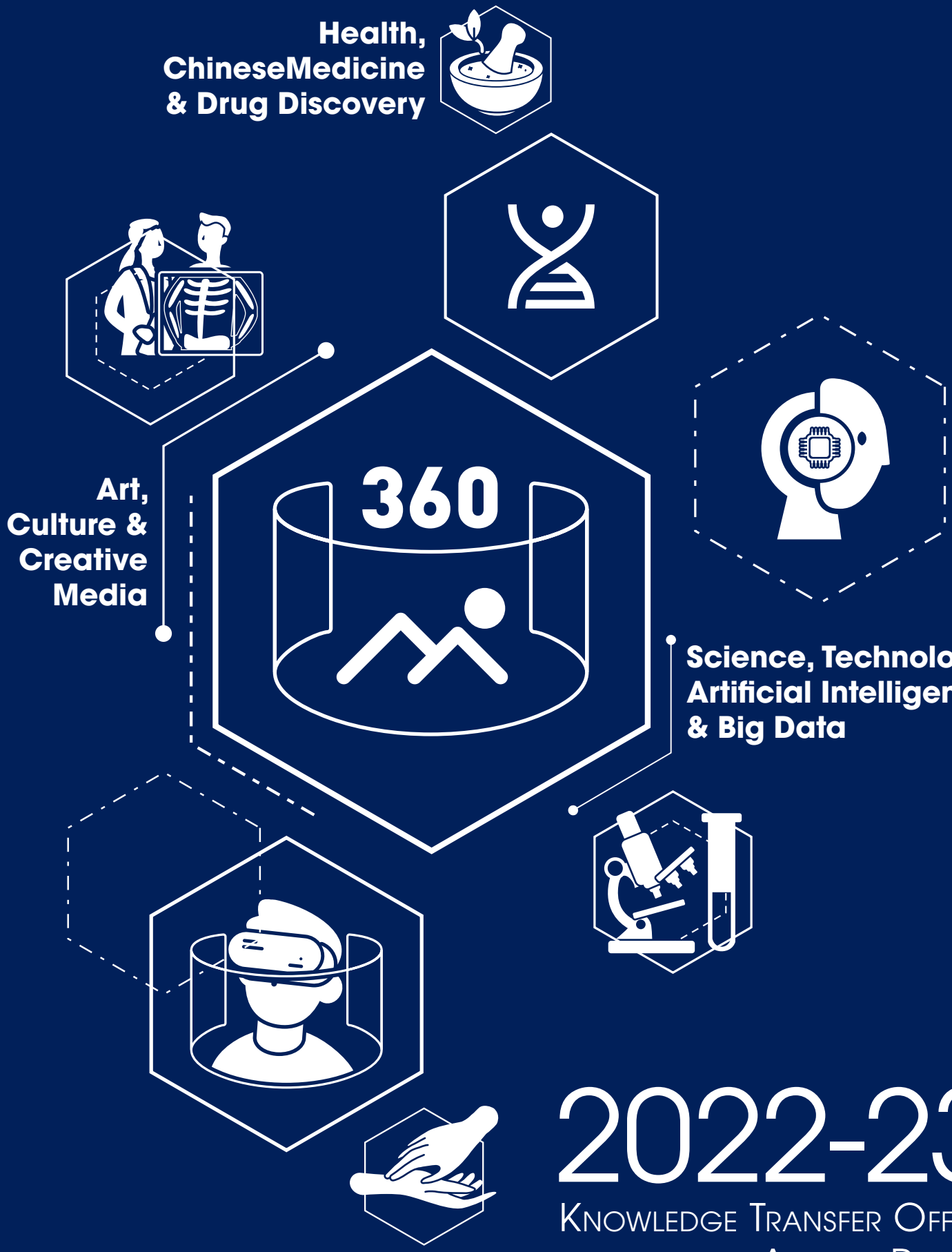
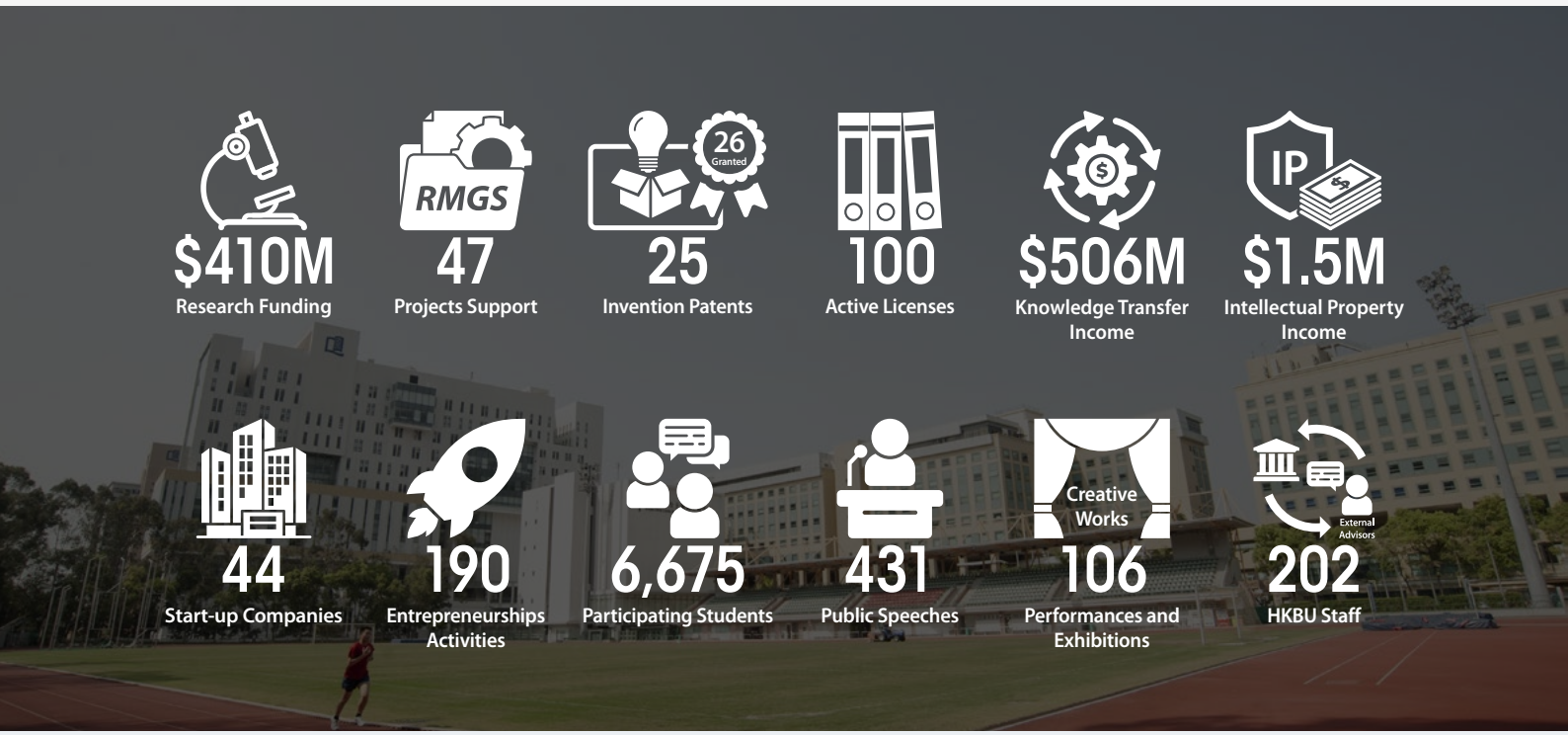
香港浸會大學
HONG KONG BAPTIST UNIVERSITY



2022-23

Knowledge Transfer Office Annual Report



CONTENTS

1 EXECUTIVE SUMMARY

The Knowledge Transfer Strategy at **Hong Kong Baptist University (HKBU)** doubles down on our past years' efforts in providing significant knowledge transfer impacts to society in the strategic areas of (1) **health, Chinese medicine, and drug discovery**; (2) **art, culture, and creative media** and (3) **science, technology, artificial intelligence (AI) and big data**. This Annual Report will summarise the key achievements for the academic year July 2022 – June 2023, and highlight our contributions to the fields of ***healthcare, creative arts and art-tech***, and ***science***.

To **foster KT strategic and infrastructure development**, the Institute for Innovation, Translation and Policy Research (ITPR) at HKBU has forged strategic alliances and collaborations with industries, government and other stakeholders to drive multidisciplinary research on emerging global challenges. By effectively leveraging knowledge transfer, ITPR would generate thrust for the University to establish its leadership and impact in the community, while driving in resources for research and teaching. Our notable partnerships include collaborations with CR Jiangzhong, China Resources Research Institute of Science & Technology, Beijing Tong Ren Tang and Shanghai Pharmaceuticals Holding Co for the healthcare; École Polytechnique Fédérale de Lausanne, Cameron Pace Group, M+ Museum, Airport Authority and Tai Kwun for the Art-tech; and ASTRI for the smart living technologies. The ITPR has also facilitated the establishment of the Institute of Translational Chinese Medicine Research (ITCMR) and an art-tech innovation translation and start-up incubation hub to optimize infrastructure for research and technology translation.

The four **impact cases** highlighted in this Annual Report exemplify HKBU's **great achievement in Chinese medicine, art-tech and A**I, namely on **a botanical drug candidate for the treatment of chronic constipation** developed by the Centre for Chinese Herbal Medicine Drug Development Ltd., known as CDD-2101, which shows promising therapeutic potentials and has been greenlit for a phase 1 clinical study by the U.S. Food and Drug Administration (FDA); **the HKBU-led "Future Cinema Systems" project** which secured HK$35.4 million in funding to construct next-generation cinema systems with the capability to serve as innovative platforms for cultural experiences, entertainment and education; **innovative technologies for human-machine collaborations in music, art, and dance** developed by the multidisciplinary research team at HKBU which gave birth to a groundbreaking collaboration between humans and machines, showcasing how AI can be a creative force and a new form of symbiotic artistic creation and performance between humans and AI systems; and last but not least the award-winning HKBU invention, **"Skin-protection composition containing dendrobium- based ingredients"**, which was developed by Professor ZHANG Hongjie and has been recognized as one of the top 50 patented inventions among 3,900+ others.

HKBU is committed to nurturing entrepreneurship, and its efforts have yielded significant outcomes. This year, three new HKBU start-up companies were awarded funding by the Technology Start-up Support Scheme for Universities (TSSSU) in the fields of Healthcare and Computer Science. These companies have been advancing alongside HKBU and have been making significant progress in their respective fields. In addition, 7 start-up companies were awarded funding through TSSSU, totalling HK$8 million. The HKBU Art x Innovation Business Plan Competition offers a platform for researchers and start-up teams to convert innovation projects into real business ventures. The HKBU Innovation Award recognises the most promising innovation resulted from the research outcome of HKBU faculty and students. The School of Business Entrepreneurship and Innovation Centre (EIC) at HKBU organised 19 events that had 1,138 participants in attendance, including the Entrepreneurship Seminar Series and Entrepreneurial Workshops. HKBU has also carried out other entrepreneurship initiatives, all of which have been well-received by budding entrepreneurs.

It is our hope that this report can provide a comprehensive overview of the numerous impacts made by HKBU, and a remembrance of our dedication to fostering global collaborations and benefiting mankind. Hopefully, the milestones we achieved in knowledge transfer would inspire more people to follow us.

2 KT STRATEGIC AND INFRASTRUCTURE DEVELOPMENT

2.1 Driving innovation and technology development for impacts

To respond to the challenges and opportunities worldwide — specifically under the aegis of the Hong Kong SAR Government's top policy priority on innovation and technology development — Hong Kong Baptist University (HKBU) envisages to become a significant contributor towards the development of Hong Kong into "an international innovation and technology hub" and "a hub for arts and cultural exchanges between China and the rest of the world".

With this mission in mind, the Institute for Innovation, Translation and Policy Research (ITPR) is established to drive innovations, research and development (R&D), technology translation, and applications. The institute strives to bridge the gap in technology readiness between academic innovation and industry applications.

To date, ITPR has identified various high-impact research projects with potential for translation and application, and has sought support and sponsorship from the industry, government, and other relevant stakeholders to establish strategic alliances and facilitate research collaborations. Notable partnerships include collaborations with CR Jiangzhong and China Resources Research Institute of Science & Technology for novel drug development, Hong Kong Applied Science and Technology Research Institute (ASTRI) for smart living and cross-disciplinary technology development, and the largest art-tech project funded by the Innovation and Technology Commission (ITC).

To optimize infrastructure for research and technology translation, ITPR has facilitated the establishment of the Institute of Translational Chinese Medicine Research (ITCMR) which will serve as a platform to develop innovations, technologies and products in Chinese Medicine that can be commercialized or applied in real clinical settings. To be located in the Hong Kong Science Park, the ITCMR will also aim at creating industrial partnerships to facilitate downstream commercialization of deliverables generated from its projects.

In addition, an art-tech innovation translation and start-up incubation hub will be established at Jockey Club Creative Arts Centre (JCCAC) located at Shek Kip Mei to support technology demonstration, commercialization, entrepreneurship, and other forms of knowledge transfer in the area of art-tech. It will also be used as a premium location for showcasing and exhibiting HKBU's cutting edge creations and innovations.

2.2 HKBU partnering with ASTRI to explore cutting-edge technologies and propel technology transfer

HKBU and the Hong Kong Applied Science and Technology Research Institute (ASTRI) have signed a memorandum of understanding (MOU) to work together on the development of smart living technologies and cross-disciplinary technological development. With a view to promoting technology innovation and transfer, the partnership will focus on areas such as smart traditional Chinese medicine, pharmaceutical R&D, art-tech and fintech. HKBU and ASTRI will develop cooperation models for R&D, including cutting-edge technologies such as artificial intelligence (AI) and big data analysis, as well as intellectual property

management and commercialisation. The partnership is expected to enhance collaborative research, promote technology transfer and commercialisation, reduce R&D time, improve resource utilisation, and accelerate the application of R&D results. HKBU has already identified three focused research areas including Creative Media and Practice, Health and Drug Discovery, Data Analytics and Artificial Intelligence — technologies for which this partnership with ASTRI can provide ample opportunities for knowledge transfer. The collaboration between HKBU and ASTRI is expected to create unique R&D conditions, thereby expanding the production capacity of applied technologies. More academic departments of HKBU, including Department of Computer Science, Department of Mathematics, Department of Interactive Media and Department of Accountancy, Economics and Finance, are currently exploring the possibility of collaboration with ASTRI in several potential projects.

MOU signing ceremony for fostering university cooperation in technology transfer.

2.3 Centre for Chinese Herbal Medicine Drug Development Ltd. joins forces with Beijing Tong Ren Tang to advance the field of Chinese medicine

The Centre for Chinese Herbal Medicine Drug Development Ltd. (CDD) at HKBU has signed a Memorandum of Understanding (MOU) with time-honoured Chinese medicine (CM) company Beijing Tong Ren Tang Medicine Co Ltd. (BTRT) to conduct collaborative research of CM formulas. Signed by Professor BIAN Zhaoxiang, Director of the CDD, and Mr CHEN Fei, Chief Executive Officer and Executive Director of BTRT at the Hong Kong Science Park, the collaboration aims to create a research platform that will advance traditional CM formulas with the aid of cutting- edge technologies and translate research outputs into new drugs. They will also provide a talent grooming program that will support the research platform and nurture local CM research talent.

MOU signing ceremony for the collaboration of CDD and BTRT.

The MOU signing marks an important milestone in the development of CM drug research, as it brings together the expertise of two leading organizations in the field. The collaboration will enable the CDD and BTRT to combine their respective strengths, knowledge, expertise and resources to accelerate the discovery and development of new CM drugs, driving the advancement of the biopharmaceutical industry and the improvement of public health.

2.4 Collaboration with CR Jiangzhong and China Resources Research Institute of Science & Technology on proprietary Chinese medicine research

HKBU signed a Memorandum of Understanding (MOU) in December 2022, with CR Jiangzhong and the China Resources Research Institute of Science & Technology to collaborate on proprietary Chinese medicine research.

At the signing ceremony and exchange, Professor Terence Lok-ting LAU, Interim Chief Innovation Officer and Professor BIAN Zhaoxiang, Associate Vice-President (Chinese Medicine Development) shared the University's recent developments and research achievements in Chinese medicine. Mr BAI Xiaosong, CEO of China Resources Pharmaceutical Group Ltd., and Mr YU Shunyan, Chairman of China Resources Double-Crane Pharmaceutical Co. Ltd., shared the research and development initiatives as well as the signature products

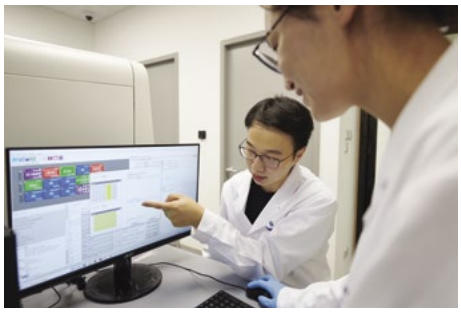
MOU signing ceremony on research into shenlingcao for treating post-COVID-19 syndrome.

of the China Resources Pharmaceutical Group. By leveraging the competitive advantages of the signing parties, the collaboration is expected to create more opportunities for technological advancement and business incubation in Chinese medicine.

The MOU signing marks an important step in the research of shenlingcao (參靈草) for treating post-COVID-19 syndrome. The combined expertise of HKBU, CR Jiangzhong, and the China Resources Research Institute of Science & Technology is expected to help advancing the development of effective treatments for post-COVID-19 syndrome, contributing to the improvement of public health.

3 IMPACT CASES

Always committed to pushing the envelope in research and innovation, HKBU has made major headways in the field of Chinese medicine, art-tech and artificial intelligence (AI). This year we have selected four cases that can exemplify HKBU's endeavour and impacts to the community.



3.1 Impact case 1 - Development of Chinese herbal medicine-based new drugs for common health problems

A botanical drug for chronic constipation authorised for phase 1 clinical study by U.S. FDA

To accelerate the development of Chinese herbal medicine-based drugs and facilitate the standardization and internationalization of Chinese medicine, HKBU established the Centre for Chinese Herbal Medicine Drug Development Ltd. (CDD) in September 2020 with support from the ITC. A key initiative of CDD is to develop drugs that are not only based on the traditional wisdom of Chinese medicine, but could also meet the requirements of national and overseas regulatory authorities for pharmaceuticals for sale and marketing internationally. CDD is currently developing a new drug that shows tremendous potential for treating chronic constipation.

A common gastrointestinal disorder, chronic constipation affects physical and social functioning and significantly interferes with daily living and wellbeing of countless people around the world. Patients with constipation, however, are often not completely satisfied with their treatments due to efficacy and safety concerns. CDD's

multidisciplinary team is developing a new constipation treatment drug, CDD-2101, based on a classic Chinese herbal formulation with well-established safety and efficacy. This CM formulation, MaZiRenWan (MZRW) granule, has been tested in a series of clinical trials and is found to be better than the existing first-line drugs.

Professor BIAN Zhaoxiang and his research team.

With a goal to bring relief to patients globally, the new constipation drug CDD-2101 follows the requirements of botanical drug development of the U.S. Food and Drug Administration (FDA) in its manufacturing process and controls to ensure quality and batch-to-batch consistency. CDD-2101 has also undergone extensive toxicological and pharmacological evaluations in animals that support its safety and therapeutic potential. CDD has already submitted an Investigational New Drug application to the U.S. FDA to initiate clinical trials of CDD-2101 in the U.S. and obtain authorization for conducting a phase 1 clinical study to collect safety information of CDD-2101 in healthy volunteers. This study will establish the highest feasible safe dose of CDD-2101 in the U.S. population and inform the design of future phase 2 and phase 3 studies to evaluate the safety and efficacy of CDD-2101 as a treatment of chronic constipation. Furthermore, CDD has identified a principal investigator and a study site in the U.S. and aims to commence the phase 1 clinical study in 2024.

The initiation of clinical studies to evaluate CDD-2101 as a drug candidate in the U.S. represents a significant milestone. It demonstrates the capability of CDD to develop a Chinese herbal medicine-based drug following the international standards of botanical drug development. Importantly, this program provides a framework, from design, manufacturing to testing of drug candidates, to collect information in support of marketing applications for Chinese herbal medicine as new drug products in the global market.

The success of CDD-2101 will set an example for the Chinese herbal medicine pharmaceutical industry to standardize and internationalize both classic and new herbal formulations. And for the public sphere, developing Chinese herbal medicine-based drugs that meet international standards will increase accessibility to Chinese medicine, facilitate the integration of Chinese and western medicine in healthcare, and transform the results into pharmaceutical products for international markets.

3.2 Impact case 2 - The novel art-tech project "Future Cinema Systems" set to deliver new forms of cultural experience and transform digital entertainment

A novel, farsighted art-tech project led by HKBU has been awarded HK$35.4 million in funding from the Innovation and Technology Support Programme (ITSP) under ITC. This is the art-tech project funded by ITC with the largest approved amount.

Agreement signing ceremony for "Future Cinema Systems".

The two-year "Future Cinema Systems: Next-Generation Art Technologies" project is being led by Professor Jeffrey SHAW, Chair Professor of Academy of Visual Arts, and in collaboration with City University of Hong Kong (CityU) and École Polytechnique Fédérale de Lausanne (EPFL) in Switzerland. It is a pioneering attempt to develop and construct a "Future Cinema System" (FCS), an integrated system for artists and the creative industries to meet the growing demand for new interactive immersive forms of cultural experience, as well as entertainment and education. Home to the world's first 360-degree immersive LED Visualisation Cinema and the 180-degree iDome Cinema, the newly established facility will provide innovative platforms for theatre, dance, music and sports, and transform multimedia archives into post-cinematic encounters that people can explore and experience.

Professor Jeffrey SHAW, the project leader of the pioneering "Future Cinema Systems".

Powered by advanced technologies including artificial intelligence, computer vision, deep learning and virtual reality, the FCS comprises three-dimensional interactive immersive visualisation environments that integrate all forms of real-time and pre-recorded content with a broad range of wearable sensors and biometric devices. With the construction of the FCS, three integrated technological innovations will be delivered in the fields of visualisation, human-computer interaction and co-evolutionary narrative.

The visualisation innovation comprises a set of immersive, interactive visualisation resources for producing a 360-degree, three-dimensional and truly immersive environment. The human-computer interaction innovation contains a set of novel tracking sensing and biometric technologies that can record human conditions, responses and movements. The co-evolutionary narrative innovation will comprise the software intelligence that will enable the audiovisual manifold to react and respond to the sensory prompts provided by the participants.

FCS integrated arts and science across disciplines to create novel arts and cultural experiences, and at the same time to nurture the younger generation in arts knowledge and innovative thinking. This project is not simply an enhancement in digitalisation and intelligent technologies in arts, but a powerful tool for art innovation and development with boundless applications and substantial values, to create innovative multi-modal frameworks for artists and creative industries.

Furthermore, this project has gained support from various organisations in Hong Kong. The deliverables of the project will first be deployed at selected facilities in Hong Kong, such as the Hong Kong International Airport, M+ Museum and Tai Kwun. This system will bring infinite possibilities to the development of cultural art and creative industries in Hong Kong and quality employment opportunities. It will also create considerable value to the education, tourism and sports industries, etc.

Besides that, the research has been successfully translated into solutions and to be commercialised in the market. With the support of the TSSSU, Immersive Unlimited Ltd. founded by Professor SHAW received TSSSU funding 23-24 from the ITC. The company aims at providing a wide range of art-tech and new media products and / or services which will feature immersive experiences and installations tailor made to suit the needs of different clientele. It offers a unique, customized and globally pioneering experience for the dissemination and application of innovative art-tech creations.

3.3 Impact case 3 - Innovative art-tech projects by the multidisciplinary research team to usher in a new era of art technology

At the HKBU Symphony Orchestra Annual Gala Concert in July 2022, a ground-breaking collaboration between humans and machines was unveiled. It was a cutting-edge art-tech research project aimed at developing innovative technologies that can foster a new direction in art created by both humans and machines.

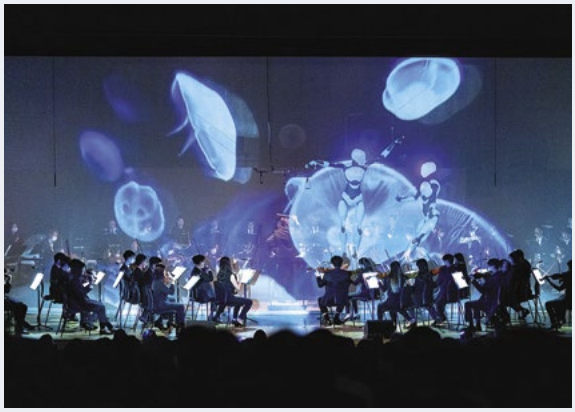
The research team, led by Professor Johnny Ming-lun POON, Associate Vice-President (Interdisciplinary Research) and Founding Dean of School of Creative Arts, and Dr HUNG Hin Shiu, Endowed Professor in Music, presented a significant outcome of the research project at the concert. This performance was the first human-machine collaboration of its kind in the world, showcasing how AI can be a creative force that can perform music, create cross-media art, and dance.

The concert featured an AI virtual choir comprising the voices of 320 virtual performers. The tool was trained on the audio recordings of just a few professional singers, of which none was asked to sing specifically the song performed on the stage. The AI development team extracted key features of vocal singing from collected data of human singing and speaking to adjust and improve the performance. The researchers also trained an AI artist to learn the music and lyrics of choral pieces. It can associate the underlying meaning of the lyrics with an appreciation of the beauty of Hong Kong, and used this information to create a cross-media visual narrative that portrayed its aesthetic imagination of the song.

Another highlight of the concert was a ballet performance featuring AI virtual dancers in Ravel's Daphnis et Chloé, accompanied live by the HKBU Symphony Orchestra. Motion capture techniques and collected movement data from the professional dancers who performed to the music were employed to train the AI choreographic tool to understand the underlying emotional and aesthetic connections between music and dance. Choreomusical rules, such as beat alignment, transition, and combination of dance sequences, were also embedded into the generative models, and the generated dance was performed by virtual dancers in a natural and artistic way based on the machine's own understanding of the music.

HKBU Symphony Orchestra Annual Gala Concert in July 2022.

Professor Johnny Ming-lun POON puts on sensors to conduct the performance of the Symphony Orchestra and the AI virtual choir.



Ballet performance by AI virtual dancers accompanied live by the HKBU Symphony Orchestra.

Professor Johnny Ming-lun POON introduce the "Turing AI Orchestra".

HKBU launches Turing AI Orchestra as next milestone in human-AI art co-creation

The innovative concert illustrated how the University is using technology to push the envelope of human imagination in arts and cultural domains. The art-tech research also enables musicians and artists to go beyond traditional forms and interact with the audience in brand new ways. Along with the successful launch of the concert, HKBU launched the world's first Turing AI Orchestra (TAIO) in August 2022 as the next milestone in its visionary plan to broaden the scope and explore potential opportunities in art co-creation by humans and AI.

By applying state-of-the-art AI technology, the Orchestra aims to achieve a new form of symbiotic artistic creation and performance between humans and AI systems. TAIO offers an open platform for artists and scientists from around the world to collaborate within a dynamic and innovative environment, and it will produce ground-breaking AI research that will disrupt the world of art. By using blockchain technologies, TAIO will realize the world's first Decentralized Autonomous Organization (DAO) ecosystem for art creation through collaboration between scientists and artists. TAIO will also promote transdisciplinary whole-person education to the next generation in Hong Kong, propelling strategic policymaking by the Government to guide Hong Kong's cultural and creative industries development going forward, thus contributing toward building Hong Kong to be an international cultural exchange and intellectual property trading hub.

(From left) Mr David Fuk-loi WONG, JP, Director of Intellectual Property Department of the HKSAR Government; Professor ZHANG Hongjie, Inventor in HKBU and Mr Tobby Sin- tou FU, Director of Innovation and Entrepreneurship, Institute for Innovation, Translation and Policy Research.

3.4 Impact case 4 - Winning in the Guangdong-Hong Kong-Macao Greater Bay Area High-value Patent Portfolio Layout Competition 2022

An HKBU invention has won the Excellence Award in the strategic pillar enterprise category of the Guangdong-Hong Kong-Macao Greater Bay Area High-value Patent Portfolio Layout Competition 2022!

Developed by Professor ZHANG Hongjie, Director and Professor of the Teaching and Research Division of the School of Chinese Medicine, the patent titled "Skin-protection composition containing dendrobium-based ingredients" has earned recognition as one of the top 50 patented inventions among 3,900+ entries from various organisations. In addition to being the only university from Hong Kong to receive an award in the competition in this report year, HKBU has also won the Excellence Award for three consecutive years in this competition.

With "high-value patents that lead to the high-quality development of an innovative Greater Bay Area" as its theme, the competition aims to uncover innovative patent projects that possess leading technology and great market potential, promote high-value patent portfolio layouts, and stimulate the development of a knowledge-based and high value-added economy within the Guangdong-Hong Kong-Macao GBA. The competition was co-organised by the Guangdong Administration for Market Regulation (Guangdong

Intellectual Property Administration), the Intellectual Property Department of the HKSAR Government, the Economic and Technological Development Bureau of the Macao SAR Government, and the People's Government of Foshan Municipality. It attracted the participation of micro, small and medium-sized enterprises, higher education institutions and research bodies from all over the country, including Hong Kong and Macao.

Professor ZHANG Hongjie (middle) and his research team.

Excessive exposure to sunlight can darken and damage our skin by generating harmful substances such as free radicals. The research team led by Professor ZHANG Hongjie has discovered natural compounds in Dendrobium plants used in Chinese herbal medicine that can whiten, protect and have anti-ageing effects on the skin by inhibiting the formation of melanin and eliminating harmful substances.

This meaningful technology has been patented and has led to the technology transfer for skincare product development that addresses the market needs for skin-lightening and skin-protecting. The research team has been developing new chemical entity drugs and herbal medicines from natural resources, promoting the use of traditional Chinese medicine in modern times.

Moreover, the research has been successfully translated into daily solutions and commercialised in the market. Supported by TSSSU, Gihon Biotech Ltd. (Gihon) founded by Professor ZHANG has gained funding from both ITC and a private investor. Gihon is a green biopharmaceutical company launched to develop skin and healthcare products enriched in natural ingredients. The team has also expanded their collaboration networks in the Mainland China and Southeast Asia, making a greater impact to the world.

4 PROMOTION OF ENTREPRENEURSHIP

4.1 Technology Start-up Support Scheme for Universities (TSSSU) 22-23

HKBU has always been committed to nurturing entrepreneurship. In this report year, seven HKBU start-up companies were awarded funding by the TSSSU, wherein three of these are new start-up companies, totaling to HK$8 million. These seven awarded companies are:

1. Herbap Biotech Ltd.
2. HK-Dtech Ltd.
3. iCounseling International Company Ltd.
4. IntelligenceX Ltd.
5. LuminMed Ltd.
6. MicroFlow Innovation Ltd.
7. Online Companion Ltd.

4.2 HKBU Art x Innovation Business Plan Competition

HKBU Art x Innovation Business Plan Competition offered a great opportunity for researches and start-up teams to actualise innovation projects into real business ventures and create bigger impact to the society. Seven winning teams were granted cash prizes, with some also admitted to HKBU x HKSTP Co-Ideation Programme and seed grant.

Winning teams of HKBU Art x Innovation Business Plan Competition.

4.3 The HKBU Innovation Award 2023

It was awarded to the titled "Next-Generation Semiconductors for Low-Carbon Energy and Urban Intelligence", invented by Dr ZHOU Yuanyuan, Assistant Professor of the Department of Physics. One of the new types of semiconductor applications is for creating high-performance low-cost solar cells with flexible and semi-transparent features. It is judged to be having significant and sustainable impact - or even fundamental change - on the community.

(From left) Professor Terence Lok-ting LAU, Interim Chief Innovation Officer; Dr ZHOU Yuanyuan, Assistant Professor of the Department of Physics.

4.4 The School of Business Entrepreneurship and Innovation Centre (EIC)

The School of Business Entrepreneurship and Innovation Centre (EIC) at HKBU organized a total of 19 events from 1 July 2022 to 30 June 2023, with 1,138 participants in attendance. These events included the Entrepreneurship Seminar Series, Kickstarting Your Career Series, Entrepreneurial Workshops (such as the Growth Mindset Workshop and Unleash the Creative Beast in You! Workshop), Entrepreneurial Pitches (such as A Night for Failure and Mini Business Innovation Gymnasium), the Entrepreneurial Internship Programme, EIC Internship Scheme, and the StartMeUpHK Festival 2022.

The increasing number of applications is a solid evidence that working in a start-up as an intern is highly popular among HKBU students. The purpose of these events and workshops was to help students developing their entrepreneurial mindsets, improving their confidence and creativity, and ultimately preparing them for their future careers. Through the Entrepreneurial Internship Programme and EIC Internship Scheme, students had the opportunity to develop their skills and knowledge. The StartMeUpHK Festival 2022 provided a valuable platform for students to connect entrepreneurs and investors, as well as to showcase their innovative ideas and projects.

Mentors of dean's cup business innovation gymnasium.

Student teams attended the mentee alignment session.

4.5 Entrepreneurship Initiatives

In this reporting year, HKBU has also carried out the following entrepreneurship initiatives, which are well received by our budding entrepreneurs:

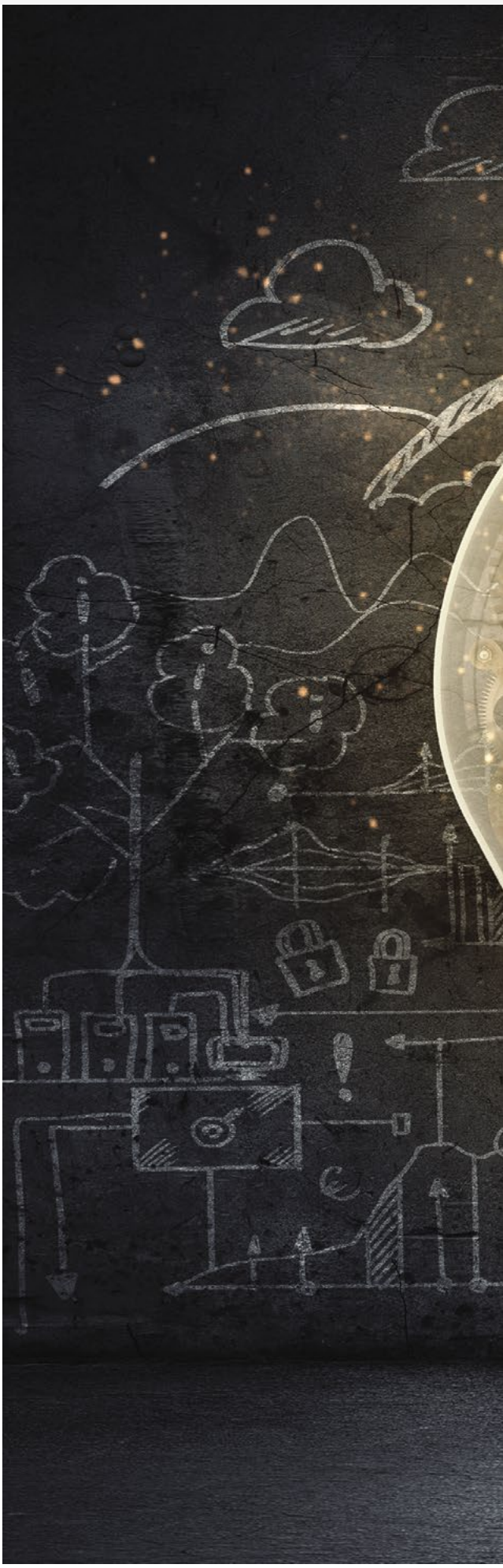
1. O2O Entrepreneurship Training Platform Programmes
2. Knowledge Transfer Partnership Seed Fund
3. Research Impact Support and Enhancement Fund
4. Matching Proof-of-Concept Fund
5. HKBU Content Creator x e-Commerce Challenge
6. HKBU Virtual Career Fair (Start-ups)
7. Start-up Saturday
8. GBA Start-up Exploration Trip
9. HK Techathon 2023
10. HKSTP Ideation Programme

5 LOOKING AHEAD

HKBU's long-term vision is to create a more holistic academic and research environment that is better suited to addressing complex, interdisciplinary challenges by combining a traditional discipline-based approach with a problem-centered research system. This approach also aims to foster collaborations between academia and industry, allowing researchers to work closely with industry partners to address real-world problems. The Institute of Translational Chinese Medicine Research and the Jockey Club Creative Arts Centre are prime examples of the university's efforts in facilitating cross-disciplinary collaborations in technologies and promote innovation and entrepreneurship.

In the 2022 Policy Address by Chief Executive John Ka-Chiu LEE of the HKSAR Government, a budget of HK$10 billion has been allocated for the launch of the "Research, Academic and Industry Sectors One plus Scheme" (RAISe+ Scheme). As a university that is committed to encouraging collaborations among industry, academic, and research sectors, HKBU is hard at work to transform R&D outcomes into tangible results, and to facilitate the commercialisation of these outcomes. We eagerly look forward to contributing to the success of the RAISe+ Scheme.

Looking ahead, HKBU will continue to foster early engagement with industry partners to explore new innovation opportunities and establish longer-term partnerships. Additionally, the university will enhance its entrepreneurship efforts to support more research-based and technology start-ups, as well as improve its start-up incubation and investment environment by building links with leading global incubators. HKBU will also facilitate business-matching opportunities to forge partnerships with business partners and investors for commercializing its intellectual property. It is our deepest hope that HKBU can continue to grow as a knowledge transfer hub and significant driving force for enhancing economic growth and societal wellbeing in Hong Kong, the Mainland and the wider world.



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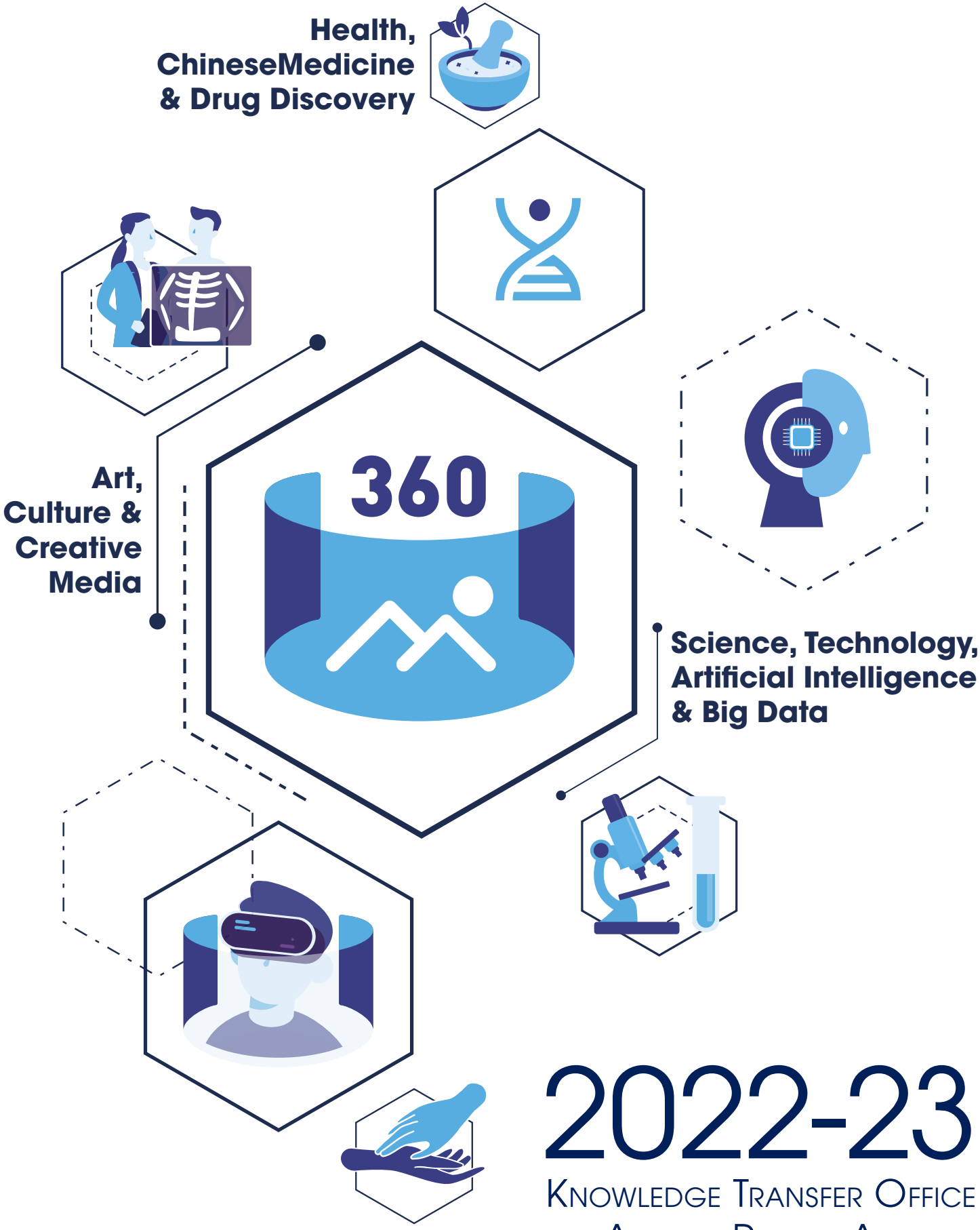


2022-23

Knowledge Transfer Office
Annual Report Annexes

CONTENTS

HEALTHCARE

In these annexes, we shall further present a number of impactful outreach and activities of HKBU, as well as the list of patents granted and our key performance indicators.

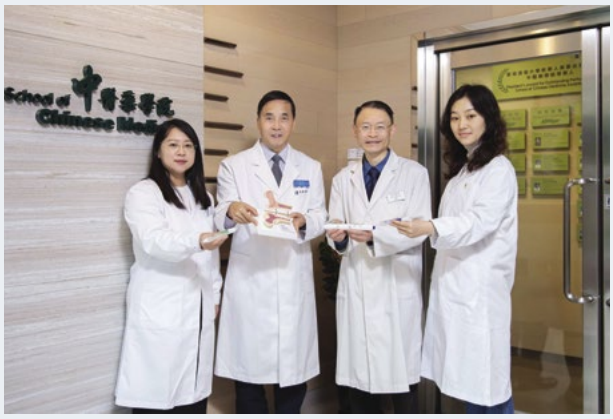
INNOVATING HEALTHCARE FOR A BETTER TOMORROW

Breakthrough aptamer drug for bone anabolic therapies discovered

HKBU has made a significant breakthrough in the treatment of osteoporosis and osteogenesis imperfecta.

A molecular target for bone anabolic therapies using a selected aptamer that serves as an inhibitor of sclerostin, a protein that prevents bone growth have been identified by a research team including Professor LYU Aiping, Dr Kennedy WONG Endowed Professor in Chinese Medicine and Director of the Institute of Integrated Bioinformedicine and Translational Science, Professor ZHANG Ge, Director of the Law Sau Fai Institute for Advancing Translational Medicine in Bone and Joint Diseases, and Dr YU Yuanyuan, Manager of the Guangdong-Hong Kong-Macau Greater Bay Area International Research Platform for Aptamer-based Translational Medicine and Drug Discovery and Assistant Professor of the School of Chinese Medicine.

Sclerostin has been identified as a therapeutic target for both osteoporosis and osteogenesis imperfecta. The U.S. Food and Drug Administration (FDA) approved the use of the monoclonal antibody against sclerostin for the treatment of postmenopausal osteoporosis in 2019. However, studies have shown that the antibody increases the risk of heart attacks, stroke, and cardiovascular death, requiring a black box warning for potential cardiovascular risks by the FDA.



Professor LYU Aiping (2nd left); Professor ZHANG Ge (3rd left), and their team.

To develop alternative drug options, the research team at HKBU worked with a local biotechnology company and engaged biotechnology companies in the Mainland for developmental research for the aptamer, including toxicology tests. The research findings have been published in international academic journals such as Nature Communications and Theranostics. In 2019, the therapeutic aptamer Apc001 was granted orphan drug designation by the FDA for the treatment of osteogenesis imperfecta.

Currently, the new drug is in the pre-clinical trial development stage, and the research team has plans to initiate clinical trials in both the US and the Mainland in 2024. This breakthrough offers hope for an effective next-generation treatment for osteoporosis and osteogenesis imperfecta. This treatment option is free of cardiovascular risk, unlike the marketed antibody drug, it contributes much to the improvement of public health.

HKBU establishes "JC STEM Lab of ChemProbes" to foster research on novel diagnostic imaging technologies

The inauguration ceremony for JC STEM Lab.

Guest and representatives of HKBU pose for a group photo at the Laboratory.

Hong Kong Baptist University has received a significant donation of HK$10 million from The Hong Kong Jockey Club Charities Trust to establish the JC STEM Lab of ChemProbes. The laboratory will be led by Professor David PARKER, Global STEM Chair Professor of the Department of Chemistry, and a fellow of the Royal Society of London.

The development of rare-earth-based molecular probes would be the laboratory's main focus. The probes could be served as bio-imaging agents for pre-clinical cellular and tissue studies as well as, potentially, in various diagnostic and optical imaging protocols. Moreover, they could also be widely used in magnetic resonance imaging (MRI), and they will eventually be translated into human applications on collaborations with partners in academia and the industries.

The development and eventual commercialisation of new imaging and diagnostic tools by the laboratory can contribute to the advancement of the diagnosis of diseases, simplification or alleviation of certain undesirable side effects with current clinical diagnostic protocols. With the much more accurate and effective diagnostic tools, a healthier community would be built by allowing citizens to monitor their own physical well-being on a more regular basis.

Fighting major diseases - Guangdong-Hong Kong-Macao Joint Laboratory for Drug Screening

The Guangdong-Hong Kong-Macao Joint Laboratory for Drug Screening is a research initiative that aligns with the "Healthy China" strategy and focuses on critical national needs and public health. The primary objective of the laboratory is to screen new drugs for major diseases, with special emphasis on viral infectious diseases, inflammation and tumor immunity, psychiatric and neurological disorders, and liver diseases.

By researching new targets and mechanisms as well as conducting drug screening, the laboratory aims to advance the pharmaceutical discipline and industry. Ultimately, it seeks to become a domestically leading and internationally influential key laboratory.

The laboratory, led by Professor Ken Kin-lam YUNG, Professor of the Department of Biology, brings together the resources of Southern Medical University, The Chinese University of Hong Kong, Hong Kong Baptist University and the University of Macau.

The implementation of the project will provide drug screening technology services to universities, research institutes, and pharmaceutical companies, promoting the advancement of the biopharmaceutical industry and the development of innovative drug research and industrialization in the Guangdong-Hong Kong-Macao region. The laboratory strives to achieve original innovation in the prevention and treatment of major diseases, contributing to the realisation of a "Healthy China".

HKBU SUPPORT ON COMMUNITY HEALTH AND WELLNESS

Long COVID Chinese Medicine Rehabilitation Programme

The launching ceremony for the "Everbright Care • Long COVID Chinese Medicine Rehabilitation Programme".

The School of Chinese Medicine at Hong Kong Baptist University has launched two Chinese Medicine Rehabilitation Programmes for COVID-19 patients. They are the "Everbright Care Long COVID Chinese Medicine Rehabilitation Programme" and the "Famous Horse Chinese Medicine Rehabilitation Programme for COVID-19 Patients". These programmes offer free Chinese medicine consultation services and medicine for patients with long COVID symptoms, such as cough, shortness of breath, insomnia, hair loss, skin irritation, and fatigue.

With the funding of HK$5 million from the Hong Kong Community Anti-Coronavirus Link (funding allocated by donation from the Hong Kong office of the Everbright Group) and HK$2 million from Famous Horse Holdings Ltd, the programmes aim to restore the health and improve the quality of life for individuals recovered from COVID-19. The role of Chinese medicine has then been enhanced in the fight against the pandemic.

The programmes are crucial for addressing the needs of the recovered COVID-19 patients experiencing long-COVID symptoms and contribute significantly to the improvement of public health.

HKBU launches Jockey Club Mus-Fit to improve health of elderly through exercise

The launching ceremony for Jockey Club Mus-Fit for Health Project.

The Dr Stephen Hui Research Centre for Physical Recreation and Wellness at HKBU has launched a three-year "Jockey Club Mus-Fit for Health Project" (Mus-Health) to design a series of exercises to train the muscle strength, endurance, balance and flexibility of 5,000 elderly people. The project, funded by The Hong Kong Jockey Club Charities Trust, has recruited 99 ambassadors aged 50 to 69. All of them have completed the training provided by the Jockey Club Mus-Fit Action project, which was inaugurated in 2019.

The project aims to increase the exercise and health knowledge of the public through diversified activities. Individuals could then be encouraged to actively participate in promoting a healthy society by collective efforts of various sectors.

INDUSTRIAL COLLABORATION ACCESS TO CHINESE MEDICINE GLOBALLY

Professor BIAN Zhaoxiang, Associate Vice-President (Chinese Medicine Development) of HKBU and Honorary President of HKAIM; Professor LYU Aiping, Dean of Chinese Medicine at HKBU; Professor Vivian Chi-woon TAAM WONG, Honorary President of HKAIM; Professor LIN Zhixiu, Director of the School of Chinese Medicine at The Chinese University of Hong Kong and President of HKAIM; and Professor Lidan ZHONG, Assistant Professor of SCM and Vice President of HKAIM, welcome the honourable guests at the opening ceremony.

SCM webinar draws insights on the global development of Chinese medicine

On 21 August 2022, The School of Chinese Medicine (SCM) co-hosted a webinar entitled "21st Century Chinese Medicine Internationalisation Strategy" with the Hong Kong Association for Integration of Chinese-Western Medicine (HKAIM), aiming to set up a platform for an international dialogue on the development of Chinese medicine (CM) including the themes of "International Regulations and Policies", "Research and Development in Hong Kong Universities", "National 14th Five-Year Plan – Key Performance Indicators" and "Industry and Markets – Perspectives from the Greater Bay Area".

Officiating at the opening ceremony were Professor LO Chung Mau, Secretary for Health of the HKSAR Government; Dr KO Wing Man, Member of the Executive Council of the HKSAR Government and Honorary President of HKAIM; Dr LEONG Che Hung, Former Chairman of the Hospital Authority and the Council of The University of Hong Kong; Professor Alexander Ping-kong WAI, President and Vice-Chancellor; and Professor LYU Aiping, Dean of Chinese Medicine.

In the webinar, Professor LO mentioned that 2022 was a significant milestone for the development of CM in Hong Kong, as the construction of two pieces of flagship infrastructure has started in the year. They are the city's first Chinese Medicine Hospital operated by HKBU and the Government Chinese Medicines Testing Institute managed by the Department of Health respectively, both of them will take the development of Chinese medicine in Hong Kong to the next level.

Professor WAI also said that Chinese medicine is being increasingly recognised in Hong Kong in view of the Government's ongoing efforts to integrate CM into the public health system. He believes that the issuance of the Construction Plan for the CM Highlands in the Guangdong–Hong Kong–Macao Greater Bay Area (2020-2025) by the National Administration of Traditional Chinese Medicine will open up even more new opportunities for CM to further unleash its potential.

CREATIVE ARTS AND ART-TECH

THE BEAUTY OF SYNERGY: INDUSTRIAL COLLABORATION TRANSFORM THE ART LANDSCAPE

Machine Visions – An exhibition, performance series and discussion forum of art, technology & machine learning

From left) Dr Roberto ALONSO TRILLO and Dr Peter NELSON.

Performance at Osage Gallery, simultaneously with machine learning-generated art, music and dance.

An illuminated sound installation system.

In 2022, Dr Roberto ALONSO TRILLO, Assistant Professor of Academy of Music and Dr Peter NELSON, Assistant Professor of Academy of Visual Arts launched the Machine Visions exhibition and performance series in collaboration with the Osage Art Foundation to showcase various artworks, sound installations, and musical performances that utilized machine-learning tools in different artistic practices.

The Machine Visions exhibition, performance, and live discussion series provided Hong Kong audiences with engagements in new technological pathways for performances, participations in discussions with world-leading artists and curators, and the chance of learning of the rapidly evolving international landscape of creative technology.

The exhibition aimed to bridge communication barriers between cutting-edge research in music, visual art, and computer science and a general audience across the sectors of arts, music and education.

During the three-month public presentation series, Dr TRILLO and Dr NELSON hosted six public performances, two live panel discussions, three tours to educational institutions, and several private tours for visiting international scholars and curators.

The baseline research of this project has been published in top-tier peer-reviewed journals, the forthcoming edited volume, and also correlates to open-source code and datasets, which is freely available to the international research community. The exhibition and performance series are a valuable contribution to the intersection of art and technology and the advancement of creative technology in Hong Kong.

HKBU stages Art Basel Hong Kong parallel exhibition "Women at the End of the World"

The Academy of Visual Arts (AVA) at HKBU was selected as one of the University Partners of Art Basel Hong Kong in 2023, which had showcased its largest show in Hong Kong since 2019. In addition to having a representative booth at Art Basel in the Hong Kong Convention and Exhibition Centre (HKCEC), AVA organized an Art Basel parallel exhibition at the University's Kai Tak campus. The exhibition focused on the theme of "Women at the End of the World" and aimed to generate dialogue about creating a culture of care for the environment and people.

Dr Evelyn KWOK, Research Assistant Professor of Academy of Visual Arts and Associate Director of Bachelor of Arts (Hons) in Visual Arts, led and curated the exhibition. The exhibition features the creative works of four alumna artists, including wood block prints, recycled textiles, and interactive installations. Dr KWOK and the four HKBU alumnae also gave an artist talk on 23 March 2023 at the HKCEC.

HKBU's participation as a University Partner in Art Basel Hong Kong provides a valuable opportunity for AVA to showcase the creative talents of its alumnae and generate discussion around important societal issues. Through its participation in Art Basel Hong Kong, AVA demonstrated its commitment to fostering creativity, innovation, and social responsibility among its students and alumnae.

The exhibition, revolving around the theme of "Women at the End of the World", is led and curated by Dr Evelyn KWOK.

The art installation project at the university's Kai Tak campus.

WHEN ART MEETS TECHNOLOGY: THE POWER OF TECHNOLOGY IN INNOVATIVE EXHIBITIONS

HKBU Professor Curates Immersive Baroque Music Experience with AI-Generated Vocals

Professor Johnny Ming-lun POON, Associate Vice-President (Interdisciplinary Research) and Founding Dean of School of Creative Arts, and Dr Hung Hin Shiu, Endowed Professor in Music, has curated a program of Baroque music and soundscapes for selected exhibits to complement the exhibition "The Hong Kong Jockey Club Series: The Road to the Baroque – Masterpieces from the Capodimonte Museum" at the Hong Kong Museum of Art (HKMoA) from 15 July to 2 November 2022.

To match the theme and the rich details of the painting, Professor POON decided to generate the tenor and bass parts by artificial intelligence (AI) along with the soprano and alto parts performed by female vocalists. The team incorporated AI-generated vocals and modern instrumental music into the soundtrack, creating a resonance chamber and immerse the visitors in an imagined world of nature.

Professor Johnny Ming-lung POON hopes that visitors will come away from the exhibition with a positive impression of the magnificent world of Baroque art.

The audiovisual elements created by the HKBU team encourage people to enjoy, appreciate and understand art in a different way. The immersive soundscape using some of the latest audio and AI technologies, sparking the visitors' imagination.

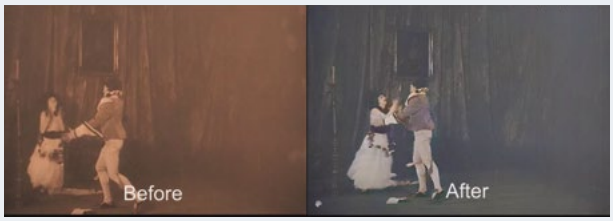
Modernising silent movies with AI

Dr WAN Renjie, Assistant Professor of the Department of Computer Science, is leading a two-year research project aimed at enhancing the viewing experience of silent films while preserving their aesthetic values.

The project, which was recently awarded the Blue Sky Research Fund, will apply image processing techniques and computer vision to colorize and enhance low-quality monochrome video frames.

Dr WAN believes that the technologies being developed by the research team will have a great potential for broader practical applications, providing a new way of preserving historical relics and making them relevant and accessible. The project can also open new prospects in the research of image processing technologies and create new opportunities in their application.

The team applied this technology in the recent Gala Concert of HKBU to add the colors to a silent horror movie - Danse Macabre created in 1922 by American director Dudley Murphy, which brought the bygone century back to the present digital age.



Before and after adding the colors to a silent movie.

The team is also developing audio processing technology that can transform intertitles into audible dialogue and analyze the oral movement of actors to generate spoken dialogue. Additionally, generative models will be used to restore lost frames and generate new content based on intertitle descriptions.

FOSTERING CREATIVITY: HKBU STRIVES TO NURTURE YOUNG TALENTS IN THE CREATIVE ARTS

The topping out ceremony for Jockey Club Campus of Creativity.

Future Jockey Club Campus of Creativity strengths the cultivation of creative talents

Construction of the Jockey Club Campus of Creativity is due to be completed in 2024.

HKBU has held a topping out ceremony for its upcoming Jockey Club Campus of Creativity, which is due to be completed in 2024. This new campus will enable the university to offer the best student experience and achieve research excellence, and it will feature four blocks of residential colleges that will provide 1,726 hostel places.

The new campus will include the Jockey Club Creative Hub, which will feature state-of-the-art facilities for music, film, television, video games and other creative disciplines. The Hub will provide teaching, learning and research space, housing HKBU's Academy of Music and the Creative Media and Practice Cluster. The development of the new campus will substantially enhance the University's capacity for nurturing talent and delivering the best student experience.

The university received a HK$452 million donation from The Hong Kong Jockey Club Charities Trust to support the development of the campus, which is the largest single donation ever received by HKBU.

The development of the new campus will substantially enhance the university's capacity for nurturing talent and delivering the best student experience. The campus will also support the Central Government's vision of developing Hong Kong into an East-meets-West centre for international cultural exchange, as outlined in the National 14th Five-Year Plan, to nurture talents for creative arts.

Award ceremony for the professional group.

Award ceremony for the higher education institution group.

Academy of Film alumni stand out in First Feature Film Initiative

Two alumni of the Academy of Film (AF) stood out respectively in the Professional Group and Higher Education Institution Group of the 7th First Feature Film Initiative (FFFI). They will receive HK$8 million and HK$5 million respectively in funding from the Film Development Fund (FDF) to implement their winning film projects and produce their first commercial feature films.

Their success in the competition highlights the quality of education and training provided by the Academy of Film, and it would definitely attract more aspiring young talents to study at HKBU.

Mr YU Sze Long, the winner of the Professional Group, is a 2014 graduate of AF's Higher Diploma in Creative Film programme. The winner of the Higher Education Institution Group is Miss WU Chui Yi, a 2020 graduate of the Bachelor of Communication (Honours) – Film Major programme.

These two AF alumni will receive significant funding from the Film Development Fund to make their first feature films. The funding will enable them to bring their creative visions to life.

Additionally, six winners of the past seven years were all HKBU alumni in the Higher Education Institution Group. A HKBU alumni won in the Professional Group this year. The results showcase HKBU's contribution to nurturing young talents in the film industry and the potential of the talents it cultivates to produce innovative and thought-provoking films.

AF's alumni CHAN Chi Fat won the 1st FFFI - Weeds on Fire 《點五步》, 2013

FROM PAGE TO THE WORLD: THE EFFORT OF TRANSLATION IN PROMOTING CHINESE CULTURE WORLDWIDE BY HKBU

Professor LEE Chack Fan, Chairman of the Management Board of the JAO Studies Foundation (second left) and Professor Alexander Ping-kong WAI, President and Vice-Chancellor of HKBU (second right) sign the addendum to the Collected Works of JAO Tsung-i: Xuangtang Anthology project.

Sharing the scholarly treasures of JAO Tsung-i: Xuantang Anthology

Professor JAO Tsung-i was a renowned scholar who left behind a vast body of invaluable scholarship, much of which is yet to be translated into English or other European languages for scholars and students of Sinology to study. To make this academic treasure more accessible to the world, the HKBU JAO Tsung-i Academy of Sinology, with the support of the JAO Studies Foundation and Simon Suen Foundation, initiated the Collected Works of JAO Tsung-i: Xuantang Anthology project in 2019. The project aims to collect and translate some of Professor JAO's finest works from his eight decades of scholarship into English, thus enhancing the spread and influence of "JAO studies" around the world.

This project is the first to translate Professor JAO's scholarly works into English, and the series will contribute to the strategic development of Hong Kong as an East-meets-West Centre for international cultural exchange, as stipulated in the National 14th Five Year Plan. After three years of labor, the initial three volumes of the English edition have been issued by Brill Publishers in both hardback and digital versions on 13 January 2023, on the same occasion of the 10th Anniversary Celebration of JAO Tsung-i Academy of Sinology.

The translation project is also instrumental in fostering a more profound understanding between Sinologists of the East and West and creating a golden opportunity to promote the splendid Chinese culture. The launch of the initial three volumes is just a few cross-sections sliced out of the countless volumes of scholarship, art and poetry of Professor JAO. They will lead new readers to their fascinating subjects, inspire some to revive an ancient song or to copy out another sutra containing timeless wisdom, and apply their creativity in response to the treasures of antiquity, as JAO's work so often encourages us to do.

Made to be an open access book series, the publication is immediately available to a global audience. Along with the availability of print options, the translated anthology is highly anticipated by a worldwide readership of the general public. The project is a valuable contribution to the field of Sinology and the promotion of Chinese culture around the world.

SCIENCE

APPLIABLE TECHNOLOGY IMPROVES SOCIAL QUALITY

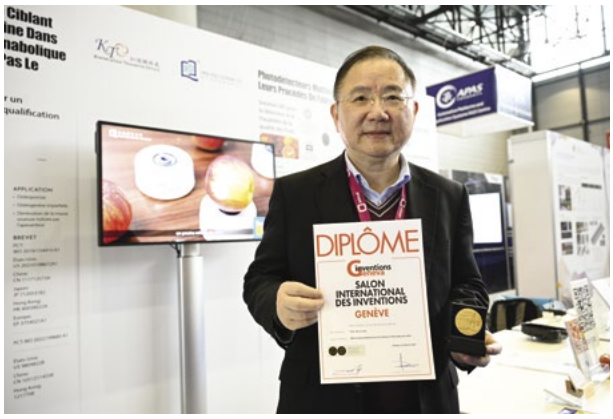
New technology to detect the quality of fruits

The Near-Infrared (NIR) fruit detection technology project has made a very significant progress under the leadership of Professor ZHU Furong, Professor of Department of Physics. He was invited to present "Traceable Fruit Quality Detection Technology and IoT Solution" at the China International Food Safety & Quality Conference held on 27 October 2022.

Also, the technology patent "Multi-Mode Photodetectors and Methods of Fabricating the Same" was awarded a gold medal in the 48th Geneva International Exhibition of Inventions held from 26 to 30 April 2023.

Through the development of fast, reliable, low-cost, and non-destructive portable fruit detection systems, the traceable fruit quality detection and IoT solution can enhance cultivation techniques and quality control in the fruit industry. By providing traceable information for fruit management, the invention greatly contributes to improving food safety and quality standards.

Moreover, the research has been successfully translated into daily solutions and commercialised in the market. Supported by the TSSSU, Crimson



Professor ZHU showcased in the 48th Geneva International Exhibition of Inventions.

Vision Technology Ltd. which is founded by Professor ZHU, successfully gained funding from both ITC and a private investor.

The company's related research project, "Traceable Fruit Quality Non-Destructive Testing Technology Project (可溯源水果品質無損檢測技術項目)," successfully advanced to the finals of the Wuzhen Cup (烏鎮杯) 2022 Global Entrepreneurshipc and Innovation Competition.

Charting the Hong Kong COVID-19 Hotspot Map

A research team led by Professor XU Jianliang, Professor of Department of Computer Science, has developed the Hong Kong COVID-19 Hotspot Map (https://covid19.comp.hkbu.edu.hk/) which allows the visualisation of the real-time and dynamic geographic distribution of COVID-19 cases in Hong Kong. The map is supported by novel computation methods of big spatial-temporal data and has a substantially enhanced resolution and speed in visualisation results output. Drawing real-time data from the Interactive Map Dashboard maintained by the Government, the map presents territory-wide data on COVID-19 infection cases on an online map for the inquiring public.

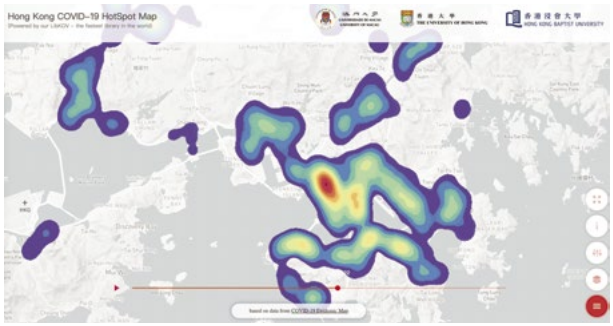
The research team is led by Professor XU Jianliang (middle).

COVID-19 infection risked in different geographical areas, in terms of abundance of COVID-19 cases, were shown in a colour scheme, ranging from purple for the lowest risk level to red for the highest. To meet the map's functional requirements, the updating and computation process must be done timely, and support the creation of high-resolution images.

A computational tool for spatial-temporal data analysis named Kernel Density Visualisation (KDV) was used to support the visual creation.

The research team developed new computation methods with the application of complexity-optimised theory and a progressive visualisation framework to create continuous partial visualisation outputs, reducing response time of KDV.

The resolution of the Hong Kong COVID-19 Hotspot Map could be increased to 1376 x 960 pixels (high-definition resolution) and process one million data points, and a response time of



Hong Kong COVID-19 Hotspot Map allows the visualisation of real-time and dynamic geographic distribution of COVID-19 cases in Hong Kong.

less than 0.5 second could be achieved, which out-performs other existing tools.

Even so, the research team is also exploring other potential applications of the new computation methods in support of KDV, such as traffic hotspots detection, crowd control in tourist attractions, property prices visual analysis and real-time weather resources management.

Reducing carbon with the SEE app

The SEE (Smart, Energy, Envision) Project, spearheaded by Dr Daphne Ngar-yin MAH, Director of the Asian Energy Studies Centre and Associate Professor at the Department of Geography, aims to empower and sustain energy behavioural changes with and for communities. The project has fostered an app-based behaviour-change intervention on household electricity savings in communities in Hong Kong, with the goal of identifying optimal human-technology interactions and conceptualising the optimal conditions for energy behavioural change in smart energy communities.

The SEE Project is funded by the Research Impact Fund of the University Grants Committee and has recruited about 600 households in four communities in Hong Kong to participate.

As of 30 June, 2023, households were expected to achieve a 10% reduction in electricity consumption, reducing electricity use by 480,000 kWh and carbon emission by 384,000 kg CO2e.

Participants shared a total of good family and community-based energy-saving practices and developed four community budgeting plans to reinvest money saved from reduced electricity

Households attend the SEE Project.

expenses and/or solar feed-in subsidies to community projects, thus carbon has been well-reduced with the SEE app.

Approximately 350 households are part of the App+Engagement intervention group, while about 230 households comprise the control group. Between 1 July, 2022 andto 30 June, 2023, around 350 households had smart sensors installed at home and downloaded the SEE App. Additionally, about 80 workshops and activities were carried out in various formats and themes in the communities. About 350 households in the four communities were given free access to the SEE app.

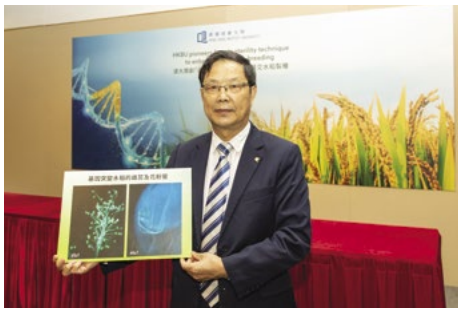
TRAILBLAZING AT THE FRONTIER OF SCIENCE FOR IMPACT

HKBU-led research facilitates more efficient hybrid rice breeding with pioneering female sterility technique

A breakthrough technique in hybrid rice seed production using the female sterility technique has been developed after nearly a decade of ongoing study by a research team led by Professor ZHANG Jianhua, Chair Professor of the Department of Biology.

The new technique has the potential to transform the rice breeding industry and improve food security. By increasing the efficiency of hybrid rice breeding, the new technique can help to meet the increasing demand for rice in many parts of the world, demonstrating tremendous potential for commercial applications.

The hybrid rice seeds produced using the female sterility technique have similar yields to those produced using the male sterility technique. However, the female sterility technique eliminates the need for manual removal of self-pollinating seeds, which will reduce the cost of production.



Professor ZHANG Jianhua explores female sterility technique for hybrid rice breeding.

The team identified a "spontaneous thermo-sensitive female sterility 1" (TFS1) gene mutation in an elite rice cultivar during paddy field production. The new technique has been tested in Hong Kong and Hunan Province in mainland China, and the results have been promising.

INDUSTRY COLLABORATION IN BIODIVERSITY CONSERVATION

The research team is led by Professor QIU Jianwen.

HKBU-led team discovers new box jellyfish species in Mai Po Hong Kong

A team of researchers, led by Professor QIU Jianwen, Professor and Associate Head of Department of Biology, along with collaborators from WWF-Hong Kong, Ocean Park Hong Kong, and the University of Manchester, has discovered a new species of box jellyfish in Hong Kong's Mai Po Nature Reserve.

This new jellyfish species, named Tripedalia maipoensis by the research team, belongs to the Tripedaliidae family. And it is the first of its kind to be found in Chinese waters. The discovery also adds a fourth species to the Tripedaliidae family.

This discovery is significant as it enriches our understanding of the biodiversity of jellyfish and highlights the importance of conservation efforts in protecting marine ecosystems.

ACHIEVEMENT

AWARD AND ACHIEVEMENT

HKBU scholars' innovations recognised at the 48th Geneva International Exhibition of Inventions

Four HKBU Inventions won in this year's Geneva International Exhibition of Inventions (three in the Gold Medal & one in the Silver Medal), held from 26 to 30 April 2023. At the 48th exhibition, over, 1,000 inventions were registered and more than 800 exhibitors from 40 countries and regions have participated in the event. The awarded HKBU inventions are as below:

Multi-mode photodetectors and methods of fabricating the same

Invented by Professor ZHU Furong, Professor of Department of Physics. The multi-mode photodetector (PD) responds in near infrared (NIR) and visible light ranges, generating either NIR or visible light photocurrents. The bias-switchable spectral response PD can obtain quality information via photocurrents, and it offers an attractive quality control option for applications in environmental pollution, bio, medical, agricultural, automotive, fishery, food, wellness and security monitoring, detection and imaging.

A rapid and sample-to-answer AST microfluidic system applicable in resource-limited conditions

Invented by Dr REN Kangning, Associate Professor of Department of Chemistry, the rapid and sample-to- answer antimicrobial susceptibility testing (AST) microfluidic system, which addresses antimicrobial resistance, is applicable in resource-limited conditions, such as low-income countries that lack expensive instruments. The new technology can provide information about any drug-resistant pathogens presented in samples simply by using a cell phone, enabling a quick screening of samples via onsite testing within three hours.

An aptamer drug targeting sclerostin loop3 for bone anabolic therapy without increasing cardiovascular risk

Invented by Dr YU Yuanyuan, Assistant Professor of the School of Chinese Medicine, a specific aptamer targeting sclerostin loop3 as a treatment for osteoporosis was effectively inhibits sclerostin's antagonistic effects, thus promoting bone formation in osteoporotic animal models. It did not increase the risk of developing cardiovascular diseases.

Bladder Cancer Photodynamic Therapeutic Agents with Off-On Magnetic Resonance Imaging Enhancement

Invented by Professor WONG Ka Leung, Chair Professor and Dr Man Hung Mok Endowed Professor, Department of Chemistry. The invention shows both impressive photodynamic therapy effects (PDT) and robust in vivo MRI signal enhancement, which enables precise diagnosis and local staging evaluation of bladder cancer. With the presence of targeting peptides and the "off-on" responsive MRI signal enhancement, the invention features a significant binding specificity and provides theranostic effects on site.

PATENTS GRANTED IN THE REPORTING YEAR

In the reporting year of 2022-2023, a total of 26 invention patents have been granted to different inventions by our innovative researchers. A table listing the details of our granted invention patents are as follows:

No.	1
Patent Title	Identification of Cyclic Peptide Agonists of Galanin Receptor 2 and 3 Guided By Spexin Solution Structure
Jurisdiction	Germany
Filing Date	2018-03-23
Application No.	EP 18780453.9
Date of Patent	2022-08-31
Patent No.	DE 60 2018 040 051.6
Inventor(s)	BIAN Zhaoxiang, LIN Chengyuan, HUANG Tao
School/Faculty	School of Chinese Medicine

No.	2
Patent Title	Identification of Cyclic Peptide Agonists of Galanin Receptor 2 and 3 Guided By Spexin Solution Structure
Jurisdiction	European Procedure (Patents)
Filing Date	2018-03-23
Application No.	EP 18780453.9
Date of Patent	2022-08-31
Patent No.	EP 3606948
Inventor(s)	BIAN Zhaoxiang, LIN Chengyuan, HUANG Tao
School/Faculty	School of Chinese Medicine

AWARD AND ACHIEVEMENT

Chen Ning Yang Award

Dr MA Guancong, Associate Professor of the Department of Physics, was bestowed with the prestigious Chen Ning Yang Award 2022 for his pioneering investigations into novel Hermitian and non-Hermitian topological phases in wave systems. Dr MA is one of three awardees this year, and the first physicist from a Hong Kong university to receive the Award.

Jointly established by the Association of Asia Pacific Physical Societies (AAPPS) and the Asia Pacific Centre for Theoretical Physics (APCTP), the Chen Ning Yang Award aims to honour young researchers and promote the development of leaders in physics in the Asia Pacific region. Dr MA's main research interest lies in classical wave physics with a focus on topological acoustics and mechanics. His topics of interest also cover areas such as acoustic and elastic metamaterials, as well as wavefield shaping.

No.	3
Patent Title	Anti-Cancer Composition Comprising of Halofuginone and Sesquiterpene Lactone Compounds of Artemisia Aplacea and the Use Thereof
Jurisdiction	Germany
Filing Date	2016-09-27
Application No.	EP 16883244.2
Date of Patent	2022-11-02
Patent No.	DE 60 2016 076 135.1
Inventor(s)	BIAN Zhaoxiang, CHEN Guoqing, GONG Ruihong, YANG Dajian, LYU Aiping
School/Faculty	School of Chinese Medicine

No.	4
Patent Title	Anti-Cancer Composition Comprising of Halofuginone and Sesquiterpene Lactone Compounds of Artemisia Aplacea and the Use Thereof
Jurisdiction	European Procedure (Patents)
Filing Date	2016-09-27
Application No.	EP 16883244.2
Date of Patent	2022-11-02
Patent No.	EP 3400936
Inventor(s)	BIAN Zhaoxiang, CHEN Guoqing, GONG Ruihong, YANG Dajian, LYU Aiping
School/Faculty	School of Chinese Medicine

No.	5
Patent Title	Anti-cancer Composition Consisting of Halofuginone and Sesquiterpene Lactone Compounds of Artemisia Aplacea and the Use Thereof
Jurisdiction	Hong Kong
Filing Date	2016-09-27
Application No.	HK 19123501.9
Date of Patent	2023-01-20
Patent No.	HK 40000274 B
Inventor(s)	BIAN Zhaoxiang, CHEN Guoqing, GONG Ruihong, YANG Dajian, LYU Aiping
School/Faculty	School of Chinese Medicine

No.	6
Patent Title	Method of Using of Dihydro-resveratrol or Its Stilbenoid Derivatives and/or Chemical Variants as Antimicrobial Agents
Jurisdiction	China
Filing Date	2019-07-03
Application No.	CN 201910596632.1
Date of Patent	2022-12-20
Patent No.	ZL 201910596632.1
Inventor(s)	TSANG Siu Wai, ZHANG Hongjie
School/Faculty	School of Chinese Medicine

No.	7
Patent Title	Skin-protection Composition Containing Dendrobium-based Ingredients
Jurisdiction	Hong Kong
Filing Date	2017-10-26
Application No.	HK 19132414.4
Date of Patent	2022-11-18
Patent No.	HK 40009031
Inventor(s)	ZHU Yu, TSANG Siu Wai, ZHANG Hongjie
School/Faculty	School of Chinese Medicine

No.	8
Patent Title	Method and Compounds for Inhibiting the Mcm Complex and Their Application in Cancer Treatment
Jurisdiction	European Procedure (Patents)
Filing Date	2013-05-09
Application No.	EP 20130787939
Date of Patent	2023-06-07
Patent No.	EP 2846807B
Inventor(s)	LIANG Chun, WANG Ziyi, YU Zhiling, JIANG Zhihong, WANG Jingrong, BAI Liping
School/Faculty	School of Chinese Medicine

No.	9
Patent Title	Method and Compounds for Inhibiting the Mcm Complex and Their Application in Cancer Treatment
Jurisdiction	Switzerland
Filing Date	2013-05-09
Application No.	13787939
Date of Patent	2023-06-07
Patent No.	EP 2846807B
Inventor(s)	LIANG Chun, WANG Ziyi, YU Zhiling, JIANG Zhihong, WANG Jingrong, BAI Liping
School/Faculty	School of Chinese Medicine

No.	10
Patent Title	Fluorescence Probes of SARM1 Enzymatic Activity and Uses Thereof
Jurisdiction	China
Filing Date	2020-06-11
Application No.	CN 202010528147.3
Date of Patent	2023-02-24
Patent No.	ZL 202010528147.3
Inventor(s)	LEE Chi Sing, HUANG Ke, LI Wanhua, LEE Hon Cheung, ZHAO Yongjuan
School/Faculty	Faculty of Science

No.	11
Patent Title	Bladder Cancer Photodynamic Therapeutic Agents with Off-on Magnetic Resonance Imaging Enhancement
Jurisdiction	China
Filing Date	2019-04-03
Application No.	CN 201980034373.1
Date of Patent	2023-06-27
Patent No.	ZL 20198003437.1
Inventor(s)	WONG Ka Leung, WONG Wai Kwok, CHAU Ho Fai
School/Faculty	Faculty of Science

No.	12
Patent Title	Bladder Cancer Photodynamic Therapeutic Agents with Off-on Magnetic Resonance Imaging Enhancement
Jurisdiction	United Kingdom
Filing Date	2019-04-03
Application No.	GB 2016849.8
Date of Patent	2022-11-30
Patent No.	GB 2587518
Inventor(s)	WONG Ka Leung, WONG Wai Kwok, CHAU Ho Fai
School/Faculty	Faculty of Science

No.	13
Patent Title	Bladder Cancer Photodynamic Therapeutic Agents with Off-on Magnetic Resonance Imaging Enhancement
Jurisdiction	United States of America
Filing Date	2019-04-02
Application No.	US 16/372,492
Date of Patent	2022-11-08
Patent No.	US 11/491,224
Inventor(s)	WONG Ka Leung, WONG Wai Kwok, CHAU Ho Fai
School/Faculty	Faculty of Science

No.	14
Patent Title	Synthetic Patentiflorin a Analogs as Antiviral Agents
Jurisdiction	United States of America
Filing Date	2020-08-25
Application No.	US 16/947,935
Date of Patent	2023-05-02
Patent No.	US 11,638,713
Inventor(s)	ZHANG Hongjie, LI Wanfei, TSANG Nga Yi
School/Faculty	School of Chinese Medicine

No.	15
Patent Title	Low Frequency Acoustic Absorption and Soft Boundary Effect with Frequency-discretized Active Panels
Jurisdiction	China
Filing Date	2019-12-31
Application No.	CN 201911416118.1
Date of Patent	2023-02-28
Patent No.	ZL 201911416118.1
Inventor(s)	SHENG Ping, DONG Zhen, PAN Jie, MA Guancong, ZHANG Xiaonan, MAK Ho Yiu
School/Faculty	Faculty of Science

No.	16
Patent Title	Chromophore-labeled Oligosaccharide Markers and Methods of Use Thereof
Jurisdiction	United States of America
Filing Date	2020-05-11
Application No.	US 16/871,188
Date of Patent	2022-10-18
Patent No.	US 11/474,100
Inventor(s)	WONG Tin Long, HAN Quanbin, LI Lifeng
School/Faculty	School of Chinese Medicine

No.	17
Patent Title	A Therapeutic Inhibitor for EBV-associated Tumor with Tailor Responsive Optical Imaging
Jurisdiction	China
Filing Date	2017-04-25
Application No.	CN 201780026402.0
Date of Patent	2022-07-19
Patent No.	ZL 201780026402.0
Inventor(s)	WONG Ka Leung, MAK Nai Ki, JIANG Lijun
School/Faculty	Faculty of Science

No.	18
Patent Title	Biocompatible Sculptured Extracellular Nanomatrix Enables Self Assembly of Neural Stem Cells Into Miniature Brain Organoids of Substantia Nigra
Jurisdiction	United States of America
Filing Date	2018-12-04
Application No.	US 16/209,934
Date of Patent	2022-09-06
Patent No.	US 11/434,470
Inventor(s)	YUNG Kin Lam, HUANG Zhifeng, ZHANG Shiqing
School/Faculty	Faculty of Science

No.	19
Patent Title	Multiple Surfaces for Physical-to-image / Image-to-physical Registration and Image Verification
Jurisdiction	China
Filing Date	2017-02-23
Application No.	CN 201780087268.5
Date of Patent	30-6-2023
Patent No.	ZL 201780087268.5
Inventor(s)	Henry Yuk-tung NGAN, Walter Yu-hang LAM, Richard Tai-chiu HSUNG, Henry Wai-kuen LUK, Edmond Ho-nang POW
School/Faculty	Faculty of Science

No.	20
Patent Title	Filter-free Tunable Spectrum Photodetectors
Jurisdiction	United States of America
Filing Date	2020-06-22
Application No.	US 16908694
Date of Patent	2022-09-13
Patent No.	US 11,444,256
Inventor(s)	ZHU Furong, LAN Zhaojue
School/Faculty	Faculty of Science

No.	21
Patent Title	System for Efficient Large-scale Data Distribution in Distributed and Parallel Processing Environment
Jurisdiction	United States of America
Filing Date	2019-12-31
Application No.	US 16/731,095
Date of Patent	2022-09-06
Patent No.	US 11/436,065
Inventor(s)	CHU Xiaowen, SHI Shaohuai, ZHAO Kaiyong
School/Faculty	Faculty of Science

No.	22
Patent Title	Nano Bi-material Electromagnetic Spectrum Shifter
Jurisdiction	Germany
Filing Date	2016-09-30
Application No.	EP 16850403.3
Date of Patent	2022-08-31
Patent No.	DE 60 2016 074 721.9
Inventor(s)	CHEAH Kok Wai, CHING Suet Ying
School/Faculty	Faculty of Science

No.	23
Patent Title	Nano Bi-material Electromagnetic Spectrum Shifter
Jurisdiction	European Procedure (Patents)
Filing Date	2016-09-30
Application No.	EP 16850403.3
Date of Patent	2022-08-31
Patent No.	EP 3356869B1
Inventor(s)	CHEAH Kok Wai, CHING Suet Ying
School/Faculty	Faculty of Science

No.	24
Patent Title	Sapphire Thin Film Coated Substrate
Jurisdiction	Hong Kong
Filing Date	2019-11-19
Application No.	HK 19132420.1
Date of Patent	2022-09-16
Patent No.	HK 40009036
Inventor(s)	CHEAH Kok Wai, LAM Wing Yui, CHAN Yu Wai
School/Faculty	Faculty of Science

No.	25
Patent Title	Sapphire Thin Film Coated Substrate
Jurisdiction	United States of America
Filing Date	2019-01-21
Application No.	US 16/252,737
Date of Patent	2022-12-27
Patent No.	US 11,535,926.
Inventor(s)	CHEAH Kok Wai, TAM Hoi Lam, LAM Wing Yui
School/Faculty	Faculty of Science

No.	26
Patent Title	Multi-mode Photodetectors and Methods of Fabricating the Same
Jurisdiction	China
Filing Date	2019-10-08
Application No.	US 201910951975.5
Date of Patent	2023-06-09
Patent No.	ZL 201910951975.5
Inventor(s)	ZHU Furong, LAN Zhaojue
School/Faculty	Faculty of Science

PERFORMANCE MEASURE - KEY PERFORMANCE INDICATORS

Number of patents FILED in the year
(with breakdown by jurisdiction and type)

2021-22		2022-23	
Jurisdiction	**Type**	**Jurisdiction**	**Type**
12 (US)	13 (A61)	14 (US)	13 (A61)
3 (CN)	7 (C07)	5 (CN)	2 (C07)
5 (PCT)	2 (C12)	1 (EP)	2 (C12)
1 (HK)	5 (G01)	1 (HK)	4 (G01)
1 (EP)	1 (H01)	1 (ID)	4 (H01)
1 (FR)		2 (PCT)	
1 (IT)		1 (CH)	
1 (MY)			
1 (TH)			
1 (SG)			
1 (ES)			

Number of patents GRANTED in the year
(with breakdown by jurisdiction and type)

2021-22		2022-23	
Jurisdiction	**Type**	**Jurisdiction**	**Type**
3 (US)	10 (A61)	7 (CN)	14 (A61)
8 (CN)	1 (C07)	4 (EP)	1 (B02)
2 (HK)	6 (C12)	3 (DE)	2 (C07)
1 (EP)	1 (G06)	3 (HK)	1 (C12)
1 (DE)	6 (H01)	1 (GB)	2 (G01)
1 (GB)		7 (US)	1 (G06)
2 (TW)		1 (CH)	5 (H01)
2 (JP)			
1 (FR)			
1 (CH)			
1 (MY)			
1 (AU)			
108 Number of licensed IP		100 Number of licensed IP	

100
Licensed IP
2022-23

Notes:

Some of the KT performance indicator data previously reported in the HKBU KT Annual Report will now be found under Domain 3 of the University Accountability Agreement (UAA) as sector-wide performance measures (PMs) and institution-specfic key performance indicators (KPIs) data.

N1 Company that has been established by staff, graduates or students and is now operationally independent of the university. It includes but not limited to all spin-off companies that were funded by HKBU Technology Start-up Support Scheme for Universities (TSSSU).

N2 Actual income received for collaborative research refers to the income received during the particular financial year.

N3 Actual income received for contract research refers to the income received during the particular financial year.

N4 Income from consultancy refers to the income received during the particular financial year. Consultancy income for 2022-23 includes HK$13.4m attributed from KT income received from the Beijing Normal University-HKBU United International College.

N5 The student contact hours are defined to be the number of enrollments multiplied by the number of contact/course hours.

N6 This number includes data from Jockey Club Creative Arts Centre (JCCAC) and the Academic Community Hall.

N7 The CPD courses are now defined to include award-bearing and credit-bearing programs (both in and outstide HK) for learners already in work who are undertaking the course for purpose of professional development/ upskilling/ workforce development, in additon to short term non-credit bearing training programs.

N8 Data are collected from all units at HKBU. The data includes both in-person and online activities.

	Performance Indicators	2021-22	2022-23
1	Income generating from intellectual property as defined in Common Data Collection Format	HK$3,364,560	HK$1,519,996
2	Expenditure involved in generating income from intellectual property rights	HK$2,031,945	HK$1,952,618
3	Number of economically spin-off companies [N1]	38	44
4	Number of collaborative researches, and income thereby generated [N2]	15 HK$7,696,799	12 HK$30,119,291
5	Number of contract researches (other than those included in "collaborative researches" above), and income thereby generated [N3]	129 HK$435,477,132	119 HK$314,967,117
6	Number of consultancies, and income thereby generated [N4]	81 HK$55,819,966	62 HK$22,750,815
7	Number of student contact hours in short courses or e-learning programmes specially tailored to meet business or CPD needs [N5]	579,223	565,283
8	Number of equipment and facilities service agreements, and income thereby generated [N6]	90 HK$3,164,008	134 HK$4,545,220
9	Income received from CPD courses [N7]	HK$161,121,832	HK$160,471,382
	Total income from knowledge transfer via the provision of research and business services (i.e. collaborative research, contract research, consultancies & continuing professional development) Item (4)+(5)+(6)+(9)	HK$660,115,729	HK$505,557,852
10	Number of public lectures / symposiums / exhibitions and speeches to a community audience	490	431
11	Number of performances and exhibitions of creative works by staff or students	44	106
12	Number of staff engaged as members of external advisory bodies including professional, industry, government, statutory or non-statutory bodies	182	202
13	Number of performances and exhibitions of creative works, public lectures, symposia, exhibitions and speeches per hundred academic staff	148	147
14	Number of entrepreneurship activities [N8]	126	190
15	Number of student participation in entrepreneurship activities [N8]	7,110	6,675

Knowledge
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