this IPA Guide. Firstly, the IPA symbols were printed in embossments, allowing visually impaired learners to acquire the symbols' typographic features through touching. Secondly, an audio version of the book was provided. By scanning the QR code on each page, learners can quickly access the audio of the content read by a native English speaker. Thirdly, audio description was provided for each IPA symbol to facilitate students' learning of the typographic features of each symbol. Last but not least, Braille is provided for the main content of the guide. These technologies help make the guide accessible to the visually impaired learners, who can either listen to the audio or use Braille to acquire IPA.

This new IPA Guide is a good demonstration of sighted and VI people working together for developing more "barrier-free" resources in real-life educational settings. It can be put in libraries for visually impaired people's daily study and reference purposes, and has been made available in the Special Education Needs Room in the Run Run Shaw Library at CityU. The project won a Silver Medal at the Inventions Geneva Evaluation Days 2021.

# Summary of Knowledge Transfer Performance Indicators

(Amounts are in Hong Kong dollars)

Performance Indicators	2020-21	
Intellectual Property (IP)		
No. of patents filed in the year	166	
No. of patents granted in the year	*80	
Expenditure involved in generating income from intellectual property rights	\$14.6M	
IP Licensing		
No. of active licenses during the reporting year (inclusive of newly granted ones)	38	
Income generated from intellectual property rights	\$2.19M	
Industry Engagement		
No. of collaborative research projects and income thereby generated (inclusive of ongoing and new projects)	65/\$40M	
No. of contract research projects (other than those included in "collaborative researches" above), and income thereby generated (inclusive of ongoing and new projects)	246/\$125M	
No. of consultancies, and income thereby generated	63/\$8M	
Continuing Professional Development (CPD) courses		
Income received from and number of attendees of CPD courses (inclusive of professional doctorate programmes and taught postgraduate programmes except for PCLL)	\$850M/11,278	
Community Engagement		
No. of public lectures/symposiums/exhibitions and speeches to a community audience organised/co-organised by CityU (seminars and workshops are included)	231	
No. of performances and exhibitions of creative works (by staff or students) organised/co-organised by CityU	16	
No. of staff engaged as members of external advisory bodies including professional, industry, government, statutory or non-statutory bodies	389	
Entrepreneurship		
Number of start-ups/projects (championed by our students/alumni/staff, inclusive of those championed by non-CityU members but using CityU IP) which have received CityU entrepreneurial funding support	83	

Remark: \* updated in Jan 2022 due to a delay in receiving formal notification from patent offices.

#### **Knowledge Transfer in College of Business**

#### **Department of Accountancy**

The KT effort of the Department of Accountancy (AC) during the reporting period focuses on facilitating a deeper understanding of Hong Kong professional services on Economic and Trade Cooperation Zones along the Belt and Road countries. AC colleague, Professor Phyllis Mo, who is Associate Director of Research Center for Sustainable Hong Kong (CSHK), CityU, is the Deputy Project Co-ordinator of the project "Advancing Professional Development on Economic and Trade Cooperation Zones Along Belt and Road", which is funded by the Professional Services Advancement Support Scheme of the Commerce and Economic Development Bureau, HKSAR Government.

During the reporting year, Professor Mo and her project team have organised an opening symposium (kick-started by Mr Lester Huang, Council Chairman of CityU and keynote address was given by Mr Bernard Chan, Under Secretary, Commerce and Economic Development Bureau, HKSAR Government) and three professional workshops covering cultural diversity and efficient management: Hong Kong professional services, overseas investments, and Special Economic Zones in Cambodia, Sri Lanka, and Vietnam respectively. The symposium and workshops are supplied and collaborated by a number of professional bodies and business chambers in Hong Kong. More than 300 participants attended the opening symposium. The number of participants in the workshops was, on average, 180. Professor Mo also serves as a Member of the Vetting Committee for the Professional Services Advancement Support Scheme.

#### **Department of Economics and Finance**

During the reporting period, faculty members of the Department of Economics and Finance (EF) continued actively serve on prestigious advisory boards of academic, professional, governmental and industry organisations, for instance, Hong Kong Insurance Authority, Hong Kong Institute of Bankers, Hong Kong Blockchain Society, Investor and Financial Education Council, Financial Reporting Council, Hong Kong Council for Accreditation of Academic & Vocational Qualifications, Vocational Training Council, Hang Seng University of Hong Kong, Lingnan University, etc.

In addition, EF faculty members are also connected closely with the community. They actively participate in various events and/or conferences, such as "Which is the next Shenzhen" organised by CM Think Tank, and voicing out / sharing views and insights on some hot topics, such as the potential independence of Scotland, COVID-19 pandemic and job creation, trade and welfare benefits of deep trade agreements, etc., through various media such as Financial Times, Reuters, Bloomberg News, The Telegraph, Voxchina, VOXEU, etc.

Despite the pandemic situation, EF managed to report an impact case. One of EF faculty members served as an Advisor for a boutique consulting company to advise and provide support on employee training, talent recruitment, as well as matters related to compliance and corporate governance. In particular, the EF faculty member has made it a win-win situation for both the company and City University of Hong Kong by helping the company recruit two CityU graduates.

#### **Department of Information Systems**

1. Editorial Service of Conferences and Journals, Especially in A+ or A Journals and Conferences

Academic colleagues in the Department of Information Systems (IS) have been serving as committee members, editorial board members and editors of a number of renowned international conferences. Representative examples are: Professor Robert Davison as Editor-in-Chief for *Information Systems Journal* and *Electronic Journal of Information Systems in Developing Countries*. Professor Choon Ling Sia as Associate Editor for *Information Systems Research*. Professor Xin Li as Associate Editor for *INFORMS Journal of Computing* and *ACM Transaction on Management Information Systems*, as Senior Editor for *Information Technology & People*. Professor Wei Thoo Yue as Guest Associate Editor for *Information Systems Research (Special issue on FinTech)*. Dr David Xu as Associate Editor for *Information Systems Research and Information Systems Journal*. Dr Juhee Kwon as Associate Editor for *Asia Pacific Journal of Information Systems*. Dr Alvin Leung as Associate Editor for *Communications of the Association for Information Systems* and *Decision Support Systems*. Dr Ben Liu as Associate Editor for *MIS Quarterly*. Dr Junming Liu and Dr Zhiya Zuo as Associate Editor for The Pacific Asia Conference on Information Systems (PACIS) 2020.

#### 2. Talks and Seminars

Owing to the COVID-19 pandemic since February 2020 and its erratic development in the local communities and countries overseas, many research activities and public events were cancelled during the census period.

#### 3. Organising of Research Collaboration with Industries

Professor Xin Li acted as the Advisor for a big data project with Guangdong Development Bank.

# 4. Serving on the Advisory Boards of Other Universities or Companies, Key Appointments in Professional Associations/Organisations, as well as External Academic Appointments

Professor Kai Lim as Honorary Professor for Fudan University and Fellow of the Association for Information Systems. Professor Robert Davison as Visiting Professor for Loughborough University, University of Sydney and University of New South Wales, as External Assessor for University College Dublin. Professor Choon Ling Sia as Visiting Professor for National Taiwan University and Fellow of the Association for Information Systems. Dr David Xu as the Distinguished Member -Cum Laude of the Association for Information Systems and External Examiner for The Hong Kong Polytechnic University.

#### **Department of Marketing**

Department of Marketing (MKT) continues to actively engage in various knowledge transfer activities in the academic year 2020-21.

In the area of industry consultancy service, the Department provided consultancy services for more than 10 companies. Professor David Li completed a consultancy project for Alibaba Group. The project is about forecasting the e-commerce orders and discovering the order structures. The project has led to a few publications, including a top-tier conference paper (SIGKDD), among others. The Department has continued the tradition of running the BBA Marketing final year projects supervised by a Senior Teaching Fellow. The companies participated in the final year projects include Otsuka Pharmaceutical (H.K.) Limited, CLUB by HKT, Price.com.hk Limited, Chiron Healthcare Group Limited, Livi Bank, Futu Securities International (Hong Kong) Limited, BOX

Group Life Assurance Company Limited, Link REIT, Shanghai Pudong Development Bank Co., Ltd., Kabushikigaisha Ltd., CooperVision Hong Kong Ltd., and Zkin Advanced Beauty.

In the area of community engagement, despite COVID-19 and limited activities were held during the period, both faculty and teaching grade staff were still proactively engaged in media interviews and community activities via online. In total, around six media interviews were conducted and more than 10 public lectures/speeches were delivered/organised in 2020-21.

Furthermore, some faculty members contributed to the success of various university and community events in different capacities. For example, a faculty member was judge for Hong Kong Top Brand Award organised by HK Brand Development Council; another faculty was judge for HKET Shopping Mall Awards; a faculty member delivered a speech for promotion of joint PhD programme with Nakai University; a faculty was being interviewed by a social media platform for promotion of EMBA programme; a teaching grade staff was panel member for Po Leung Kuk Chow Shun Kam Primary School Alumni Committee, and advisor for Hong Kong Creative Public Relations Competition.

In 2020-21, the Department organised nine guest talks/Business Leader Forums, which were opened to the public.

In the area of professional services, faculty members are reviewers for a number of journals such as Association for Consumer Research, Color Research and Application, Global Media and China, Industrial Marketing Management, Information Systems Research, International Journal of Emerging Markets, International Journal of Physical Distribution & Logistics Management, International Marketing Review, Journal of ESIC Market, Journal of Business Research, Journal of Inter-Organisational Relationships, Journal of International Marketing, Journal of Management, Journal of Marketing Communications, Journal of Retailing, Journal of Academy of Marketing Science, Management Science, and Young Consumers.

MKT faculty members also served as advisors for some organisations such as Hong Kong College of Technology, Hong Kong Statistical Society, Lingnan Institute of Further Education, Lingnan University, Tung Wah College, and UOWCHK Academic Board.

A senior faculty member is the Subject Convenor for Research Grants Council, Hong Kong; and Specialist for Hong Kong Council for Accreditation of Academic & Vocational Qualifications.

Some faculty members are editors or editorial board members of some journals such as Asia Pacific Journal of Operational Research, Asian Journal of Business Research, European Journal of Marketing, Journal of Contemporary Marketing Science, Journal of Marketing Science (Chinese), and Journal of Advertising.

In conclusion, the Department always encourages faculty to engage in knowledge transfer activities. Contract research will be an area the Department will continue to promote.

#### **Department of Management**

For 2020-21, the Management Department remains highly engaged in activities serving the academic community. Professor Jane Lu is the President of the Asia Academy of Management and a member of its Board of Governors, as well as senior editor of *Journal of World Business*, consulting editor for the *Asia Pacific Journal of Management* and consulting editor of the *Journal of International Business Studies* (an A+ journal). Nine members of the department are currently holding a total of 26 editorial board positions. Included in these are five A+ journal board positions, three A journal board positions, and eight each in B+ and B journal board positions.

Professors Jane Lu and Maris Martinsons are on the list of the world's top 2% of business and management scholars/scientists, according to a recent study by Stanford University.

#### **Department of Management Sciences**

Department of Management Sciences (MS) has proactively engaged in the dissemination of knowledge and providing inputs to problem solving for the community, industry and the public.

The Statistical Consulting Unit (SCU) has conducted four investigations using telephone interviews to create the Hong Kong Consumer Confidence Index (HKCCI), which is an index that represents the confidence level of the Hong Kong consumers across a given time period in six important areas, such as Economic Development, Property Purchase, Stock Investments, and Employment.

The Unit also helped the LES Taskforce and the Career and Leadership Center in CityU with the Student Learning Experience Survey and the Graduates Employment Survey respectively. For the industry, the Unit has provided professional consulting services for RoadShow Media Limited. The Unit also helped the Food and Environmental Hygiene Department and provided research study service for improvement on provision of sanitary fitments in public toilets.

SCU has ignited students' passion for knowledge enhancement. In 2020-21, SCU has offered around 90 part-time job positions with effective training to the student helpers. MS faculty members also actively take up honorary consultant roles in the committees of the public/private organisations, hence directly providing professional comments and advices to the community. For example, one of the MS faculty members is recently elected as the President of the Hong Kong Statistical Society. Other members also act as member in the Vocational Training Council and reviewers of the journals in Operations Management.

#### **Knowledge Transfer in College of Engineering**

#### **Department of Architecture and Civil Engineering (ACE)**

With its inter-disciplinary nature and the wide range of expertise, the Department has been proactively participated in KT activities to transfer its professional knowledge and research results into practice to benefit the industry as well as the society. The department has built up KT relationship with the industry and community through providing high-level consultancy services (eight projects amounting to HK\$2.82M), conducting contract / collaborative research (amounting to HK\$1.80M with six projects and two matching grants) and donation research (amounting to HK\$0.89M with one project and three matching grants) for the public and private organisations. There were 82 externally funded research projects with total funding of over HK\$67.35M (TBRS, ECF, ITF, RIF, ECS/GRF, and other-RGC joint scheme) in progress. Besides, ACE faculty members are also conducting 18 Mainland funded projects with total amount of RMB23.01M. In addition, ACE colleagues also conducted research projects under the PPR funding scheme to facilitate the formulation and development of government's policies in the respective disciplines.

In the area of community services, ACE colleagues are actively sharing their expert knowledge by taking up public services appointments of high-level government committees such as members of the Engineering Panel of RGC, members of Advisory Committees in different aspects for the Building Department and the Hong Kong Fire Services Department, members of Technical Committee on the Code of Practice in various disciplines for the review and establishment of the Code of Practice to satisfy the relevant provisions of the Buildings Ordinance and related regulations. They serve as professional assessment committee assessor and member of statutory professional bodies, for example, Hong Kong Institution of Engineer (HKIE), Hong Kong Institute of Surveyors, and etc. During the reporting period, more than 23 ACE faculty members served on over 81 HKSAR Government Committees, professional institutions, non-profit making organisations and the industry as external examiners / advisors for other institutes or universities. They also took up the role of editor or editorial board members for prestigious journals as well as committee members of international conferences and judging panels. Meanwhile, ACE colleagues engaged in community activities such as giving delivered speeches in various forums, conference and training sessions which related to built environment and smart green building.

# **Department of Advanced Design and Systems Engineering (ADSE) – (formerly Department of Systems Engineering and Engineering Management)**

Department of Advanced Design and Systems Engineering (ADSE) (formerly Department of Systems Engineering and Engineering Management) focuses on research in smart manufacturing and systems engineering which aligns with the Hong Kong government's strategic goal of re-industrialization and the cultivation of high-end intelligent manufacturing.

ADSE faculty members has established a strong network of industrial linkage worldwide. Industrial collaborators include companies and organisations in diversified industries such as public utilities, transportation, healthcare, government organisation, etc. ADSE faculty members also provide advisory services to the government and professional organisations including the University Grants Committee, Occupational Safety and Health Council, Hong Kong Institution of Engineers, Hong Kong Institute of Utility Specialists, Hong Kong Nuclear Society, Hong Kong Society for Quality, American Society for Quality, etc.

#### **Department of Biomedical Engineering (BME)**

In the reporting period, BME researchers made their efforts to apply their research expertise and

innovations with substantial impact to the industry and community in Hong Kong and mainland. Faculty members were engaged as members of external advisory bodies including professional, industrial, government, statutory and non-statutory bodies; as editorial board members of international journals; and as adjunct / visiting professors and advisors / consultants of universities, institutes and companies. Faculty members also took part in exhibitions during the year.

There were a total of 17 on-going consultancy and collaborative projects led by BME faculty members (including CRF, ITFs, contract research, donations, and NSFC/RGC Joint Research Scheme) at a total value of HK\$26.6M during the reporting period, including projects with and donations from local and mainland manufacturers and mainland universities. Among them, nine projects totalling around HK\$14.4M was approved during the reporting year. Professor Dong Sun received RMB\$2.6M under the NSFC Key Programme for his project entitled "*Study of a magnetic micro-robot system in precise delivery of mesenchymal stem cells for articular cartilage regeneration*", which is the first time for CityU to obtain the NSFC Key project as the leading university. Professor Dongan Wang was appointed as Head of Research of Ming Wai Lau Centre for Reparative Medicine, Karolinska Institutet (KI), Hong Kong from 1 August 2020 onwards, which was built upon the MOU between the two universities to promote exchange of knowledge and technical approaches through joint activities including research collaboration. One US patent and two mainland patents were granted, along with six US patents filed during the year.

During the reporting year, a PhD student obtained the Student Innovation Grand Award for her project "*Flexible and Wearable Yarn-Based Strain Sensor*" in the Hong Kong ICT Awards 2020. The start-up company co-founded by another PhD student and former CityU graduates invented an intelligent patient transfer robot called "Horizon" to facilitate the transfer of patients between beds which will be used in local care homes soon. The invention won the Community Engagement Award in the Blue Innovation Challenge 2020. Faculty members won two Silver Medals at the International Exhibition of Inventions of Geneva 2021 held virtually this time for their projects "Magnetic Microrobotic System for Precise Cell Delivery in Vivo" and "Neural Motor prosthesis Prototype for the Restoration of Motor Function in Spinocerebellar Ataxia" (team project).

#### **Division of Building Science and Technology (BST)**

Staff members are encouraged to contribute to the development of the building industry through applied research, consultancy services, contract research, engagement in advisory bodies, and delivery of public lectures to practitioners.

In 2020-21, BST has won a large contract research project from the Electrical and Mechanical Services Department (EMSD) with an amount of HK\$981,250, in addition to two on-going projects, one from a private company (HK\$500,000) and another one from EMSD (HK\$1.4M). Through conducting these research projects, two patent applications for invention have also been submitted this year (US Patent Application 63/071,514 and PCT International Patent Application PCT/CN2021/075763).

Besides, as the Division is well-connected with many related government departments and reputable professional institutions such as HKIE, HKIS, CIOB, CIC, HKGBC, BST staff have actively served in many external advisory bodies, as well as holding various leading positions in these professional bodies and government departments, such as Director of Urban Renewal Authority, Director of Hong Kong Green Building Council, and Member of the Appeal Tribunal. During the reporting year, nine staff members served on 36 various Government Committees, professional institutions and non-profit making organisations of the building industry.

The Division will continue to explore knowledge transfer opportunities in the areas of building energy and environmental technology, construction management and engineering, and surveying so as to benefit the community and promote the image of the Division.

# **Department of Computer Science (CS)**

The Department of Computer Science has received worldwide recognition for its outstanding research and pedagogical development. Ranked the 36<sup>th</sup> best Computer Science Department globally by the US News & World Report (2021), and top-100 worldwide by QS World University Rankings in the Subject of Computer Science and Information Systems (2021), the Department is engaged in an on-going pursuit of excellence.

The Department conducts world-class fundamental and applied research. With 227 research projects in progress with total funding of over HK\$175M, the vital areas covered include artificial intelligence, bioinformatics, cloud computing, data science, evolutionary computation and metaheuristic, information security, machine learning, mobile computing, multimedia computing, software engineering, vision and graphics.

The Department has established strong reputation in the research community and actively participated in various KT activities. CS staff have been serving as journal editors, committee members of international conferences, judging panels & committees for government, learned societies and professional bodies (e.g. Vice President of IEEE Systems, Man and Cybernetics; Vice President of Chief Executive's Award for Teaching Excellence, Education Bureau etc.).

# Collaboration with Industry

The Department has developed a wide range of applied research initiatives in collaboration with leading edge institutions and companies such as Huawei Technologies, Tencent Mobility, and ByteDance, etc. These include projects on blockchain applications, bioinformatics, advanced video coding and system optimization which have attracted funding amounts of over HK\$25M from the industry and the Innovation and Technology Commission in the past year. Examples of applied research projects obtained by CS Staff in 2020-21:

Principal	Project Title
Investigator	
Dr WANG Shiqi	Study of High Efficiency Video Coding Technologies for Cloud Gaming
Dr XUE Chun Jason	Hardware-based acceleration for storage systems
Dr WANG Shiqi	Intelligent Compression, Transmission and National Standardization for
	High-throughput Genome Data
Prof ZHANG Qingfu	Investigation on Multi-fidelity Multi-objective Heuristics
Dr LEUNG Wing Ho	Trial: Smart Handwriting Analysis and Recognition Platform (SHARP)
Howard	

Nurture Entrepreneurship and Encourage Start-ups

The Department recognises the importance of nurturing students' entrepreneurial spirits in leveraging the knowledge to applicable business practices. The efforts in promoting entrepreneurship have reaped fruits with a number of graduates starting up their own companies.

Graduate (Name, Prog&Year)	Name of the Company
GUO Kailun (BScCS 2020)	Areix Analytics Limited (fintech)
XIONG Bernie (MPhil 2010)	Klook Travel Technology Limited (online travel platform)
WONG Nok Ching Joshua (BScCS 2017)	Flow Entertainment Limited (intra-day hotel

	reservation)	
Mr HANG Ching Nam (BScCS 2019, PhD	Nautilus Software Technologies Limited	
student)	(STEM education)	
Mr LING Lin Alex (PhD student)		
Mr YU Pei-Duo (PhD student)		
ZHOU Liuyang Leo (PhD 2014)	智言科技 (artificial intelligence to develop chatbot solutions)	
WONG Shek Fei Duncan (BScCS 2015)	HoTechie Ltd. (IoT solutions, mobile apps)	
CHAN Chung Ngok (BScCS 2014)	Innothink Tech Ltd. (mobile apps); Musedom Tech Ltd. (cloud-based appl.)	
WONG Ka Wai (BScCS 2013)	Algo Tech Ltd. (enterprise sys.); Raysion Tech Ltd. (clinic mgmt. sys.)	

#### IT Professional Placement

Since its introduction in 1988, the IT Professional Placement (at least nine months) has constituted a fundamental and strong component of CS's undergraduate BScCS programme – allows students to gain experience within a workplace and transfer their knowledge learned at the University to the industries. The number of organisations participating in the IT Professional Placement programme has increased every year since it started, and there were around 66 companies offering placement in 2020-21. They included some very prestigious companies like ASM Pacific Technology, Swire Resources, HK Exchanges and Clearing, Siemens, PricewaterhouseCoopers, Bank of East Asia, Hongkong Electric, etc. with extension to overseas institutions in recent years. Through expanded liaison with industry partners and enhanced administrative support, CS successfully placed 168 students and received a mean score of 4.03 out of 5 rated by employers in 2020-21.

#### **Department of Electrical Engineering (EE)**

EE Faculty members have continued to actively engage in various knowledge transfer activities. Top-notch research activities led to publications in prestigious journals in IEEE, as well as high-calibre journals including *Nature* and *Nature Communications*. There are 103 externally funded projects in progress with a total funding of over HK\$144M including Collaborative Research Funds, Theme-based Research Funds, Innovation and Technology Funds. In the past year, there were 14 active licenses and 12 industrially related grants with an amount of HK\$46M. EE has connections with the local community through providing seven consultancy services amounting to HK\$2.7M and 11 contract research projects amounting to HK\$7.0M. Actively engaged in COVID projects, several faculty were granted a total of HK\$11.2M by the Innovation and Technology Commission on "Portable Disinfection Device for COVID-19 Using Far-UVC Light" and "Precision Prediction Models for COVID-19". A Midstream Research Programme of HK\$7.4M was recently granted on "Viral Metagenomic Sequencing as a Broad-spectrum Pathogen Detection Technology for Viral Diseases". Since 2001, there has been a total of 172 patents granted and 83 patents filed.

EE continued to foster connection on research and technology transfer between Hong Kong and Mainland. This year saw the establishment of The Greater Bay Area Joint Laboratory of Big Data Imaging and Communications, funded by the Department of Science and Technology of Guangdong Province. Launched since 2019. CityU EE Joint Lab as а Government-Industry-Academic-Research Centre Scheme was expanded with 11 newly established partnership with Huawei Technologies Co. Ltd. (Huawei), Microchip Technology Inc., Sengital Ltd., Shenzhen Corerain Technologies Co. Ltd., Xilinx Inc., ASM Pacific Technology Ltd., Gold Peak Industries (Holdings) Ltd., Microsoft Hong Kong Ltd., Sino Group, SmarTone

Telecommunications (Holdings) Ltd., and SUGA International (Holdings) Ltd.. The frequent interactions with industry is beneficial for enabling knowledge transfer continually.

# **Department of Mechanical Engineering (MNE)**

Despite the pandemic in 2020, the faculty members of MNE continue to be engaged in a variety of knowledge transfer activities. These include serving as a member of various advisory committees, or panels, e.g., engineering panel of RGC, Innovation and Technology Fund (ITF) and Hong Kong PhD Fellowship scheme and postdoctoral fellowship scheme, and editor or editorial board of various journals, such as *Advanced Engineering Materials, Materials Research Letters, Nuclear Engineering and Design*, etc. Our faculty members also actively participated in community engagements. Over the past year, our faculty members have filed seven patents in US and mainland China through their innovative researches. There are a number of outside practices conducted by MNE faculty members with the estimated contract value exceeding HK\$2M.

Significantly, we are proud to present two impact cases. Professor Jian Lu and Dr Yangyang Li invented an Ultrasensitive and Low-Cost SERS Sensors for Realizing the Point of Care Testing (POCT), which provides an economical and environmentally friendly electrochemical fabrication method for efficient roughening of precious materials (e.g., Ag, Au or Cu) to produce topological nanostructured surface of high specific area and desirable morphology that can be easily controlled by adjusting the electrochemical parameters. The sensitivity of the SERS sensors is 100 times higher than the current commercial SERS sensors (Renishaw, Nanova, etc.), while the cost is tens of times lower than the cheapest commercial SERS sensors (Ocean optics, etc.).

Another impact case of outstanding KT endeavours is led by Dr Jiyun Zhao, who is serving as Vice Director for Guangdong Province Advanced Nuclear Energy Artificial Intelligence and Virtual Reality Research Center --a joint nuclear research center in Guangdong province by China Nuclear Power Technology Research Institute, Guangzhou Huantek Technology, and CityU. The center will focus on the lead cooled fast reactor (LFR) development. The cutting-edge technologies such as Artificial Intelligence and Virtual Reality will be adopted for the research. The joint research center will make significant contribution for the advanced nuclear technology development in the Greater Bay Area.

#### **Department of Materials Science and Engineering (MSE)**

In the year of 2020-2021, MSE faculty members have accomplished extraordinary achievements in various knowledge transfer activities including contract research and patent applications. To be specific, they published more than 1000 articles in various high-impact journals during the report period. Among them, many of the works have the promising potential to be further commercialized. For example, several patents of Professor Chunyi Zhi have been licensed to various companies for the further technology and product development. Apart from these product commercialization activities, MSE colleagues are also very active engaging into different communities, including to serve as editors or editorial board members for prestigious scientific journals. In particular, Professor Andrey Rogach serves as the Associate Editor for *ACS Nano*, one of the top journals in materials chemistry. Professor Yuntian Zhu is the Founding Editor-in-Chief for *Materials Research Letters*, another top journal in the area of structural materials. MSE colleagues are also invited to review research grant proposals for overseas research funding agencies as well as master's theses and doctoral dissertations for local and overseas universities.

# Knowledge Transfer in College of Liberal Arts and Social Sciences

CLASS was the first College in the University to launch the Excellence in Knowledge Transfer Awards in 2011 and this has become an annual event of CLASS since then. In the year of 2020-2021, three winning projects were selected as follows:

Project Title	Department	Recipient	
Excellence in Knowledge Transfer Award			
Rethinking and Shaping Knowledge and Practice on Aging: Forging close ties among universities, industries, and the wider public	Department of Social and Behavioural Sciences	Dr CHOW Oi Wah Esther	
Certificate of Merit			
A Chinese-English Glossary of Terms Commonly Used in the Teaching of Junior Secondary Chinese History to Support Non-Chinese Speaking Students Learning Chinese History and Culture in Secondary Schools	Department of Chinese and History	Dr TSUI Lik Hang	
Multimodal English Language Learning	Department of English	Professor Diane PECORARI	

Departments of CLASS were also actively engaged in various KT activities and their significant highlights are summarised as follows:

# Department of Asian and International Studies (AIS)

Through its KT activities, AIS disseminates new knowledge concerning socio-political, economic and cultural processes of change in Asian countries, situating these changes in the broader global context. AIS placed a strategic focus on media outreach for its KT contribution in 2020-21. For a small department, we managed a record number of media interactions during the year—79 to be exact—enabling us to reach regional and global audiences. AIS takes seriously the role of engagement with top global media outlets to ensure that CityU remains ranked as the world's most international university and the DAA has observed that "few departments around the world can boast such an array of media impact." AIS media engagement serves to offer new ways of approaching issues that are then reflected upon by decision-makers and the general public. It also builds CityU's global brand, which facilitates research ties and recruitment of top international students.

# Department of Chinese and History (CAH)

CAH members transferred knowledge by:

- 1. developing a "Chinese-English Glossary of Terms in Chinese History" for secondary schools in Hong Kong;
- 2. using online (such as a podcast) interviews and mainstream media to present exciting discussions to the mass public;

- 3. organising an online art festival "Performing Our City: Mask ON-Theatre" aims to transfer cultural knowledge to the internet community;
- 4. actively participating as board members in government bodies; and
- 5. organising workshops for secondary-school teachers and students and lecture series for the mass public.

# **Department of Media and Communication (COM)**

In 2020-21, COM carried out the following KT activities:

- 1. 22 public lectures, seminars, workshops, and exhibitions to a variety of audiences, including:
  - public lectures and seminars to audiences at major universities locally and in the Greater China area on a variety of topics including health communication, new technology in communication and communication policy;
  - lecture session on how to execute crisis intervention in the suicide prevention hotline service; and
  - exhibitions for original creative work on Hong Kong Harbour and Lighthouses.
- 2. 4 Media interviews/publications were recorded including:
  - interview with Nishinippon Shimbun;
  - interview with local press *Ming Pao*;
  - public service website for disseminating research output; and
  - public blog for disseminating knowledge about computational research.
- 3. 32 advisory positions at various professional organisations including :
  - 19 editorships/associate editorships at academic publication outlets;
  - 13 external advisory appointments in the capacity of external examiners, mentors, and administrative leaders; and
  - Supervision of a team of undergraduate students to win a HK Tech 300<sup>TM</sup> Seed Fund to develop a start-up mobile business.

#### **Department of English (EN)**

The knowledge transfer activities of the Department of English focus on academic/professional communication, teaching/training activities and community literary events. Literary events include a writing competition for secondary school students and the publication of a collection of creative writing by Hong Kong secondary and tertiary students, entitled *Halfway Home X*. The Department also participated in the COVID-19 writing competition run as part of the One Health cluster. One significant case study related to academic/professional training activities was a project entitled *'Multimodal English Language Learning*'. This involved the use of media and social media to reach out to a wider public with a series of instructional YouTube videos on academic and professional communication in social sciences and natural sciences.

#### **Department of Linguistics and Translation (LT)**

In this reporting period, faculty members at the Department of Linguistics and Translation continued to contribute their expertise outside CityU as conference committee members and panel members at government bodies, and in leadership roles in a number of academic associations and journals. Our knowledge transfer activities include numerous public talks and workshops, media engagement, and student internships; contract research projects with support from industry and from UGC's Research Matching Grant Scheme; and, notably, the *IPA Guide for Visually Impaired Learners*, which received a Silver Medal in the prestigious Inventions Geneva Evaluation Days.

# **Department of Public Policy (POL)**

POL colleagues have actively participated in KT activities, in the aspects of external advisory appointment (serving on editorial board of international journals, advisory panel of professional organisations, academic programmes, industrial bodies, NGOs and governmental departments) and community engagement (delivering public lectures or speeches, having media interviews, writing newspaper articles, participating and organizing online seminar and workshops, etc.) during the reporting period.

The impact case of the reporting year is the CSHK PASS Workshop Series led by Professor Linda Li, aiming at advancing professional development on economic and trade cooperation zones along Belt and Road. It showcases POL colleagues' KT capabilities, KT performances and their efforts in bridging academic, government officials, industry practitioners and professional bodies.

# **Department of Social and Behavioural Sciences (SS)**

The growing spotlight on achieving impact through academic activities has inspired the Department of Social and Behavioural Sciences (SS) to promote knowledge transfer (KT) activities with community collaborators. A culture of collaboration is being promoted among faculties, students, alumni, non-government organisations (NGOs), and community partners to discover and innovate to the best practices to build capacities, improve health and education, and inform public policy to benefit our society. Despite being confronted by COVID-19 pandemic in 2020-21, SS colleagues continue to lead actively in conducting public lectures, workshops, and exhibitions of students' creative work. They have also organised international conferences and seminars, received media interviews, press conferences and radio shows, providing consultations and conducting contract research for external bodies, including professional, government statutory and non-statutory bodies and NGOs.

# Chan Feng Men-ling Chan Shuk-lin Language Centre (LC)

KT activities for the reporting period include the engagement in accreditation and examining work for Hong Kong Examinations and Assessment Authority (HKEAA).

The engagement in accreditation exercises organised by Hong Kong Council for Accreditation of Academic and Vocational Qualifications (HKCAAVQ) provides the Centre with up-to-date knowledge in quality assurance and qualification frameworks. The experience also strengthens the Centre's network, including the Industry Training Advisory Committee, professional bodies and representatives of education institutions.

The examining work for HKEAA provides a great opportunity for the Centre to share its expertise and assessment skills to its educational counterparts. The collaboration gives the Centre's access to the best practices and developments relating to teaching, learning and assessment.

#### Knowledge Transfer in College of Science

Member departments of the College of Science are active in KT with accomplishments given below:

#### **Department of Chemistry**

The Department of Chemistry does not hesitate to support its faculty members to actively participate in various knowledge transfer activities. There are two examples in 2020-21.

Dr Vincent Chi Chiu KO and his team has secured a contract research project with Aptorum Therapeutics Ltd to develop characterization methods for their recent collaborative project on various drug candidates. On the other hand, their work on the developments of water-repellent materials and new surface functionalization technology has been approved by CityU's Knowledge Transfer Office to file a US non-provisional patent application (PWG/PA/975/2/2021). The draft of the patent is under review. Besides, their collaborative work with Professor Rudolph WU (The Education University of Hong Kong) in the development of dissolved oxygen sensors and monitoring systems has been filed for a US patent application.

Dr Maria BABAK and her team has invented Ruthenium Arene Shiff-base (RuTEN) Complexes, Uses and Methods for Treating Cancer. The US patent application has been filed on ruthenium anticancer candidates for treatment of aggressive tumours. The drugs demonstrated excellent efficacy against triple negative breast cancers and in particular breast cancer stem cells.

#### **Department of Mathematics**

The Department of Mathematics has continued to step up its efforts to engage activities in community outreach and transfer knowledge to impact the society in 2020-21.

A project to develop new online teaching platforms with modern technologies for students e-learning integration and enrichment of learning experience was awarded a UGC Special Grant (HK\$1.052M) this year. This initiative supports UGC's strategic move towards more intensive and systematic adoption of virtual teaching and learning in the educational landscape. To promote transfer of scientific research knowledge, ongoing projects include collaboration with hospitals to establish segmentation algorithms for medical images, research works to study optimal combined control of Neospora caninum in dairy cattle, developing a model for study transmission dynamics of tuberculosis with age-specific disease progression, and establishing a new predictive tool combined with economic impact and individual behavior change.

To help promote the master programme and benefit students with the current trends and frontiers in mathematical finance, the Department has co-organised with two local institutions and the Hong Kong Consortium of Quantitative Finance to offer a seminar series with 15 financial mathematics/ engineering talks which have been started in May 2021.

Faculty members have made tremendous efforts in their active participation in government, industry and professional advisory bodies and have served selection/advisory committee membership roles for mathematical awards and competitions. They have continued to deliver public lectures/science talks to promote mathematics and the Department to the community. During the year, three teams of undergraduate students participated in the Mathematical Contest in Modeling (MCM)/The Interdisciplinary Contest in Modeling (ICM) and received Meritorious Awards (2 teams) and Honorable Mention (1 team).

The Department has 79 ongoing projects with a total funding of HK\$40.32M. One of the projects is funded under the RGC Senior Research Fellow Scheme which is a prestigious honor with awarded amount of HK\$7.798M. To promote global networks for research collaboration, the Department has co-organised an International Conference on Applied Mathematics with the Liu Bie Ju Centre for Mathematical Sciences this year. In professional services, 10 faculty members are actively serving editorial roles in 72 mathematics journals.

### **Department of Physics**

In 2020-21, the Department of Physics made significant knowledge transfer achievements. Our faculties, Professor Paul Chu and Dr Condon Lau, have been notably active in the industrial sector: Professor Chu was a co-founder and board member of Shenzhen CAS Morefound Co., Ltd and the president of Plasma Technology Limited; and Dr Lau was the director of ITsci Company Ltd. Our faculty members continued to engage in various local, national and international academic and industrial institutions. Locally, Professor X L Wang was the president of the Physical Society of Hong Kong. Several of our faculties played active roles serving as committee and advisory board members of professional and governmental agencies including the Biomedical Discipline of the Hong Kong Institute of Engineers, the Hong Kong Physics Olympiad Committee, the interview panel of the Hong Kong Scholarship for Excellence Scheme (HKSES), the Hong Kong Examinations and Assessment Authority, the Assessment Panel for Competitive Research Funding Scheme for the Local Self-financing Degree Sector (APSF) and the Joint Research Scheme (Physical Science Panel) for the Research Grants Council, UGC. Nationally, Professor X L Wang and Professor Wei Bao were particularly active as advisors and committee members of several academic institutions and national facilities in China, including China Spallation Neutron Source (CSNS), Chinese Academy of Sciences, Chinese Physics Society, the Institute of Advanced Science Facilities (IASF), Songshanhu Materials Laboratory, and the Chinese Ministry of Education. In the international scientific community, our faculties served as editors and editorial board members of numerous reputable journals, such as the Journal of Environmental Radioactivity, Nuclear Technology & Radiation Protection Journal, Journal of Cluster Science, Journal of Electronic Materials, Scientific Reports, Chemical Physics, Journal of Theoretical and Computational Chemistry and Journal of Applied Physics. Furthermore, some of our colleagues served as External Examiners for PhD candidates and as reviewers for grant proposals and faculty promotion/tenure panels in local as well as overseas universities and research funding agencies. Promoting science education was also one of our emphasis in community involvements. In the reporting year, our faculties have made several public lectures targeting the local public audience as well as secondary school students in high schools and the science museum.

The Department strongly encourages colleagues to reach out and contribute directly to the Hong Kong society and the international scientific community. Contribution to consultancy and patent application are recognised in the Department's performance-based pay review scheme. The Department also facilitates the application for industrial related research funding, e.g. ITF, and contract research by colleagues in order to build up direct collaborative relationship with the industries. The Department will work towards maintaining high-level and high-quality capabilities and external links for KT.

#### Knowledge Transfer in Jockey Club College of Veterinary Medicine and Life Sciences

Over the past year, the Jockey Club College of Veterinary Medicine and Life Sciences (JCC) continued its efforts to contribute to the transfer of knowledge through various channels and platforms to benefit the community at large. The following highlights showcase JCC's knowledge transfer endeavours to make a difference at local, regional and international levels.

Department of Biomedical Sciences (BMS) and Department of Infectious Diseases and Public Health (PH), Department of Neuroscience (NS) and Department of Veterinary Clinical Science (VCS) carry out internationally competitive research and promotes interdisciplinary collaboration in fields of biomedical sciences and veterinary medicine. The research programmes aim to understand fundamental mechanisms of biological processes and diseases, and translate new knowledge into the development of novel diagnostic and therapeutic strategies for prediction, prevention, and treatment of human and animal diseases.

BMS research focuses on the following strategic areas: systems cancer biology, neuroscience, regenerative medicine, biotherapy and nanomedicine, and infectious diseases and immunity and the Department has strong record in obtaining competitive external grants such as GRF/ECS, CRF, ITF, NSFC and Research Projects funded by the Mainland Government.

The Centre for Applied One Health Research and Policy Advice (OHRP) in JCC provides a pivotal platform to facilitate knowledge transfer activities. Its mission is to generate scientific knowledge that will lead to the development of evidence-led policies at local, national, regional and international levels for the prevention and control of infectious animal diseases affecting human health and animal production, welfare and health. It will also emphasize the societal impact of its outputs through effective science-policy communication.

With generous support by the Agriculture, Fisheries, and Conservation Department, HKSAR Government, the Jockey Club College of Veterinary Medicine and Life Sciences and the OHRP research team have developed the first ambulatory veterinary service for fish, pig, and poultry farmers in Hong Kong. The overarching goal of the ambulatory service is to work with the farmers to find solutions for preventing disease and to improve the sustainability of their farms. The ambulatory team examines terrestrial and aquatic production animal populations at the request of the farmers and assist them with animal health and production needs. The team aims to enable the farmers to respond more rapidly and cost-effectively to different animal health and production issues. The projects not only benefit individual farmers but also enhance the economic and environmental sustainability of the pig, poultry and fish farming industries in Hong Kong. Effective animal health strategies for local farms ensure healthy animals and safe food for the consumers. Having healthy local animal populations will also guarantee a steady supply of fish and meat to safeguard Hong Kong's food security.

The Department of Neuroscience and Department of Veterinary Clinical Sciences were established in the past two years. As the Departments grow in size, they also begin to engage in different forms of KT activities in the form of Community Engagement and External Advisors in various capacity.

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### **Knowledge Transfer in School of Creative Media**

The School of Creative Media (SCM) has yielded a remarkable range of activities in this reporting year which resulted in significant knowledge transfer. The School's performance in knowledge transfer is largely characterized by public engagement through the organisation of exhibitions and research and teaching practices that emphasize the creation of widely seen creative outputs.

The first case of outstanding knowledge transfer endeavour is the Art Machines: Past and Present Exhibition which was held between 24 November 2020 till 23 May 2021 at CityU Indra and Harry Banga Gallery. The exhibition sought to document the long standing collaboration between artists and engineers in the 20th century and featured the work of faculty, alumni, and friends of the School of Creative Media organised into four categories: Kinetic Sculpture and Rube Goldberg Machines, Computer Graphics and Animation, Computer Installation Art, and Sound Art.

The second case of knowledge transfer is the international conference, Art Machines 2, organised and hosted by SCM between 10-14 June 2021. After the success of Art Machines in 2019, this follow up symposium provided for in-depth assessment of the role of AI in the making of computational art and media, and articulated the difference AI Art makes to our understanding of AI in general. With over 180 participants worldwide, the highlights were three keynotes, four plenaries featuring both artists and scientists, 21 panels, an exhibition of 27 artworks, and a student salon.

The third case of knowledge transfer is Professor Jeffrey Shaw's Hong Kong Tourist Board Project: CITY IN TIME which is a cutting-edge new media concept directed by Professor Shaw and produced by the CityU School of Creative Media. This features historical augmented reality

> panoramas at Hong Kong's most visited and history rich locations which can be

accessed through iPhones. Sixteen have been completed and a further 12 are planned.

The fourth case of knowledge transfer is the research/teaching practice of Dr Max Hattler. Hattler is an award winning abstract animator who has created a research led teaching practice which has resulted in numerous exhibitions of student works all over the world and many awards.







#### **Knowledge Transfer in School of Data Science**

The School of Data Science (SDSC) was established in July 2018 with its faculty members comprising interdisciplinary academic leaders in multiple domains, including theoretical analysis, algorithm development, smart cities, Industry 4.0, and applications in FinTech, energy, environment, public health, and precision medicine. SDSC distinctively advocates education and research in data science and encourages active participation in knowledge transfer activities. An example is the joint forces between Hong Kong Institute for Data Science (HKIDS) and DataStory, a fast-growing unicorn enterprise in artificial intelligence (AI), for a strategic collaboration in research areas including Key Opinion Leader (KOL) Sales Model and Intelligence Recommendation to catalyze the transformation of research outcome into the business world.

Our faculty members established KT connections through the provision of consultancy services and contract research. There were three ongoing consultancy projects and 68 contract research projects (GRF/ECS, ITF, NFSC/RGC, TRS, Ger/HKJRS, other-RGC joint schemes, various mainland funding schemes) undertaken by SDSC members under the reporting period. Dean Professor S. Joe QIN was elected as a Fellow of the U.S. National Academy of Inventors (NAI) for his outstanding contribution in creating and facilitating outstanding inventions that made a tangible impact on the quality of life, economic development and welfare of society. A patent application for the invention of "Method of Stable Lasso Model Structure Learning to Build Inferential Sensors" was also filed for submission.

SDSC faculty members were engaged in external advisory appointments during the reporting period through active participation in 48 positions. Their advisory responsibilities were required in industries, institutions, publishers, editorial boards, and professional bodies with entrusted invitations from the international network. SDSC proved its knowledge transfer capacity by advising education curricula, reviewing academic publications, innovative research, and steering industrial practices.

On community engagement, SDSC was invited to deliver plenary talks and keynote speeches at international conferences and proactively organised public seminars and lectures on a wide range of topics, from theoretical development to data science applications. CityU's Data Science Day, an annual event to foster academic exchange on data science education and research, received local, regional, and international professionals from academia and private sectors to cultivate discussions for cutting-edge research in data science. The three-module IFAC workshop series on "Control Systems and Data Science Toward Industry 4.0", co-organised by SDSC, Hong Kong Institute for Data Science and the International Federation of Automatic Control (IFAC), successfully reached global attendees across all continents for innovative creation, development, and dissemination of research ideas and results on high-speed rail and metro systems.

### Knowledge Transfer in School of Energy and Environment

#### Introduction

The School of Energy and Environment (SEE) was founded in July 2009 with the mission to perform state-of-the-art research and provide professional education in energy- and environment-related issues. The faculty staff in SEE is enthusiastic in participating in knowledge transfer activities, like contract research, community service, external advisory bodies, etc. which developed interactive exchanges with government, collaborators, related organisations, and society in general.

# **Outside Practice**

Faculty staff in SEE has undertaken contract research with different institutions, e.g. CLP Power Hong Kong Limited, Electrical and Mechanical Services Department, Hong Kong Productivity Council (HKPC) and LANCOME PARFUMS BEAUTE & CIE, from 1 July 2020 to 30 June 2021.

# **Efforts to Build Up KT Capabilities**

SEE worked with Headline Daily by contributing monthly articles to promote SEE and the respective research areas of faculty staff, and also inspire the general public to care and recognise the importance of energy and environment issues, so as to promote CityU's excellence in research and professional education, and care for the community and environment.

Faculty staff in SEE were interviewed by various media, such as BBC Future, Radio Television Hong Kong (RTHK), Wen Wei Po, and other newspaper publishers and TVs on innovative research and technology. The interviews help transfer innovative knowledge to the general public.

#### **Outstanding Knowledge Transfer Initiatives**

As a Project Coordinator, Dr Carol Sze Ki Lin receives One-off Collaborative Research (CRF) Coronavirus Disease and Novel Infectious Disease Research Exercise Funding under the University Grants Committee (UGC) for a project titled '*Reducing Transmission of Novel Coronavirus and Other Infectious Diseases Using Food Waste-derived Medical Textiles Via Electrospinning for Healthcare Apparel and Personal Protective Equipment*' with HKU, HKPolyU, HKUST and Southern Medical University in Guangzhou as co-principal investigators. The aim of this project is to develop food waste-derived non-woven medical textiles via electrospinning for healthcare apparel to limit the transmission of COVID-19.

To promote outreach/knowledge transfer on Sustainable Systems, Technologies and Policies for Hong Kong, SEE organised SEE Tech Talk Series on June 12, 2021. Professor Angus Yip, Dr Wanxin Li and Dr Shauhrat Chopra were the speakers to present their latest technologies and methodologies on solar cell technology, as well as the role of life cycle sustainability science and engineering on Environmental, Social, and Governance (ESG).

#### Knowledge Transfer in School of Law

Below are highlights of knowledge transfer activities that School of Law and/or its colleagues carried out during the reporting period:

#### i) Research Contracting/Consultancy

Two of the major forms of knowledge transfer by universities and academics are through which research contracting and provision of consultancy services, enable scholars universities/individual their expertise to transfer to the necessary organisations/institutions, the broader society at large, or even internationally. Below are examples of contract research/consultancy services performed by our colleagues during the reporting period:

- Professor Zhu Guobin has been appointed as an Advisor of Our Hong Kong Foundation.
- Dr Surya Deva has been invited by the United Nations Global Compact to join its Target Gender Equality Global Coalition, a multi-stakeholder group bringing together gender equality and business experts.

#### ii) Professional Services

In addition to their excellent achievements in teaching and research, our colleagues are also engaged in knowledge transfer through serving as members of professional bodies, government bodies, statutory bodies, and being given visiting or adjunct appointments by other universities, for example, during the reporting period:

- Professor Tan Cheng-han is member of the Law Reform Commission and member of the Standing Committee on Legal Education and Training;
- Ms Theresa Low is a member of the Standing Committee on Legal Education and Training.

#### iii) Community Engagement Activities

As a law school, one of our missions is to facilitate academic exchange and to provide a platform for disseminating legal information and knowledge to academics, students, practitioners, as well as the interested general public. The most direct method to achieve this mission is through organising conferences and public lectures/seminars.

During the reporting period, the School of Law, together with the research centres under it, namely the Centre for Chinese and Comparative Law, the Centre for Judicial Education and Research, the Hong Kong Commercial and Maritime Law Centre, and the Public Law and Human Rights Forum, have organised various conferences / workshops / symposia / public lectures / seminars. Most of these events were open to the public for free.

Apart from events organised by the School, our colleagues were also invited to participate in various conferences/seminars and to give lectures to different groups of audiences. Their active participation and contribution in these activities definitely enhanced our School's achievements in knowledge transfer.

#### iv) Impact Case

Regarding the impact case, the research conducted by Professor Liu Qiao and Professor Wang Jiangyu on "Promoting Sales Law Harmonisation and Integration between Hong Kong and

Mainland with Properly Devised Policies and Strategies for Bilateral Arrangements" has been extensively relied upon by the Department of Justice of the HKSAR in a proposal submitted to the Legislative Council (Legco) for discussion with a view to drafting and enacting a legislation to allow Hong Kong to join the United Nations Convention on International Sale of Goods (CISG). This demonstrates that the two CityU colleagues' research has contributed significantly to the legal development in Hong Kong, particularly with respect to solidifying Hong Kong's position as an international business and legal hub.

### v) Mooting

Mooting competitions are important knowledge transfer activities for law students. By participating in mooting competitions, students not only learn substantive legal principles related to different moots but also develop oratory and advocacy skills. These skills equip students for future learning and their pursuit of a legal career. Below were our students' participation in some of the prestigious international mooting competitions during the reporting period:

- The 2<sup>nd</sup> ICC International Commercial Mediation Competition (HK) & The 16<sup>th</sup> ICC International Commercial Mediation Competition (Paris)
- The 2021 Philip C. Jessup International Law Moot Court Competition
- The 18<sup>th</sup> Annual Willem C. Vis (East) International Commercial Arbitration Moot & The 28<sup>th</sup> Annual Willem C. Vis International Commercial Arbitration Moot
- Manfred Lachs Space Law Moot Court Competition 2021

#### vi) Training for Mainland Judges

We collaborate with the Supreme People's Court of the PRC and its National Judges College to admit Chinese judges to our Master of Laws (LLM) programme and to offer a tailor-made Doctor of Juridical Science (JSD) programme for Chinese senior judges, while a short-term and highly specialized programme is also organised for other Chinese senior judges. The presence of these mainland judges in our School offers an exceptional opportunity to our students for exchange of views as well as a well-informed understanding of the current Chinese legal system and its development.

As of May 2021, there are 273 Chinese judge graduated from our LLM (Common Law) programme. 15 batches/ cohorts of Advanced Programme for Chinese Senior Judges were held since May 2009, and a total of 408 senior Mainland judges joined the programme. For the JSD programme, a total of 124 Chinese judges, out of which 120 are senior judges in the mainland China, have been admitted since 2011.

#### vii) Student Placement

Legal placement enhances students' hands-on experiences apart from their theoretical learning in Hong Kong. Given its significance, legal placement is offered as one of the electives for our LLB and JD students. The students did placement in Hong Kong, mainland China, Seoul and Geneva in a variety of organisations such as law firms, barrister chambers, international banks, insurance companies, NGOs, courts and international institutions. Due to the pandemic situation, the overseas placement has been cancelled during the period.