# KNOWLEDGE TRANSFER

## ANNUAL REPORT 2021/2022

Submitted to
University Grants Committee

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The Hong Kong University of
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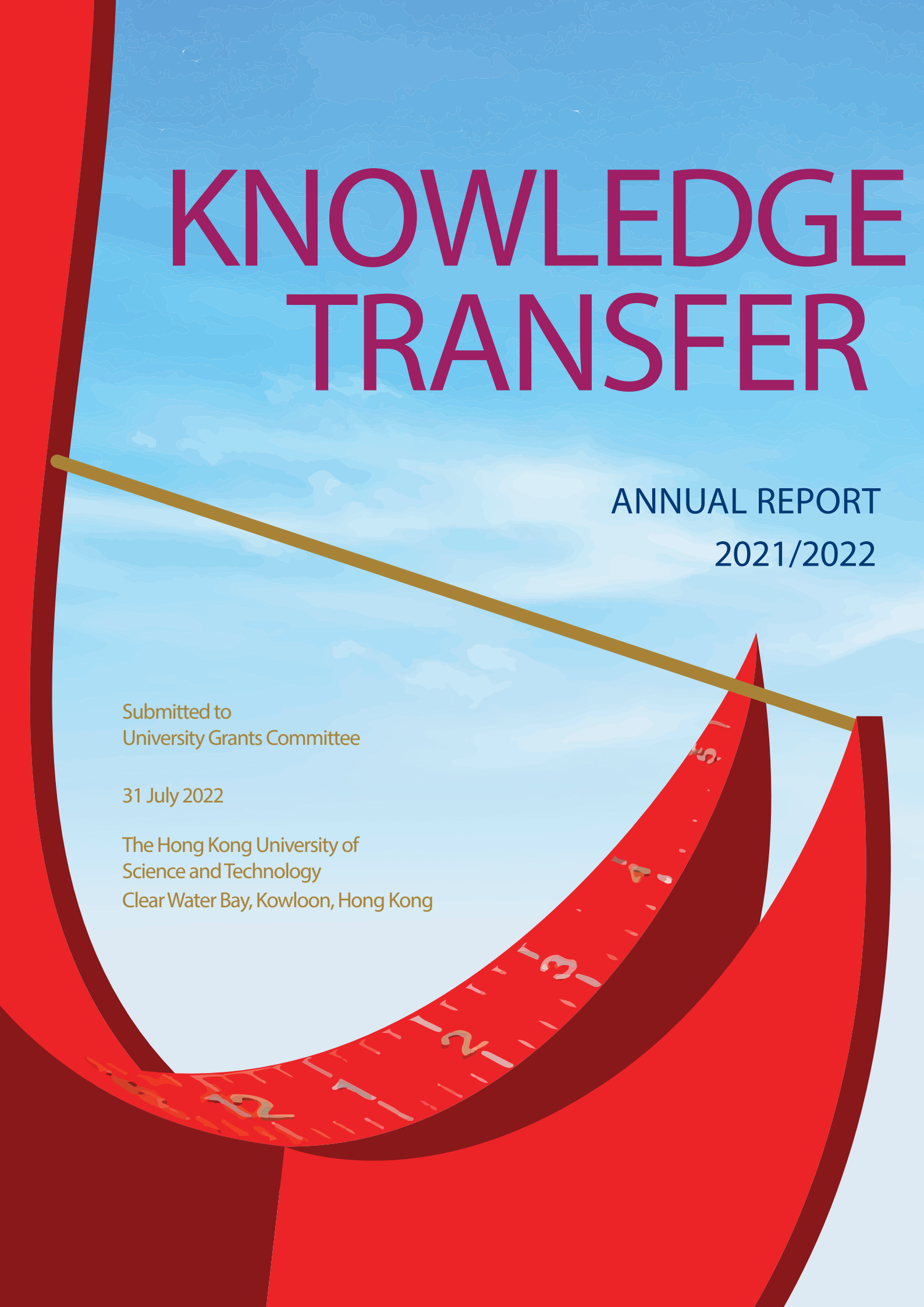
Clear Water Bay, Kowloon, Hong Kong



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## Executive Summary

The end of the current triennium, coinciding with HKUST's 30th Anniversary, marks a memorable time at the University and a highly fruitful period for Knowledge Transfer (KT) achievements. Under the University's latest Strategic Plan 2021-2028, KT continues as one of HKUST's five major strategic objectives and its goal to incorporate innovation and entrepreneurship into the spirit of the University demonstrates the long-term commitment made to the transformation of HKUST research discoveries, technologies, and new knowledge into societal impact.

The KT contribution that HKUST is already making to Hong Kong's endeavors to develop into an international innovation and technology hub was highlighted by an official visit by President XI Jinping to the HKUST-led Hong Kong Center for Neurodegenerative Diseases on 30 June 2022 during his trip to Hong Kong. The Center, which has made promising breakthroughs in early diagnosis and therapeutic treatment of Alzheimer's disease, is one of three led by HKUST under the Hong Kong government's flagship InnoHK initiative to bring cutting-edge research and translational activities to areas of economic and social importance to improve people's lives.

Indeed, despite the on-going challenges to activities brought by COVID-19, HKUST's entrepreneurial spirit has revealed itself to be in action in many different ways in 2021-2022, supported by the University's holistic KT support system. The wide-ranging and effective nature of this KT pipeline is illustrated by the five impact cases featured in this report. Other significant outcomes and HKUST's increasing KT momentum include:

- A total of 1,616 active start-ups founded by HKUST students, alumni, staff, or incubated by HKUST programs or facilities and located in multiple countries/regions by June 2022.
- Two initial public offerings by companies co-founded by HKUST alumni; and 7 out of the 18 companies on the first Unicorns HK 2021 list founded or co-founded by HKUST faculty or alumni.
- Launch of wide-ranging collaborations with industry leaders, such as Huawei and MTR, and a pioneering new KT and technology commercialization collaboration model with Hong Kong Applied Science and Technology Research Institute Company Limited (ASTRI).
- Numerous KT sustainability-related developments, including the launch of the Sustainability/Net-Zero Office to drive implementation of the University's sustainability strategy, and winning the Honorary Member Award in the International Sustainable Campus Network Excellence Awards recognizing the University's pioneering Sustainable Smart Campus as a Living Lab (SSC) initiative. By 2022, SSC had involved more than 150 faculty, 400 students, and 30-plus University-funded projects. It has also been adopted at the University's new HKUST(GZ) campus.

Another milestone for the University's long-term future was achieved when final approval was granted by the Ministry of Education in June 2022 for the establishment of the new campus in Nansha, which will now join HKUST at Clear Water Bay and the University's earlier Mainland platforms in providing cutting-edge education, research, and knowledge transfer. Through the HKUST2.0 concept, HKUST and HKUST(GZ) will offer complementary academic structures and collaborative activities, with the resulting synergy set to lead the way forward in higher education, nurturing of talents, and impactful translational activities for the Greater Bay Area and beyond.

HKUST(GZ) will open in September 2022. It is an immensely exciting prospect, providing the impetus and resources for HKUST to: enhance the impact of its discoveries and applications through an extension of the traditional R&D model to R&BD (Research and Business Development); expand strategic industry engagement through direct engagement with key industry partners in the Mainland; further improve its framework of start-up incubation and investment; and build links with leading global incubators.

HKUST thus looks set to have excellent opportunities in the next triennium to deepen and widen its KT contribution, help address pressing global social and economic challenges, and in line with its Strategic Plan, advance the future of living, work, and people.

## Comprehensive KT Pipeline Delivers Multiple Routes to Entrepreneurship and Societal Impact

In line with HKUST's Strategic Plan, the University is increasingly generating knowledge transfer (KT) and entrepreneurial endeavors that draw on its championing of deep technologies, innovation, and sustainability to turn new knowledge and technologies into services and products of value to society's future. The outcome, as manifested by the impact cases below, is a dynamic pipeline of diverse applications and start-ups to spur the development of Hong Kong and beyond.

### Fostering Deep-Tech Innovation for an Internet-of-Everything (IoE) World

HKUST spin-off company Atom Semiconductor is one beneficiary of the University's long-term support for "technopreneurship" – the integration of deep technology with entrepreneurship. While Atom itself was only founded in 2020, the start-up specializes in fabless integrated circuit design emanating from the world-class original technologies developed by Prof. George YUAN, Department of Electronic and Computer Engineering, and his Mixed-Signal Sensory Integrated Circuits Laboratory (MIXIC) researchers over more than a decade. The company's focus is on developing state-of-the-art high-performance analog signal-chain integrated chips and integrated digital sensor chips, with prospective impact on smartphones, consumer electronics, industrial electronics, medical electronics, and many other sectors.


*Prof. George YUAN, Founder of Atom Semiconductor.*

As innovation in electronic technology accelerates, such chip technology is increasingly becoming a key differentiator in the Internet-of-Everything (IoE) era. However, in contrast to new businesses with products of more immediate market applicability, deep technology often involves a long lead time, encompassing the generation of creative new technologies requiring intellectual property (IP) protection as well as capital investment for technical research and development ahead of commercialization.

Starting with technology incubation through guidance on and protection of IP, HKUST's forward-looking KT ecosystem has provided on-going support over the years to move Prof. Yuan's deep tech innovation forward to start-up readiness. Proactive KT team input has included exploring and lining up collaborative opportunities, providing information on market needs to assist business development and marketing plans, and building funding support to develop the technologies further.

After Prof. Yuan founded Atom, KT units nurtured the company in numerous ways. KT teams assisted with licensing of three core HKUST inventions (involving four patents) generated by the MIXIC Lab, giving the company its technical edge. The HKUST Entrepreneurship Fund (E-Fund), a capital investment program for promising HKUST technology start-ups, brought Atom to the attention of Alibaba Entrepreneurs Fund, which became the young firm's angel co-investor along with E-Fund. Further KT support enabled Atom to join the government's Technology Start-up Support Scheme for Universities in 2021-2022. In March 2022, the start-up further received subsequent pre-A round funding from several leading investors.

Total investment now amounts to close to US$15 million (approximately HK$117 million), and Atom is headquartered in Hong Kong Science Park (HKSTP). There, the founding team is vigorously pursuing its vision to provide chip solutions to support customers' innovation in the IoE future and raising Hong Kong's techno-innovation hub profile. Branches in Shenzhen and Shanghai have also been set up.

### Balancing Start-up Commercial Goals and Social Responsibility

Student sustainability entrepreneurship is another major focus, with upcycling start-up Breer showcasing the motivational KT environment and practical support available to aspiring young creative thinkers at HKUST.

Keen to turn an environmental protection project on reducing surplus food into "social innovation", four undergraduates from the School of Engineering and School of Business and Management got in touch with the University's KT units to find out how. Their goal was to repurpose some of the large quantities of unsold bread being discarded every day by bakeries in Hong Kong – nearly 1,700 tonnes in total – and turn it into craft beer.

*(From left) Students Suyash MOHAN, Anushka PUROHIT, Naman TEKRIWAL and Deevansh GUPTA, Founders of Breer.*

Benefiting from the comprehensive KT programs and assistance available, the Breer founders learned about the practicalities of running a company and how to commercialize their pioneering concept, from honing their socially responsible business idea to supply chains and funding. Meanwhile, successful applications to the Entrepreneurship Acceleration Fund supported the start-up in its initial stages.

As the business took shape, the interactive relationship between the start-up and KT teams continued to spur development. The undergraduates came up with the idea of "Breer-runners", student volunteers who helped collect the leftover items, and HKUST supported the move by storing the waste bread in HKUST The BASE's co-working hub. In addition, the University's long-established industry connections enabled the students to contact major organizations and start collaborations. The team's self-devised Breer App followed, adding a valuable technology element that streamlined operational arrangements.

Once Breer's craft beer started to be sold commercially and gain media attention, the students were tempted to widen the investment base. However, after advice from the KT team, the founders decided to stay focused on improving their product and business know-how. Participation in the MentorHUB@HKUST scheme helped facilitate experience-sharing with a wide range of individuals and industries. The Breer team went on to win the prestigious HKUST-Sino One-Million-Dollar Entrepreneurship Competition in 2021, along with many other recognitions.

By June 2022, Breer had teamed up with Jardine Restaurant Group's Pizza Hut and Maxim's Group and sold 15,000 units of its first two brands via 200-plus outlets and 13,000 units of its third brand at some 100 outlets. With HKUST's support, the start-up has also joined HKSTP's incubation program. There, it is set not only to continue to cheer its customers but also the environment in Hong Kong and overseas, given the students' plans to expand.

### Moving Breakthroughs from Concept to Commercialization to Benefit the Community

As more HKUST research teams seek to move their discoveries from lab to market to improve people's lives, the University's KT pipeline is generating a range of ventures that are taking exciting new innovations into the community. In the case of polymer material expert Prof. Ping Gao, Department of Chemical and Biological Engineering, and her team, this has led from IP protection to the founding of two start-ups that are seeking to utilize the researchers' multifunctional polymer nanofilm technology.

The research team's new material is ultrathin and super-strong, free-standing and self-supporting, with other benefits including high transparency, gas permeability, and tunable porous properties. Such a range of significant characteristics makes it suitable to serve as a platform for product development in numerous areas, from water/air filtration and wearable electronic devices to antibacterial film for healthcare and flexible ultrathin batteries for energy. The technology's potential has also garnered international recognition, receiving a Gold Medal with Congratulations of the Jury at the 2022 International Exhibition of Inventions of Geneva.

With early contact between KT units and research teams, an established part of HKUST's KT ecosystem, KT colleagues facilitated the researchers take their first essential steps to commercialization by protecting the IP arising from the original research and by developing an effective patent filing strategy. A total of 12 patents for associated technologies have since been filed.

*Prof. GAO Ping holding the polymer material.*

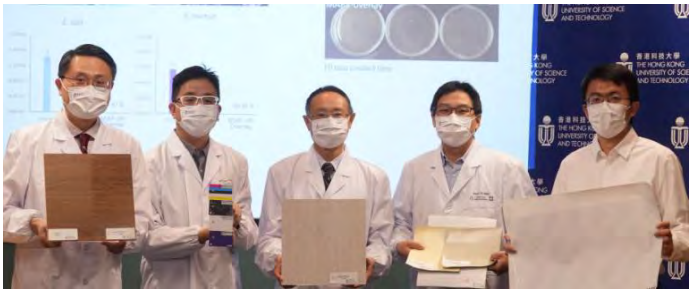
This close working relationship further assisted the research team after they established the two start-ups. Through the KT team's guidance, the companies and their founding teams were able to apply for the most suitable schemes and funding to optimize their growth and entrepreneurial progress at different stages of development. These included: the Bridge Gap Fund and HKUST-Kaisa Joint Research Institute for technology incubation and test-bedding; Entrepreneurship Acceleration Fund to boost innovation and entrepreneurship development; the Tech-Ship Program, introducing faculty research outcomes to students keen to form partnerships with academics for technopreneurship development and to build start-up team skills; and the Technology Start-Up Support Scheme for Universities, with funding for promising young companies provided to HKUST by the Innovation and Technology Commission (ITC).

The first start-up, PointFit, has now licensed nanofilm technology to develop a non-invasive sweat sensor to alert athletes to muscle fatigue levels while training through a connected mobile app. The second, GP Nano, is currently exploring further applications related to the nanofilms. Meanwhile, cutting-edge research into the field is set to extend at HKUST(GZ), where the first laboratory devoted to ultra-thin polymer membrane materials at a university in China is being set up. The new campus is due to open in Nansha in September 2022.

### Partnering with Industry and Government to Address Health and Environmental Challenges

Besides founding start-ups, HKUST researchers successfully collaborate with external partners to transfer cutting-edge research technologies to society. Recent extensions of the eco-friendly multilevel anti-microbial polymer technology (MAP-1), developed by a research team led by Prof. YEUNG King-Lun, Department of Chemical and Biological Engineering and Division of Environment and Sustainability, provide a significant example of how one fundamentally well-conceived HKUST technology can deliver multiple applications of benefit to the wider community through partnerships with industry and government.

The MAP-1 coating is a "smart", non-toxic technology that is fast and effective in inactivating up to 99.9% of highly infectious viruses on surfaces for up to 90 days. It is the result of 15 years' research optimization by Prof. Yeung, with funding support from the government's ITC, and field testing in public hospitals, among other locations. It was co-developed and licensed by Chiaphua Industries Limited (CIL) for commercialization as GERMAGIC™. The technology has already proved an essential part of Hong Kong's battle against COVID-19 through large-scale sanitization of surfaces in diverse premises, including schools, elderly homes, shopping malls, and sub-divided flats. Recently, the research team and CIL have extended the original technology to develop MAP∞, raising effectiveness from 90 days to five years for products that are constantly handled, such as plastic cards and spectacles, and sustained effectiveness against COVID-19, including Omicron. This has again been licensed by Chiaphua Industries.



*Prof. YEUNG King-Lun (first left) and his research team.*

In a further extension, a research team led by Prof. Yeung and funded by ITC has developed a multifunctional hydrogel that can be tailored to treat diverse odor problems and microbial contamination safely and efficiently. The team has been working with the Drainage Services Department to apply and test an inexpensive and eco-friendly **M**al**O**dor-**C**ontrol (MOC) hydrogel at manholes, nullahs, water channels, and other drainage sites. Testing has proved the technology effective in suppressing 99% of hydrogen sulfide, 80%-90% of Volatile Organic Compounds produced by microbes, and 80%-90% of sulfate-reducing bacteria. All commonly lead to foul odors, causing a nuisance to the community.

A new anti-microbial hydrogel (AMGel) that disinfects flush water, removing bacteria and viruses, including Omicron, is now being trialed at 2,880 flats at three public housing blocks in collaboration with the Housing Authority, and an elderly home under ITC's Public Sector Trial Scheme. With CIL's support, AMGel is also due to be applied to flush water systems in primary/secondary schools and subdivided flats in Sham Shui Po.

Along with disinfection of surfaces and water, the research team has developed a potent air purification technology to address airborne microbial transmission. The HKUST-developed air purification system is able to remove up to 99.999 percent of airborne bacteria and viruses and is available in the retail market as a household purifier. Industrial partner CIL has also donated up to HK$1.5 million worth of anti-microbial air filters to various hospitals in the Mainland, including Wuhan's COVID-19 emergency Huoshenshan Hospital.

### Speeding Up Knowledge Transfer with Direct Social Impact

As well as generating products that add value to society, HKUST researchers deliver social impact through directly working with different sectors of the community to transfer new knowledge. A notable venture of this kind, led by Prof. ZHANG Xin, Department of Mechanical and Aerospace Engineering, is bringing the results of decades of leading-edge aerodynamic research to Hong Kong's elite athletes and high-performance teams in a growing number of sports, including cycling, windsurfing, and triathlon.

With funding support from the two-year A. Kwok Sports Aerodynamics Science Initiative and the ITC, both starting in 2019, the HKUST research team has worked with the Hong Kong Sports Institute to lift Hong Kong teams' global competitive edge in sports of wide community interest and potential national and international acclaim for the city. As such, cycling has been a special focus.

The HKUST researchers' cycling aerodynamic R&D platform utilizes advanced wind tunnel test equipment and computational fluid dynamics simulations based on Formula One racing car and aerospace technology. It includes a next-generation test rig that accurately measures aerodynamic forces acting on a cyclist in wind. It can be used to evaluate cycling equipment, athletes' performance, and develop new skinsuits. Meanwhile, full simulation software running on Tianhe-2, China's second largest high-performance supercomputer, examines the aerodynamic force distribution and flow field around cyclists, among others; helps design cycling equipment; and assesses overtaking strategies for competitions.

*HKUST President Prof. Wei SHYY and the research team attend the opening ceremony of the Inspiration of Hong Kong photo exhibition at Olympian City.*

Drawing on these innovative technological tools, HKUST researchers have worked together with Hong Kong's leading cyclists, including Olympic medalist LEE Wai-Sze, to analyze individual competitive factors such as posture, riding equipment, and cycling apparel as a whole, using advanced wind tunnel tests to generate reliable data to optimize performance. The collaboration has contributed to better preparation for top events, such as the Tokyo Olympics, UCI Track Cycling Nations Cup, and National Games of China. Other Hong Kong sports teams gaining enriched performance insights from HKUST's aerodynamic expertise range from windsurfers to triathletes. The Hong Kong Olympic Committee has also visited HKUST to discuss the collaborative sports science initiative. Beyond athlete beneficiaries, HKUST researchers' sports performance enhancement work has generated wider community interest in the engineering technologies involved. This has seen high school students take up internships with the research team and gain hands-on experience of related experiments as well as a public showcase of the technologies at the *Inspiration of Hong Kong* photo exhibition at Olympian City in September 2021.

The research team is now looking into ways to develop specialized equipment and sensors for regular training sessions and assessments of athletes, and make the new cycling suits more cost-effective to enable a greater number of sporting enthusiasts to progress.

## *TECHNOPRENEURSHIP HIGHLIGHTS*

### ENTREPRENEURIAL SPIRIT IN ACTION

The entrepreneurial spirit inspired and implemented at HKUST had led to a cumulative total of 1,616 active start-ups founded by HKUST students, alumni, staff or incubated by HKUST programs or facilities by 2022. Highlights of the achievements of the University's many start-ups and entrepreneurial talents over 2021-2022 include two initial public offerings by companies co-founded by HKUST alumni: SmartSens, a leading high-performance CMOS image sensor chip manufacturer, listed on the Shanghai Stock Exchange STAR Market; and Yoho, a top B2C e-commerce platform in Hong Kong, listed on the Main Board of the Hong Kong Stock Exchange. HKUST 2021-2022 start-ups supported by the Technology Start-up Support Scheme for Universities (TSSSU), a government funding initiative, also received subsequent funding from additional sources of almost HK$111 million, an increase of 300% from the previous year. Until now, the University is proud to have two TSSSU awardees being acquired by Fortune 500 companies.

### HKUST UNICORNS GALLOP TO THE FOREFRONT IN EMERGING SECTORS

In the inaugural "**Unicorns HK 2021**" shortlist, announced by the Hong Kong X Foundation, 7 out of the 18 companies named were founded or co-founded by HKUST faculty or alumni. The Hong Kong X Foundation was established by Sequoia Capital China to promote the city's entrepreneurial culture. As unicorns, the unlisted start-ups each have a market value of more than US$1 billion (approximately HK$7.8 billion). Those related to HKUST focus on AI, robotics, high-end manufacturing, sensors, virtual banking, and autonomous driving.


*Unicorns HK 2021.* *(Source: CGTN)*

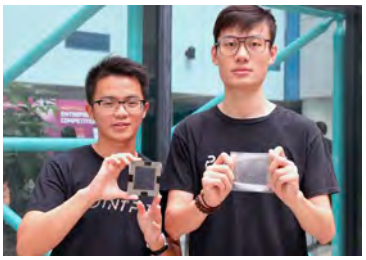
### START-UPS READY TO MAKE A DIFFERENCE


*Alumnus Patrick TU, Co-founder of Dayta AI Limited.*

**Dayta AI Limited (TSSSU 2019/20):** The company creates SaaS-based solutions that deliver AI and data analytics for retailers and brands. In 2020, Dayta received investment from HKUST's Entrepreneurship Fund (E-Fund) along with Co-Investment Partner Particle X, a Hong Kong-based accelerator and angel investor. The start-up raised a further US$1.8 million (approximately HK$14 million) for R&D, product development, and overseas expansion at its Pre-A funding round in 2022, with total investment to date totaling almost US$3 million (approximately HK$23.4 million). The company was named in the Forbes Asia 100 to Watch 2021 list.


*Alumnus Justin CHAN, Chief Executive Officer of Gense Technologies Limited.*

**Gense Technologies Limited (TSSSU 2018/19 & 2019/20):** Gense offers an affordable and portable self-help medical imaging device for in-depth health monitoring and diagnostic screening at home and in clinics. The E-Fund was one of its first investors in 2021, with Particle X also investing around the same time. The company was named one of the two winners of the Alibaba Entrepreneurs Fund/HSBC Jumpstarter 2022 Global Pitch Competition from a field of 600 start-ups from 60 countries and regions.



*Alumni Kenny OKTAVIUS and Jack CHEN, Co-founders of PointFit Technology Limited.*

**PointFit Technology Limited (TSSSU 2021/22 & 2022/23):** The sports technology start-up (see also P.4) has developed a non-invasive, real-time, and continuous health monitoring system to measure muscle fatigue based on sweat sensors using nanomembrane technology licensed from HKUST. PointFit received the Silver Award at the HKUST-Sino One-Million-Dollar Entrepreneurship Competition 2021. The E-Fund was one of its first investors in February 2022.

### TECHNO TALENTS SHOW COMPETITIVE EDGE


*HKUST's five winning teams at the City I&T Grand Challenge entrepreneurship competition.*

Hong Kong's first **City I&T Grand Challenge**, a competition focusing on environmental sustainability and social connectivity, saw HKUST become the university with the largest number of participants and start-up teams to receive championships and awards. The 2021 contest drew 740 submissions, with HKUST teams winning a total of six awards, including three championships, two innovation awards, and a "most favoured" honor in the Open and University/Tertiary Institute groups. The competition was organized by the Innovation and Technology Commission (ITC) and Hong Kong Science and Technology Parks Corporation (HKSTP).

A University team centered on reducing and recycling domestic food waste became champion of the **AECOM CityHack Hong Kong 2021**, while a HKUST social enterprise seeking to redistribute and resell stocks of soon-to-expire snacks via vending machines received the HKSTP Technopreneur Silver Award in the **YDC Dare To Change Business Pitch Competition**.

Ten out of 19 HKUST start-up teams won a total of 11 awards in six fields (information technology, life sciences, entrepreneurship, entrepreneurship proposal, start-up, and social enterprise/cultural & creative services) at the **7th Hong Kong University Innovation and Entrepreneurship Competition.** For the **8th Competition** in 2022, the number of HKUST teams rose to 33, an increase of 74%.

Three HKUST teams also graduated from the **Cyberport University Partnership Programme 2021,** and two have received support for their companies from the **Cyberport Creative Micro Fund**.


*Winners at the 7th Hong Kong University Student Innovation and Entrepreneurship Competition.*

## *HOLISTIC KNOWLEDGE TRANSFER PIPELINE*

### LAUNCHING THE ENTREPRENEURSHIP JOURNEY

The achievements highlighted above, and many others, are the fruitful outcome of the University's one-of-a-kind ecosystem. HKUST's holistic pipeline provides comprehensive and integrated support for faculty, students, and alumni to turn novel ideas and discoveries into applications and new businesses. This journey to commercialization is supported by numerous facilities, resources, and initiatives working successfully in synergy, along with guidance and assistance provided by dedicated Knowledge Transfer (KT) staff. Over 2021-2022, 511 active HKUST start-ups and spin-offs benefited from the University's start-up and incubation programs.

### FIRST STEPS AND INCUBATION

The **HKUST Entrepreneurship Center (EC)** incubates on average over 90 start-up companies per year, an achievement propelled forward by numerous entrepreneurship events and training, together with support from KT staff. EC-organized events saw over 1,500 students and alumni participate in competitions, including hackUST 2022, HKUST-Sino One-Million-Dollar Entrepreneurship Competition 2022, and HKUST Social Entrepreneurship Climate Challenge 2022, among others. In addition, over 30 start-ups were nominated by EC and fast-tracked into key incubation programs and open competitions. Meanwhile, the student-run HKUST The BASE continued to provide essential space and resources to the University's young innovators and start-ups to work on and introduce entrepreneurship projects to the HKUST community, partners, and investors.

### ENHANCING VALUE AND READINESS OF TECHNOLOGIES FOR COMMERCIALIZATION

Established in 2020, the **Bridge Gap Fund (BGF)** strengthens commercialization of HKUST technology and creates societal impact through funding support for HKUST faculty to engage in technology realization and validation. Since then, it has successfully enhanced the willingness of HKUST faculty to participate in research and development (R&D) for commercialization by creating viable intellectual property, forming start-ups and/or collaborating with industry. The BGF also works with the University's pioneering "Sustainable Smart Campus as

a Living Lab" (SSC) initiative (see P.16) to maximize outcomes and showcase the sustainability of BGF projects. In 2022, the fund received 29 applications and supported 14 projects, ranging from biomedicine and materials to the Internet of Things, communication, and electronics.

## Spurring a Larger Investment Pool and Ecosystem

Several significant funding initiatives are available to give fledgling businesses with strong impact potential the opportunity to move further along the technology transfer pipeline.

### Technology Start-Up Support Scheme for Universities (TSSSU)

TSSSU, launched in 2014 by ITC, enables HKUST to further support technology-focused start-ups. In 2021, 74% of the businesses formed by the 14 HKUST TSSSU funding awardees were based on University technologies. Around 79% of TSSSU 2021 awardees have also participated in incubation programs organized by either HKSTP or Cyberport. Demonstrating their business development progress, almost 80% of the awardees received external funds, creating around 90 jobs and training opportunities in the year under review, a 60% increment on the previous TSSSU round. TSSSU 2022 attracted a record 60 applications, bringing the total number of HKUST TSSSU funding applications in the past nine years to 384.

### HKUST Entrepreneurship Fund

The HKUST Entrepreneurship Fund (E-Fund) has assessed more than 150 HKUST start-ups' potential for investment, with KT teams working together to provide practical training, workshops, and events to the HKUST start-up community to enhance their all-round development and appeal to investors. There are currently 20 Co-Investment Partners under the E-Fund's Co-Investment Model, managing an investment pool of more than HK$14 billion and investing approximately HK$25 million in E-Fund portfolio companies. An advisory panel comprising 12 international experts advises on due diligence for investment under the HKUST-Initiated Investment Model. Since December 2019, the E-Fund has approved 12 investment proposals totaling HK$12.9 million and completed investments in nine companies totaling HK$8.9 million. Co-Investment Partners, along with other investors, have invested seven times more than the E-Fund, demonstrating the fund's role as a catalyst for quality investors.

*The HKUST E-Fund Portfolio Showcase 2021, which attracted around 120 guests.*

### Drawing In External Investment


*HKUST President Prof. Wei SHYY delivers opening remarks at the HKUST Start-up Showcase 2022.*

The **HKUST E-Fund Portfolio Showcase 2021** took place in December, giving E-Fund start-ups a valuable opportunity to pitch their innovations to the University's investor and industry partner network. Around 120 guests, including E-Fund's Co-investment Partners, HKUST senior management, donors, and industry partners from nine cities participated. Riding on its success, a larger-scale face-to-face **HKUST Start-up Showcase 2022** was held on 30 June, drawing 150 participants, including 105 investors and industrial partners. More than 25 E-Fund and TSSSU-supported start-ups showcased their cutting-edge technologies, including biomedical, health tech, smart city, and sustainability innovations. Both events, organized by the Office of Knowledge Transfer (OKT), strengthened connections between HKUST start-ups, the business and innovation community. They also enhanced the start-ups' visibility with OKT's investor network.

### ALL-ROUND START-UP SUPPORT

*Companies incubating in the HKUST Start-up Zone.*

A further platform assisting faculty, staff, students, and alumni to establish technology-based start-ups is the **HKUST Entrepreneurship Program.** Established in 1999, the scheme offers all-round incubation support, with a total of 67 companies gaining approval to join the program since its inception. In 2021-2022, a total of 26 start-ups were incubating in the HKUST Startup Zone; among them include members of the Entrepreneurship Program, HKUST Technology Licensees and awardees of other HKUST-funded entrepreneurship programs. Support for new enterprises over the year included help in identifying their value propositions and in formulating compelling business models along with webinars and clinics covering topics such as Entering the Market in the Greater Bay Area and Financial Management as a Key for Company Growth. Provision of accounting, company secretarial, and legal services from internal and external providers are among future plans to strengthen the development of start-up members.

## Strengthening Infrastructure, Capabilities and Partnership

### ACCELERATING HONG KONG AS A GLOBAL R&D HUB

HKUST leadership of three major research centers under the Hong Kong government's flagship InnoHK initiative is bringing cutting-edge discoveries and translational activities in areas of key economic and social importance to people's lives. The three centers focus on healthcare, AI chip design, and hi-tech innovation in the construction industry. Research involves collaborations with distinguished local and overseas university research teams as well as Mainland organizations, with projects seeking to raise Hong Kong's national and international profile as an innovation and technology hub. The significance of such work was recognized by an official visit by President XI Jinping to the HKUST-led Hong Kong Center for Neurodegenerative Diseases during his visit to Hong Kong for the 25th anniversary of the establishment of the Hong Kong Special Administrative Region (HKSAR).

**Hong Kong Center for Neurodegenerative Diseases (HKCeND)**

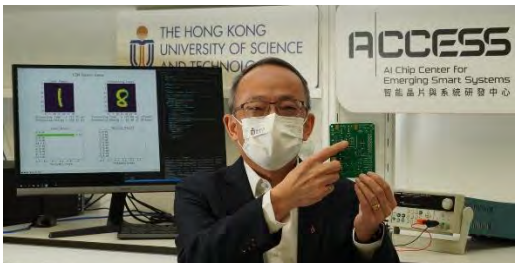
*HKCeND receives President XI Jinping, and the Chief Executive of the HKSAR Carrie LAM Cheng Yuet-Ngor at the Center on 30 June 2022.* (Photo: Xinhua News)

HKUST and researchers at HKCeND were highly honored to receive President XI Jinping, together with other officials from the Central Government and the HKSAR, at the Center on 30 June 2022. HKCeND researchers have made promising breakthroughs in early diagnosis and therapeutic treatment of Alzheimer's disease that have the potential to transform disease management, including the identification of new blood-based biomarkers and an AI-based scoring system that enables risk prediction, early detection and classification of the disease. During the visit, Prof. Nancy IP, Center Director and The Morningside Professor of Life Science at HKUST, introduced President Xi to the Center's key projects and outcomes, with the President enquiring in detail about research progress, technical advantages, and future clinical applications for the Alzheimer's disease projects. The Center, located at Hong Kong Science Park, is also working with Hong Kong Science and Technology Parks Corporation (HKSTP) to put genomic technology development in Hong Kong on the world map.

**AI Chip Center for Emerging Smart Systems (ACCESS)**

ACCESS is Asia's first transnational consortium to perform research and development on AI chip and hardware design, and to nurture talent for the booming global AI chip market. The end-to-end consortium is driving innovation through novel AI chips that improve performance and energy efficiency by up to 1,000 times. Software-

hardware co-designed solutions will enable companies of all sizes to rapidly deploy their own customized AI-driven applications, helping to realize ubiquitous AI applications in society. Fourteen projects are underway, and 10 local and global companies have shown interest in ACCESS technologies. In June 2022, ACCESS also signed a Memorandum of Understanding with the Hong Kong Applied Science and Technology Research Institute (ASTRI).



*Prof. Tim CHENG, Founding Director of the AI Chip Center for Emerging Smart Systems.*

**Hong Kong Center for Construction Robotics (HKCRC)**


*Prof. Zexiang LI, Founding Director of the Hong Kong Center for Construction Robotics*

The Center brings robotics, AI, and other advanced technologies to the construction industry, setting out to address real-life and immediate challenges. HKCRC assisted in the rapid building of Mainland-supported quarantine facilities at Hong Kong's Penny's Bay and Kai Tak Pier in early 2022 through the provision of the latest R&D findings. It also hosted the Innovation Training Camp Summer 2021, with "Intelligent Construction and Smart Homes" as the camp's theme. Design thinking sessions, entrepreneur sharing, and industry tours were among the activities provided for the student participants to experience building a business from scratch. Outcomes were showcased on the camp's Demo Day.

## Fostering Research Excellence

2021-2022 continued to present headwinds for HKUST. Nevertheless, persistence and dedicated effort meant University researchers were still able to secure a total of HK$344.2 million in funding for 140 collaborative research projects. HKUST's established network of research laboratories, centers, and institutes continued to provide significant platforms for impactful research, knowledge sharing, and talent creation, alongside global partners. HKUST(GZ), which opens in September 2022, will offer another major springboard for development of the University's research, translational, and entrepreneurial endeavors.

**Theme-based Research Scheme Projects**

Prof. XIE Ting and his team were awarded HK$58.20 million to identify the key molecular mechanisms underlying stem cell-niche interactions during tissue development, maintenance, and aging. Breakthroughs made in the project will pave the way for the use of stem cells in treating degenerative diseases, and combating cancer and aging. Meanwhile, HK$41.31 million went to a project seeking to develop Hong Kong into a globally leading green finance center, led by Prof. ZHANG Chu, Department of Finance. The 27-strong team of academics, former policymakers, and experienced practitioners will formulate policy recommendations and generate industry impact through derivative products, finance models, manpower studies, and new business ventures.

**Research Impact Fund Projects**

Accumulating almost 30,000 citations to his work thus far, Prof. YEUNG Dit-yan's Computer Science and Engineering team has received HK$6.865 million in funding from the UGC's Research Impact Fund to develop graph-based spatiotemporal trend forecasting machine learning models. The models will be applied to weather forecasting and electric power load forecasting to verify their accuracy through a collaboration with the Hong Kong Observatory and Hong Kong Electric.

**Applied Research Projects**

The Innovation and Technology Commission (ITC) supported 34 applied research projects with total funding of HK$140.8 million. Notably, backed by the Environment Bureau, Prof. Alexis LAU's team was granted HK$18.03 million to set up the first volatile organic compound (VOC) laboratory in Asia that can quantify at least 149 VOC species at one time, with parts-per-trillion sensitivity and precision. Meanwhile, Prof. Nancy IP and partners at Morningside Life Science Limited and the Chinese University of Hong Kong received funding of HK$16.04 million under the ITC's Partnership Research Programme. The funding will support a project involving a randomized-controlled trial to gain critical insights into the clinical use of the antidepressant, trazodone in delaying the

progression from mild cognitive impairment to Alzheimer's disease in individuals with obstructive sleep apnea.

**Green Tech Fund Projects**

In the inaugural round of the Green Tech Fund, HKUST received three funding awards totaling HK$18.86 million to conduct R&D on decarbonization and green technologies that can expedite low-carbon transformation and enhance environmental protection in Hong Kong.

**Mainland Funding**

HKUST continued to receive research funding from a range of Mainland bodies, among them the Nanhai People's Government of Foshan and the National Natural Science Foundation of China who contributed HK$52.07 million and HK$16.66 million respectively in 2021-2022. Such projects also involve commercial partners such as the Midea Group to ensure new knowledge is transferable to industry to create economic and social value.

## University of Strathclyde Collaboration Extended


*(From left) HKUST President Prof. Wei SHYY, HKUST(GZ) President Prof. Lionel NI, and University of Strathclyde Principal Prof. Sir Jim MCDONALD at the online signing ceremony.*

Over the years, HKUST has actively established strategic international alliances with universities and research institutions worldwide. In March 2022, the Memorandum of Understanding (MoU) on research and academic collaboration with the University of Strathclyde in Scotland was extended and enlarged to incorporate HKUST(GZ). The collaboration will cover exploration and development of early-phase joint projects related to numerous key areas for the future, including decarbonization, renewable energy and engineering, net-zero wireless communications systems, quantum technologies, and health technology and digital health.

## Donations, Facilities and Operational Moves that Drive Forward the Future

**Yuexiu Group Extends Support and Boosts Collaboration**

Further to a generous donation totaling HK$180 million in the two previous years, HKUST received another HK$100 million donation from the Yuexiu Group in support of the University's efforts in teaching, research and talent development. HKUST and Yuexiu also signed a framework agreement to step up cooperation in technology innovation, talent nurturing and research commercialization. Areas being explored include transportation, infrastructure, fintech and population aging.

**Students' Green Living Hub Seeks to Build Sustainable Lifestyle**

The opening of HKUST's Jockey Club Global Graduate Tower, a new student hostel for research postgraduates, has brought novel green features to campus living. The tower, launched in October 2021, has received a prestigious final BEAM PLUS platinum rating for its eco-friendly design, which helps it save an estimated 45% annually in water consumption and operate at an energy level 26% lower than comparable buildings. The 504 bed-space residence has also become the testing ground for a smart metering project to cut energy consumption and encourage hall residents to adopt a more sustainable lifestyle. Construction of the tower was supported by a donation of more than HK$175 million from the Hong Kong Jockey Club Charities Trust.

**Complementary HKUST2.0 Framework Fuels Sustainability Mindset**

Green living received a boost with HKUST's first cross-campus collaborative program, the "Sustainable Smart Campus Net-Zero Journey: Innovation Challenge". The Challenge put into action the cutting-edge HKUST2.0 framework being forged between HKUST and HKUST(GZ), bringing together their students to develop smart and sustainable solutions. Winning ideas included a net-zero pavilion for HKUST members to relax and reduce stress, a wasteless canteen, and a mobile app to promote sustainable behavior. The HKUST2.0 structure will serve as a blueprint for next-generation pedagogies that leverage the complementary academic structure and resources of the two campuses under the "Unified HKUST, Complementary Campuses" umbrella, which has received a

generous donation of HK$100 million from The Tung Foundation. The donation will support future HKUST2.0 initiatives through The Tung Foundation Frontier Fund for Collaboration.

**Shaw Auditorium Adds Major Venue to Showcase Creativity**

*The HKUST-SINO One-Million-Dollar Entrepreneurship Competition 2022 at the Shaw Auditorium.*

The opening of the state-of-the-art Shaw Auditorium in November 2021 made a large-scale, purpose-built venue for HKUST and community events available at the Clear Water Bay campus for the first time. The multifunctional auditorium will nurture a range of creative activities, hold major University occasions, and provide a significant focal point for campus-community interaction. The new landmark has already hosted two KT events: the Final and Award Ceremony of the HKUST-Sino One-Million-Dollar Entrepreneurship Competition 2022, and the HKUST Start-up Showcase, both in June 2022. The building of the Auditorium was supported by a HK$150 million donation from the Shaw Foundation Hong Kong.

**Consolidation of KT Resources**

To synergize and optimize KT resources, the University has merged the Office of Knowledge Transfer and Technology Transfer Center into a one-stop office for the oversight of KT activities and deep tech start-up development. The merger is set to enhance the quality and effectiveness of overall KT services for internal and external stakeholders, facilitating closer coordination and a seamless workflow to better support KT activities while strengthening collaborative initiatives with business and industry partners.

## Technology Transfer Endeavors

### Inventions, Patents, Intellectual Property, Contracts, and Services

HKUST's wide-ranging intellectual property (IP) portfolio is made available to external parties through HKUST R and D Corporation Limited (RDC), the University's business arm. Total income from contract research, consultancy, and testing services with industry reached HK$131.4 million in 2021-2022, including projects initiated by HKUST's Mainland platforms.

### Licensing and Related Activities

The University also proactively explores opportunities for IP licensing to the commercial sector, with an income of HK$9.77 million generated from licensing by RDC, Massive Open Online Courses, and the University's Mainland platforms in the year under review. Key knowledge transfer figures are listed in the table.

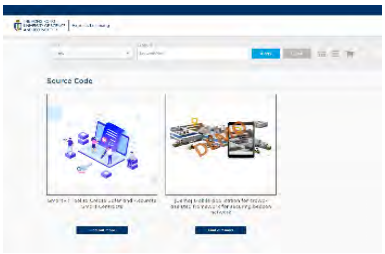
| Invention Disclosures | New Patent Applications Filed & Granted | Cumulative Active Pending Patent Applications and Granted Patents | Active IP/ License Agreements |
|---|---|---|---|
| 217 | 328 / 218 | 1,929 | 143 |

| IP Income Generated (*Cash Received*) | Contract Research & Income Generated (*Cash Received*) | Consultancy Projects & Income Generated (including Analytical & Testing Services) *(Cash Received)* |
|---|---|---|
| HK$9.77 million | 217 / HK$117.8 million | 443 / HK$13.6 million |

The University's IP management and business development teams strategically identify inventions with strong commercialization potential and establish strategic IP portfolio management. They conduct IP landscaping analyses for multiple R&D projects, provide a thorough overview of current patents and practices, offer input to develop IP filing strategies, and identify potential commercialization/collaboration partners based on the relevant technology portfolio. An IP Policy Task Force has also been established to put forward a harmonized IP policy framework for HKUST's Clear Water Bay and HKUST(GZ) campuses, and to comply with local laws and regulations.

### Speeding Up Commercialization Through Express Licensing

The setting-up of an Express Licensing Platform has provided a rapid and effective gateway to promote and commercialize HKUST IP, from research outputs to start-ups and industry partnerships. The platform currently covers software, with the potential for extension to datasets, patents, or other forms of IP in the future.




*The Express Licensing Platform.*

### HKUST OKT Innovation Seminar Series

The Office of Knowledge Transfer organizes seminars in partnership with industry leaders, IP professionals, and consulting firms to enhance awareness of possible challenges in technology commercialization, the importance of IP, the concept of confidentiality in the University's research community, and entrepreneurship development. This year's topics included management of trade secrets at the University, patent landscaping tools, and how biomedical innovations could be taken forward from bench to bedside.

## Cultivating an Innovation and Entrepreneurial Spirit

The University has made entrepreneurship a core component of its knowledge transfer strategy, nurturing an innovative environment on campus through a comprehensive array of programs and activities that spur faculty, students, and alumni to pursue their entrepreneurial dreams. Many HKUST-organized competitions also drive entrepreneurship regionally and globally. Examples are provided below.

### HKUST-Sino One-Million-Dollar Entrepreneurship Competition


*AutoSafe, Champion of the 2022 Hong Kong region in the HKUST-SINO One-Million-Dollar Entrepreneurship Competition.*

The flagship contest, first launched by HKUST Entrepreneurship Center in 2011, serves as a valuable learning experience for members of the HKUST community in the creation and evaluation of new businesses. The competition now covers seven regional contests nationwide – Hong Kong, Macao, Beijing, Guangzhou, Shenzhen, Foshan, and the Yangtze River Delta – and a Grand Final. This provides a unique opportunity for start-up participants to gain insights into ideas and innovation in different parts of the country, and to draw attention to their own endeavors. As an indication of the contest's appeal, a total of 1,302 start-ups joined the 2021 competition overall. In the Grand Final in Nansha, X-MAGTECH was named the winner by jury panels comprising leading HKUST academics and investor members of the HKUST Innovation Industry Alliance. The start-up, from Beijing, specializes in quantum sensing technology. In 2022, the Hong Kong regional contest opened up to overseas as well as local contestants for the first time, attracting over 700 participants from 175 teams and nine countries and regions. The winner of the 2022 Hong Kong region was AutoSafe, co-founded by civil engineering postgraduates and faculty from HKUST. The company provides a computer vision-based solution for automated site condition and safety monitoring for construction project owners, such as governments or developers.

### Entrepreneurship Center Dream Builder Programs

**Tech-Ship Program:** Since its launch in 2020, the program has helped over 100 HKUST students and alumni from different fields and backgrounds to collaborate with more than 20 faculty members, propelling forward the commercialization of over 20 patented technologies. Support by the Lo Kwee Seong Foundation has now enabled selected Tech-Ship start-ups to receive up to HK$200,000 each to kick-start and expand their business development.


*hackUST 2022 Finale.*

**hackUST 2022:** For its 2022 contest, the popular HKUST hackathon adopted the timely overall theme of social

entrepreneurship, drawing students from universities worldwide to work together and foster international collaboration and innovation. The contest attracted more than 760 participants from over 31 countries and regions, together with strong support from commercial partners and over HK$1 million in prizes.

**MentorHUB@HKUST:** The enterprising model of mentorHUB@HKUST enables mentors and mentees to reach out to one another anytime and anywhere, facilitating real-time feedback and just-in-time outcomes that can propel forward start-ups' early-stage growth. In 2021-2022, mentorHUB@HKUST attracted 22 established mentors and over 400 mentees from 161 start-up teams across 10 fields and industries.

**Hong Kong Techathon 2022:** A platform for programmers, engineers, designers, marketers, and entrepreneurs to collaborate and develop ideas and prototypes, and to pitch for seed funding and incubation support. In 2022, HKUST members constituted 47% of the 540 participants and 6 of the 20 winning teams, with University participants named champions of all four of the contest's themes. The event is co-organized by the HKSTP and seven local universities, including HKUST.

### Creating Positive Value through Social Entrepreneurship

The Chan Dang Foundation Social Entrepreneurship Award, funded by the Chan Dang Foundation, is a key way to recognize student social entrepreneurship at HKUST. In 2021-2022, 10 student projects that seek to turn creative, socially beneficial ideas into feasible sustainable business ventures received a sum of HK$0.5 million.

## Reinforcing Industrial Engagement and Collaboration

### Joint Laboratories and Collaboration with Industrial Partners and Organizations

In 2021–2022, 6 research institutes/centers and joint labs were established to reinforce KT processes, talent development, and research innovation. HKUST formed a pool of state-of-the-art research centers/joint labs in line with the latest science and technology advancements, serving as robust platforms to facilitate collaboration with industrial partners and organizations.

**Huawei Expands Partnership Activities**

HKUST and Huawei Technologies Co. Ltd. have formed a strategic partnership to support recruitment of top visiting researchers at HKUST and establish seed funding for high-impact research. The visiting researchers will be recruited globally from a variety of disciplines and are set to reinforce the University's research excellence through academic and research collaborations with HKUST faculty and nurturing of research postgraduates. The seed funding will be used for discovery-driven research in potential high impact areas such as information and communications technology. Meanwhile, the HKUST-Huawei Joint Innovation Laboratory was renewed for another five years from July 2021.

**Mission-Oriented Research Institutes and Centers with Industry**

HKUST-Bright Dream Robotics Joint Research Institute, HKUST-Kaisa Joint Research Institute, and HKUST Collaborative Innovation Center all seek to develop projects that address industry needs based on HKUST technology and capabilities. More than 50 projects have been undertaken since these units were established in 2019. These cover strategic areas including construction robotics, materials, Internet of Things, fintech, blockchain, biomedical, and autonomous vehicles, supporting Hong Kong's transition into a smart city and helping to generate opportunities in the Greater Bay Area (GBA).

**MTR Strategic Partnership Targets Smart Mobility**

HKUST signed a Memorandum of Understanding with the MTR Corporation and MTR Academy to set up the **HKUST-MTR Joint Research Laboratory**. The collaboration marks the first time the MTR has launched such a venture with a higher education institution. The joint lab will focus on smart mobility and smart community through

*The HKUST-MTR collaboration is the first of its kind for the MTR.*

collaboration with HKUST's GREAT Smart Cities Institute and projects tailored to facilitate the public's transportation and daily needs.

**Innovation and Technology Boost for Manufacturing**

The University and Hong Kong Productivity Council established the **HKUST-HKPC Joint Research Lab for Industrial AI and Robotics**. The joint lab will develop innovative industrial technologies to address technical challenges facing manufacturers and provide solutions based on AI and robotics technology to enhance productivity and foster talents in intelligent and advanced manufacturing.


*Signing ceremony for the HKUST-HKPC Joint Research Lab.*

**Innovative Joint IP Collaboration with ASTRI**

HKUST and the Hong Kong Applied Science and Technology Research Institute Company Limited (ASTRI) signed a pioneering Memorandum of Understanding (MoU) to strengthen knowledge transfer and technology commercialization in December 2021. Under the MoU, IP generated by R&D collaboration between HKUST and ASTRI would be jointly owned by both parties according to their respective Inventive Contributions. This marked the first time in Hong Kong that an applied research institute and a university have officially collaborated using this IP framework, setting an example on how to advance the innovation and technology ecosystem in Hong Kong, the GBA, and beyond. Both parties will work jointly to commercialize their R&D deliverables promoting Smart City development, including research on advanced 5G applications, third-generation semiconductors, and the use of sensors for waste sorting.


*Dr. Denis YIP, Chief Executive Officer of ASTRI, signs an MoU to collaborate with HKUST on new R&D projects by leveraging patented technologies from both parties.*

## Enhancing Community Engagement and Social Impact

### Accelerating Greener Lives

**Fathoming the Marine World**


*Bringing diverse marine stakeholders together.*

As a coastal city and international hub, Hong Kong has a leading role to play in the development of the Blue Economy. To reinforce collaboration among marine sectors, the **Blue Marine Economy Summit**, organized by HKUST ocean scientist Prof. QIAN Peiyuan, brought together local and international industry, university, government, consulate representatives from Hong Kong, Mainland China, France and Israel in June 2022 to explore issues encompassing marine industries and technological development, government policies, and local and global maritime security and governance. On the research front, a team of interdisciplinary scientists led by Prof. GAN Jianping at HKUST has developed the first online marine environmental visualization platform. **WavyOcean** utilizes state-of-the-art oceanic numerical simulations to visualize oceanic processes as well as deliver physical and biogeochemical data to bring fresh insights on hydrodynamics, hazards, pollution, eutrophication, and climate change, among others. It also offers valuable data for policymakers to balance marine conservation with societal development plans.

**Setting the Pace on Green Living and Net-Zero Carbon Emissions**

The launch of a **Sustainability/Net-Zero Office** at HKUST in December 2021 has created a core unit to support and oversee implementation of the University's sustainability strategy. This includes HKUST's 2028 Sustainability Challenge, embracing operational performance targets, education, campus engagement, and the University's pioneering

*Prof. Davis BOOKHART, Director of the Sustainability/Net-Zero Office (fourth left), Prof. LO Hong-Kam, Director of GREAT Smart Cities Institute (third left), and their team.*

**Sustainable Smart Campus as a Living Lab** (SSC) initiative. Launched in 2019, SSC leverages the campus as a testing ground to showcase HKUST innovations to the wider community and has involved more than 150 faculty, 400 students, and 30-plus University-funded projects to date. In 2021, the SSC Hub opened, with delegations from industry and government agencies visiting the hub to learn about the SSC and collaborations with the University. In 2022, the SSC initiative received global acclaim, winning the Honorary Member Award in the International Sustainable Campus Network (ISCN) Excellence Awards.

*Prof. Irene LO and Mr. David NG of Sino Group at Sino's Skyline Tower in Kowloon Bay.*

Regarding net-zero advances, Prof. Irene LO, Department of Civil and Environmental Engineering, is working with Sino Land Company Limited to reduce the company's environmental footprint. Meanwhile, HKUST's **Net-Zero Carbon Taskforce** launched the Incentive Scheme for Net-Zero Carbon Research Projects in collaboration with the University's GREAT Smart Cities Institute, calling for large-scale project proposals from University members. Outstanding net zero projects already underway under the SSC include development of a self-cleaning nanocoating for building envelopes and a transparent thermal-resistant coating on glazing and solar panels from Prof. YANG Jinglei, Department of Mechanical and Aerospace Engineering. These technologies have been showcased at HKUST, drawing interest from major businesses.

## Active Mainland Engagement

### Final Approval Granted for HKUST(GZ)

In June 2022, the Ministry of Education granted final approval for the establishment of HKUST(GZ). HKUST and HKUST(GZ) in Nansha will offer complementary academic structures and seamlessly collaborate in teaching, research, and knowledge transfer through the HKUST2.0 concept. The synergy created by HKUST2.0 will pioneer a new way forward in higher education, nurturing of talents, and impactful knowledge transfer for the Greater Bay Area (GBA) and beyond.


*An impression of the Sundial at HKUST(GZ).*

### Green Initiatives Bloom at New Campus

*HKUST(GZ) and Jiangmen Municipal People's Government sign a comprehensive strategic cooperation framework agreement.* (Source: Jiangmen)

Cross-campus adoption of HKUST's Sustainable Smart Campus as a Living Lab (SSC) concept has already seen four SSC projects (empowering our community for positive change, embracing digital resources for liveability, protecting our scarce resources, and supporting biodiversity and the ecosystem) incorporated into HKUST(GZ)'s infrastructure. The campuses are also seeking ways for students to collaborate on sustainability initiatives through design thinking workshops and camps. On the resources front, the setting-up of the signature SSC Campus Brain Lab will ensure the new campus continues to accommodate fresh ideas and testing of new smart equipment. In addition, HKUST(GZ) will jointly build a "DOUBLE CARBON" Laboratory under a strategic cooperation framework agreement signed with Jiangmen Municipal Government.

### Research Highlights Innovation Policies to Enhance Hong Kong Social Mobility

Prof. XU Yan, Society Hub Consultant at HKUST(GZ), and co-author Calvin YU delivered a report on "Innovation for Hong Kong's Upward Mobility", proposing that development of Hong Kong's technology and innovation industries should be positioned to provide upward social mobility opportunities for the city's younger generation, and putting forward corresponding policies. The report provided insights for policymakers, KT practitioners and the industry, including Hong Kong Science and Technology Parks (HKSTP) and Cyberport.

## HKUST LED-FPD Technology R&D Center at Foshan (FSC)

The FSC held a celebration for its 10th anniversary in March 2022. Some 50 guests attended, including senior management from HKUST and leaders of Foshan Municipal Government. In addition, the HKUST Foshan Center for Technology Transfer and Commercialization (FCTTC) was officially opened, showcasing its capabilities and well-equipped facilities to the community. The FCTTC, funded by Foshan Municipal Government and Nanhai People's Government of Foshan, was first launched on a trial basis in April 2021. It provides an area of 4,000 square meters for incubating entrepreneurial projects, with 14 start-ups successfully supported to date. With the opening of the exhibition/multi-function hall, FCTTC plans to hold promotion activities regularly. The first event, "Meeting with Redbird" (红鸟有约), was launched in May 2022. This series will be continued as quarterly events.

*The opening ceremony for Foshan Center for Technology Transfer and Commercialization.*

## Entrepreneurship Initiatives in the Greater Bay Area

With the opening of HKUST(GZ) in September 2022, a task force has been set up to review HKUST's start-up development framework and engagement of both campuses. Of the University's 1,616 active starts-ups established by HKUST students, faculty, and alumni, 328 (20%) are registered in the Mainland.

### HKUST Greater Bay Area Youth Entrepreneurship Fund Program

This program assists HKUST students, young faculty, alumni, and staff to develop and realize their entrepreneurial aspirations in Hong Kong and the GBA. In 2021-2022, 12 start-up teams received funding. Other activities include seminars on entrepreneurial stories, start-up culture, and policies in different cities in the GBA. The program is supported by the Youth Development Commission and Home Affairs Bureau through the Funding Scheme for Youth Entrepreneurship in the Guangdong-Hong Kong-Macao Greater Bay Area.

### Seeding Entrepreneurship in the Greater Bay Area

HKUST and HKSTP signed a Memorandum of Understanding to advance innovation and technology growth opportunities across Hong Kong and the GBA. The collaboration paves the way for the establishment of the HKSTP and Guangzhou Nansha Co-incubation Base in Nansha, which will directly connect the HKUST and HKSTP ecosystems across the region to help grow R&D and technology talent pools.


*The signing ceremony is witnessed by guest-of-honor Mrs. Carrie LAM Cheng Yuet-Ngor, the Chief Executive of the HKSAR (back row second left).*

### Shenzhen

The University's Blue Bay Incubator has successfully established an ecosystem to support HKUST entrepreneurs and start-ups at different stages, with 42 start-ups being incubated in 2021-2022. The ecosystem's four schemes encompass student and start-up teams with straightforward innovation ideas; start-ups at the prototype stage; new companies with a business model and some growth; and businesses seeking to accelerate growth. Over the year, 17 entrepreneurship-related events were also organized, including roadshows, training, and communication activities. In external recognition of its achievements, Blue Bay Incubator was named an "Excellent Institution for Innovative Entrepreneurship" in the Shenzhen Media Group's Shenzhen Innovation List. Separately, the HKUST Shenzhen Research Institute (SRI) received the 2021 Shenzhen-Hong Kong-Macao Cooperation Excellence Award from the Shenzhen-Hong Kong-Macao Angel Investor Alliance.

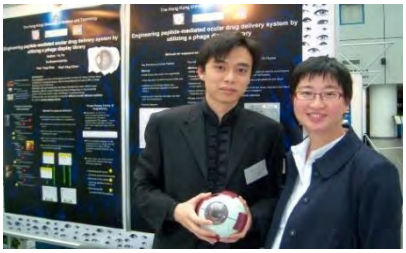
### Nansha

Guangzhou HKUST Fok Ying Tung Research Institute and Yuexiu Property Company Ltd. signed an agreement in May 2022 to jointly build the Yuexiu Guangzhou-Hong Kong Industry-University-Research Base in Qingsheng. The facility aims to encourage start-ups from Hong Kong, Macao, and overseas to set up their companies in Nansha while facilitating long-term collaborations with HKUST and its new HKUST(GZ) campus, located adjacent to the research base. In further developments, the Institute's Technology Seeding Programme (previously INCU-

TECH) blossomed in 2021 with the recruitment of five Hong Kong technology teams led by academics with innovative technologies and commercialization potential. Two teams have already registered companies in Guangzhou and are starting to generate revenue.

**Start-up Highlight: Pleryon Therapeutics Limited (Shenzhen)**

Pleryon Therapeutics, a Blue Bay Incubator graduate firm, announced nearly RMB100 million (approximately HK$108.7 million) of Pre-A funding in 2022. The start-up is a biotechnology company that uses advanced drug delivery and biomaterial technology to develop new drugs. The business was jointly established by Prof. Ying CHAU, Department of Chemical and Biological Engineering, and her student Dr. YU Yu, who are dedicated to solving global unmet clinical needs through leading-edge sustained-release technologies.



*Prof. Ying CHAU (right) and Dr. YU Yu, Co-founders of Pleryon Therapeutics Limited.*

## Triennium in Review and Looking Forward

Over the 2019-2022 triennium, HKUST has sought to extend and strengthen its Knowledge Transfer (KT) endeavors to inspire the University community to harness new knowledge and technologies that can impact society and hence improve people's lives. Despite the social and COVID-19 challenges during this period, the University has made considerable strides in raising public awareness of the significance of technology in addressing many of the key issues that people face through its impactful KT. Sustainability and biomedical advances, COVID-19 disinfection and screening technologies, AI and fintech are just some of the areas in which HKUST has been making a significant difference over the past three years. The University has achieved this through its championing of deep-tech, technopreneurship, and a distinctive holistic KT pipeline from lab to market, which has led to a diverse array of start-ups, unicorns, and collaborations with industry, government, and NGOs. Moreover, HKUST-related enterprises are not only located in Hong Kong and the Mainland but in countries and regions around the world.

The triennium has also seen the Clear Water Bay campus and Mainland platforms build up the University's reach and capacity to foster entrepreneurial talents through greater KT engagement with industry, the corporate world, and investors in Hong Kong, the Greater Bay Area, and beyond. This reach will now be extended following the Ministry of Education's final approval for the establishment of HKUST(GZ) on 29 June 2022. The campus will open in September 2022, giving an exciting new meeting point for minds, research resources, and internal and external cooperative ventures.

Indeed, HKUST(GZ) and the pioneering synergistic "Unified HKUST, Complementary Campuses" being put into practice with the Hong Kong campus offer an excellent opportunity to address pressing global social and industrial issues by combining a traditional discipline-based approach with a problem-centered research system and direct interface with industry players in the Mainland. The birth and growth of HKUST2.0, powered by cross-fertilization of insights from diverse disciplines, will thus be focused from the outset on producing the talents and innovation needed to drive future society forward, with KT as the bridge between the University's cutting-edge education and research outcomes and innovation and impact in society.

To take this forward, the next three years will focus on three key KT strategies: the evolution of the traditional research and development (R&D) model to a novel research and business development (R&BD) framework to enhance the speed of innovation to address societal challenges; leveraging the direct engagement with Mainland industry that the opening of HKUST(GZ) offers to foster early engagement of industry partners when new innovation opportunities arise and longer-term partnerships based on technologies that HKUST intends to develop; and further improvement of the University's start-up incubation and investment environment through building links with leading global incubators.

As such, it promises to be a truly exciting triennium for KT at HKUST and the wider community.

## Appendix A – Key Performance Indicators

| Performance Indicators | 2020/2021 (Achieved) | | 2021/2022 (Achieved) | |
|---|---|---|---|---|
| **Inventions, Patents, Licenses, IP, Contracts, and Services** | | | | |
| Number of invention disclosures received [Note 1] | 176 | | 217 | |
| Number of patents filed in the year [Note 1 & Note 2] | 332 | | 328 [Note 3] | |
| Number of patents granted in the year [Note 1 & Note 2] | 205 | | 218 [Note 4] | |
| Number of patents used based on new contracts (according to contract date) [Note 5] | 91 | | 85 | |
| Number of patents used based on active contracts (according to contract period) [Note 6] | 327 | | 408 | |
| Number of new intellectual property (IP)/license agreements signed in the year [Note 7] | 23 | | 24 | |
| Number of total active IP/license agreements signed [Note 7] | 120 | | 143 [Note 8] | |
| Income (on a cash basis) generated IP rights [Note 9] | $11.9M | | $9.8M | |
| Number of collaborative researches, and income thereby generated [Note 7 & Note 10] | 144 | $618.4M | 171 | $433M |
| Number of contract researches (other than those included in "collaborative researches" above), and income thereby generated [Note 7] | 221 | $111.5M | 217 | $117.8M[Note 11] |
| Number of consultancies, and income thereby generated [Note 7] | 59 | $6.2M | 58 | $9.6M[Note 12] |
| Number of equipment and facilities service agreements, and income thereby generated [Note 7] | 326 | $3.8M | 385 | $4M |
| **Sub-total Income** | $751.8M | | $574.2M | |

The figures reported for 2021-2022 are subject to year-end adjustments.

[Note 1] Starting from 2013-2014, the number reported also includes invention disclosures, and patents filed, granted and used by Mainland platforms.

[Note 2] The numbers are counted based on the definition laid down by the University Grants Committee (UGC) under the Common Data Collection Format (CDCF) according to (1) the number of countries where patents are filed, and (2) the number of patent types, defined in accordance with the international patent classification (i.e., technology area) of the patents.

[Note 3] CDCF Table 65: The number of patents filed came to 328 and the number of inventions involved totaled 240 during 2021-2022.

[Note 4] CDCF Table 66: The number of patents granted came to 218 and the number of inventions involved totaled 102 during 2021-2022.

[Note 5] Refers to the number of patents utilized by licensing during the reporting period, including rights granted as background intellectual property (IP) in newly signed contracts with value according to the contract date. All patents used are only counted once if included in more than one contract.

[Note 6] Refers to the number of patents utilized by licensing during the reporting period, including rights granted as background IP in active contracts with value according to the contract period. All patents used are only counted once if included in more than one contract.

[Note 7] Starting from 2017-2018, the number reported also includes the number of new IP/license agreements signed, total active IP/license agreements signed, collaborative researches, contract researches (other than those included in "collaborative researches"), consultancies, equipment and facilities service agreements, and income thereby generated by Mainland platforms.

[Note 8] The number reported comprises 125 patents and software license agreements, and 18 assignments on technology transfer managed by HKUST R and D Corporation Limited (RDC).

[Note 9] Includes licensing income from patents via RDC and Mainland platforms as well as copyright of courseware via the University. The reporting period for copyright of courseware via the University is 1 April to 31 March of the respective financial year, as data for 1 July to 30 June of the respective financial year are not available by the date of submission for the Knowledge Transfer Annual Report.

[Note 10] The number reported comprises the number of InnoHK projects and income thereby generated.

[Note 11] The total number of new contracts and contract value of contract research agreements signed in the 2021-2022 period are 138 and $126.1M respectively.

[Note 12] The total number of new contracts and contract value of consultancy agreements signed in the 2021-2022 period are 47 and $7.1M respectively.

| Performance Indicators | 2020/2021 (Achieved) | | 2021/2022 (Achieved) | |
|---|---|---|---|---|
| **Entrepreneurial Education and Culture** | | | | |
| Number of teams for One-Million-Dollar Entrepreneurship Competition at the Clear Water Bay campus [Note 13] | 185 | | 175 | |
| Number of teams for hackUST: total teams/HKUST teams [Note 14] | 184 | 91 | 154 | 114 |
| Accelerator: number of teams/start-up companies [Note 15] | 78 | | 133 | |
| Number of teams/start-up companies in the mentorHUB [Note 16] | 150 | | 151 | |
| Number of students engaged in start-ups and entrepreneurship [Note 17] | 9,704 | | 4,261 | |
| Number of advising hours for student entrepreneurs | 800 | | 864 | |
| **Start-up and Spin-off Companies** | | | | |
| Number of start-up companies [Note 18 & Note 19] | 162 | | 182 | |
| Number of spin-off companies [Note 18 & Note 19] | 128 | | 329 | |
| **Total number of start-up and spin-off companies** | 290 | | 511 | |
| **Contributions to the Public** | | | | |
| Number of student contact hours in short courses or e-learning programs specially tailored to meet business or Continuing Professional Development (CPD) needs | 1,857,881 hours [Note 20] | | 1,463,423 hours [Note 21] | |
| Income received from Continuing Professional Development (CPD) courses | $748.1M [Note 20] | | $545.1M [Note 21] | |
| Number of public lectures/symposiums/exhibitions and speeches to a community audience | 564 | | 564 | |
| Number of performances and exhibitions of creative works by staff or students | 33 | | 19 | |
| Number of staff engaged as members of external advisory bodies including professional, industry, government, statutory or non-statutory bodies | 500 | | 509 | |

The figures reported for 2021-2022 are subject to year-end adjustments.

Note 13 HKUST One-Million-Dollar Entrepreneurship Competition is one of the Entrepreneurship Center (EC)'s annual flagship events, providing a platform for students and alumni to turn their entrepreneurial ideas into an actual business.

Note 14 HKUST hackUST is another EC annual flagship event. It has become one of the largest hackathons organized in Asia. Students and alumni from HKUST as well as other universities in Hong Kong and other countries/cities hack out prototypes of hardware/software solutions to solve real problems.

Note 15 Accelerator includes funding programs and co-working space programs for HKUST start-up teams and companies, such as the Yeung Wing Yee Entrepreneurs Fund (YWYEF), HKUST Dream Builder Incubation and Accelerator Program, Lo Kwee Seong Technopreneurship Fund (Tech-Ship), and HKUST Entrepreneurship Development Fund (EDF).

Note 16 A mentoring program launched in 2020 and tailored for co-founders of start-ups. Its mentoring model offers flexible and timely advisory input and experience-sharing by mentors from diverse professional backgrounds.

Note 17 Student participation in EC entrepreneurship events over the reporting year (by headcount).

Note 18 Includes economically active start-up and spin-off companies being funded or incubated by HKUST entrepreneurship programs at the Clear Water Bay campus and via Mainland platforms. Programs include: the HKUST Entrepreneurship Program (EP), Technology Start-up Support Scheme for University (TSSSU) Program, U*STAR Award, Yeung Wing Yee Entrepreneurs Fund (YWYEF), HKUST Entrepreneurship Acceleration Fund (EAF), Alumni Endowment Fund (AEF) Student Start-up Grants, HKUST-SINO One-Million-Dollar Entrepreneurship Competition (regional competitions inclusive), MentorHUB, HKUST Dream Builder Incubation Program, Entrepreneurship Development Fund, HKUST Greater Bay Area Youth Entrepreneurship Fund, other entrepreneurship programs such as HackUST, Tech-Ship Program, The BASE facility user, HKUST Entrepreneurship Fund (E-Fund), companies under InnoHK; programs under the Blue Bay Incubator, Blue Bay X of HKUST R and D Corporation (Shenzhen) Limited (RDCSZ) and HKUST Shenzhen – Hong Kong Collaborative Innovation Research Institute (SHCIRI) in Shenzhen; programs under Guangzhou HKUST Fok Ying Tung Research Institute (FYTRI) in Nansha; and programs under HKUST LED-FPD Technology R&D Center at Foshan (FSC) in Foshan. Companies funded or incubated by more than one program or with offices in more than one location are only counted once.

Note 19 The reporting period is 1 January to 31 December of the calendar year, as per UGC under the CDCF requirement.

Note 20 Starting from 2017-2018, the number reported includes taught postgraduate programs (including EMBA, MBA, MSc, MA, PgD) with reference to the definition of Continuing Professional Development (CPD) courses laid down by UGC under the CDCF. As the compiled income of the programs above for 2020-2021 was not yet available by the date of submission for the Knowledge Transfer Annual Report, 2020-21 data reported was based on data collected in 2019-2020.

Note 21 Starting from 2017-2018, the number reported includes taught postgraduate programs (including EMBA, MBA, MSc, MA, PgD) with reference to the definition of Continuing Professional Development (CPD) courses laid down by UGC under the CDCF. As the compiled income of the programs above for 2021-2022 was not yet available by the date of submission for the Knowledge Transfer Annual Report, 2021-2022 data reported is based on data collected in 2020-2021.

## 1. FIGHTING COVID-19

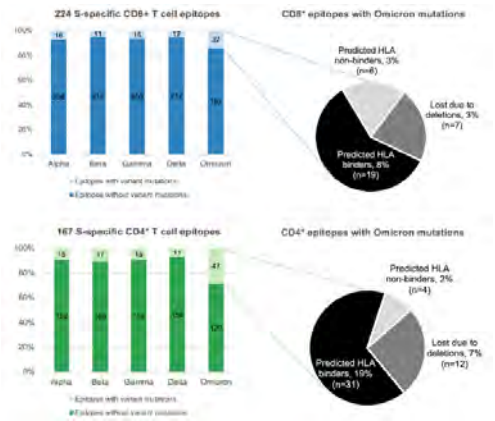
### High School Students Build Light Disinfection Devices Based on HKUST-Patented Technologies to Benefit the Community

*The STEAM education project, led by Prof. YEUNG King-Lun (back row, fifth left), involves students from two secondary schools creating disinfection devices for deployment in homes for seniors and community centers.*

Two HKUST light disinfection technologies have been transferred to the community to assist in its battle against COVID-19. Secondary school students have successfully fabricated 15 light disinfection devices that will be deployed in elderly homes and community centers, using patented Hi-NW light disinfection technology developed by Prof. YEUNG King-Lun (see P.4). The students from Carmel Alison Lam Foundation Secondary School and Lok Sin Tong Yu Kan Hing Secondary School were taking part in a HKUST Science, Technology, Engineering, Arts, and Mathematics (STEAM) initiative, sponsored by the Lee Hysan Foundation.

### Early Insights into Tackling Omicron

Researchers from HKUST and the University of Melbourne published a study in January 2022, near the start of the Omicron global surge, revealing that T cells, one of the body's key defenses against COVID-19, were expected to be effective in mounting an immune response against the variant. The team analyzed over 1,500 fragments of SARS-CoV-2's viral proteins (epitopes) that had been found to be recognized by T cells in recovered COVID-19 patients or after vaccination. T cells, generated both by vaccinations and COVID-19 infections, have been shown to be critical in limiting progression to severe disease. The team's findings suggested that Omicron was unlikely to be able to evade T cells.




*The researchers' findings suggested that Omicron was unlikely to be able to evade T cells.*

### Boosting Knowledge of Vaccine Effectiveness

A HKUST team working with University of New South Wales researchers demonstrated how to measure vaccine effectiveness (VE) in the absence of adequate public health data. Using a straightforward statistical model known as a Regression Discontinuity Design, the team compared various COVID outcomes (including positive cases, hospitalizations, and deaths) of groups of individuals above and below the cut-off age for vaccination program eligibility, enabling VE to be calculated with much less data than standard methods. The researchers' work offers an easy-to-implement way of keeping data-deficient countries informed when formulating and adjusting their vaccination and immunization policies.

## 2. GENERATING GREENER HORIZONS

### Setting the Pace on Sustainability with Green Tech Fund Projects

HKUST received Green Tech Fund support totaling HK$18.86 million for three R&D projects focused on decarbonization and green technologies. One project involves the development of low platinum catalysts and membrane electrode assemblies for integration into hydrogen fuel cell stacks for high performance, longevity, and with wide applications in stationary power plants and electric vehicles. Another is seeking to devise an innovative active flow membrane-less electrolyzer to boost green hydrogen production. The third will explore low

*Prof. CHEN Guanghao (top left), Prof. Francesco CIUCCI (top right) and Prof. SHAO Minhua.*

carbon waste management technologies that can make hard-to-treat black water from a landfill site co-treatable with a downstream wastewater treatment plant, minimizing black water treatment costs and space.

### Building Policymakers' Understanding of Regional Ozone Issues

*HKUST, the Environmental Protection Department, and Government Flying Service are working together to solve regional ozone pollution.*

The HKUST Institute for the Environment is partnering with the Hong Kong government in a three-year cross-border study to monitor air quality on land, at sea, and in the air. Using state-of-the-art technology, HKUST researchers have instigated a series of investigations in collaboration with the Environmental Protection Department and Government Flying Service to study the three-dimensional distribution, transportation, and formation of ozone pollution. The study is set to play a key role in the formation of science-based policy for effective control of ozone in the region, providing policymakers with an advanced understanding of the formation and transportation of ozone pollution in Hong Kong and across the Greater Bay Area.

### App Helps Manage Personal Exposure to Air Pollution and Health Risks

The HKUST Institute for the Environment released its PRAISE-HK-EXP app, providing users with leading-edge real-time and 48-hr forecasts, along with detailed outdoor air quality information. The app helps users keep track of their personal air pollution exposure budget, encompassing outdoor, indoor, and different micro-environments, including transportation. It utilizes innovations related to traffic modeling, air quality and atmospheric modeling, sensor technologies, big data, and mobile technology. The PRAISE-HK team is now working with patient groups to lower their air pollution exposure risks.

*HKUST Institute for the Environment releases its PRAISE-HK-EXP App.*

### Design-Thinking Drives Digital Transformation of Lab Resource Management

A cross-disciplinary faculty-student team has founded WeShare Tech, a start-up originated from a HKUST Design Thinking course and a project on wet labs management. The team proposed a user-friendly chemical inventory management system using an internet-of-things and AI-driven solution to improve labor-intensive web labs. The enterprising technology was supported for knowledge transfer by the University's Sustainable Smart Campus as a Living Lab initiative and the Bridge Gap Fund. On-going development led to the filing of a patent and the establishment of WeShare Tech, which has since been admitted to the Hong Kong Science and Technology Parks Ideation Program.

### Evolving Hong Kong Into a Green Finance Center

HKUST Business School launched a host of sustainability-related education initiatives over the reporting year. An MBA elective course on Sustainable Finance with Business Practice was co-developed with Hong Kong Exchanges and Clearing Limited (HKEX). This marks the first time that HKEX has partnered with a university in Asia in offering an executive education course in the field. A front-running BSc in Sustainable and Green Finance is now available to undergraduates to boost young talents and support Hong Kong's development into a leading green finance center. The program includes a Green Finance Speaker Series, arranged with the University's BSc in Environmental Management and Technology program and featuring speakers from major companies


*HKUST Business School has teamed up with Hong Kong Exchanges and Clearing Limited to drive forward sustainable and green finance executive education in Asia.*

and universities overseas. The School also arranged a fireside chat for the HKUST community and general public in which the Chairman and President of the Hong Kong Green Finance Association shared his perspectives on national and international developments in the area.

### Clean Air Challenge Advances Air Quality Literacy

*The launch of HKUST's Clean Air Challenge. The Challenge sought to enhance youth empowerment and raise public literacy on air pollution.*

To raise environmental health literacy on air quality among the younger generation, the HKUST Institute for the Environment launched a competition for secondary schools in Hong Kong during 2021-2022. Through the Clean Air Challenge, students were able to acquire technical skills and knowledge in scientific data collection and analysis, environmental engineering, air science and problem solving through a variety of seminar and workshop series. The Challenge formed part of the "Clean Air Neighborhood" campaign, initiated by the Clean Air Network NGO, with support from The Robert H. N. Ho Family Foundation.

## *3. IMPROVING LIVES AND COMMUNITY ENGAGEMENT*

### Contributing to a Healthy, Caring Society

**Technologies to Assist the Battle Against COVID-19**

HKUST technologies relating to photocatalytic reactive oxidative species formation and a photocatalyst coating have been licensed to Raze Technology Limited to develop new disinfection strategies and products to combat COVID-19. Raze's engineering technology partner has gone on to develop photocatalyst embedded meltblown fabrics for high-performance masks, among others.

**App Helps to Find Dementia Wanderers**

A HKUST-devised mobile app is helping to locate missing dementia patients in Hong Kong through crowdsourcing and Bluetooth positioning technology. The Dementia's Secret Angel app and a low-cost iBeacon tag carried by people with dementia were created by a research team led by Prof. Gary CHAN, Department of Computer Science and Engineering, and launched through the Jockey Club Caring Communities for Dementia Campaign.

*Prof. Gary CHAN with his Dementia's Secret Angel app and Bluetooth tag in its portable card format.*

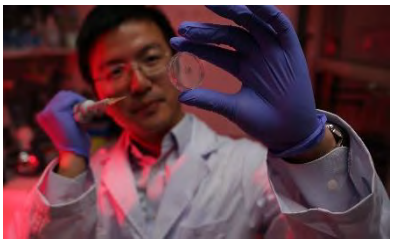
### Healthy Aging for the Brain

HKUST start-up Infitech is leveraging over two decades of research in neuroscience and traditional Chinese medicine (TCM) by scientist Dr. Fanny IP and colleagues to develop TCM-based brain health products to tackle the rising challenge of Alzheimer's disease, backed by early identification at onset stage and gene therapy for alleviation. Infitech has received strong support from the University, becoming a member of the HKUST Entrepreneurship Program and being recommended for seed funding under the government's Technology Start-up Support Scheme for Universities (TSSSU), in 2018/19 and 2019/20.

*Infitech is setting out to develop TCM-based brain health products to tackle Alzheimer's disease.*

### Tomorrow's Biomedical Solutions Today

Smart hydrogels, based on research insights by Prof. SUN Fei, Chemical and Biological Engineering, provide an excellent microenvironment to promote the engineering of tissues and organs and pave the way for next-



*Prof. SUN Fei with the smart hydrogel.*

generation regenerative therapeutics. In 2019, biotechnology start-up SPES Tech was founded by Prof. Sun's research postgraduates to accelerate commercialization of such materials. Among many potential areas to benefit is medical research involving cell culture models, ranging from oncology to drug discoveries. Hydrogels can also be used as a channel to carry drugs within the body to achieve better therapeutic outcomes. The company's flagship LitGel product is scheduled for mass production around summer 2022.

### AI Learning Software Offers Support for Dyslexic Students

*FUNG Ka-Yan (left), designer of the AI-learning software.*

A HKUST doctoral student-designed software is assisting identification of dyslexic students at an early stage to assist educational support for such special needs learners. Dyslexic students find it difficult to read, recognize, and write words accurately and fluently. They also have lower concentration than average students. The AI-learning software provides a series of games to examine students' Chinese proficiency and probability of dyslexia. Comprehensive test reports enable parents and teachers to seek advice from professionals. In addition, the software seeks to improve hearing, speaking, reading, and writing skills. The project was among HKUST awardees at the 7th Hong Kong University Student Innovation and Entrepreneurship Competition.

### Delivering STEM Know-How Through Soccer Robot Contest

*Secondary school students at a soccer robot pilot workshop.*

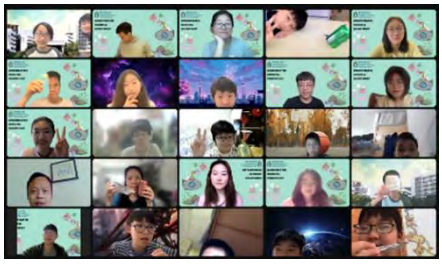
The Academy for Bright Future Young Engineers, under the School of Engineering, held two well-received soccer robot workshops for secondary school students as part of its new Bright Future Cup – Soccer Robot Competition. At the workshops, students set science, technology, engineering, and mathematics (STEM) knowledge and skills to work to devise game-playing robots in HKUST's Undergraduate Student-initiated Experiential Learning Lab (USEL Lab). Last summer, pilot workshops involving junior and senior secondary school students were successfully held. A grand final bringing together teams from various schools is due to take place in August 2022.

### Business Students Assist Community Service Endeavors

*Undergraduates present their findings and recommendations to Project Futurus representatives.*

HKUST Business undergraduates have put their knowledge and skills into practice by collaborating with non-governmental organizations (NGOs) and social enterprise partners on a variety of projects. Student groups have worked to expand market reach with Kaifong Tour (marketing plan), the well-being of subdivided flat residents with Caritas Hong Kong and Health in Action (market research, social media strategy, outreach materials), and dignified diets for the elderly with Project Futurus (market research, interviews with stakeholders, business and service improvement plan).

### Underwater Robot Community Engagement Project



*HKUST undergraduates help primary school students learn about robots.*

This project provides the opportunity for HKUST Business, Engineering, and Science undergraduates to work with primary and secondary school students, students with special educational needs, and other community groups to create underwater robots. In taking part in the project, the undergraduates have to learn the scientific concepts behind building a robot, how to apply theoretical knowledge to the construction of underwater robots, and teaching parameters for different groups of participants. They also assist in workshop design, preparation of teaching materials, and as workshop tutors, assisting student groups to build their

own prototypes. The project is associated with the Underwater Robot Competition, one of the main activities under the HSBC / HKUST Robotics For Youths Programme supported by HSBC.

## *4. REINFORCING INDUSTRY COLLABORATION*

### AI Solutions Assist Government Operations

HKUST researchers have teamed up with the Hong Kong government's Electrical and Mechanical Services Department to undertake projects related to robotics, artificial intelligence, and fintech-related technologies. One example is i-Cremation, which has used a reinforcement learning technique to automate and optimize operations at the government-run Wo Hop Shek Crematorium.

### HKUST Business School Signs MoU with Microsoft Hong Kong

Microsoft Hong Kong signed a Memorandum of Understanding (MoU) for an AI Business School 2.0 Strategic Partnership with HKUST Business School. The collaboration seeks to empower business leaders, organizations, and young talents through enhanced knowledge in areas such as big data and cloud computing. The two parties will also work closely on curriculum integration, professional training, as well as academic research and business case development.


*HKUST and Microsoft Hong Kong sign an MoU regarding their AI Business School 2.0 strategic partnership.*

### Advancing Business and Management

*The Best Managed Companies presentation ceremony in Chengdu, with HKUST Business School management joining the occasion online.*

HKUST's academic partnership with Deloitte China's "Best Managed Companies (BMC)" program continued over the year under review, while the University was again the sole official knowledge partner for Deloitte Hong Kong's "Technology Fast and Rising Star Program". The latter contest celebrates the fastest-growing and most innovative enterprises in Hong Kong, with winners including start-ups formed by HKUST alumni. HKUST Business School also served as the professional editor for the research report "Rekindling Hong Kong's Economic Growth Through Innovation".

### Augmenting the Internet

An Information Hub academic at HKUST(GZ) has partnered with Protocol Labs, a company that builds protocols, tools, and services to improve the internet, to boost the InterPlanetary File System (IPFS), a technology that enables decentralized access to web resources without the need for highly centralized entities. The team has set out to develop techniques to better understand how IPFS operates and improve user experience using data-driven engineering. In line with this, the researchers have devised tools to measure and enhance IPFS. Their work has been published at ACM SIGCOMM, a leading international forum for discussion of communications and computer networks.

### Developing a Green Metropolis in the Sandbox Metaverse

HKUST Business School has joined up with the Regal Hotels Group and other Hong Kong companies in the MetaGreen project, fostering the first green metropolis in the Sandbox's virtual gaming world. Through the MetaGreen platform, the School aims to explore the interplay between sustainability education, business, and the Metaverse, with the aim of leveraging the Metaverse's immersive experience to open new possibilities in business education and ways to contribute to a green future.


*MetaGreen, a metaverse project promoting green education.*