THE PRESSURE PARADOX

THE GOOD AND THE BAD
OF EVERYDAY STRESS

AWARD-WINNING INVENTION

An AI system detecting
abnormalities and saving lives

THE NEW SWIRE COASTAL OUTREACH HUB

Voyaging into the world of marine science

CONTENTS

02

THE PRESSURE PARADOX

Stress can motivate us to action, but it can also have a negative impact on our well-being. Factor in COVID-19, geopolitical events and the constant presence of technology – on top of personal issues – and it seems increasingly difficult to find peace of mind. HKU scholars have been exploring the positive and negative effects of stress in the workplace, in childhood and in reaction to external events like pandemics, while also identifying ways to build resilience to withstand the pressures of 21st-century life.

12

AbundANTS

16

China's Pollution Successes

18

Less Pain, More Gain

34

A Garden Grows at HKU
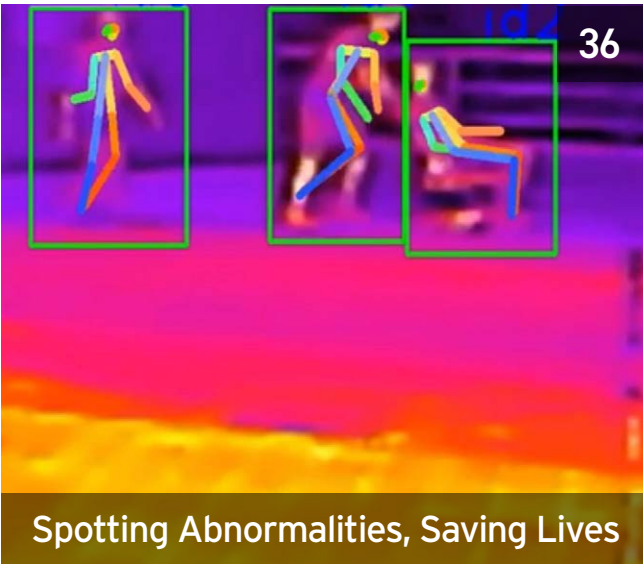
36

Spotting Abnormalities, Saving Lives

38

Voyage of Discovery

58

Music, Maestro, Please!

THE PRESSURE PARADOX

Stress can motivate us to action, but it can also have a negative impact on our well-being. Factor in COVID-19, geopolitical events and the constant presence of technology – on top of personal issues – and it seems increasingly difficult to find peace of mind. HKU scholars have been exploring the positive and negative effects of stress in the workplace, in childhood and in reaction to external events like pandemics, while also identifying ways to build resilience to withstand the pressures of 21st-century life.

PROS AND CONS OF WORK STRESS

Research on anxiety has only recently focussed on the workplace. One of the instigators behind this is Dr Bonnie Hayden Cheng, who looks at the 'bright and dark' sides of anxiety at work, which can motivate us to get more done but also feed into worry or negative rumination that undermines productivity.

If you think anxiety is a bad thing, consider deadlines. They often induce anxiety yet they also motivate people to complete tasks. To Dr Bonnie Hayden Cheng of the Faculty of Business and Economics, they are an example of the positive potential of anxiety.

Dr Cheng has constructed a theory of workplace anxiety that breaks down how anxiety can be managed to positive ends. She has also worked with industry partners to put into practice the ideas that have emerged from her research.

"Most research on workplace anxiety is about how it hurts your performance. I wanted to approach it from a positive angle because anxiety can also make you more vigilant and laser-focussed," she said.

Her theory explains how normal ranges of anxiety experienced at work, which can fluctuate from low to high but not tip into clinical concern, can manifest. Some people are anxious by nature (the trait condition), while others become anxious when faced with stressful situations such as doing a presentation or interview (the state condition).

"In the state condition, if you have an interview and you're feeling anxious and your mind is constantly running, you have less cognitive resources to devote to the task at hand. Over the long term, if we accumulate that into trait levels, it becomes exhaustion. That's a key element of burnout," she said.

Stopping the cycle

But if people can learn how to effectively regulate their emotions, their thinking and their behaviours, they can view their anxiety as a motivator to get focussed on their task – "getting really comfortable with your anxiety by naming it and taming it," she said.

Dr Cheng is working on new research showing how this can play out in proactive behaviours in which employees go beyond their job requirements, such

> "Most research on workplace anxiety is about how it hurts your performance. I wanted to approach it from a positive angle because anxiety can also make you more vigilant and laser-focussed."
>
> DR BONNIE HAYDEN CHENG

as re-arranging workloads or their immediate environments to enhance productivity. Those who see their anxiety as a positive challenge rather than a barrier are more likely to be proactive.

The question then arises: how can people and companies cultivate this state? Dr Cheng is examining one particular strategy around how mindfulness can relieve anxiety, which is anticipatory and often irrational.

"Mindfulness can help people be more focussed on the present. It's not about stopping thoughts entirely, but being aware of them without judgement. Focussing on the here and now creates space for self-acceptance, and that brings anxiety relief," she said.

One of the ironies is that the people most in need of anxiety relief are the least likely to pursue it, she said. They are overworked and overwhelmed, and rather than recover from stress, they work overtime, think about work all the time and lose sleep over it, feeding an unhealthy cycle. "What we really need to do when we are under stress is consciously step back and say, no, this is not conducive to my recovery," she said.

Take a micro-break

The literature supports the idea that taking a break is beneficial to both well-being and job performance – especially frequent breaks. Waiting for a holiday or the weekend or even the evening probably will not be enough to stop the rumination.

"New research has been looking at micro-breaks that you can take during the day. You can set alarms to prompt you to walk away from your desk every hour or so, or to get up and stretch and detach for a moment. Pursuing activities you enjoy outside work is also useful because it can separate you from thoughts of work," she said.

Dr Cheng's research is based on multiple studies within companies that use self-reported feedback on stress recovery over time, as well as reports by colleagues and supervisors on stress indicators and performance. She also gives workshops to companies on topics related to her research, to ensure the findings benefit those who most need it.

Recently, she has focussed on how to cultivate 'servant leadership', which means leading from behind and putting people first. This circles back to her research on stress.

"Change starts from the top. We can teach employees how to relieve their anxiety all we want, but at the end of the day, if they're working in toxic cultures, there's only so much you can do before that's not going to work," she said.

LET IT GO

Ruminating excessively on the negative aspects of your life or condition is a well-known feature of depression. But research from the Department of Psychiatry has found that ruminating about external stressors, such as COVID-19 and other societal events, can also tip people into an unhealthy state of mind.

Rumination, in which one's thoughts are stuck in a loop on one subject, can at times be useful in helping us concentrate and solve problems. But living too much in one's mind is by no means healthy. Scientists have known for decades that 'inward-focussed' rumination is linked to depression and other psychiatric disorders. There is now evidence that the mental health of people who ruminate excessively on events impacting the whole population can also be affected.

Professor Eric Chen Yu-hai, Chi-Li Pao Foundation Professor in Psychiatry, and Research Officer Dr Stephanie Wong Ming-yin identified this phenomenon in a study involving over 10,000 people who participated in a large-scale online survey conducted in the wake of the 2019 social events in Hong Kong and the COVID-19 pandemic.

Over half reported frequent rumination on these events to the extent their thoughts disrupted their tasks at hand. Such 'event-based' rumination was also associated with higher levels of depressive and post-traumatic stress disorder symptoms.

"Previous research had identified depressive rumination as a sort of selective focus on repetitive negative thoughts surrounding one's distress that prevents you from updating the contents in your awareness," Professor Chen said. "We have broadened this idea to accommodate our observation that a relatively strong influence of external events can also trigger such fixated, repetitive thoughts."

Smartphones don't help

These loops of thoughts can be worsened by smartphone use. Professor Chen and his team found links between smartphone overuse and poorer mental health among youths. Their latest research further showed that higher levels of smartphone overuse are also associated with event-based rumination but not depressive rumination, suggesting the intake of information via smartphones may keep one fixated even more on negative events beyond one's control.

"When we feel distressed, it is now common for us to try to seek comfort or an outlet through information or activities via our smartphones. But often, negative and sometimes exaggerated news will come up, which may form another 'external' technological loop of rumination that further aggravates mental health problems," he said.

Rumination's role in suicide – specifically, rumination about suicide – was also investigated in youths between 2019 and 2022. That epidemiological study also sought to examine the roles of other factors such as hopelessness, family functioning, cognitive functioning, and COVID-19 on suicidal ideations, plans and attempts.

"We found each of those factors was related either to suicidal ideation or plan, and COVID-19 stressors were related to suicide attempt; but importantly, suicide-related rumination was the only factor associated with all three outcomes," Dr Wong said. "This gave more support towards the transdiagnostic nature of rumination and the need to look at rumination beyond the depressive type."

The team has also looked at how rumination may be disrupted before it becomes harmful. Normally, our thoughts flow spontaneously from one to another, but ruminators become stuck in one place. This often happens imperceptibly, so it is important to use methods that penetrate daily life, Professor Chen said.

Their data showed that event-based rumination often involves anger and a sense of injustice, which can further perpetuate the feelings of frustration and cycles of rumination. It is important to support people in being aware of their rumination processes, realising that the problems could not be solved merely by fixating on these thoughts, and exploring whether there could be alternative perspectives, he said.

Need for intervention

Professor Chen further noted that rumination can also induce changes in the brain and those with higher levels of rumination may require more intensive interventions. Evidence has shown the positive impact of exercise-based intervention on the brain, which may be a promising future direction.

Bringing these two ideas together, Dr Wong is studying the effectiveness of smartphone-based 'ecological momentary intervention' – providing prompts in everyday life to engage a person in simple in-the-moment interventions designed by the team that engage both body and mind, such as guided finger-tapping.

"It may sound a little contradictory to use smartphones but we're very aware that complete abstinence from smartphone use is not possible – and probably also not ideal – in today's world. So we are looking at how to utilise it optimally as a mode of intervention to help reduce rumination and improve mental health of the population more generally," she said.

Professor Chen added: "We do need to develop new habits of using the smartphone healthily in terms of having more control over the device rather than being at the mercy of whatever information comes up. This would be important in understanding mental health and future intervention strategies in many societies."

> Previous research had identified depressive rumination as a sort of selective focus on repetitive negative thoughts surrounding one's distress that prevents you from updating the contents in your awareness. We have broadened this idea to accommodate our observation that a relatively strong influence of external events can also trigger such fixated, repetitive thoughts.

PROFESSOR ERIC CHEN YU-HAI

SURVIVING THE PRESSURES OF CHILDHOOD

Academic demands, unfair treatment by parents and teachers, and negative body images can contribute to stress and poor mental health in childhood. Dr Lee Juyeon of the Department of Social Work and Social Administration has examined the impact of these factors on Korean children and is exploring how child well-being can be cultivated.

> "Mental health in childhood and adolescence is important for adult life, not necessarily in a linear or determinant way, but because it is the time when children start to develop their identity and self-perception and think about who they are as a member of society. "

DR LEE JUYEON

In 2015, the first International Survey of Children's Well-Being was published by Children's Worlds and it immediately caught the attention of Dr Lee Juyeon. The pilot study surveyed 10- and 12-year-olds in 15 countries across five continents. The country where children reported the lowest life satisfaction? Dr Lee's homeland of South Korea, sitting well behind such nations as Ethiopia, Nepal and South Africa that have more troubles and lower income levels.

"Korean children have consistently low subjective well-being indicators, like happiness, self-satisfaction and positive affects. I wanted to find out the reasons behind this result," said Dr Lee.

She and her collaborators zeroed in on the highly competitive academic environment as an aggravator but decided to study the bigger picture beyond academic demands, by focussing on the moderating role of parents and teachers in students' stress levels. They found that the more children perceived they were being treated unfairly – such as being subjected to unrealistic expectations – the more unhappy they became.

"Our findings suggest that the fairness of significant adults in childhood years could be a buffer to the negative effects of academic stress on their subjective well-being," she said.

The study is part of a body of work by Dr Lee that looks at factors affecting childhood well-being and how these can be addressed by building up children's capacity and improving their social environments.

Negative body image

Following on from the academic stress study, she also studied body image satisfaction among Korean children. She found that if children perceived themselves as being overweight – even when they were not – their well-being was affected. Moreover, girls who perceived themselves as underweight had a boost to well-being, unlike boys whose happiness levels were negatively affected.

"For children in early adolescence, body image perception is really important for their self-esteem and self-satisfaction, and ultimately for their mental health. But this perception is also influenced by society's ideals or expectations, which are different for each gender," she said.

"Mental health in childhood and adolescence is important for adult life, not necessarily in a linear or determinant way, but because it is the time when children start to develop their identity and self-perception and think about who they are as a member of society."

The importance of children's well-being is recognised not only by the Children's Worlds studies (subsequent surveys have been held, including in 2016–2019 for 35 countries and regions; South Korea placed 29th for overall well-being and Hong Kong 34th, just ahead of Vietnam), but also by the Organisation for Economic Co-operation and Development (OECD). The latter organises the Programme for International Student Assessment, which surveys the academic abilities of 15-year-olds across dozens of countries every three years and recently launched a new international survey on students' social and emotional skills.

Stress management for children

"Social and emotional competence encompasses different domains such as self-regulation, emotion and stress management, and social and communication skills. Brain science and other research supports the idea that this competence is malleable, especially throughout the school years, and can be cultivated with effective interventions," Dr Lee said.

"Stress and emotional management on the individual level is an important part of this but so are things like anti-bullying initiatives and making more inclusive, pro-social environments in schools, which circles back to my previous findings on fairness."

Dr Lee has analysed one intervention called Toolbox, which is popular in northern California. Its premise is that even young children have the tools within themselves to manage their emotions and stress, such as using breathing or going to a quiet place on their own to calm down, and to build positive relationships, such as remembering to thank people and apologise for mistakes. Dr Lee and her team studied four elementary schools that adopted Toolbox and compared them with two non-intervention schools of similar demographics. Using teacher assessments of students throughout the year, they found teachers in the intervention group reported greater social and emotional competence among their students, such as managing strong emotions, being kind to others and persisting when they encountered difficulties.

"The academic stress and body shape studies show that societal environments can affect children's stress and well-being. But children can also learn how to manage their stress and live more fulfilling lives if there is effective intervention through social and emotional learning [SEL]," she said.

Dr Lee is now studying the OECD data to understand cultural differences in social and emotional competence in Western and Asian children, and ultimately hopes to implement SEL initiatives in Asia that are effective, sustainable and equity-enhancing.

HELP IS AT HAND

Poor mental health is a growing problem globally. Psychologist Dr Christian Shaunlyn Chan proposes a simple and accessible solution: go back to the basics to ease stress, improve well-being, and reduce the growing burden on health services.

The COVID-19 pandemic was a stressful time for everyone. The World Health Organization estimates depression and anxiety increased 25 per cent globally during its first year alone. In Hong Kong, as hospitals became overwhelmed, people were asked to stay home unless their symptoms were severe. And therein, Dr Christian Shaunlyn Chan of the Department of Psychology saw a lesson.

Dr Chan had worked previously on disaster relief in the Philippines following destructive typhoons. He saw parallels with the COVID-19 situation – insufficient resources and people overwhelmed. Both situations forced people to get on with looking after themselves and each other.

"One thing that became very clear to me during the pandemic is that you can't always rely on having access to professional support. If we use that perspective to understand the mental health crisis, there's a lot to be learned," he said.

One takeaway is that professional mental health resources are essential but will never be sufficient to meet all needs. Another is that awareness can lead to hypersensitivity about one's condition.

"During the pandemic, if you started coughing or had a fever, the first thing you would think is, do I have COVID? This is also true in mental health. When people feel down or anxious, very quickly they wonder if they are mentally unwell. This reflects on one hand a destigmatisation of mental health, which is a good thing. But it can also lead to over self-diagnosis or worse, with increasing demand flooding the existing medical system," he said. "The question is, how do we educate people to have a certain level of awareness without overwhelming the system?"

Lifestyle medicine

That inspired Dr Chan to think about how mental health has been handled in other societies and other times, especially during hardships and calamities. "Before the advent of psychiatry and psychology, there were tools and resources in the community that people used, knowingly or inadvertently, to support themselves through hardship," he said.
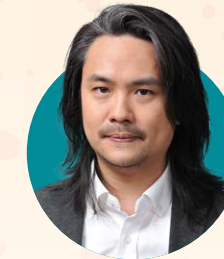
Many of these tools are well known to researchers – diet, exercise, relationships, sleep, exposure to nature and finding meaning in life. Dr Chan has compiled them into a six-facet framework, the Health Hexagon Model, to guide his own research and hopefully guide others in their daily lives.

"For some reason, the idea of lifestyle medicine has not gained much traction. Maybe in part because these things by and large cannot be commodified. But they have sustained civilisations and we should not neglect them to the point that we get sick and need professional help," he said.

The benefits of exercise, sleep and constructive relationships to mental health have been extensively researched and reported. Dr Chan has also been exploring the role of diet, not so much in terms of intake but when and how people eat and with whom. In an outreach exercise, he organised a film screening and discussions for Kerry Group staff during the 2019 social movement that focussed on the role family meals can play in bridging differences and mending divisions.

He has also done work on the mental health benefits of exposure to nature. One published study looked at the effects of mandatory hotel quarantine during COVID-19 and found perceived stress was somewhat mitigated by having a view of nature out the window versus a city view. Another published study used virtual reality to increase enjoyment of nature among people who did not like to spend time outdoors.

Creating a safety net

Dr Chan is also interested in the idea of 'sacredness' in people's lives, such as having special days or events that are protected from everyday concerns. There is less and less of this in Hong Kong, he notes, as people deem it acceptable to miss important days, such as a grandparent's 90th birthday banquet, due to work. "What are the consequences when we chip away at the sense of sacredness so nothing remains sacred? This is an important question to be explored," he said.

His goal is not to eliminate stress or mental disorders but, as a community clinical psychologist, to find ways of helping people try to work through them before they think of turning to therapies or medicines.

The approach is also more aligned with different cultural approaches where the mind and body are regarded as unified, rather than separate entities.

"It's quite unproductive to tell people that what they're dealing with is psychological, it's not physical. We need to take care of the person holistically and help them build routines and habits that weave a safety net for when hardship comes and they are stressed out," he said.

The Health Hexagon Model

Dr Chan has compiled diet, exercise, relationships, sleep, exposure to nature and finding meaning in life into a six-facet framework – the Health Hexagon Model.

Dr Chan (first from left) organised a film screening and discussions in 2019, focussing on the role family meals can play in bridging differences and mending divisions.

Abund/ANTS

A first-of-its-kind census into the distribution of abundance and biomass of ants on Earth has yielded surprising results and underlined the massive role these tiny insects play in the earth's well-being.

On a daily basis, we tend not to pay these tiny creatures much heed but ants play a vital role across ecosystems and regions, and the Insect Biodiversity and Biogeography Laboratory (IBBL) within the School of Biological Sciences recently initiated a global census to find out just how abundant they are. The answer? At least 20 quadrillion ants inhabit the planet and, in terms of biomass, all the ants on Earth weigh more than all the wild birds and mammals combined, or about 20 per cent of human biomass.

"The number has massive implications because of the significance of ants as crucial players in our environment, with multiple important functions and countless interactions with all kinds of organisms worldwide," said the study's senior author Dr Benoit Guénard, head of the IBBL.

Despite many estimates over the centuries, nobody has carried out this kind of census before. Asked the reason, Dr Guénard replied: "It was about the effort required to identify and compile decades of research into a single coherent database that would allow both ecological and global analyses."

In 2012, Dr Guénard began a database on ant abundance. "A substantial amount of data existed, scattered in scientific literature as many researchers already had this information. However, these kinds of data were treated mainly as a collateral product of the study being conducted. Here, we wanted these data to be the key focus and obtain something valuable about the global patterns of ant abundance."

The question of how to go about it remained. "I had a eureka moment about partitioning the world into different types of biomes (for example tropical rainforest/desert) to ultimately gain a global understanding of ant abundance and biomass. But could we get enough data to be able to compare biomes? To do so, the different laboratory members were responsible for searching literature within specific continents, based on the

language that they could read besides English (*e.g.* Chinese, French, German, Japanese, Spanish), which was possible thanks to the international nature of the team."

Over two years, they compiled data from nearly 500 different studies, enabling them to quantify the density of ants in various areas of the globe, and to estimate the total number of ants on Earth.

"We compared the different biomes," said Dr Guénard, "and expected rainforests to harbour particularly high abundance and biomass as we already know their importance for species richness – but the high numbers of ants encountered in savannahs and some other more arid areas were a surprise."

They also compared different habitat types and found that areas modified by humans, such as urban areas, have significantly lower abundance. "People don't necessarily want ants around, but this means the environment degrades – as they are not fulfilling their usual roles in decomposition, pest control or soil enrichment – and ultimately we'll have to pay to get the services that ants do for free. It's crucial to recognise not only how many services ants provide but also the importance of their continued abundance to do so efficiently."

Sustaining other species

"Ants bring massive value," said Dr Guénard. "First, they are food for other organisms shaping the ecology and evolution of bird, herp or even some mammal species – therefore the more ants you have, the more other species can be sustained. Second, ants are major ecosystem engineers, modifying the soil structure and quality, acting as gardeners maintaining plant diversity and health. These processes are essential for plant growth and survival, supporting entire communities of animals and bacteria, and ultimately fostering healthy ecosystems. As they bring food underground, they further enrich soils – and the more ants, the more action, the more enrichment.

"Third, decomposition – they play a vital role in ridding us of decomposing dead animals, burying them underground and thus limiting pathogenic spread. Fourth, predation [the preying of one animal on another] which results in control of herbivores, and that in turn increases plant productivity as they keep more leaves to do photosynthesis."

Dr Guénard hopes that the study findings will prompt further research, particularly into potential consequences should the ant population fall. "There are still many gaps in our knowledge – particularly geographical ones since there are parts of the world for which no data are available. Similarly, we still have very limited information on the abundance of ants underground or for those living in the tree canopy.
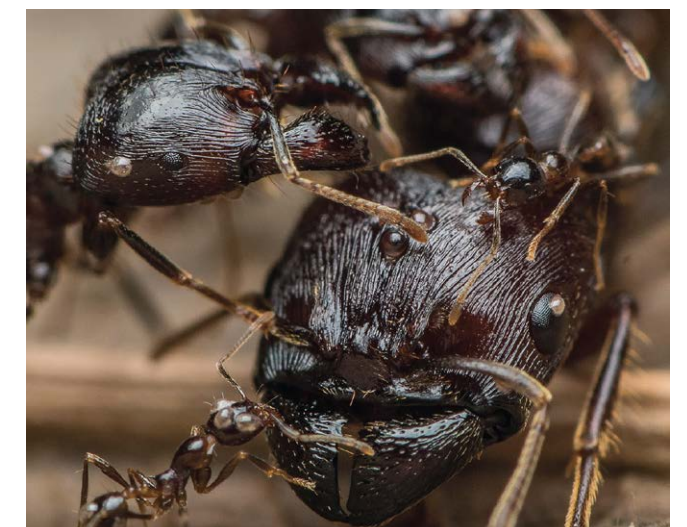
> "The number has massive implications because of the significance of ants as crucial players in our environment, with multiple important functions and countless interactions with all kinds of organisms worldwide.

DR BENOIT GUÉNARD

Therefore, it is likely that 20 quadrillion ants is a conservative estimate. We hope that other people, including schools, could start working on this, as counting ants is something that most can do."

The findings have been published in the *Proceedings of the National Academy of Sciences of the USA (PNAS)*, and relayed by media all over the world. "This helped us get our message across. As humans, we see things at a certain scale which differs from the vast majority of life, including groups like insects that are so important – not by their size but through what they do because of their abundance. Insect populations are in decline in many parts of the world and with it all the functions they fulfil. If those can't be fulfilled then this may lead to consequential changes in ecosystems and for our own lifestyles."

The global ant census initiated by the School of Biological Sciences estimates that there are at least twenty quadrillion ants dominating global ecosystems. The ant highlighted above is Gesomyrmex howardi, a rarely known arboreal ant from the Oriental subtropics. (Courtesy of François Brassard)

Carebara is a genus of myrmicine ants mainly within the tropical regions of Africa and Asia. (Courtesy of François Brassard)

HKU SCIENTISTS DISCOVER DEAFNESS MASTER GENES
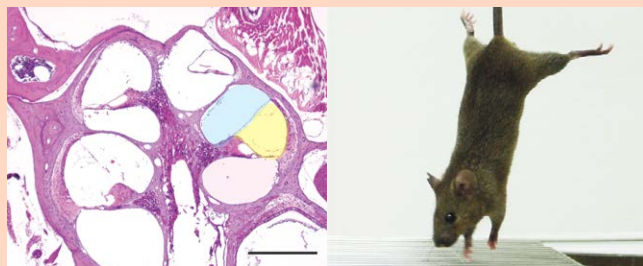
> " Our study reveals how the development of the normal ear is controlled and which genes are essential for the normal ear to be formed and for the correct composition of the endolymph. "

PROFESSOR KATHRYN CHEAH

Two master genes related to congenital deafness have been uncovered by an international team of scientists led by Professor Kathryn Cheah.

Our senses of hearing and balance are determined by the inner ear, which has six organs made up of sensory hair cells and the endolymphatic system whose fluid carries sound, gravity and linear acceleration signals to the brain. Defects in any of these can affect our hearing and balance. Professor Kathryn Cheah, Chair Professor of Biochemistry and Jimmy and Emily Tang Professor in Molecular Genetics, has done groundbreaking work to pinpoint genetic causes for these defects.

In 2005, while studying the development of the skeleton, she accidentally created a mouse model that was deaf and unable to balance. Her subsequent investigations led to the landmark discovery of a gene, SOX2, that controls the six sensing organs within the inner ear and is therefore a master gene essential for hearing.
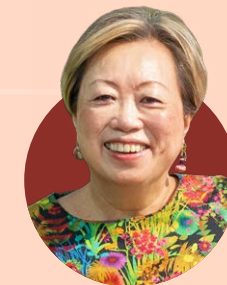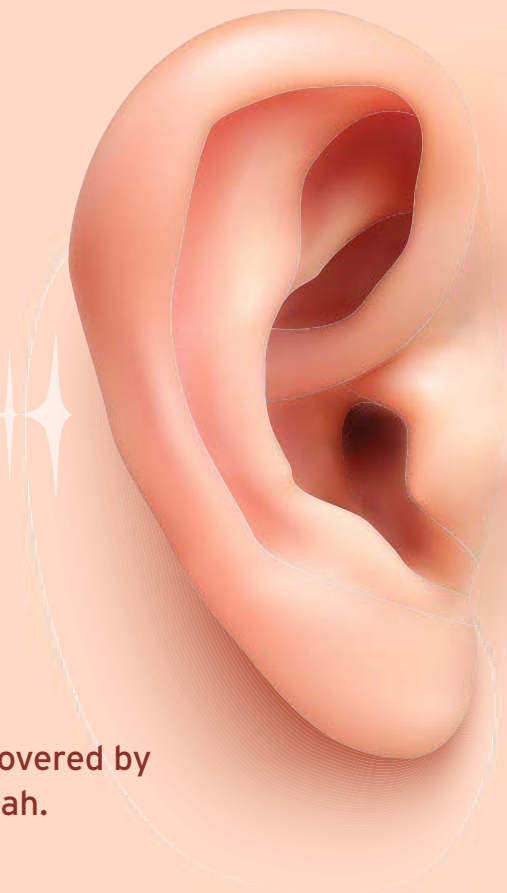
But the identities of other master genes controlling the development of the endolymphatic system went largely undiscovered. Last year, however, Professor Cheah and her team reported two other master genes, SOX9 and SOX10, that play this role.

The latter discovery was also unexpected and arose from her work on campomelic dysplasia (CD), a rare and severe genetic disorder caused by mutation in the gene SOX9 that affects the development of a baby's airway, lungs, bones and reproductive organs. Few babies survive birth so she and her team developed mouse models to study how the mutation causes CD in humans.

"Much to our surprise, we found that the mice were both deaf and had a vestibular problem," she said. The vestibular function enables a person to balance themselves in space and is controlled from the inner ear. When there is a disturbance there, the mice are deaf and unable to balance.

Problem with fluid control

Professor Cheah and her team isolated the cause of the CD deafness to a problem in their endolymphatic system, which was very swollen, suggesting a problem with fluid control. Further investigation through both biochemistry and genetic investigations, with collaborators from HKU, The Chinese University of Hong Kong, the Francis Crick Institute in London and the University of Iowa, showed that genes controlled by SOX9 were causing the defect of the endolymphatic system.

"We discovered that SOX9 [of the same family as SOX2] is a master transcription factor that controls both how stem cells in the endolymphatic system develop and, at the molecular level, the expression of many genes that are important for producing the correct ionic composition in the endolymph fluid," she said.

"What is even more interesting is that among the genes affected by the mutation was SOX10, which is another transcription factor and a sister gene of SOX9 belonging to the SOXE family. The mice deficient in SOX10 also had a similar problem with the endolymphatic system, implicating it as another master factor. We showed that SOX9 and SOX10 work together to control the development of stem cells for the endolymphatic system in the inner ear."

Implications for common conditions

The finding has implications beyond the case of CD. Rare diseases are by definition severe, making it simpler to identify master genes that may also be related to more common conditions. Consider that one in 10 people is expected to experience hearing loss by 2050, that about one-to-three newborns per 1,000 born are hearing impaired with half of those cases due to genetic causes, and that malfunction in the ionic composition in the endolymph is the most common cause of deafness. Problems associated with a swollen endolymphatic system include deafness, vertigo and tinnitus (ringing in the ear).

"Our study reveals how the development of the normal ear is controlled and which genes are essential for the normal ear to be formed and for the correct composition of the endolymph. Since SOX9 and SOX10 are master genes controlling other genes, our study also provides a rich resource for discovering other candidate congenital deafness genes or identifying disease genes regulated by other SOXE-gene factors," Professor Cheah said. Ultimately, this can lead to new directions for developing treatments for hearing loss.

Professor Cheah and her team published their findings in the *Proceedings of the National Academy of Sciences*, together with a list of all the genes they found to be affected by the SOX9 mutation to help other researchers identify additional deafness genes. Her research could even aid in the study of age-related hearing loss, which may be caused by variants in other genes in the pool, by less severe mutations in the master genes or by a combination of other genes controlled by SOX9 and SOX10. The findings will also be useful for the future development of transplantable stem cells and/or artificial organs or tissues as regenerative medicine for hearing loss.

Cross section of the inner ear in a normal mouse, which can balance itself and stretch to reach the ground when falling.

Swollen inner ear chambers are observed in SOX9 and SOX10 mutants which cannot balance themselves and are deaf.

CHINA'S POLLUTION SUCCESSES

China launched its war on pollution a decade ago. Research by Dr He Guojun of the HKU Business School has shown that it is saving lives and reducing pollution across the country. His research has also demonstrated how citizen watchdogs can improve the results further.

Until 10 years ago, China's approach to environmental pollution was to place it a distant second in the rush to accelerate economic development. But growing evidence of the health impact motivated a change of tune. A 'war on pollution' was launched in 2013. As environmental economist Dr He Guojun has shown, that war has been a success, offering lessons for other countries trying to reduce their own pollution.

Dr He has documented the impact of reducing pollution on both health and the environment. His first major study, conducted with the University of Chicago in 2017 (he is also the research director of the Energy Policy Institute at the University

of Chicago [EPIC-China]), found definitive links between particulate matter (PM2.5) in the air and life expectancy. The team had compared data from north of the Huai River, where residents were receiving free or subsidised heating through coal-fired boilers, and south of the river where they were not. People north of the river had a reduction in lifespan of 3.1 years and a 37 per cent greater incidence of death from heart disease and stroke.

The findings contributed to a change in government policy to use natural gas or electricity wherever possible instead of coal. Dr He then did follow-up studies which showed that China's PM2.5 level had fallen more than 40 per cent by 2021 and that
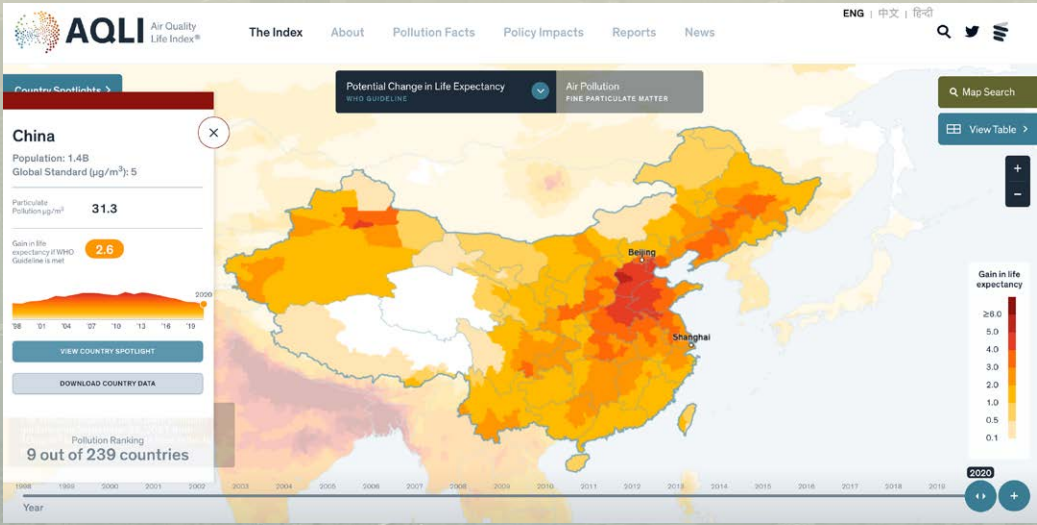
The Air Quality Life Index measures the loss in life years due to air pollution.

> " Our team filed more than 3,500 complaints that involved more than 2,000 companies. We found that when people complained on social media, the firms reduced emission violations by 60 per cent. "
>
> **DR HE GUOJUN**

the average Chinese citizen could add two years to their life expectancy if these pollution reductions were sustained.

"We also compared China with other countries and found that in most other developing countries, air quality has been deteriorating rather than improving over the past decade. China alone actually contributed to more than 75 per cent of the total global reduction in particulate matter in that period," he said.

"Another interesting observation is that in the US, it took three decades for them to achieve a similar level of emission reductions through the Clean Air Act. China, in comparison, did all this in eight years."

Reasons for improvements

Changes in policy have been a major contributor to China's anti-pollution success, but so has improved technology, he said. Another study found that automated environmental monitoring networks reduced cheating behaviours by regulators (such as manipulating data) and improved the accuracy of air quality measurements. Furthermore, this improved accuracy motivated individuals to protect themselves as pollution problems became apparent, with immediate increases in sales of face masks and air filters on Taobao.

But Dr He felt more could be achieved. "Although the government might have the data, without public pressure, local regulators may be reluctant to enforce federal regulations," he said.

That concern led to a nationwide field experiment that itself contributed to measurable reductions in air and water pollution.

The research team recruited volunteers in 2020 to monitor data from more than 25,000 major polluters. These polluters are required to have monitoring equipment installed and the resulting measurements are published online in real time. The volunteers monitored the data and were assigned to file either a public or private complaint when they came across violations. The study found that public appeals to regulators through social media substantially reduced both violations and pollution emissions, especially when the 'like' and 'share' buttons were activated.

Cost-effective option

"Our team filed more than 3,500 complaints that involved more than 2,000 companies. We found that when people complained on social media, the firms reduced emission violations by 60 per cent. At the same time, we also observed that air pollution reduced by 12 per cent and water pollution by four per cent," Dr He said.

"There are quite large improvements that show the positive impact of citizen participation in environmental governance. This can be a cost-effective way of encouraging firms to comply with environmental standards."

To underscore the benefits to human health of reduced pollution, Dr He also led a study that looked at how COVID-19 lockdowns in China inadvertently reduced non-COVID deaths due to cardio-respiratory failure, especially in heavily-polluted cities.

Dr He's work has influenced policymakers in China and helped inform the rest of the world about the country's anti-pollution successes. His work also contributed to the creation of an Air Quality Life Index by EPIC that applies his approach to understand the impact of PM2.5 pollution on life expectancy in the rest of the world. He has also disseminated his findings widely in media and to governments and organisations, including at a webinar that attracted more than 244,000 online participants. His achievements were honoured this year with the HKU Knowledge Exchange Excellence Award.

Dr He (right) receiving the Knowledge Exchange Excellence Award from Provost and Deputy Vice-Chancellor Professor Richard Wong.

LESS PAIN, MORE GAIN

Study shows artificial intelligence (AI) can help automate the design of artificial teeth accurately and efficiently, meaning less time and discomfort for the patient and less expense too.

> " We are the first team in the world to use AI to design artificial teeth that mimic nature's teeth. We believe nature is the best and only AI is able to learn such minute features for an individual in an effective way. "
>
> **DR WALTER LAM**

One of the biggest problems with tooth replacement – particularly for the patient – is the amount of time it takes and the discomfort involved. Multiple fitting procedures can be tedious and uncomfortable. From the dentist's viewpoint, existing design processes can involve a great deal of manual inputting on the computer.

Researchers from the Faculty of Dentistry at HKU have teamed up with the Department of Computer Science of Chu Hai College to investigate the effectiveness of using AI technology based on 3D Generative Adversarial Network algorithms to automate the design of artificial teeth to a very high degree of accuracy. They tested their ideas on 175 participants recruited at HKU.

Principal Investigator Dr Walter Lam, who is Clinical Assistant Professor in Prosthodontics, said: "Designing artificial teeth is labour-intensive and therefore expensive. Clinically, dentists need to record patients' features – such as how the opposing teeth work in static and in function – and then send this clinical information to a dental technician to simulate the patient's mouth.

"Dental technicians design and fabricate artificial teeth, and some already use computer-aided design (CAD) software. However, most of the resulting designs do not fit into the patient's mouth properly and require significant and often lengthy adjustment by dentists at the chairside. In addition to being unpleasant for patients, the adjustment often weakens the artificial teeth."

He describes the biting (occlusal) surface of teeth as being like 'hills and valleys' – with cusps and fissures – that are particularly complicated. "The slope/steepness of these cusps are different in different individuals, making this more complex as teeth will occlude (bite) with opposing teeth and patients can sense a minute difference in the biting surface up to a hair-like thickness," he said. "We believe that it is difficult – if not impossible – for humans to identify such minute details."

At the same time, however, teeth within an individual do share similar features, since they are controlled by the same set of genes and share similar environmental factors. Hence, the team proposed using AI to learn the features of individual teeth in a subject and apply these features to design artificial teeth for that subject. "We hoped that the AI-designed artificial teeth would mimic the healthy natural teeth in morphology as well as function," said Dr Lam. "Treatment costs will be reduced and the function and longevity of artificial teeth will increase."

For the research, the team selected subjects who had healthy natural teeth with almost full dentition – that is, almost no missing teeth. The subject's teeth were then digitised via 3D scanning, and one back tooth, the right first permanent molar, removed from the resulting digital teeth models.

"We then input one digital teeth model (with one tooth removed) and its original model (all teeth) as a pair and the AI is able to design artificial teeth based on learning the features of the remaining teeth," said Dr Lam.

"We are the first team in the world to use AI to design artificial teeth that mimic nature's teeth. We believe nature is the best and only AI is able to learn such minute features for an individual in an effective way."
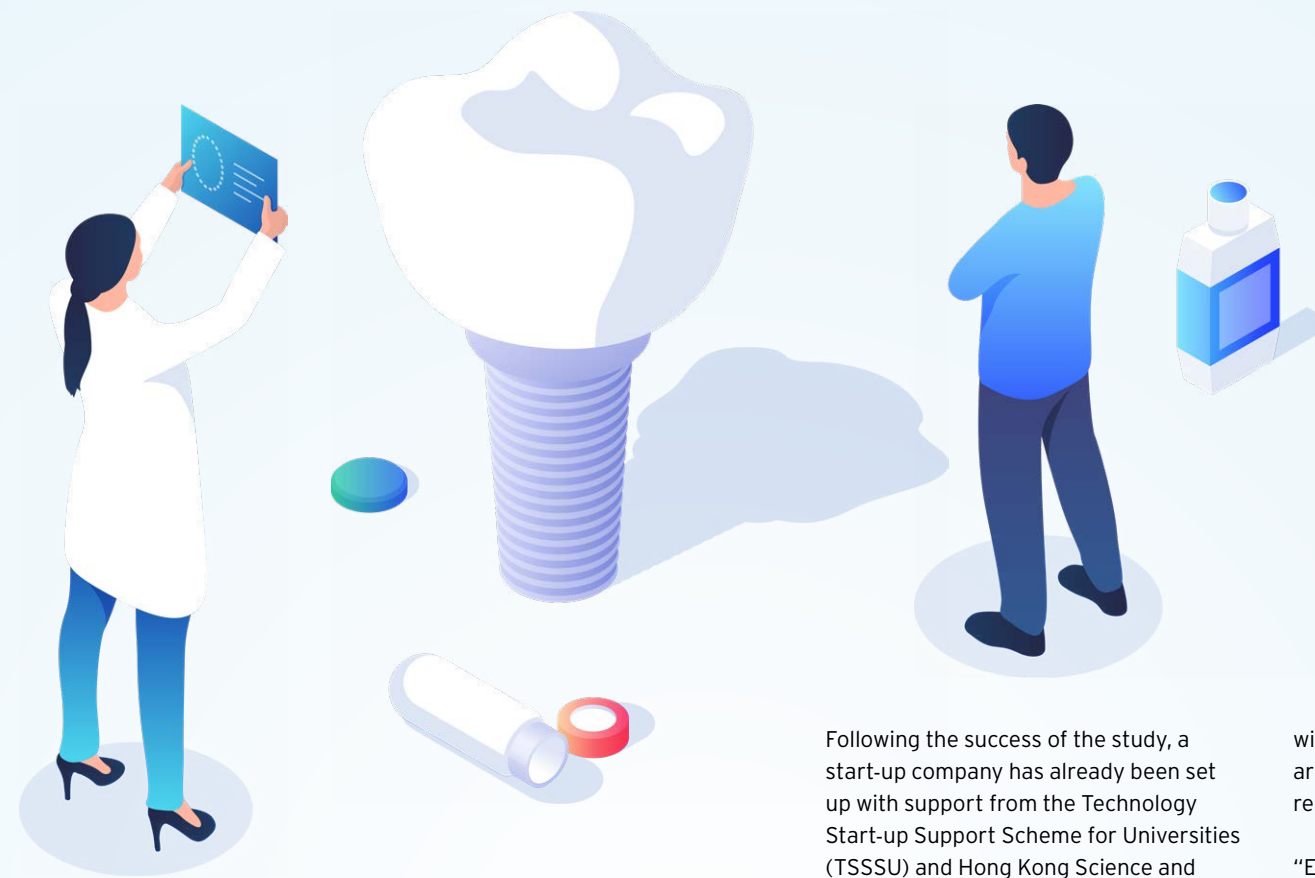
Following the success of the study, a start-up company has already been set up with support from the Technology Start-up Support Scheme for Universities (TSSSU) and Hong Kong Science and Technology Parks Corporation.

AI design service

"When making artificial teeth, dentists provide all clinical information including teeth models to the dental technician for fabrication of artificial teeth," said Dr Lam. "We plan to launch an AI crown design service in the near future, by which dentists can tick a box in the prescription form to use AI design service (versus manual design with or without CAD software). Then the dental technicians send us the teeth model with missing teeth and our AI can design artificial teeth by learning features of the remaining teeth.

"Expenditure should be low because we only need to set up an AI system, which is a normal server costing only about HK$100,000 plus system maintenance fees. After that, there is no cost difference between designing one or one million crowns. We plan therefore to charge only a few hundred Hong Kong dollars. Moreover, our AI system can provide services not only in Hong Kong but all over the world via the use of the digitalised teeth model."

Now, the team plans to move from single tooth design, to multiple teeth design and finally to patients who have no teeth. "But whether it is one tooth or many," said Dr Lam, "AI design benefits all patients by shortening the treatment time, reducing labour and therefore treatment costs, and producing better quality artificial teeth and reducing the need for re-treatment."

The study has been published in both *PLOS ONE* and the *Journal of Prosthetic Dentistry*, and the preliminary results were presented at the recent International Association of Dental Research (IADR) General Session. The study also won the IADR Neal Garrett Clinical Research Prize and was First Runner-up in the 2022 IADR-SEA Hatton Award – Senior Category.

From left: Dr Richard Hsung, Professor Colman McGrath, Dr Reinhard Chau, Dr Khaing Myat Thu and Dr Walter Lam.
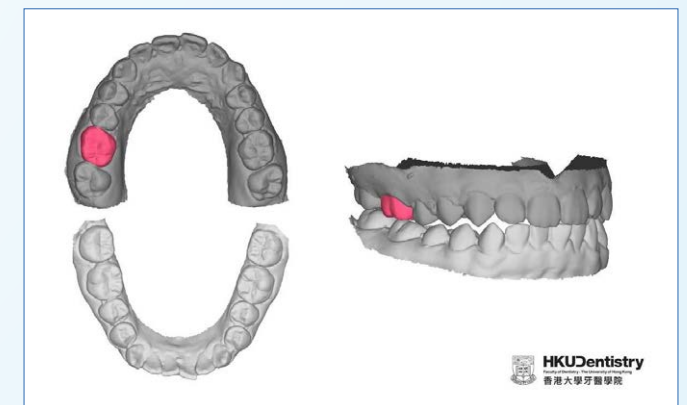
The research team uses the 3D Generative Adversarial Network (GAN) algorithm to learn the relationship of teeth in a dental arch on 175 student participants. After training, 3D GAN is able to generate a tooth (red) based on the feature of remaining teeth (dark grey).

AN HISTORIAN WHO LOOKS TO THE FUTURE

Dr Cha hopes to store the output in the Arctic World Archive, which is a secure underground vault located deep inside an Arctic mountain on the isolated archipelago in Norway, storing the world's digital memory and treasures.

How might future historians access the digital archives of today when they are produced using a variety of hardware and software? And what should go into those archives? Digital historian Dr Javier Cha is trying to figure this out.

Dr Javier Cha is an unlikely combination of Korean medievalist and digital historian, two seemingly unrelated subjects that were brought together by the fact that his medieval research had too much data for one person to comfortably compute on his own. Starting 15 years ago, and spurred on by a mentor during his doctoral studies at Harvard University and a lifelong interest in computers, he began to adopt digital tools into his work at a time when digital humanities had not yet gained traction.

Dr Cha not only used the tools to solve his immediate problem – which was how to consolidate raw data on kinship formation, political associations, marriage alliances and the like to show how Korea's highest social class, the *yangban*, consolidated power for over 500 years – but he also began to develop an interest in data as a topic of study.

"Historians draw information from many sources. I'm interested in how to draw links from multiple heterogeneous data sources so that we can make new discoveries with the aid of software tools," he said.

In 2019 he established the Big Data Studies Lab – subtitled 'The humanities in uncharted waters' – at Seoul National University to explore this further and brought the initiative with him when he joined HKU last year. His approach is to apply traditional teachings about book history and how ideas travelled, to 21st-century historical research and the age of digital materials.

Future orientation

"As an historian interested in today's technology, I want to show that historians should be partially future oriented. We should think about what interesting materials of today should be collected and curated, while keeping in mind that they should be diverse enough for someone in the future to explore something obscure or something that we may have missed," he said.

That role requires not only an analysis of content but the creation of archives themselves. One of his projects is focussed on Korean webtoons, where he is scraping available materials such as ratings and comments, while also digging deeper to provide context by interviewing not only the famous creators,

> We should think about what interesting materials of today should be collected and curated, while keeping in mind that they should be diverse enough for someone in the future to explore something obscure or something that we may have missed.
>
> **DR JAVIER CHA**

but also their assistants and even people who were mistreated by companies.

Explorations on data storage are also part of this project – he hopes to store the output in the Arctic World Archive in Norway – as well as a separate subject of study at his lab. "People tend to think big data is just a structured Excel sheet with a billion rows, but it is incredibly large and complex and it cannot possibly fit on a single computer. There are serious logistical challenges such as how to archive primary sources that are not printed or circulated in the way we traditionally associate with books. And how to preserve that data properly," he said.

Physical limitations

Befitting an historian, Dr Cha is also interested in the impact of the concept of time in the age of digital technology. People experience the internet as boundless and unifying – a single entity accessible to all at all times. The experience on Zoom calls are one example of the flaw in that perspective. There is always a millisecond delay, which is detectable, especially compared to voice or text messaging. This is because data transmissions are limited by the speed of light. Moreover, data does not zip along one line, it jumps across multiple points in multiple jurisdictions

before it reaches the user, raising issues about digital sovereignty and content protection. "Rather than timeless time, we are seeing the physical limitations of digital infrastructure," he said.

Dr Cha believes these issues all call for the role of the historian to be revisited. Since the second half of the 20th century, historians have tended to shun archiving and focussed on analysing and interpreting events and trends, and writing books. But now there are all these new kinds of sources, such as webpages and online platforms, that could be useful references in future. What should be collected and who should do the collecting?

"Archivists have tended to be treated like support staff in recent times, but that is not how history has always operated. Digital historians argue that we should go back to the previous paradigm, where historians cared about curating and archiving materials, and be partially professional archivists as well. Because historians are best placed to know best what future historians might want to look for," Dr Cha said. He is also cultivating a future orientation in students through his teaching in the new Bachelor of Arts in Humanities and Digital Technologies.
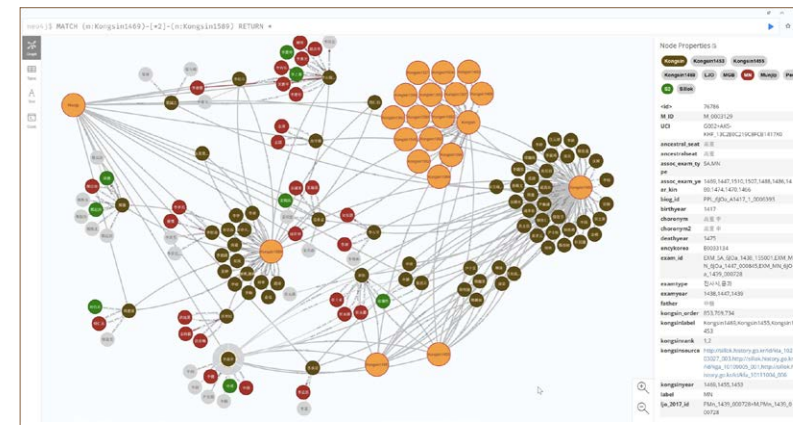
Biographical data of medieval Korean personalities in Dr Cha's medieval yangban Neo4j database.

Dr Cha at his Bachelor of Arts in Humanities and Digital Technologies class.

GOLDEN OLDIES

Reforestation has been identified as an important tool to mitigate climate change, but a new study suggests that priority should be given, not only to planting new trees but also to conserving the older trees in the upper forest canopy for their exceptional drought tolerance and carbon storage capacity.

The findings have thrown up something of an environmental irony. "Global forests have been gradually shifting to a younger age structure owing to major reasons like deforestation, natural regeneration and human reforestation. As a result, younger trees are playing a important role in carbon storage and being seen as a nature-based solution to mitigate climate change," said Dr Jinbao Li, a senior author of the study and Associate Professor of Geography.

"However, under global warming drought is occurring more intensely and frequently in many regions of the world, owing to precipitation reduction and more water loss through evapotranspiration due to higher temperatures. We embarked on the study because it had become imperative to understand whether younger trees in comparison with older trees can cope with drought."

Nearly 22,000 trees across five continents were analysed, focussing on trees in the upper canopy as these are the main components in a forest and take up more carbon from the atmosphere than other forest components. They also provide important ecosystem services such as microclimate buffering – including cooling the temperature – and are habitats for other organisms.

"The most significant finding is that younger hardwoods from the upper forest canopy have a greater growth reduction (28 per cent) compared to the older ones (21 per cent) during drought," said Dr Li. "During extreme drought, the difference could amplify to 17 per cent. Young conifers are also more sensitive to drought (27 per cent growth reduction) than the eldest but the difference between them is not remarkable (2.5 per cent). We did not expect this finding as some previous studies reported that larger, presumably older, trees are more sensitive to drought with greater growth reduction."

Dr Li explained that these previous studies may have been confounded by the effects of canopy position – that is, smaller trees tend to live in the lower canopy. "In addition, tree size does not necessarily represent tree age when the trees reach the upper canopy. In a subset of species in the upper canopy with both tree size and tree age data, we observed a substantial variation in tree age (up to 200 years) even when the tree individuals share a similar size."

The team undertaking the research was a mix of long-term and new colleagues from across the globe. "Some of us are long-time collaborators, such as first author Dr Tsun Fung Au, an HKU graduate whom I supervised (now at the Institute for Global Change Biology, University of Michigan) and co-author, Dr Teng Li, who was formerly my PhD student at HKU and is now at Guangzhou University," said Dr Li. "We also established new collaborations with ecologists and climatologists from institutions like Indiana University in the US and Centre national de la recherche scientifique (CNRS) in France, which enabled access to more worldwide tree-ring data, as well as brilliant ideas to improve the quality of this research."

The team used two key methods for the study. First, they considered how to measure tree growth reduction and recovery after drought, and decided to use two metrics – drought sensitivity and drought resilience. Drought sensitivity was defined as how much tree growth is being reduced during drought. Drought resilience was defined to quantify how trees recover after drought and restore to pre-drought-level growth.

Species-specific age

"We also considered at what age trees are considered as young or old, because an individual tree being young or old is subjective and possibly species-specific," said Dr Li. "For example, a 200-year-old oak tree can be very old but a pine tree of the same age is still quite young, since pine species can live up to a few thousand years (for example, Bristlecone pine). In this work, we looked into the age distribution and longevity of each species and classified individuals from different species as 'relatively young' or 'relatively old' in a comparable and fair manner."

For each drought-sensitive species, the team classified the youngest and oldest 25 per cent of the population as the young and old cohorts while the remaining 50 per cent was classified as the intermediate cohort. This relative ranking allowed the team to compare tree individuals from different species that have very distinct longevity.

Their findings have led them to suggest a shift in the approach to the role of forests in mitigating climate change. "Preserving mature trees and planting new ones are both important, as more younger trees can boost carbon storage and younger trees have a higher ability to recover from drought than older ones," said Dr Li. "However, we often ignore what we already have – the mature trees. These existing old trees contribute to long-term storage of atmospheric carbon captured several hundreds to thousands of years ago while also being more tolerant to climate-induced droughts. Were these old trees to be destroyed, carbon captured long time ago would be released back into the atmosphere and exacerbate climate change.

"We hope future national and international carbon- and climate-related policies will take into account our findings and emphasise the conservation of exiting old forests instead of merely focussing on reforestation efforts."

> We embarked on the study because it had become imperative to understand whether younger trees in comparison with older trees can cope with drought.
>
> **DR JINBAO LI**

Old-growth trees are more drought resistant than surrounding young trees of the same species (Pinus kwangtungensis).

THE DISTANCE BETWEEN US

Working or learning from home became the new norm during COVID and is a practice favoured by many since, but new research indicates that collaborating at geographical distance can adversely affect learning and productivity.

> " When people work from home, they don't build (as easily) the trustful relationships they would when they interact face-to-face repeatedly in the office… For businesses, this potentially means barriers not only for creativity and problem-solving but also for talent retention and employer loyalty. "
>
> **DR FRANK VAN DER WOUDEN**

" An informal discussion between colleagues about the benefits of having a collaborator close by led to agreement that face-to-face interactions – no time-difference, no Zoom meetings – seemed to spur more in-depth exchange," said Dr Frank van der Wouden, Assistant Professor of Economic Geography and Innovation Studies in the Department of Geography, explaining the origins of the study.

"The pandemic pushed us to limit our face-to-face interactions. In a way, most of the world was, at some stage, collaborating 'at distance'. Previous research has suggested that proximity leads to more trustful relationships which in turn are more likely to result in knowledge sharing. However, there is little empirical evidence on whether knowledge sharing (or learning) happens more frequently for people who, indeed, are close by."

Together with Dr Hyejin Youn from the Kellogg School of Management, Dr van der Wouden examined this theory for a population of people who are considered knowledge producers – academic scholars. Scholars collaborate locally and non-locally, and it is possible to track their careers. Using databases from 1975 onwards and involving 17.6 million publications authored by 1.7 million scholars, the team was able to evaluate scholars' knowledge portfolio, as reflected in their academic output. They then used a clever sampling technique to identify 'knowledge spill-overs' and analyse whether locally collaborating scholars tend to share and learn more during collaboration, as compared to similar scholars collaborating across distance.

The results show that those collaborating at distance tend to learn significantly less (57 per cent), leading the researchers to conclude that social distancing during the pandemic has very likely limited the flow of knowledge among collaborators.

Insights into the role of information and telecommunication technologies were also revealed. "It has long been argued that developments in these technologies – like email, telephone and the internet – have removed 'the friction of distance' on social and economic processes," said Dr van der Wouden. "Interestingly, our research shows that the positive effects of collaborating locally are now greater than they used to be at the start of our sample in 1975. It has been steadily increasing. Being geographically close matters more, not less, even considering all the recent advancements in these technologies!"

Complex knowledge

Asked to analyse this, he said: "A possible explanation is that novel knowledge is becoming more complex, all the easy stuff is already discovered. To produce complex novel knowledge, we need to specialise and collaborate (like the medical profession does so well – there is a special doctor for everything). To collaborate effectively on novel, complex issues, we need trustful relationships. You will not share your cutting-edge knowledge with people you don't trust. These relationships are probably not built effectively across digital means. So, the internet still doesn't substitute for physical interactions and colocation."

Furthermore, not only does the probability of learning drop with geographical distance but it also corresponds to the number of institutional boundaries crossed during collaboration. "A lot of institutions are geographically bounded," he said. "For instance, Hong Kong has specific norms, values, but also laws, that govern social interactions. These will differ from New York, or Amsterdam, but will be more similar to those of Shenzhen or Shanghai.

So, as geographical distance increases, more and more of these boundaries are crossed: different cultures, languages and norms affect how to collaborate; different values such as hierarchy in social relationships; and different laws, for example, 'can we patent this technology?'"

Now that some companies are at loggerheads with their employees about continued working from home, the results have significance. "When people work from home, they don't build (as easily) the trustful relationships they would when they interact face-to-face repeatedly in the office," said Dr van der Wouden. "This would mean that working from home results in less knowledge sharing and learning. For businesses, this potentially means barriers not only for creativity and problem-solving but also for talent retention and employer loyalty. Other research has shown, for instance, that people who work from home are less likely to be promoted."

For academia, he sees two main implications. "First, local and non-local collaborations might serve different purposes. When knowledge exchange is encouraged, local collaboration is best – for instance, between supervisor and PhD student. If the objective is to produce output that relies on complementary knowledge/inputs in which knowledge sharing is not of interest, teams from across the world can be established. Second, to promote knowledge exchange and production, local collaboration is to be favoured over non-local collaboration – all else being equal. This would benefit society-at-large the most."
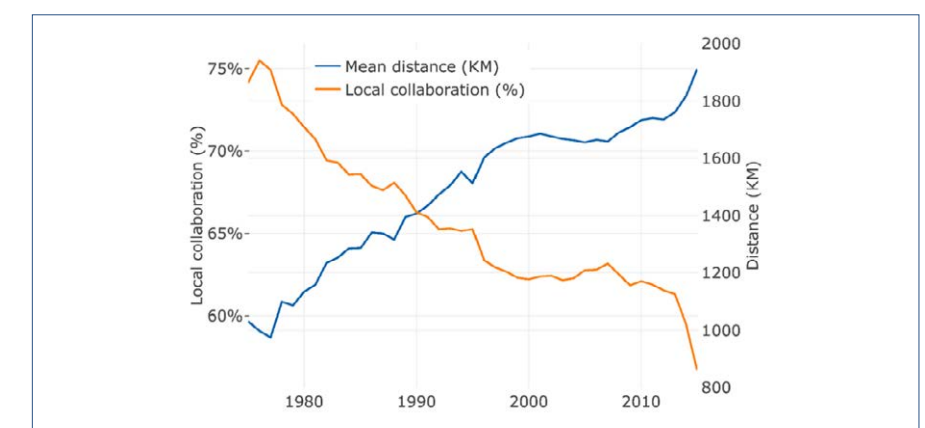
Rates of local collaboration (in percentage, orange) decrease over time while the average distance between collaborators (in kilometres, blue) increases.

Virtual Visibility

Curios is a metaverse-like digital learning platform that was begun in pre-pandemic days in response to concerns about how students learn online, and has developed into a comprehensive socialised virtual learning environment.
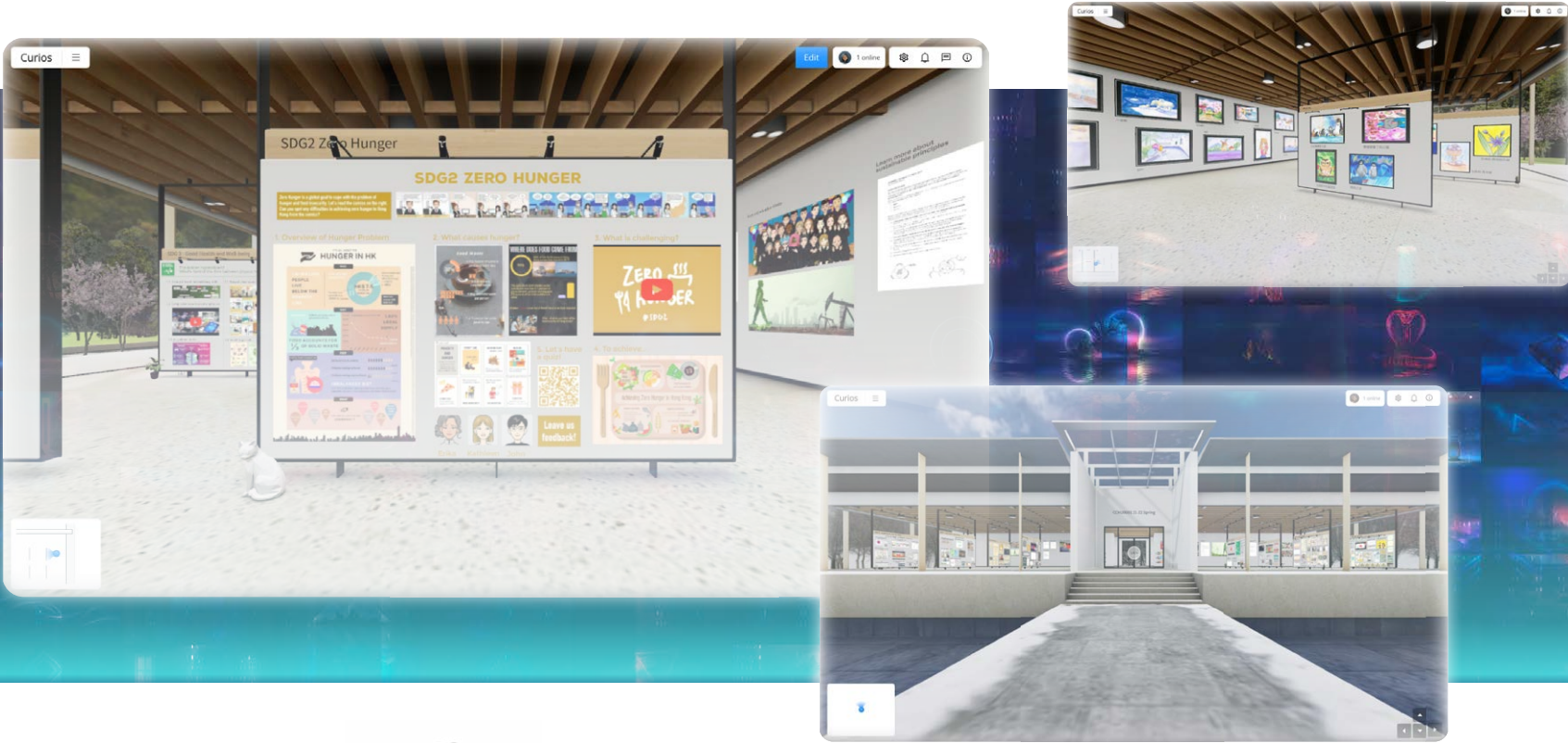
Now supporting more than 2,000 users within and outside the University of Hong Kong, Curios is a virtual teaching and learning tool that is open for teachers and students to use in facilitating their courses.

The platform grew out of a decision by Mr Mathew Pryor, Associate Professor (Teaching) in the Faculty of Architecture and the principal investigator of Curios Metaverse project, to rework a long-running Common Core course as a flipped class, replacing the lectures with a learning journey of pre-class online exercises, tutorials and in-class workshops.

"It was 2018, so pre-COVID, and I had become interested in how students operated in online environments," he said, "in particular how they interacted outside the classroom when they were no longer in the same physical location and working at different times."

The advent of COVID gave impetus to the project and in 2020, Mr Pryor and Ms Lynn Hanyuning Lin, Digital Learning Designer in the Division of Landscape Architecture, joined forces to develop the idea of creating a digital exhibition space (now called Curios), a virtual 3D gallery which students could use to present and share their projects and undertake peer review and give peer feedback. A key feature of Curios was that it would provide students with oversight of their classmates' work and make learning outcomes visible.

"We wanted to break the boundaries of the classroom and provide teachers and learners with a multifunctional, affordable virtual workspace where learning would be social, manageable and sharable, and where the learning process and outcomes would be visible," said Mr Pryor.

Throughout development, the team sought input from teachers and learners on what the pain points of working from home were. These included poor communication in online and hybrid environments – particularly a lack of social and technical dialogue – which could lead to misunderstandings that were only exacerbated by the use of Zoom. Lack of peer support, little opportunity to compare their own work with what others were doing, limited reflection on learning, and no regular working environment were also frequently cited as problematic.

"Usually students see the campus as 'the space to study and work' and can lack learning motivation when outside this space," said Mr Pryor. "Working online often generates a sense of isolation. Some students are able to find a way to cope but less confident students struggle and often just stop. A sense of a 'learning community' is essential and something teachers need to facilitate amongst students."

In answer, Curios has fostered socialised forms of online learning, creating a virtual space and a pedagogical approach

Curios has supported over 2,000 users within and outside the University of Hong Kong over the past two years, including some local schools and NGOs.

> We wanted to break the boundaries of the classroom and provide teachers and learners with a multifunctional, affordable virtual workspace where learning would be social, manageable and sharable, and where the learning process and outcomes would be visible.
>
> **MR MATHEW PRYOR**

that require students to interact and collaborate even though they may be working at different times and in different places.

Guided interactions

"Both contextual relationship-oriented and designed task-related interactions are carefully facilitated and guided by the instructor and tutors," said Ms Lin. "Students work on Curios, both in the classroom and outside (in the study room, dorm, home) and can use the chat function to collaborate and give feedback. Clear course planning and technical support are provided so that students will not feel lost."

The virtual space also visualises learning progress and learning outcomes, allowing students oversight of each other's work, and enabling them to give and receive feedback. Importantly too, Curios has a series of embedded game elements (for example, rewards and events that happen when they reach a milestone) that encourage students to interact and explore, and promotes progressive learning.

"We aim to make Curios sustainable in different educational contexts, technically and financially affordable for instructors

and learners, and hope that it will promote innovative pedagogical design across disciplines," said Mr Pryor. "Curios has been particularly effective in facilitating socialised learning in the large-sized classes (120 students) of HKU's Common Core curriculum, with students working in mixed groups from different faculties. Users outside HKU, including schools and NGOs, also enjoy using Curios for different events. Our long-term vision is to make the platform available to as wide an audience as possible, particularly amongst low-income sectors and schools with limited resources in Hong Kong and the wider region."

In 2023, the Curios team is hoping to collaborate further and help more teachers and students enrich their virtual learning experiences. "Although the 'metaverse' concept is still emerging, and to date investment in the idea has been largely focussed within the computer gaming and finance industries, we are excited by the possibilities of creating an 'educational metaverse' and we are exploring how platforms such as Curios might be developed to link students and instructors together within a socialised virtual learning environment," said Mr Pryor.

SERIOUS GAMING

Gaming is a surprisingly under-researched topic in pedagogy. Dr Jack Tsao in the Common Core Office is addressing the research shortfall with a programme that asks students to design games on weighty topics such as citizenship, fake news and gender equality.

Students collaborate and make tough ethical decisions about the sustainability of our planet in the Global Goals Game.

> " I hope the prototypes and exemplars can showcase how game design and storytelling can be embedded within courses and expand students' future readiness capacities. "
>
> **DR JACK TSAO**

People are bombarded every day with news stories that may or may not be truthful, but it is not always easy to sort the real from the fake. What if a game could show players how news is manipulated and fake stories generated? Breaking News, a game developed by third-year BSc student Tang Yiyi, does just that.

Players take on the role of troll factory operators on the internet who want to attract popularity without being shut down by the government. They use action cards, such as emotional appeal, conspiracy and polarisation, to spread news and inflammatory speech to gain supporters and damage their opponents – and reveal how digital media can misinform and incite netizens.

The game was developed as part of a Common Core pilot programme that shows students how to produce games and podcasts and asks them to focus on issues of societal concern, such as fake news, business ethics, climate change and gender equality.

The driver behind the programme is Dr Jack Tsao, Associate Director of the Common Core, who has a Teaching Development Grant (TDG) to investigate and devise innovative teaching approaches through both gaming and storytelling, which is typically a key component in games.

"Gaming is so prevalent but has not been widely researched or applied within the educational space. I'm interested in how to use it to create a more self-driven educational experience, where teachers act more like guides and mentors rather than dictating knowledge," he said.

Play, tell and learn

The programme's first iteration was in early 2022 when students created their own games based around existing Common Core courses with the help of Press Start Academy, an educational games consultancy company. The storytelling component also got underway then in partnership with the Centre for Applied English Studies by asking students to interview experts on gender inequality and feed in their own experiences to create a podcast called 'The Voice of an Equal Future'.

The latter was carried forward earlier this year when a group of 11 students travelled to the Thai-Myanmar border to interview

Hong Kong students travelling in a songthaew near the Thai-Myanmar border to interview Myanmar students.

refugee students about their educational experiences for co-creating a podcast series for broadcast on local radio, while the gaming component was transformed last autumn by re-focussing to the theme of citizenship. This was inspired by the University's growing emphasis on future readiness to prepare students for their lives beyond university.

"Citizenship is not just about allegiance or nationalism, it is also about using your agency to respond to issues in society, such as climate change and sustainability, through advocacy or education or doing things with other social actors," Dr Tsao said. "We wanted to use gaming to tap into that deeper purpose and create a world lesson through the player experience."

Potential for impact

Yiyi, who is passionate about playing games, enrolled in the course to learn more about the game-making process, including how to balance the educational and entertainment value of games. "The theme of my game was inspired by the widespread dissemination of manipulative or misleading information in the current global media landscape. The game development process enhanced my confidence in building a worldview to convey a message effectively," she said.

The students' games have all had to be analogue, given the short two-month time frame in which they were created, but there is potential for some to be digitised. Common Core and Press Start Academy is working with Yiyi and other students to further develop their games.

The gaming programme was offered again early this year under the moniker Serious Gaming, which is both a gaming term and a reflection of the deeper intentions of the programme. This was the last iteration under Dr Tsao's TDG, but he is compiling a guidebook and research paper on the results of the gaming and podcast programmes to share with colleagues.

He is also running a conference on June 10 at the University called Games for Change, an initiative started in the US that invites people of all ages and backgrounds to explore, learn and create games for social impact. Hong Kong will be the first venue in Asia to host a version of the conference.

"My TDG project is part of a larger initiative to explore how gamification and storytelling enhance the teaching and learning experience for students. I hope the prototypes and exemplars can showcase how game design and storytelling can be embedded within courses and expand students' future readiness capacities. Development in this space has significant potential for impact across programmes and institutions," he said.

The Breaking News game developed by student Tang Yiyi.

STUDENTS AS PARTNERS

Professor Michael Botelho of the Faculty of Dentistry is spearheading a University-wide effort to engage students in partnering with their teachers and peers on activities that go beyond course learning, both in the Faculty and across the University.

> " It never ceases to amaze me the potential we have with our students and their skillset, dynamism, energy, enthusiasm and insights. I hope we can tap into this rich resource and help our students contribute more through enhanced partnering in teaching and learning, research and service. "

PROFESSOR MICHAEL BOTELHO

The concept of Students as Partners is not a new approach, but COVID-19 accelerated the need for this to address gaps created by work-from-home and travel restrictions.

When final-year dentistry students were unable to go overseas for their capstone experience, Professor Michael Botelho of the Faculty of Dentistry seized the opportunity to create a range of projects that involved peer-to-peer partnership for teaching and learning. The aim was to get students involved with peer teaching and its delivery, allowing them to learn skills they will need in their future careers – including content creation, communication skills, problem-solving and teamwork.

In one small group project, dentistry students created a student manual and videos on clinical photography and on clinical digital scanning skills. The resources were uploaded to the HKU Libraries DataHub for use by future students. Senior students used these resources to conduct hands-on workshops for junior students about these skills. The senior students also surveyed the recipients for feedback for future improvement and were interviewed themselves, with the outcomes written up for publication.

These projects fed into Professor Botelho's role leading a project funded by a University Grants Committee teaching grant to develop a Community of Practice across the University on Students as Partners.

"From this experience, I was able to design a framework about how you might be able to go about implementing Students as Partners across other faculties, which is basically having students take an integral role in the educational process. They are not consumers of a product, they are co-contributors and collaborators," he said.

In his new role, he has organised meetings and workshops on the Community of Practice with academics and students from a range of faculties across HKU, who have shared good practices. Aims and objectives have been produced as well as resources, with a collective publication planned based on presentations that focussed on three key stages of a Students as Partners collaboration. These are: creation and design, implementation and performance, and evaluation and sustainability. Professor Botelho noted that this is a generalisable framework that can help anyone wishing to undertake Students as Partners confidently implement projects in their faculties.

Pushing the boundaries

Other faculties had already embraced the Students as Partners concept in recent years and they shared their experiences through the workshops. In Medicine, for instance, MBBS students led the Near-Peer Teaching Programme in which senior students tutored junior students via Zoom during pandemic restrictions to support biomedical and clinical learning. In 2021–2022, 45 sessions were hosted, benefitting more than 150 first- and second-year medical students. In Education, students have worked with faculty and in-service

A series of Students as Partners Community of Practice Seminars were held in the CETL Learning Lab where teachers share their experience working with students in the partnership projects.

teachers to develop innovative teaching packages suitable for online and face-to-face teaching in Hong Kong schools.

But Professor Botelho wants the boundaries pushed further. He thinks the Students as Partners approach can broaden beyond education and extend to research and service. This could include anything from working with an NGO to participating in student committees and coaching HKU sports groups, and he is proposing recognition for students, such as credits on their transcripts or faculty or University prizes. The main requirement would be that the project not be part of their regular learning experience, so for example, nursing student placements in a hospital would not count, but having nursing students engage in peer mentoring or teaching within that placement could.

"On research, obviously there are a number of projects that students already work on but they don't always get formal recognition for that. Likewise, for service. They are doing these things outside of classroom time on their own motivation. If there is a framework for recognition, it will engage more students to become more involved in their education within their course or even beyond the University," he said.

The level of contribution from staff and students can be flexible, but he expects initiatives will be led more by teachers at first, which is why he is focussed on raising awareness and creating resources for them.

"It never ceases to amaze me the potential we have with our students and their skillset, dynamism, energy, enthusiasm and insights. I hope we can tap into this rich resource and help our students contribute more through enhanced partnering in teaching and learning, research and service," he said.

Learn more about the Community of Practice of Students as Partners

Medical students discussing the pictures and different visual narratives with the elderly volunteers during the workshops.

CHANGING OLD ATTITUDES

Age-related bias is a persistent problem within the healthcare industry. A teaching project in HKUMed aims to counteract this by adapting photo-elicitation methods to enhance medical students' awareness of ageism.

The term 'ageism' was coined during the 1960s by physician Robert Butler to refer to systematic stereotyping of people based on chronological age, and little progress has been made to address age-bias in healthcare over the years. Recently, big increases in the size of the aged population worldwide prompted the United Nations to declare 2021–2030 the Decade of Healthy Ageing, calling for international action to "change how we think, feel and act towards age and ageing".

Sensing that that frequent exposure to frail and vulnerable older patients might lead some medical students to perceive the human ageing process negatively, which might in turn impede their future practice of medicine, Mr Ki Sum Samson Wong, Assistant Lecturer in the Medical Ethics and Humanities Unit, embarked on a teaching project that aims to sensitise students to age-related stereotypes in healthcare and improve their attitudes toward caring for older persons.

Images evoke emotions

Mr Wong's idea was to adapt 'photo-elicitation' – a method based on the idea that visual images evoke emotions, abstract ideas, and the shared human experience – to become a teaching tool. "Our eyes are not just viewers, they're also projectors, generating a second story over the visual trigger presented to us," said Mr Wong. "The process is usually subtle, and often unbeknown to us, since we rarely examine our own underlying, personal assumptions.

"Photo-elicitation, then, is a great tool to surface our own age-related beliefs, allowing us to turn towards and examine them. For instance, photographs of aged care settings may elicit learners' apprehension about caring for older adults, and images of senile and frail older adults may elicit anxiety about growing old, thereby enabling dialogue about stereotypes and prejudices, and thereby in turn facilitating sensitivity, perception, empathy and insight, and altering the perspective."

Mr Wong's teaching practice is very much inspired by an earlier project entitled 'Depth of Field: Exploring Ageing' pioneered at the University of Western Australia, which made use of photographs of older adults and questioning prompts to enhance empathy and reflective capacity in health professions students. Inspired by their success, Mr Wong and his colleagues Dr Pauline Luk, Dr Abigail Wright, and Ms Karina Chan co-developed a new 'Experiencing Ageing through the Lens' workshop in HKUMed's Medical Humanities Curriculum.

A crucial part of the workshop is the inclusion – along with the students – of a group of healthy older adults recruited from the Hong Kong community. Each student group is joined by at least two elderly discussants who are living examples of healthy ageing.

"This year, for example, we had a pool of eight elderly discussants with experiences in being different health stakeholders," said Mr Wong, "including a retired social worker, a retired nurse, several older persons who supported persons living with dementia, and even two silver age entrepreneurs who founded a social business, in their 60s. Researchers have suggested that socialising medical students with healthy older adults through visual art can foster positive attitudes toward the other age group and enhance a sense of commonality."

The workshop begins with a mini lecture on negative ageism in healthcare and how it might affect patient care – from therapeutic nihilism to unjust moral judgements such as labelling older patients as 'unworthy'. Next, visual images are shared in class – encompassing topics such as polypharmacy and vision impairment in old age – prompting a great variety of visual triggers. MBBS students and the elderly discussants then work together to examine and dispel their own negative age-related stereotypes and to explore alternative understanding of the photo triggers.

After class, students are invited to contribute new photographic reflections that best encapsulate their newly garnered insight into the human experience of ageing. These creative outputs are then adapted as photo triggers at future sessions. "One strength of this approach is that our growing pool of learning materials resonate well with medical students, since they are all produced from a student perspective," said Mr Wong.

Student participants say they have found the workshop interactive and engaging, and research evidence has found this instructional method to have improved student attitudes both toward caring for older patients and toward personal ageing.

"The essence of this teaching practice is that we seek to shape a supportive, encouraging learning environment that students feel is personally relevant. Individuals are tempted to compare and contrast what they thought they knew from the images, against how their peers and the elderly discussants made sense of the same visual stimuli," said Mr Wong. "I believe that by drawing these interesting cognitive discrepancies to the learner's attention, we encourage transformative reflective learning to occur."

> " Individuals are tempted to compare and contrast what they thought they knew from the images, against how their peers and the elderly discussants made sense of the same visual stimuli. I believe that by drawing these interesting cognitive discrepancies to the learner's attention, we encourage transformative reflective learning to occur. "

MR KI SUM SAMSON WONG
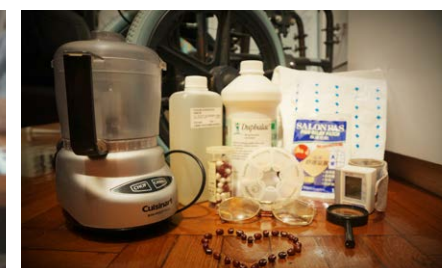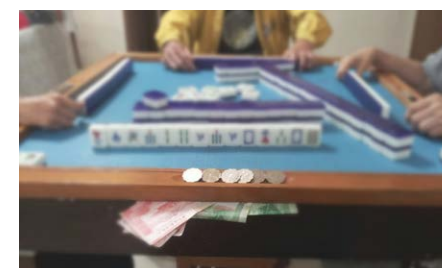
Prior to class, photographic reflections were collected from fourth-year MBBS students on their perceptions and interpretations of the meaning of ageing. The project team screened the images and shortlisted some for teaching purposes.

A Garden GROWS AT HKU

A rooftop farm and herb garden on campus have given students a chance to connect with nature and, in the wake of the COVID-19 pandemic, with each other. The benefits are now spreading to the neighbouring community.

Jane Zhang Qinya, a fourth-year BA(Linguistics) student, spent much of her first three years at HKU doing online learning due to pandemic restrictions. It could get lonely, so she sought company through online events to connect with others. One of her most fruitful experiences has been with the HKU Rooftop Farm and Herb Garden operated by the Centre of Development and Resources for Students (CEDARS), which has enabled her to connect not only with other people but also nature. This year she has been able to participate in real life, helping water and care for the plants on a regular basis.

"I learned that looking after plants helps me feel a connection to the land. And watching seeds become a plant reminds me of the need to take time, make an effort and have patience. This has helped me calm down and see that maybe everything has its own speed," she said.

The gardening initiative was started in 2013 and, outside of pandemic restrictions, hosts nearly 1,000 students each academic year at two sites, a small farm on Meng Wah rooftop and a herb garden next to the Main Library. Workshops at Meng Wah are led by an expert from Kadoorie Farm and Botanic Garden who trains and educates students on gardening, while one-off meet-ups are hosted monthly at the Herb Garden where students are given small kits to grow their own herbs. Harvests have also been shared in the past with Bijas restaurant and student cooking sessions on campus.

The social values of farming

Recently, the programme branched into the community, working with the Caritas Mok Cheung Sui Kun Community Centre in Kennedy Town to organise farming workshops for families and the elderly, with HKU student ambassadors assisting.

"Our philosophy is to plant new seeds – if you don't start and experiment, you will never grow anything," said Dr Elvin Wong Chi-chung, Head of General Education (GE) under CEDARS, providing a metaphor for the gardening programme.

In fact, the programme has had an experimental bent from the start. It was inspired by Mr Mathew Pryor in the Division of Landscape Architecture, who was doing research on how to make productive use of under-utilised space in Hong Kong. "We found the amount of produce from rooftops was quite limited compared to farmland, but this activity has had other social values, including education and social engagement, which are also important," said Celeste Shai, Senior Programme Officer in the GE team.

Students joining workshops are taught how to prepare fertiliser, understand the growing seasons of different crops, transplant crops, water and weed them properly, and manage plants through pruning and pest control. They are also educated in how to live more sustainable lives, such as through upcycling, material recovery and composting. Students who complete the workshops are allowed to join the team that tends to the plants on the Rooftop Farm and in the Herb Garden.

A break from plastic

Research students have been as keen as undergraduates to take part. Aaron

Xing Nu, who is in his third year of a PhD in economics, is on the duty roster. "This programme gives us a physical and mental break from studies, and from looking at digital screens and touching things made of plastic by firms we know little about. If we can get closer to the soil and plants, it feels relaxing," he said.

Siyu Chen, a second-year MPhil student in epidemiology, also welcomes the break from studies. She enjoys cooking and has used the produce she has helped grow in her recipes. "This experience makes me think of how to live a healthy life and protect the environment by eating the food that is closest to us."

For Wendy Wan Yung-yee, a second-year BSocSc majoring in geography and psychology, the closeness is not just to the land but to her heritage. She grew up in the New Territories and started learning about farming from her family.

"It's intuitive to me to seek out green spaces - it's a way for me to relax and connect with nature," she said.

The Caritas programme has been made possible through the UGC's special COVID-19 fund to strengthen student services in the wake of the pandemic. It was also used to fund workshops for the elderly in 2021 that were facilitated by students, and to teach families in need this spring about basic organic farming and food processing skills. "I hope in future we can show them how to grow herbs for use in cookery or even how to dry them and sell them at weekend markets to help them earn income," Ms Shai said.

> Our philosophy is to plant new seeds – if you don't start and experiment, you will never grow anything.

DR ELVIN WONG CHI-CHUNG

Learn more about
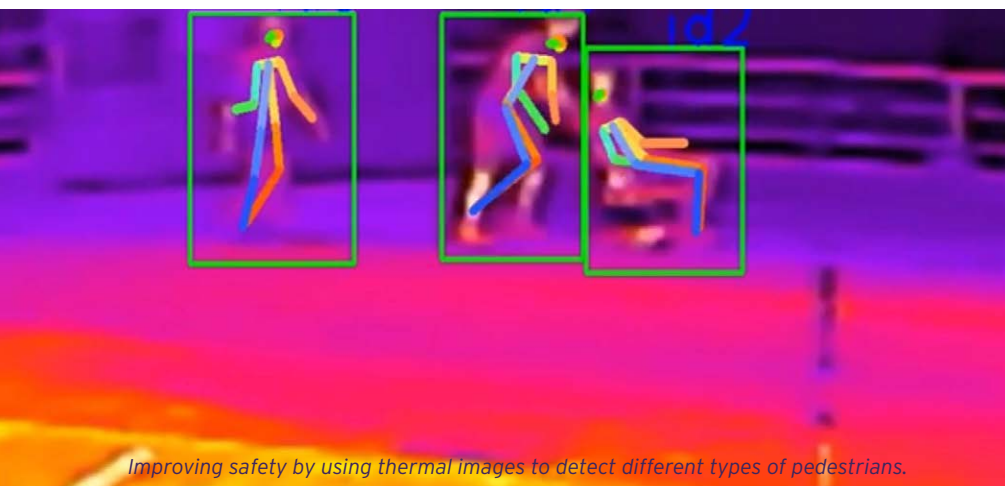HKU Holistic Urban Farming

The gardens are not only a space for learning about nature, but offer a chance for building greater social engagement and understanding.

Giving away free herbs on Earth Day 2023.

SPOTTING ABNORMALITIES, SAVING LIVES

Improving safety by using thermal images to detect different types of pedestrians.

The Sports AI Lab has developed an AI system to quickly detect unexpected – and potentially dangerous – changes in behaviour.

The opening page of the Sports Artificial Intelligence Lab (SAIL) website announces 'Artificial Intelligence – The Future of Everything'. 'Everything' is a big term but may be viewed as being synonymous with the breadth of the Lab's scope, given that an AI system that SAIL originally developed to monitor swimmers for potential signs of drowning has now been adapted to monitor for signs of child abuse in early learning centres.

"We were first approached by the Hong Kong Society for the Protection of Children in April last year to explore using our AI technology for child safety monitoring in their children's home," said Dr Wilton Fok, Director of HKU Sports AI Lab. "The project was quite successful and it became a reference for the Social Welfare Department and other children's homes and centres."

SAIL was originally set up to focus on developing AI solutions for sports safety and performance analysis. The Lab's first major project was Smart Swim, a drowning detection system which uses AI abnormal detection technology and deep learning via computer vision to detect potential drowning cases in swimming pools, and triggers an alert. This project was awarded the Hong Kong Information and Communications Technology Award (HKICT Award) in 2021.

Motion movement

Their second was RoboCoach, a real-time feedback system for golf and yoga which uses a Human Pose Estimation algorithm to identify motion movement and enables users to learn and correct their own posture and movement when practising a golf swing or doing a yoga pose. It can also be utilised as an evaluation tool for teachers and coaches. The 'RoboCoach AI Exercise Mobile Apps' won the Silver Award at the 2022 HKICT Awards under the category of 'Smart People (Smart Education and Learning)'.

The child abuse monitoring system is based on technology that SAIL developed for Smart Swim using AI that analyses abnormal situations in human posture in swimmers. "For Smart Swim, the position, orientation and posture of the swimmer are analysed and an alarm is triggered if any dangerous situation is detected," said Dr Fok. "Similar technology can be used to monitor children in a children's home. If a child is in a risky location, or there is abnormal movement or action, the caretaker or their supervisors can be alerted.

"Key points of the human skeleton, such as head, shoulder, elbow, wrist, knee and ankle, are monitored. The geometry of the body can be calculated to classify the posture and actions. The posture and motion of multiple persons can be detected to predict if there is any potential risk – for example, being frightened, or violence occurring. The position of the baby or child can also be located and analysed within the surrounding environment to detect if there are other risks, such as being dropped on the floor, exist."

The technology is licensed to a TSSSU spin-off tech start-up called Hong Kong Univisual Technology Intelligent Ltd through HKU Versitech Ltd and the pilot system has been deployed in several social welfare organisations, such as the Hong Kong Society for the Protection of Children and Hong Chi Children Home. "It has proven to be an effective tool that can help caretakers spot any risky or unusual behaviour," said Dr Fok.

New scenarios

SAIL is continuing to work on refining and improving the system. "AI requires large amounts of data to train the model," said Dr Fok. "We are looking into some new scenarios where the existing data is not enough, and nor is the initial model accurate enough. But we are developing an online self-training model so that the system can learn from its mistakes automatically and self-improve – just like a clever boy who can learn and prove himself and turn into a smart man."

The project team would also welcome the chance to transfer this technology to Mainland China and overseas. Opportunities in the Shenzhen branch of the Hong Kong Science and Technology Park are currently being explored.

In April, the system – entitled 'Artificial Intelligence MGF Network for Anomalies Detection' – received major recognition when it won two grand prizes and a gold medal at the 48th International Exhibition of Inventions of Geneva, a prestigious event dedicated to introducing new inventions from industry and universities around the world and demonstrating them to manufacturers and financiers.

> " Key points of the human skeleton, such as head, shoulder, elbow, wrist, knee and ankle, are monitored. The geometry of the body can be calculated to classify the posture and actions. The posture and motion of multiple persons can be detected to predict if there is any potential risk – for example, being frightened, or violence occurring. "
>
> **DR WILTON FOK**

Dr Fok (left) demonstrating the AI abnormal detection technology to the Deputy Financial Secretary Mr Michael Wong in the InnoCarnival 2022.

'Artificial Intelligence MGF Network for Anomalies Detection', developed by Dr Wilton Fok's team, won the Invention & Innovation CAI Award (China Delegation), Prize of the Delegation of Malaysia, and a gold medal at the 48th International Exhibition of Inventions of Geneva.

VOYAGE of *Discovery*

The Swire Coastal Outreach Hub, based at HKU's marine research facility, is an ambitious new outreach programme, funded by the Swire Trust, and established to invite school students to voyage into the world of marine science and learn about biodiversity.

Located on a rocky peninsula on the southside of Hong Kong, on the shores of Hong Kong's only Marine Reserve, the Swire Institute of Marine Science (SWIMS) is one of the premiere coastal research centres in Asia. Recent expansion work has included state-of-the-art labs for molecular work, specimen tanks and aquariums for research, touch tanks for visitors, and a seminar room with a stunning view over the surrounding sea, as well as facilities for the Swire Coastal Outreach Hub (SCOH), including a multipurpose classroom/visitor centre/museum for experiential workshops.

"While we already have a strong connection with the community," said SWIMS Director, Professor Gray A Williams, "under SCOH we want to bring a more rounded and science-based approach to providing workshops and activities for school and university students, which will include biodiversity surveys, marine debris clean-ups and assessments, rocky shore and inter-tidal monitoring, and coral reef restoration modules.

"Marine conservation is so important now, but we can't simply expect people to protect the sea if they have no knowledge or interest in it. We want to help local people make a connection with the ocean and inspire them to want to help because they care about what is there."

Science communication

A team of three is spearheading the new programme, led by Outreach Manager Dr Phil Thompson. "Before, we have hosted shore tours for schools and research projects but no official

Dr Phil Thompson (centre) showing visitors new research apparatus that can simulate different marine habitats.

High school students visiting the Swire Institute of Marine Science (SWIMS) and learning to identify local marine species with the guidance of SWIMS researchers.

> " Marine conservation is so important now, but we can't simply expect people to protect the sea if they have no knowledge or interest in it. We want to help local people make a connection with the ocean and inspire them to want to help because they care about what is there. "

PROFESSOR GRAY A WILLIAMS

programme," he said. "Now we are expanding the breadth of our science communication with modules that will give visiting students and guests the immersive experience of being a marine scientist for the day.

"The content will be linked closely with school lessons so that teachers can use our courses to fulfil curriculum needs, through experiential modules and planned activities outside of the classroom that are relevant to what they're learning at school."

"SWIMS is also collaborating with other like-minded organisations, such as the Hong Kong Maritime Museum's Swire Marine Discovery Centre," said Outreach Officer Mr Calvin Foo. "We want to conduct joint outreach programmes, and to connect with groups that do beach clean-ups and coastal arts projects, for example, so that we can bridge the gap with them by bringing the science, as well as showcasing the Marine Reserve, and our coastal and marine biodiversity research."

Communications Officer Ms Katie Liu is responsible for spreading the word about the new SCOH activities on social media such as Facebook, Twitter, Instagram and the SWIMS website. "SWIMS had a media presence before but we were probably only talking to the scientific community," she said. "Now with SCOH,

we're focussing on a new generation and presenting a more coherent and comprehensive picture.

"We're encouraging city kids to join our science community, become citizen scientists and come to SWIMS for hands-on experiences. The point is we are sharing our science to save our seas – and they can be part of that. Perhaps in some it will also spark an interest in becoming a marine scientist."

Collecting species

"Our SCOH modules will also use similar methodology to our research work," said Dr Thompson. "To collect samples from sites around Hong Kong, students will use the same Autonomous Reef Monitoring Structures (ARMS) that our MarineGEO research project employs. In one ARMS unit, an area the size of a basketball, they can collect 100-plus species, which we help them separate and classify what they have found."

"This all feeds into our 'experience the science' approach to SCOH," said Mr Foo. "A recent group saw a moray eel – what a great first step on their journey to connecting with our oceans!"

SCOH will be up and running early in the coming academic year, in October, ready to welcome a full schedule of students from local and international schools. Eventually, SCOH will also welcome hikers to the SWIMS' visitor centre too. "There are so many hikers visiting Cape d'Aguilar now, and many of them don't know about the Marine Reserve or what SWIMS is," said Professor Williams. "The research we do here is relevant to the protection of diversity across the globe, but it's not enough for us just to do the science, we need to help inform the wider public. If we can stimulate just 10 per cent of visitors to be interested in what we do, that could make a big difference to knowledge and awareness of marine protection in Hong Kong and beyond."

The Swire Coastal Outreach Hub (SCOH) welcomed members of the HKSAR Government's Agriculture, Fisheries and Conservation Department staff club for a tour of its facilities.

Trainers at the training programme with the representative of the Nigerian Health Minister.

ORAL SURGEONS BRING AI TOOL TO NIGERIA

A tool to detect oral cancer at an early stage, developed in the Division of Oral and Maxillofacial Surgery in the Faculty of Dentistry using artificial intelligence (AI), is being brought to Nigeria, together with a programme to raise awareness of the disease among both dentists and patients.

In 2022, researchers in the Faculty of Dentistry led an international team to develop an AI web tool that could predict patients' risk of developing oral cancer. The tool, based on the AI algorithm DeepSurv, had a 95 per cent accuracy rate on a cohort of more than 700 Hong Kong patients, and an 82 per cent rate on a British cohort of 382 patients using slightly different data.

But achieving those good results was not the only aim for its developers. "We saw potential for the web tool to be impactful in regions with finite resources," said Professor Richard Su, Division Coordinator and Clinical Professor in Oral and Maxillofacial Surgery who led the project.

Drawing on the Nigerian roots of Professor Su's PhD student, Dr John Adeoye, a team comprising Professor Su, Dr Adeoye, and Dr Jane Pu decided to introduce their tool to the country this year through a three-part knowledge exchange project.

The first goal is to educate dentists on the role of AI in predicting oral cancer risk, second is to develop a model using Nigerian data, and third is to educate the population, especially in rural communities, on using the Nigerian version of the tool.

The attraction of the tool is that it can be used by non-specialist dentists (there are few specialists in rural Nigeria) as well as patients. Oral cancer is preventable if detected early but requires continual follow-up by experts.

Helping dentists and patients

"Patients tire of having check-ups and biopsies and that can lead to poor help-seeking behaviour. They may not return again until the cancer is at a late stage. The tool aims to avoid this," said Dr Adeoye.

The tool is based on clinical and pathological inputs of a patient's condition, particularly the white lesions in the mouth that are often present for years before turning into cancer, as well as multiple other factors such as demography and past treatments. The Hong Kong version of the AI tool can predict if someone will develop oral cancer up to 10 years or more in the future. The Nigerian version will also likely include such factors as kola nut usage and consumption of herbal concoctions, which are linked to increased cancer risk.

While the tool has not yet undergone a randomised clinical trial and is mainly intended at this stage to support clinical decisions, both dentists and patients can use it with some training. For dentists, it can narrow down which patients require follow-up.

"For patients, if they are at high risk, it can motivate them to do follow-up and also self-examination with a mirror, although this is not recommended unless people are living in areas with few dental resources," Dr Adeoye said.

> " We saw potential for the web tool to be impactful in regions with finite resources. "
>
> **PROFESSOR RICHARD SU**

Partners on the ground

HKU has partnered with two organisations in Nigeria on the project – the College of Medicine at the University of Lagos and the Cleft and Facial Deformity Foundation, which between them have extensive experience in training dentists and running outreach projects. They have now received training on the AI model and data collection and have started training dentists. The target is to educate about a quarter of dentists in the cities of Lagos and Abuja by the end of the year, who can then bring the AI tool deeper into the community.

"The idea is that once these organisations have this knowledge, they can still continue to reach more dentists when they have the chance. We are not just empowering them as a one-off," Professor Su said.

Later this year, once the model is validated with Nigerian data, it will be brought into rural communities in six regions to raise awareness among dentists and residents there of oral cancer risk and the need for screening. Since the country has high internet penetration, Dr Adeoye said it should be easy to attract users.

The project is not only a team effort between HKU scholars and their partners in Nigeria. It also represents a successful culmination for Dr Adeoye, who decided to pursue his PhD at HKU in 2019 because of the Faculty's interest in promoting clinical AI. "There were good opportunities here compared to other parts of the world so the decision was a no-brainer," he said.

The HKU team implementing the knowledge exchange project in Nigeria. From left: Dr John Adeoye, Professor Richard Su and Dr Jane Pu.

CONNECTING THROUGH
CAMPUSLAND

HKU Campusland is a metaverse campus, which combines mixed reality and AI to accelerate the learning of school and university students on an intelligent virtual platform and allows them to connect virtually with industry experts.

"The Data Science Lab (DSL) developed HKU Campusland and used mixed reality to bring the virtual world to the real world and vice versa," said Dr Adela Lau, Deputy Director of DSL in the Department of Statistics and Actuarial Science (SAAS). "Users create an avatar for themselves and enter an immersive world. It deploys web6.0 technologies to integrate human and artificial intelligence into one for the purpose of collaboration."

For the project, DSL developed workshops to teach secondary school and university students how to create the virtual avatars, 3D models and AI chatbot for scenes, develop the content and 3D visualisation in Roblox for interactive, collaborative, personalised and immersive learning, and make virtual robots to interact and communicate with learners for collaborative intelligence and knowledge enquiry.

In the first phase last year, DSL developed the major AI tools and 3D visualisation for HKU Campusland, and the second phase this year includes programme enquiry, the design of integrated STEAM learning content to streamline students' learning from primary through secondary and to university level, and connects local and overseas industries with students for virtual internship and mentorship in the 'We together in metaverse' project.

Applying AI to STEAM

"We collaborated and exchanged knowledge with school teachers on how to apply AI to integrated STEAM education, and to cultivate and nurture school students to be junior applied research scientists," said Dr Lau.

"Our goal is to cultivate junior scientists by integrating arts and science knowledge with data science, AI, immersive technologies, and process re-engineering for innovation creation and applied research. The platform enables secondary school students to have a taste of studying at university – for example, we recently offered a taster workshop on mixed reality in the metaverse to Junior Science Institute participants."

University students can use HKU Campusland to learn how to apply AI, neuroscience, web and computer programming, arts design, mathematics and statistics calculations, electronic

and product design re-engineering to develop innovative tools, application and learning content in the metaverse. Once they have entered HKU Campusland, students from diverse disciplines can gather to collaborate, exchange ideas and inspire each other.

"The aim is to provide them with a virtual space for different kinds of learning and expose them to other opportunities like internship, mentoring, company and student workshops and on-demand education. The platform helps students equip themselves and establish connections with industry experts for better career planning," said Dr Lau.

The idea of HKU Campusland was incubated in close collaboration with Dr Herbert Lee and Dr Patrick Ma, the Chairman and the CEO respectively of technology company Marvel Digital Ai Ltd (MDAi). "They kindly donated HKU Campusland to us and provided funding support to HKU DSL for the development of the AI tools in metaverse," said Dr Lau. "Around 20 internship opportunities for our students from various disciplines including AI, Data Science, Statistics, Decision Analytics, Design+ and Electronic and Computer Engineering have been made possible based on the funding."

In addition, this year Dr Lau asked the company to donate a virtual internship building and the metaverse buildings for primary and secondary schools in HKU Campusland, so as to enable the

> "
> The aim is to provide them with a virtual space for different kinds of learning and expose them to other opportunities like internship, mentoring, company and student workshops and on-demand education. "
>
> **DR ADELA LAU**

creation of integrated STEAM education to streamline the applied education across school and university levels. The aim is to nurture young scientists from an early age to achieve the Hong Kong government's strategic plan in Human Capital and the Youth Development Blueprint for Hong Kong in the Greater Bay Area.

"Using MDAi's school donation, we worked with Bloom KKCA Academy to develop a 'mixed reality music and dance' interactive learning module with AI. It is an innovative integrated STEAM showcase that stakeholders can join in the 'We together in metaverse' project," said Dr Lau.

"The metaverse helps students establish connections with industry experts for better career planning and learn how to apply theories to real practices," said Dr Eddy Lam, Associate Head of SAAS, and Associate Dean of the Faculty of

Science. "HKU Campusland provides innovative ideas to the company through discussion and has developed workshops to train their staff to participate in the virtual workshop programme and give students early opportunities to fill the gap between academia and industry."

"The ultimate goal of HKU Campusland is to connect people around the world, to broaden our students' horizons and to learn from people with different backgrounds, to create a wisdom knowledge base using AI in metaverse, and to accelerate the development of AI talents and digital economy in Hong Kong," said Professor Guosheng Yin, Patrick S C Poon Professor in Statistics and Actuarial Science.

Learn more about the Data Science Lab

Secondary school students at the 'Mixed Reality in Metaverse' workshop organised by the Data Science Lab of the Department of Statistics and Actuarial Science and the Faculty of Science.

The Data Science Lab and Bloom KKCA Academy developed a 'mixed reality music and dance' interactive learning module with AI.

LIVING WITH LOSS

Perinatal bereavement is still a taboo subject in many cultures, making it even more difficult for parents who have suffered pregnancy loss to cope. Now an online care service has been set up to provide psychological and social support.

> " Bereaved parents are left feeling disappointed and saddened by expressions that advise them to forget about their miscarried child, disregard their identity as a parent, and diminish their grief. "
>
> **DR CELIA HOI YAN CHAN**

Miscarriage is not uncommon – 10 to 20 in every 100 pregnancies end before term – yet it's still rarely discussed. HKU's Department of Social Work and Social Administration and the Hong Kong Jockey Club have worked together to launch the Perinatal Bereavement Care project to help bereaved parents who find themselves isolated in their sadness.

"The term we use is 'disenfranchised grief', which means the grief is not socially recognised," said Dr Celia Hoi Yan Chan, Associate Professor of the Department of Social Work and Social Administration (DSWSA), who led development of the service. "If the foetus dies within the first trimester, often it is not even mentioned, as though it never existed. But to expectant parents it is a significant loss."

Work began on developing the bereavement care service last year, with an online survey to examine attitudes towards and knowledge of pregnancy loss in Hong Kong. "The results revealed misconceptions about the causes of miscarriage – including strenuous exercise, eating certain foods and sex during pregnancy – as well as misplaced expressions of condolence that are meant well but may add to the parents' distress," said Dr Chan.

"We found that even some health professionals are not good at talking to parents and may offer trite and ill-informed responses such as: 'You'll get over it. Time heals all wounds', and 'You are still young; you still have a chance to get pregnant again in the future'. Bereaved parents are left feeling disappointed and saddened by expressions that advise them to forget about their miscarried child, disregard their identity as a parent, and diminish their grief."

After the survey, Dr Chan initiated a public campaign, named '*Break the Silence – Pregnancy Loss Week*', to raise public awareness and create a supportive space for parents who are grieving. "A series of echoing events related to life and death education, professional training, therapeutic programmes were delivered during the campaign," she said, "and community partners were invited to 'Light a Candle' to remember all the precious little lives that have been lost."

The survey also revealed that bereaved couples are disinclined to ask for help in a face-to-face situation but felt they would be more comfortable – at least initially – with an online approach. "We wanted the bereavement service to connect hospital to community," said Dr Chan. "To this end we collaborated with the Hong Kong Young Women's Christian Association Family Wellness Centre and Caritas-Hong Kong Grace Port-Caritas Miscarriage Support Centre to develop integrated care for the bereaved couples from hospitals to the community with online and in-person support."

The goal is to give holistic psychosocial support to the parents, their families and friends, as well as to equip health and care professionals with the empathy skills needed for the situation.

"The DSWSA's main responsibility in this was the establishment of the service delivery framework," said Dr Chan. "Based on the step-care model, we identified three tiers of intervention upon the assessments performed in the triage process: universal emotional support, acute support and clinical/therapeutic level support."

Slowing the pace

For the design of the online platform, Dr Chan and the NGOs worked closely with local artists because they specifically wanted the design to set a different approach. "We wished to slow down the visitors' pace, and to feel and understand the experience of pregnancy loss," said Dr Chan. "Through discussing pregnancy loss from different perspectives, we hope to accompany the bereaved parents to walk through the grief and pain."

Various sections of the website include information about pregnancy loss, help produce a family reminiscence album, connections with community support services, and testimonials from other bereaved parents.

For family and those close to the parents, the website gives practical advice and summarises some dos and don'ts to help them grasp the psychological and social challenges a bereaved parent can face, as well as recommendations of how to support them emotionally and practically. An online memorial space, entitled 'Lantern of Remembrance and Support', enables people to send their blessings and condolences.

Dr Chan said: "Our overall vision is to develop seamless, integrated care and support for bereaved couples going through grief over pregnancy loss. There is an unknown quote that I really like: 'There is no foot too small that it cannot leave an imprint on this world – the little footprint of the baby shall be forever remembered by parents.'"

CUTTING-EDGE CHORAL

Making its debut at the Gulbenkian in Lisbon last year, a new musical work – *The Longest Days and the Shortest Days* – creates a dialogue between art, digital technology and drama to create a powerful experience that resonates with contemporary audiences.

Termed a 'tech cantata', the piece features a live choir which vies for the audience's attention with a virtual choir singing on a massive hologram screen behind them – the two groups both competing with each other's performances and enhancing them. Said Professor of Music Giorgio Biancorosso, who staged the event: "The work raises new questions about the relationship between art and technology."

Gulbenkian Música, a prestigious institution that is central to Portugal's cultural life, commissioned acclaimed Hong Kong-based composer Dr Eugene Birman, from Hong Kong Baptist University, to write a work, and he chose the pandemic as the subject. Professor Biancorosso takes up the story: "Dr Birman approached me with his ideas, and in the fall of 2021 the Calouste Gulbenkian Foundation introduced us to prominent Portuguese writer Djaimilia Pereira de Almeida – virtually, via zoom

of course! In response to our prompting, she wrote a beautiful, long poem dealing with the experience and legacy of the pandemic, especially the lockdowns, which had devastating effects on the performing arts scene in Lisbon."

Summarising the original idea, he adds: "After so many months of watching live performances online, Dr Birman wanted to examine what it might mean to play a recording inside a theatre to a live audience. Hence the idea of a virtual

choir singing to a live audience. It's a brilliant premise, and immediately got me thinking about how to go about delivering it onstage."

While references to the pandemic are an important part of the text, the three creatives agreed that they would not be too explicit to allow the work to remain fresh well after the memory of the pandemic subsides. The result is a provocative reflection on the passing of time during the lockdowns, peppered

Virtual choir (left) rendered on a 3D mesh hologram screen.

with references – some explicit, others ambiguous or even enigmatic – to the life of performing artists in Lisbon during the lockdowns.

Tech cantata

"We came up with the term 'tech cantata' because it helps clarify that this is a large-scale vocal work and stresses the central role of technology in its creation and delivery," said Professor Biancorosso. "You could say it's a take on the old genre of the cantata, where soloists and a choir vie for your attention in ever changing permutations. But the really important quality of *The Longest Days and the Shortest Days* is that it sets up and feeds off the relationship between a live and a virtual choir – its avatar, in a sense – in ways that have never been explored so thoroughly and with such depth."

Describing how the piece works, musically and visually, he added: "The virtual choir is both a substitute and a double: the singers are the same, and the relationship between the choirs is written into the score itself. The virtual choir is not a hologram in the strict sense but a high-resolution projection, based on a series of audiovisual recordings made in Lisbon in June 2022. The quality of the audio recordings is so high, and the playback system of the Gulbenkian

Auditorium so fine, that it was impossible to tell the virtual and the live choir apart without the visuals."

The mix of virtual and real also allowed Professor Biancorosso to have some fun with the staging. "The first movement was quite a gamble: asking a large audience to face what was in essence just a projection for 12 long minutes. But it paid off. Unlike the choir, the conductor walked onstage first, and bowed, complete with sound effects. But he too was virtual. When at the end of the movement he burst into a cloud of dust along with everyone else, the audience was very surprised and responded with huge, amused applause."

Professor Biancorosso says he jumped at the opportunity to stage the work because of the brilliance of Birman's

premise and the resulting piece, and the resources and professionalism of the Gulbenkian Foundation. "I felt honoured to be working for them. Given the challenges the work presented, the support was nothing short of extraordinary, and the audience's rapturous appreciation at the debut performance was thrilling. This whole experience strengthened my conviction that we need to rethink the question of art and technology.

"Technology has always been central to the presentation of musical and indeed theatrical performance. The challenge today is to channel new technologies in ways that resonate with contemporary audiences. To do that we need to move beyond the showcasing of expensive toys and put the human experience front and centre."

> "The really important quality of *The Longest Days and the Shortest Days* is that it sets up and feeds off the relationship between a live and a virtual choir – its avatar, in a sense – in ways that have never been explored so thoroughly and with such depth."
>
> **PROFESSOR GIORGIO BIANCOROSSO**

Live soloists (right) rehearsing with the virtual choir.

Professor Giorgio Biancorosso (centre) and Dr Eugene Birman (left) at the colloquium 'The Longest Days and the Shortest Days: A Dialogue on Art & Tech'.

LANDING IN THE SWEET SPOT

The new Dean of Science, Professor Zhou Qiang, aims to deepen his Faculty's impact and seize the many opportunities now available. People are at the heart of his vision.

When Professor Zhou Qiang took up deanship of the Faculty of Science last autumn, he arrived in a place with several stellar achievements. Six professorial staff were among the top one per cent of highly cited researchers in their fields in 2022 (according to Clarivate Analytics), and others are members of prestigious science academies abroad and in China. Faculty members have also led two major InnoHK programmes, six Areas of Excellence projects, a State Key Laboratory and three joint laboratories with the Chinese Academy of Sciences.

Where can he take things next?

For Professor Zhou, there is a clear-cut answer: to a place of wider and deeper impact and global reach, built on the opportunities now abounding as the Hong Kong government and HKU invest historic amounts of resources in science and innovation.

"Due to the many geopolitical conflicts and economic downturns in the world, Hong Kong is now situated at a sweet spot to attract top talent. This is really a good time to bring great scientists to HKU so we can thrive and make a big splash in Asia and the world," he said.

> " I see an opportunity to do something impactful that will not only improve the University's standing, but also the standing of Hong Kong science. "
>
> **PROFESSOR ZHOU QIANG**

Professor Zhou has made a splash himself through his groundbreaking research on viral-host interactions at the molecular level. He spent 27 years at the University of California, Berkeley, where he identified and characterised a number of human protein complexes that control both HIV and human host gene expression. Although originally thought to work only for the virus, these complexes turn out to have much broader implications for general gene expression and thus play a key role in human health and diseases such as cancer.

But he was lured away by the prospect of making an even bigger impact leading the Faculty at this promising time, and giving back to academia after years of receiving support from colleagues.

Room to improve

Since arriving last autumn, he has prioritised recruitment and expects to soon announce the appointment of several world-class scholars. This will be key to the Faculty's future success, but he also wants to sharpen the Faculty's strategy and direction.

"There are areas in the Faculty that perform very strongly such as Chemistry and Physics," he said, but there are others he hopes to improve, such as strengthening research collaborations between the Faculty's molecular and cellular biologists and biomedical scientists in the Li Ka Shing Faculty of Medicine and building up the Statistics Department to replace several recent retirements and departures. "Even for strong departments, I still feel we have room to improve," he said.

He is keen to look after junior staff, too, such as simplifying the process for promotion and improving support for postdoctoral fellows and research assistant professors. "I want to improve the efficiency of the system so our scientists have higher morale and can concentrate more on doing research," he said.

Education also gets high priority. He hopes HKU Science remains the top choice for students who want to study science in Hong Kong and hopes to increase the Faculty's slate of international dual degree programmes with other top universities in the world.

More importantly, he wants to raise the status of science in society. "The attitude in Hong Kong towards science education is traditionally not very enthusiastic. I want students to see science as attractive and fashionable, and for them to feel a strong incentive to study in our Faculty instead of everybody crowding into medicine or finance," he said. This will require investment in creating STEM-related job opportunities, but the Hong Kong government has already signalled support for scientific innovation and technology industries.

From left: Professor Yuan Xiaoming, Professor Mok Ngai-ming, Mrs Mok, Professor Gong Peng and Professor Zhou Qiang at the Future Science Prize Award Ceremony 2022.

Impact through translation

That support, plus the emphasis on societal impact in research performance and funding evaluations, is influencing the Faculty, too. Professor Zhou is pleased that Faculty members are now thinking beyond publications to the wider effects of their research, for example through the two InnoHK programmes at Hong Kong Science Park.

"Any translational value still rests solidly upon your original discovery because otherwise, you have nothing to translate or innovate," he said. "But while basic research remains important, there are now mechanisms to make people think about how to use their discovery to make people's lives better, such as curing diseases and solving social problems. This is really wonderful."

Professor Zhou himself intends to continue doing research with his collaborators in Mainland China, which will also provide a distraction from daily administrative work alongside hiking around Hong Kong and enjoying classical music and opera concerts.

"I really like Hong Kong and I see an opportunity to do something impactful that will not only improve the University's standing, but also the standing of Hong Kong science. It's a good fit," he said.

LEVELLING UP

The new Dean of Social Sciences brings a strong quantitative background and an air of cheery decisiveness, after joining HKU sight unseen.

It takes someone skilled in weighing multiple variables to take the decision made by Professor Ming Wen last summer. She agreed to become the new Dean of Social Sciences, having never been to HKU or even Hong Kong Island.

Professor Wen was headhunted for the position and initially hesitated, having enjoyed 19 years as a professor at the University of Utah where she produced a substantial body of research on the social determinants of health and well-being and enjoyed the lifestyle there.

"I never expected to get this opportunity, but after talking to people and starting the interview process, I became truly interested," she said. "I saw that I could meet lots of interesting people, design or revamp existing programmes, and hire new people. I could also have broader, positive societal impact, particularly in this region. Hong Kong is also a good fit for me because lots of cultures come together here. So when I got the offer, I made my decision pretty quickly."

Professor Wen is originally from China herself, and her research has increasingly focussed on bringing new insights into social and human developments in the country. For instance, a study of left-behind children found that separation from their parents was not uniformly bad because they had more economic stability due to remittances from their parents and higher life aspirations due to exposure to the outside world.

Similarly, a study on the effect of living arrangements on older people's mental and cognitive health found that while those over 80 and living alone were lonelier, they had cognitive benefits from having to do everything for themselves and were more motivated to seek social interactions outside the home.

"My research basically is figuring out what kind of non-genetic multi-level factors contribute to health and human development, defined by different outcomes such as health status, lifestyles, and longevity and mortality," she said.

Consolidating resources

In doing research, she uses both interdisciplinary and quantitative approaches (she has a PhD in sociology and Master's in statistics from the University of Chicago and a BS in Information Science from Peking University), all of which she is promoting as Dean.

One goal is to establish an Institute of Population Studies to build on the Faculty's existing strengths. This is now going through the internal approval process at the University.

"We already have very successful scholarship and people working on health and well-being, migration, gender equality, and social inequalities – all demographic topics. By creating a new institute, I think we can enhance interdisciplinary collaborations and do a better job in global outreach and more effective branding. When people see this name, HKU Faculty

of Social Sciences, I want them to think of our institute. It's a way of reframing or consolidating our resources," she said.

Professor Wen is also working to rejuvenate the Social Sciences Research Centre, which used to be very active. Much of its work consisted of surveys conducted by phone, but nowadays, people rarely answer unknown numbers. "I want us to think about how to reform or revamp some of these previous activities to provide effective and affordable services," she said.

She has also given a boost to researchers with a new seed grant for interdisciplinary collaboration and started a Professional Development Forum to provide informational support on topics such as tenure promotion and managing online publication references to properly reflect and present research accomplishments in UGC (University Grants Committee) activities.

Quantitative expertise

Recruiting is inevitably a high priority as the University seeks to hire top talents from around the world. Professor Wen started reaching out to prospective candidates even before she took up her post last October and several are close to confirmation. Quantitative research method expertise will be valued in both recruitment and training – a new taught master's degree in social data analytics is being launched – but Professor Wen sees this more as a levelling up.

"HKU Social Sciences are well known for their strength in qualitative research methods and output. We're now catching up by hiring top quantitative researchers. But qualitative research still remains strong," she said.

As she implements these plans, Professor Wen will continue her own scholarly work. She is involved in a major project in the US to examine the effects of place-based structural, social, built, and natural environments and individual factors in mid-life health and lifestyle outcomes. She is also keen to do Hong Kong research and has formed multidisciplinary teams and submitted two large-scale research grant applications on early childhood development and on Hong Kong children with autism and their families.

"I hope more people will realise this is a great place to work and join us, especially from outside Hong Kong. And I hope our Faculty of Social Sciences can become a leading social science research hub worldwide," she added.

> " I never expected to get this opportunity, but after talking to people and starting the interview process, I became truly interested. "
>
> **PROFESSOR MING WEN**

Professor Wen at the Faculty of Social Sciences' Student Prize Ceremony 2022–23.
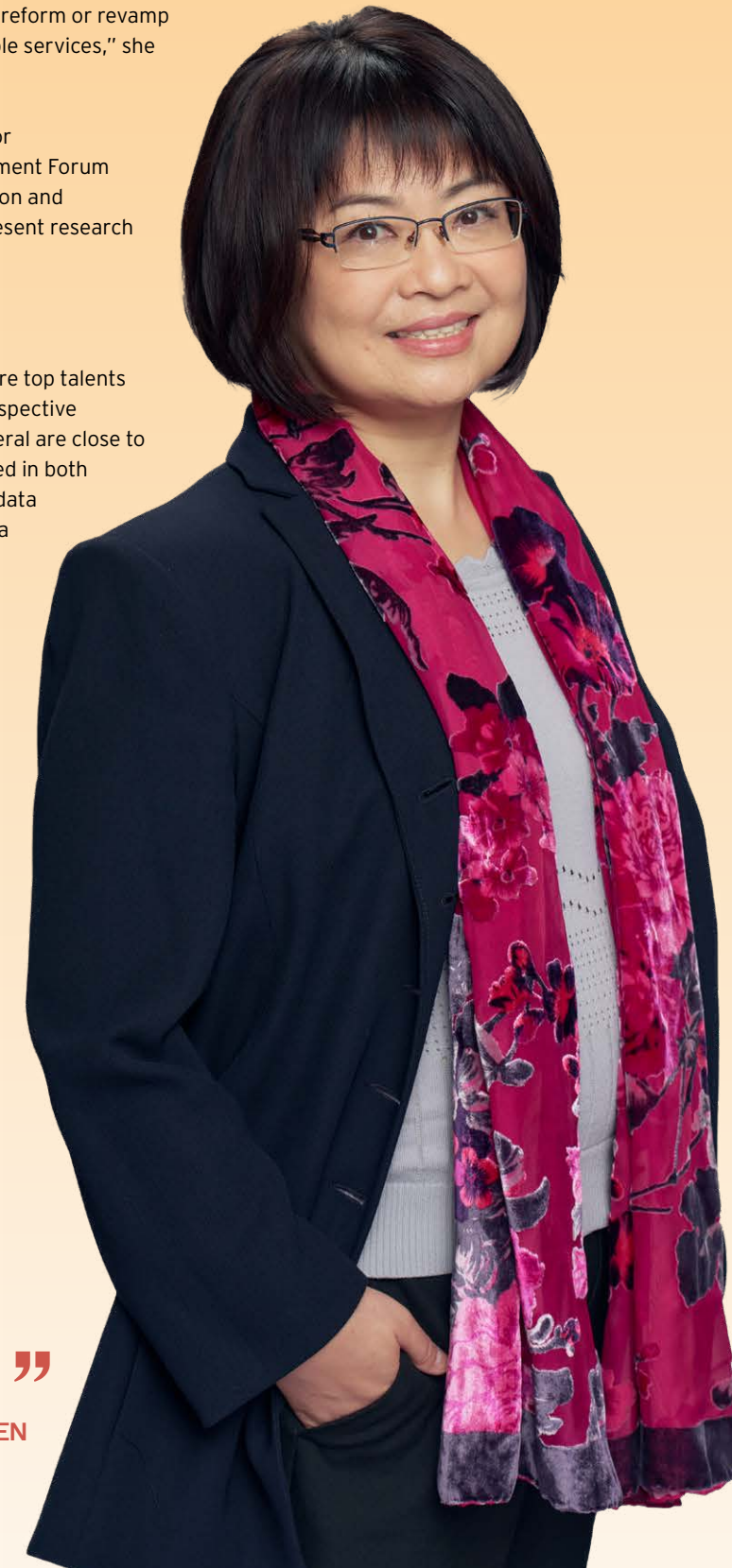
BREAKING DOWN BARRIERS

Professor Julian Tanner is the new Director of the Common Core. He aims to carry forward its successes in building bridges between disciplines and teaching and research, and encouraging teaching innovation.

HKU's Common Core was launched in 2012 to bring together undergraduate students from all faculties to engage in multidisciplinary emerging topics, ranging from climate change to nature-inspired innovations to Chinese cities to the human mind. Its 150-plus courses have also provided space for teachers to collaborate and innovate – among them, Professor Julian Tanner, the new Director of the Common Core.

Professor Tanner had been interested in multidisciplinary teaching and learning even before the Common Core launched. He developed one of the first Common Core courses, on synthetic biology, then piloted undergraduate transdisciplinary research as convenor of one of the four Areas of Inquiry under the Common Core, on Science, Technology and Big Data.

"Teaching in the Common Core means teaching in a different way so all students across the University can understand and engage and provide their own perspectives. There's a lot of active learning and debates and space to innovate in both content and assessments, so it's a really rewarding experience," he said.

Professor Tanner saw his own disciplinary teaching enhanced by the experience – he brought model-making of DNA from the Common Core back to first year biomedical students, and he has advocated for innovations in large-class active learning in the first two years of the MBBS curriculum.

> " I think it's important as a research-led university that we have more student-led, curiosity-driven research amongst undergraduates. It's a big challenge with large classes but I hope the Common Core can move towards promoting a research culture and opportunities for interdisciplinary research. "
>
> **PROFESSOR JULIAN TANNER**

After seeing the enthusiasm with which Common Core students embraced opportunities to ask questions and explore the world more widely, he decided to throw his hat in the ring when Professor Gray Kochhar-Lindgren announced he would step down as Director effective the end of 2022.

Innovation outlook

Professor Kochhar-Lindgren spent eight years laying a solid foundation of courses and networks both within and beyond the University. Professor Tanner will be driving these forward, with a particular focus on getting students engaged in multidisciplinary research and promoting innovation and international perspectives in teaching.

He cites the COVID-19 pandemic as an example of the importance of multidisciplinary learning: solutions to its impact have had to come not only from medicine, but also economics, psychology and other disciplines. "Finding solutions and doing research with real impact on the community is at its core very multidisciplinary. Of course, it's important that students develop expertise within their discipline, but I think early on as undergraduates, they should also be exposed to the multidisciplinary angle," he said.

Professor Tanner has such experience both as teacher and researcher. In the pilot transdisciplinary research programme, he mentored students from different disciplines who surveyed awareness about hepatitis C in Hong Kong and Canada, providing insight into different perspectives globally. The project's success contributed to the Common Core team receiving the University Grants Committee's 2019 Teaching Award (Team), awarded to one team across Hong Kong each year for teaching excellence.

As a researcher specialising in chemical biology and DNA nanotechnology, Professor Tanner also works closely with colleagues in medicine, engineering, dentistry and science, including an ongoing collaboration with Professor Anderson Shum Ho-cheung of the Department of Mechanical Engineering to develop new methods for diagnostics that integrate microfluidics with molecular biology.

"I think it's important as a research-led university that we have more student-led, curiosity-driven research amongst undergraduates. It's a big challenge with large classes but I hope the Common Core can move towards promoting a research culture and opportunities for interdisciplinary research," he said.

## Preparing students for the future

Professor Tanner hopes to provide space for teachers to innovate in how they use Common Core teaching time – to think more in terms of flipped classrooms and other active learning methods where students solve problems and collaborate in class, rather than passively receive lectures.

Furthermore, he will be pushing forward international opportunities for both students and staff, especially now that COVID-19 restrictions have abated. He wants students to participate not only in Common Core-related activities in Mainland China and overseas, but also HKU's Collaborative Online International Learning programme, which enables students from HKU and partner universities overseas to collaborate using digital technology. "I'm really interested in what the University can do to help prepare students more broadly for their careers and futures by thinking globally, creatively and across emerging disciplines," he said.

He will have his work cut out for him, dividing his time between the School of Biomedical Sciences and the Common Core, where he is supported by a strong administrative team and Associate Director Dr Jack Tsao. But he draws motivation from seeing many of the best teachers at HKU engage with the Common Core and improve their own teaching in light of that experience.

"There are so many incredible people working at HKU, and it's a huge privilege to interact with students and staff across all 10 faculties," he said.
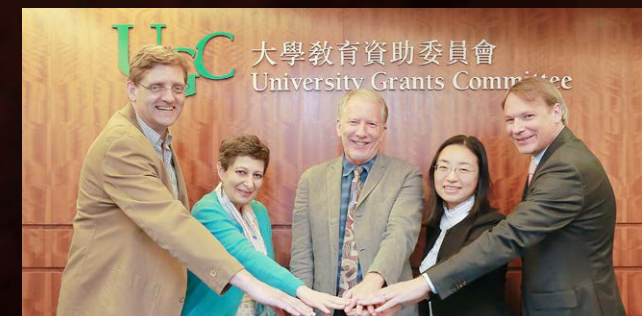
The Common Core@HKU: Transdisciplinarity-in-Action Team was the recipient of the 2019 UGC Teaching Award.

Professor Tanner at the Student Learning Festival 2022–23 that showcases interdisciplinary and international student work from across faculties.

HKU'S NEW HEAD OF DATA SCIENCE

Professor Ma Yi leads the new HKU Musketeers Foundation Institute of Data Science, which will develop collaborative data-based research and a new postgraduate curriculum on data science, and grapple with the fast-developing impact of machine learning in society.

For years, data science was the purview of engineers and computer scientists, among them Professor Ma Yi, Chair Professor and Director of the HKU Musketeers Foundation Institute of Data Science (IDS) and an expert in computer vision. But recently it has reached a tipping point.

"Data science now has the potential to make fundamental, transformative and disruptive impact in areas like medicine, finance, the economy, social sciences, education or natural language processing. All of the top universities – like MIT, Berkeley, Stanford, as well as HKU – sense that reform in research and education needs to take place. We are all trying to reposition ourselves, but it's still early days and nobody has quite figured out the best way to respond," he said.

Through the IDS, Professor Ma is steering efforts at HKU to figure out how to incorporate data science into broader research questions and teaching programmes, as well as address the wider implications that data and machine learning pose in

> " For the University, we already know that data science will grow into a very substantial fraction of activity here, just like in all the top universities. So we have to both reform education and organise the research around this topic. "
>
> **PROFESSOR MA YI**

Professor Ma speaking at the IDS Distinguished Speaker Series.

terms of security, privacy, the generation of fake information, and other concerns. He is supported by a multidisciplinary steering committee of experts in engineering, science, finance, medicine, philosophy, and psychology.

Professor Ma himself brings experience not only as an academic but also an administrator – he was the founding Dean of the School of Information Science and Technology at ShanghaiTech University from 2014 to 2017, the principal researcher and manager of the Visual Computing group of Microsoft Research Asia from 2009 to 2014, and recently was on the faculty of his alma mater, the University of California, Berkeley, where he obtained two Masters degrees and his PhD.

His pivot to Hong Kong came through outreach from HKU's senior management and the realisation that there was potential to have impact not only at the University, but beyond.

"Hong Kong is trying to develop its high-tech industry and the need for talent will be very immense. I like the IDS platform because it can be an amplifier of young talent," he said.

"For the University, we already know that data science will grow into a very substantial fraction of activity here, just like in all the top universities. So we have to both reform education and organise the research around this topic. Precisely in what form, I think that still has to be developed."

Vehicle for collaboration

His first priority is to develop a new research postgraduate programme that will provide a theoretical and computational foundation on machine intelligence, practical algorithms and systems, to support computing and data science at all scales. He brings extensive teaching experience to that task as well as

resources: he is the author of three texts for postgraduates on data science, including the recently released *High-Dimensional Data Analysis with Low-Dimensional Models: Principles, Computation, and Applications*.

He will also prioritise recruiting staff who can apply data science methodology and technology to a wide variety of fields.

"My vision is that the IDS will be a vehicle for collaborative, multidisciplinary research. Because data science cannot survive alone – data scientists don't produce the data, it has to come from physics or medicine or computer vision or natural languages or other fields. We have to work with people from these domains," he said. "Our role here is really to provide a good environment, motivate and train scholars, and challenge them with some big directions that have impact in society."

Data privacy, security, ethical issues and the like are also on the agenda and Professor Ma said he hopes to recruit experts who can address these matters and educate students and faculty on the pitfalls and the need for integrity.

"I'm actually not worried about machines right now because they do what they're designed to do. It's the humans behind them, who can manipulate them, that we should worry more about," he said.

Professor Ma added that he is excited at the prospect of creating something new and relevant at the IDS. "This is our chance. Even Berkeley and Stanford have not figured what the best education programme is for data science. If we can create a logical, coherent and well-thought-out curriculum, and even a research programme related to that, maybe our colleagues can learn a thing or two from us," he said.
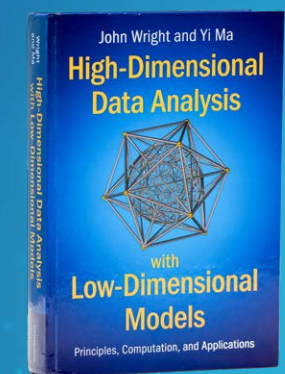
High-Dimensional Data Analysis with Low-Dimensional Models: Principles, Computation, and Applications by John Wright and Ma Yi was published by Cambridge University Press in 2022.

MODERN FAMILIES IN TURBULENT CHINA

The tumultuous period before and after the fall of the Qing dynasty saw old ways of life overturned and new ones emerge – not only at the societal level but for family life, the home and gender identity. Historian Dr Elizabeth LaCouture uses the case of Tianjin to show how this played out.

The breakdown of order in the early 20th century in China placed many people in an uncertain position. The scholarly class lost relevance as the civil service examinations for mandarins were abolished. Foreign imperialism weakened the state, but also opened up economic opportunities in port cities. As people moved into these cities, family ties and social identities were challenged.

In the midst of all this, argues Dr Elizabeth LaCouture, Assistant Professor of History and Director of the Gender Studies Programme at HKU, in her book *Dwelling in the World: Family, House, and Home in Tianjin, China, 1860-1960*, individuals were finding new ways of living and piecing together a modern Chinese identity, with consequences for gender roles and ideas about house and home.

She uses the example of Tianjin to elucidate the changes. Tianjin was the second largest city in China at the time and had nine foreign concessions – Shanghai had only three - that had majority Chinese populations. Drawing on women's magazines of the time, archives in Tianjin and overseas, surveys, the few available floorplans of buildings dating to the period and observations of the surviving colonial buildings, Dr LaCouture shows how new ideas of modernity, the nuclear family and gender identity infiltrated as people re-imagined their families and homes – in particular, the 20th-century idea of *jiating*, a term uniting family, house and home into one concept.

A Tianjin carpet template from 1937. The modern design juxtaposes Chinese and Western styles, using decorative tropes of Chinese landscape painting, Art Deco lines and Rococo flowers.

> Many people living in cities in this period had space to figure out and define who they wanted to be and what they wanted families and home to look like.

DR ELIZABETH LACOUTURE

Gendered shifts

Tianjin was attracting smaller families and women there found they had more leisure time away from the duties of ritual-keeping and child-rearing in family compounds. Interior design became part of female knowledge, whereas previously it had been the domain of the male scholarly class.

Women also began to build new social networks by organising social activities that were widely covered in women's magazines, such as parties, restaurant-going and theatre-going, although this transition was not always easy. Dr LaCouture cites the college entrance essay of a girl who enjoyed the objects of her middle-class urban life, such as her pet kitten and her record player, but also felt lonely and missed her extended family in the country.

"I hesitate to say women's lives improved. I would call it enhanced agency. Many people living in cities in this period had space to figure out and define who they wanted to be and what they wanted families and home to look like," she said. "There was less of that opportunity before and after this period, when you had more of a state-prescribed ideal of the role that women should play in nation building."

Masculine identities were changing, too. "Chinese men at this time were forming ideas of masculinity around property ownership. This is something new. It used to be that property was owned by the family unit. The law changed in the 1930s and shifted property ownership to the individual. And this helped Chinese men forge an identity of individuality, especially when they fought for property rights. We might typically think of the home as a woman's space, but house and home became central to masculine identity, too."

A sum of the parts

Education was an equaliser, both in terms of economic classes and genders. "Some people had money, some had social capital, and some had educational capital, which enabled a kind of middle-class knowledge of how to live," she said. A warlord may be able to buy a house in a foreign concession, but the educated daughter of a mid-level bank manager may have had a better idea of how to decorate and manage that home.

Dr LaCouture argues that the process of change in individual lives contributed to defining modernity in Tianjin and perhaps China as a whole, as people mixed the old and new and East and West - for instance, placing Chinese pavilions atop modern British or Italian buildings. "The juxtaposition makes it unique. It's a chimera – the parts are not fused but remain distinct. These things develop together in the Tianjin modern."

Her insights into urban life earned her a Best Book Award in Non-North American Urban History from The Urban History Association in 2022. "Often in urban histories, women are on the sidelines, so I was very pleased with this recognition. It shows that when you put women at the centre of any genre of history, you make that genre better," she said.

Warlord Chen Guangyuan's house in the former British Concession in Tianjin.
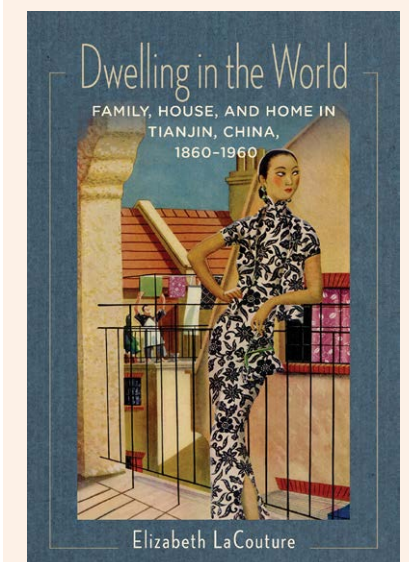
Dwelling in the World: Family, House, and Home in Tianjin, China, 1860-1960

Author: Elizabeth LaCouture
Publisher: Columbia University Press
Year of Publication: 2021

> Because MUSE is from HKU, there is a unique academic dimension that others don't have. Many cultural sources exist in Hong Kong but we offer academic context and infrastructure. It's not just about the performance but also the knowledge involved and the events surrounding it.

PROFESSOR IAN HOLLIDAY

MUSIC, MAESTRO, PLEASE!

In the 10 years since its launch, HKU's MUSE has brought an ambitious and innovative classical music programme to Hong Kong and established itself as a prominent player in the city's cultural landscape.

MUSE, for My University Spotlight Encounters, was created as a collaboration between the Cultural Management Office (CMO) and the Music Department to offer framed artistic experiences with intellectual engagement, and to fulfil the bigger creative objective of taking the relationship between musician and audience to the next level.

"Usually there's a glass wall between audience and artist – we aim to break through that wall to enable them to interact and engage with one another," said Ms Sharon Lu, Programme Director of the CMO, which works with the Music Department in developing MUSE's programmes. "We have built a very good reputation among audiences, from complete newbies to learned music critics. They love that we create unique

programmes and invite innovative artists and we offer supplementary activities and projects around every event which everyone can share in to enhance their overall experience."

"We aim to go further," said Professor Ian Holliday, Vice-President and Pro-Vice-Chancellor of HKU, who also serves on MUSE advisory board. "Because MUSE is from HKU, there is a unique academic dimension that others don't have. Many cultural sources exist in Hong Kong – Hong Kong Philharmonic Orchestra, Hong Kong Sinfonietta *etc* – but we offer academic context and infrastructure. It's not just about the performance but also the knowledge involved and the events surrounding it. And we have the cultural weight within our Music Department to back it up: Professor Daniel Chua [MUSE founder, Chair of HKU's Music Department and Mr and Mrs Hung Hing-ying Professor in the Arts], for example, is a world-class expert on Beethoven."

Examples of the range of MUSE's creative programmes include The Immortal 32, which saw one pianist (Konstantin Lifschitz) play all 32 of Beethoven's piano sonatas in chronological order, in eight concerts performed over two weekends – a rare chance to hear how Beethoven's music progressed through his life. On the more quirky end of the music spectrum, renowned harpsichord player Jean Rondeau gave several performances during his visit to HKU including a jam session with *zheng* player Chiu Tan Ching!

Central to all MUSE activities is the 900-seater concert hall, built as a crowning centrepiece to the University's Centennial Campus, and renowned for its world-class acoustics. "The Grand Hall is our instrument," said Ms Lu. "It is a tremendous venue, and the moment an audience member steps into the space they start to soak up the atmosphere and realise this experience is going to be totally different to other classical music events. We regularly sell it out and we make tickets affordable [HK$50] to HKU students."

MUSE strives to ensure HKU students are encouraged to participate in a variety of ways: there are Master Classes with visiting artists; student singers get to perform alongside world-class choirs such as St John's College Cambridge; and visiting artists play and/or read new works by composition students. They can also get involved in the production side of main events, whether it's through writing the programme notes, greeting audiences at concerts or backstage preparation.

Audience engagement

"Engaging people who are new to classical music is no simple matter," said Professor Holliday. "If you come to it later in life, some composers may be a stretch, and we want to help people make that stretch. But people need to meet us halfway – they need to get to grips with the programme. We don't dumb it down, we're not advocating 'pop classics', and other orchestras already do concerts aimed at kids. Our core audience is young adults – HKU students – and this also reflects our academic niche."

A measure of MUSE's success in meeting the needs of their target audience can be found in the concert last semester by 18-year-old South Korean pianist Yunchan Lim, tickets for which sold out in around an hour. Lim shot to worldwide fame when he became the youngest

pianist to win the prestigious Van Cliburn International Piano Competition.

"It says a lot that we were able to get him," said Ms Lu. "He chose to accept our invitation to HKU for his debut performance in Hong Kong. We also know we're on the right path when musicians are happy to return because they like our approach. For example, Paul Lewis came to play Schubert's *Piano Sonata in G Major* in 2019, and is now returning to perform and discuss all of the composer's completed sonatas as part of our 10-year celebrations."

Other MUSE activities include CDs and podcasts, an annual Messiah Sing-Along, the Public Piano Project – a piano located on campus that anyone is welcome to play – as well as outreach projects such as Ink Art & New Music, a collaboration with Hong Kong's M+ museum and Bard College Conservatory of Music in New York that combined ink paintings and music, and a Literature x Music series, introducing subjects such as *Musical Murakami* and *Musical Pushkin*.

Summing up 10 years of musical high notes is hard, but Professor Chua put it well in his website intro: "In the last 10 years, MUSE has amused, bemused and confused the standard practices in concert presentation, bringing new ideas to the cultural offering in Hong Kong."

Care for the Environment

While our publication is printed on environmentally friendly paper, we urge you to share your copy with friends and colleagues to help reduce our carbon footprint. Alternatively, you may like to read the *Bulletin* online at *bulletin.hku.hk*

If you would like to opt-out of receiving a printed copy and subscribe to the electronic version of publications from the Communications and Public Affairs Office, please visit *go.hku.hk/puboptout*

MIX
Paper | Supporting responsible forestry
FSC
www.fsc.org   FSC™ C176382