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SOLITARY LIVES

The global epidemic of loneliness

Towards hepatitis B elimination

An all-round battle from community testing to drug development

Preserving silent voices

Efforts to document the endangered Hong Kong Sign Language



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SOLITARY LIVES

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GOING VIRAL

SOLITARY LIVES

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MORE THAN A FEELING

Bioethicist Dr Zohar Lederman has been exploring the philosophical implications of the individual and social harm caused by loneliness, and practical solutions.

When Dr Zohar Lederman was an emergency medicine doctor in Israel, he was struck by how many patients did not want to go home because they had no one to go home to. They often ended up in the hospital longer than their condition warranted, but medical staff were not trained nor evaluated on how to help such people. "It was heartbreaking. These patients were really out of the realm of emergency medicine," he said.

The situation inspired him to delve deeper into the problem of loneliness. The results, in both

philosophical and scientific terms, were stark: loneliness puts people at higher risk of stroke, anxiety, dementia, depression, suicide and other diseases, and it is common. "Loneliness makes you sicker and increases your risk of premature death. Basically, it's a kind of social determinant of health," he said.

Dr Lederman, now Clinical Practitioner in HKU's Department of Emergency Medicine in the School of Clinical Medicine and Research Fellow in the Centre for Medical Ethics and Law, has been investigating how to mitigate the problem and better

understand the implications for society from medical and bioethics perspectives – particularly as surveys show that loneliness affects one-third of people in Hong Kong and Mainland China, about 40 per cent in Japan and one in two in the US.

"I believe there is an ethical case to engage more systematically with loneliness, first of all as a public health issue and secondly, as a deeply fundamental issue for human beings that goes beyond human health. I think we have largely failed so far in dealing with loneliness because our definition is too narrow," he said.

Lots of kinds of loneliness

Traditionally, loneliness has been considered a distressful mismatch between expected and perceived social relations. But social scientists have proposed that it can come in many forms, he said.

Political theorists such as Hannah Arendt talk of political loneliness in which people are deprived of political participation and feel alienated from the process, such as Palestinians in the West Bank and Gaza.

There is also ethical loneliness, where someone suffers a great injustice such as the Holocaust but does not feel heard or understood when they talk about the experience. And there are things like a lonely death, sexual loneliness or the loneliness of people with disabilities that hinder their communication with others. Caretakers can also feel lonely.

Dr Lederman said these are not simply alienating experiences. Since people have evolved to be social and interdependent, loneliness should be seen within that context. "If one recognises that not being lonely is important to human life and human flourishing, and that people have an entitlement or right not to feel lonely in much the same way they have a right to health, then

there are ethical implications for governments and society," he said.

The World Health Organization has recognised some of the implications with the establishment of the Commission on Social Connection in November 2023, which is intended to galvanise countries to act. Some have already started. The UK and Japanese governments both have ministries of loneliness. Examples of government actions include mobile cafes that bring people together, subsidised socialisation classes and investment in social robots.

Investigating the problem and solutions

Dr Lederman has also been investigating how to mitigate loneliness. One project has focussed on social robots that interact and chat with people, although he thinks these are a far from perfect solution. "Intuitively, it feels wrong that human society should decide to care for the lonely by throwing technology at them. But from an

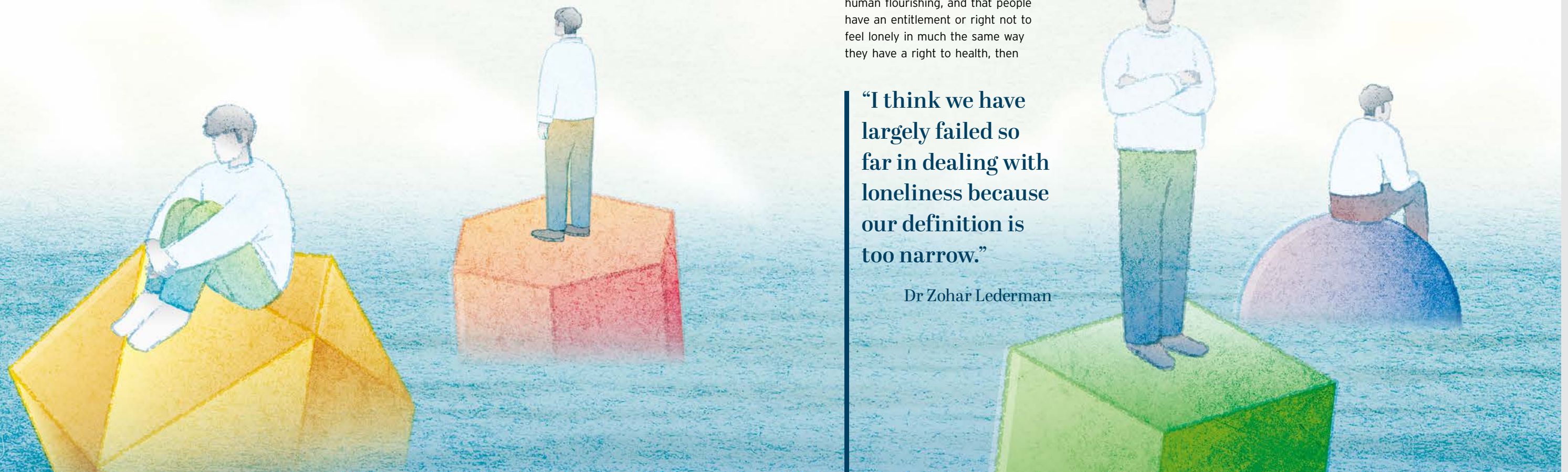
academic perspective, we try to be more generous. We have done some work on them and it's plausible they can help some people as a last resort or a temporary measure," he said.

He also hopes to dovetail his two interests – emergency medicine and bioethics – to investigate loneliness in the emergency departments of Hong Kong hospitals. The yet-to-be-funded project aims to determine whether people coming to the hospital are lonelier than those in the community and whether there are correlations between feeling lonely, hospitalisation, mental health outcomes, recurrent visits and the use of healthcare services. The project also hopes to map the available social services for mitigating loneliness.

"Loneliness is not only bad for human beings. It can be bad for the economy. If we want to promote public policies that are effective and cost-effective, that's another reason to engage more seriously with the problem of loneliness," he said.

"I think we have largely failed so far in dealing with loneliness because our definition is too narrow."

Dr Zohar Lederman





A SLIPPERY SLOPE TO DEPRESSION

Professor Tatia Mei-chun Lee and her colleagues have been investigating brain activity to see how loneliness can tip people into depression and what might be done to mitigate the effects.

As many as 40 per cent of middle-aged and elderly adults may suffer from chronic loneliness, meaning there is a discrepancy between their preferred and actual social relations. That puts them at risk for depression. But what is the mechanism that links the two? Professor Tatia Mei-chun Lee, Chair Professor of Psychological Science and Clinical Psychology and May Professor in Neuropsychology, is a pioneer in researching the problem of loneliness in Chinese populations from behavioural and neuroscience perspectives, with the hope of finding a pathway for helping sufferers.

Working with local, national, and international collaborators, Professor Lee has been studying

the patterns in the brain related to loneliness and how these interlink with depression, rumination, and higher cognitive functions.

"I became interested in loneliness because number one, it is a significant threat to mental health. And number two, because people now live longer and the risk of feeling lonely also increases," she said.

Her team's first major study, published in 2016, identified a neural network in the brain associated with feelings of loneliness. Subjects underwent a functional magnetic resonance imaging (fMRI) scan to look at their brain in a resting state and in response

to affective pictures. They also completed a standard loneliness survey to measure their perceived loneliness.

The results showed weaker structural connectivity between key parts of the brain among those who reported feeling lonely. They also had stronger brain activity in response to negative emotional images, suggesting loneliness facilitated hypervigilance to emotions that posed a social threat.

Depleted resources

Professor Lee noted that while the brain typically changes in response to experience, "rarely has this been shown in relation to an intangible experience like loneliness. Feeling lonely leaves marks on the brain."

She also did a study showing how loneliness and late-life depression interact in the brain. The number of depressive episodes was found to increase when a person's perceived loneliness increased. Initially, that increase activated the striatum in the brain - a neural region responsible for reward sensitivity and reward learning. However, after multiple depressive episodes, this activation decreased.

Professor Lee's explanation is that with the first depressive episodes, the brain may work hard to compensate. "It may be that after repeated depressive episodes, their resources become depleted. That's why there's a changing relationship. This is our speculation."

She and her team have also looked at how cognitive status and higher cognitive functions are affected when depressed people feel lonely. Unsurprisingly, there is a negative impact. However, Professor Lee's team member, Professor Robin Shao Zhengxi, Assistant Professor (Research), was able to tease out the different impacts of depression and loneliness.

Among middle-aged adults performing a cognitive task measuring executive control functions, depression was associated with more errors, while loneliness was associated with faster response time, showing that depression and loneliness impact executive control functions in different ways. Correspondingly, depression and loneliness were also associated with opposite patterns of brain functional connectivity during task performance.

"The better executive control performance and stronger functional connectivity of the high loneliness individual may imply enhanced top-down cognitive control. Maybe they are using that to try to regulate the very uncomfortable feeling of loneliness. But when they do that in the long term, this upregulation might lead to exhaustion of high-level cognitive resources, and the

"We know loneliness is a high-risk factor, so if we can do something to reduce it, it will lower the risk of developing mental health problems."

Professor Tatia Mei-chun Lee

person may then develop a mood disorder," Professor Lee said, adding that this, too, was speculation.

Other risks and possible remedies

Professor Lee has also found that loneliness can interact with rumination to exacerbate depression. While negative rumination, or brooding, is known to be associated with depression, her research showed that it is of greatest risk when a person ruminates on being lonely. Another known depression risk factor - childhood experience of emotional neglect - was also found to be mediated through loneliness.

Explaining the neural effects of loneliness is not Professor Lee's only interest. She has also been looking at how to mitigate the problem. One project used a specially designed, eight-week meditation training programme and found a significant cause-and-effect relationship, with participants less affected by emotional stimuli after the training. She is also leading a Collaborative Research Fund project on psychological resilience, which relates to how quickly one can recover from psychological challenges and trauma, and how resilience relates to mental health.

"We study loneliness to understand how it impacts neural functions and our behaviours so we can then look at how to manage it and promote well-being. We know loneliness is a high-risk factor, so if we can do something to reduce it, it will lower the risk of developing mental health problems," she said.

A MEASURE OF THE PROBLEM

HKU scholars have been investigating the effects of loneliness and social isolation in different cultures and the possibility of having a universal framework to identify people at risk.

On the surface, determining a person's sense of loneliness and social isolation should be straightforward: just ask them how they feel and who they are socially connected with. But the reality is much more complicated, says Professor Chen Yu-chih, Assistant Professor of Social Work and Social Administration, who is working with collaborators in the US, UK and South Korea in response to a call from the World Health Organization for a measure that would allow for international comparisons.

While standardised questionnaires for loneliness exist, different countries have different ideas about what makes a person socially isolated.

"Social isolation is about things like social network size and quality, social participation, social support and proximity to people. In China, living in a rural area is considered an indicator of social isolation. In the UK and US, participation in religious activities, such as attending church, is a measure," he said. "We are using large datasets of about 20,000 people each from China, the UK, US and South Korea to try to find more general denominators."

The data, collected between 2011 and 2018, is also allowing Professor Chen to test the connections between physical activity, depression, social isolation and health. While the full results will not be available for at least another year, a couple of interesting early findings have emerged.

One is a correlation of sorts between social isolation and loneliness. While people can feel lonely yet not be socially isolated, or *vice versa*, if they are both lonely and isolated, they have a higher risk of severe mental distress.

The other result is a lower reporting of loneliness in China, which Professor Chen said may be attributable to cultural reasons. "Chinese people tend not to share their feelings so that may be why they report

a lower rate of loneliness," he said. He will dig deeper into this as the full results emerge.

Reluctance to engage

Professor Benjamin Ho Mu-hsing, Assistant Professor of Nursing, has also found that it can be difficult to get lonely people to join qualitative studies and accept interventions. He and a research team from the Hong Kong Polytechnic University have been working with data from more than 10,700 older adults in the 2018 China Health and Retirement Longitudinal Study, in which 28 per cent reported feeling lonely.

"People who suffer from loneliness won't usually come to an interview and share what they think, so it is frustrating," he said. "We can only capture how people feel in the moment. We don't have very concrete concepts or measures beyond things like a self-reporting loneliness scale."

The research team's attempts to use robots and pets in Taiwan and New Zealand have also shown the limits of interventions when lonely people are unreceptive to outreach – those most lonely or isolated are less willing to interact.

Professor Ho thinks it might be better to categorise loneliness as a variable rather than a focus itself and try to treat it alongside depression or other mental health issues with things like cognitive behavioural therapy.

The young are lonely, too

Medical sociologist Professor Tarani Chandola of the Department of Sociology has also shown how loneliness has effects beyond mental health. He was part of a longitudinal study using data from the UK Biobank that found higher levels of loneliness among those aged over 50 were associated with higher levels of physical ill-health, including mobility and cognitive frailty, and higher mortality.

"We can only capture how people feel in the moment. We don't have very concrete concepts or measures beyond things like a self-reporting loneliness scale."

Professor Benjamin Ho Mu-hsing

Life events, such as widowhood and the death of friends, were closely associated with feeling lonely. But that did not explain emerging evidence from another group – the 16 to 25 year-olds in Britain are the loneliest group in their society, followed by those over 65.

"This is becoming more and more common. Mental health issues, which never used to be too bad for young adults, have increased quite dramatically in the last 10 or 20 years. And that's correlated with a very large increase in loneliness around the world amongst young people," he said.

Possible causes could be the rise of social media and an increase in online gaming, alongside traditional factors like inadequate sleep. People under 40 are also more susceptible to the negative effects of toxic relationships, which Professor Chandola found in other research he did measuring levels of biological stress. "There tends to be a focus on older people when it comes to loneliness, but perhaps it is even more important to look at what is happening amongst young people," he said.

He is now investigating the different effects of social isolation and loneliness on biological stress markers because these would entail different kinds of interventions. If loneliness is the main factor, then therapy might be the best approach. If social isolation is driving both stress and loneliness, then it may be better to do more work fostering social connections. "We need more research to be done on this gap," he said.



NEIGHBOURHOOD EFFECTS

Evidence shows that urban density and planning can have direct effects on social isolation and loneliness. Therein could lie a solution, says urban scientist Professor Chinmoy Sarkar.

Cities have been associated with many things - more pollution, crime, inequality and traffic congestion. When they are poorly designed, with high population density, they can also increase social isolation and a sense of loneliness.

This insight has been well-embedded in urban planning and design for years. But a study led by HKU was the first to support it with robust evidence, using a dataset of more than 400,000 subjects from the UK Biobank.

Professor Chinmoy Sarkar, Associate Professor at the Department of Urban Planning and Design, was part of the team that showed, paradoxically, that being physically close to many people can leave us feeling lonely.

"When there are higher densities, there will be more unwanted social contacts. If the quality of social contacts is not good, and there is a lack of privacy and social overload, then people tend to withdraw or confine themselves," he said. "Unwanted social contacts have been found to cause a loss of social networks and social support and eventually lead to loneliness and social isolation."

Professor Sarkar and his colleagues drew on the UK Biobank, which contains information on people's self-reported sense of loneliness and their social isolation in terms of engagement with other people, and compared this with their environment, such as residential unit density, walkability and greenness. They looked at one- and two-kilometre buffers around the places where individuals lived.

For every increase of 1,000 units in the one-kilometre buffer, the odds of feeling lonely rose by 2.8 per cent while social isolation rose by 11 per cent. When that was broken down further, and the people in the top quartile of density were compared with the lower quartile, the odds increased by 14.4 per cent for loneliness in the upper quartile and 30.4 per cent for social isolation.

Perception of safety

The researchers also looked at housing types. People living in self-contained flats in high-density areas had the worst outcomes - those in the highest-density of flats had increased odds of 9.6 per cent for loneliness and 28.9 per cent for social isolation versus those living in the lowest flat density.

Conversely, living in detached housing actually had a higher protective or beneficial effect with increasing density - those in the highest density of detached housing had reduced odds of 13.2 per cent for loneliness and 20.2 per cent for social isolation versus the lowest density. There were also protective effects from such attributes as greenness, the density of public transport and walkability, or centrality, of a place.

"If you are living in a detached house in the leafy suburbs with a garden or other defensible space, you have the perception of safety. You can sit in your garden and talk to your neighbours, which contributes to a sense of community and cohesion that may reduce your perception of loneliness or isolation. Whereas in apartment blocks, at least from my experience in Hong Kong and other high-density cities, you may not even know who your next-door neighbour is; hence the importance of designing functionally interactive public spaces in neighbourhoods," he said.

In all cases, the effects were more pronounced at the two-kilometre buffer, which Professor Sarkar said was due to the urban scaling effect, and among males and older people.

Need to optimise density

Loneliness and social isolation are both associated with poor mental and physical health, and he said the findings imply that government loneliness strategies need to take into account urban planning and policies, such as densification.

"With demographic shifts to ageing societies, the way we design and pack our cities will be the key to creating multifunctional and interactive neighbourhoods that promote social well-being and longevity."

Professor
Chinmoy Sarkar

"Optimising housing density and the mix of housing should be the cornerstone of any government's population-wide policy that aims to enhance the social well-being and mental capacity of our population. This should happen alongside the design of neighbourhoods that allow people to interact in ways that help reduce the burden of social isolation and perceived or actual psychosocial stress," he said.

"After all, these policies affect millions of city residents. With demographic shifts to ageing

societies, the way we design and pack our cities will be the key to creating multifunctional and interactive neighbourhoods that promote social well-being and longevity."

Professor Sarkar is also looking at the relationship between the living environment in Hong Kong and depression by measuring the build-up of the stress hormone, cortisol, in hair samples. And he is participating in a study looking at the effects of urban design and density on longevity in Hong Kong and the UK.



RELIEF FOR THE LONESOME

HKU researchers have been investigating interventions to help alleviate loneliness among Hong Kong's elderly.

When the COVID-19 pandemic struck, Professor Doris Yu Sau-fung of the School of Nursing was overseeing a team of nurses working to identify and engage with 'hidden elders' – those who live alone – and bring them to community facilities for health assessments and counselling. The pandemic put a halt to that work, but team members saw a deep need in this group for social contact. They organised a get-around of 'gate nursing' where they stood at the gates of people's homes and did exercises and provided them with psychological support.

For Professor Yu, the experience revealed the vulnerability of older people in Hong Kong when it comes to loneliness. It has inspired her to dig deeper into the problem and apply those insights to her other research.

In one study, she surveyed more than 10,000 older people in all 18 of Hong Kong's districts and the results confirmed her concerns: 58 per cent of people aged over 65 reported being lonely. "The high prevalence calls for more attention to be paid to effective interventions for this growing public health problem," she said.

Professor Yu also undertook a detailed and systematic review of the literature on interventions to classify them in a consistent way and determine which had

the best results. Psychological intervention, either alone or with other activities such as exercise, was found to be the most effective.

"There are a lot of studies about psychological counselling and helping people build up their self-image. They may feel lonely because they don't feel they are good at socialising. So self-esteem is a very important individualised factor contributing to loneliness," she said.

Loneliness and healthy ageing

Professor Yu has incorporated loneliness into her work on healthy ageing. Building on earlier work on sarcopenia (muscle loss) in the elderly, she is looking at the environmental and social demographic factors associated with loneliness. The focus is on life-space mobility which captures 'real-life mobility' extending from one's bedroom to the neighbourhood area and community, as well as technology acceptance and subjective memory loss – all of which can impact or interact with loneliness.

"How often a person goes out depends not only on their physical ability but also on their psychological status and the social environment," she said. "Our preliminary findings are significant. We found that technology acceptance and subjective memory loss predict

life-space mobility, and that mobility is a very important mediator of the effect of loneliness."

On technology use, Professor Yu has also found that people who live alone, once trained on digital technology, tend to engage more with apps that have a psychological component, such as a laughing yoga app to boost mood, which supports her finding that psychological interventions could be important for combating loneliness.

She has also found that it is best to engage with older adults in person, given many elderly are not familiar or comfortable with digital technology. That insight has been applied in other research she is doing to test apps that help people monitor heart disease – it motivated her to add a component where the app is paired with human interaction.

Moving forward, Professor Yu will combine data on the physical environment, socio-economic demographics and loneliness surveys to see which factors are affecting or determining loneliness among Hong Kong's elderly. She also has a project to train elderly people as health coaches that she hopes can engage people who live alone to become coaches. "I am thinking of how to use interventions that are not labelled as combating loneliness, but can still help older people tackle lonely feelings," she said.

"We found that technology acceptance and subjective memory loss predict life-space mobility, and that mobility is a very important mediator of the effect of loneliness."

Professor Doris Yu Sau-fung

Social robots as companions

Professor Vivian Lou Weiqun, Director of the Sau Po Centre on Ageing, has been collaborating with the Singapore University of Social Sciences to see if technology in the form of social robots can help relieve loneliness. These robots offer emotional support and a sense of connectedness, rather than just entertainment.

A preliminary study of people aged from 60 to 75 living alone in Hong Kong and Singapore found that they fell into three groups: the practicalists, who wanted the robots to perform specific tasks such as medication reminders; the traditionalists, who were reluctant to acknowledge the robots as pets and wanted human contact;

and the enthusiasts, who enjoyed interacting with the robots.

But while overall loneliness levels were reduced among subjects in Singapore, in Hong Kong "the loneliness level increased after initial interactions with 'the robot', which may be attributed to a desire for human interactions among study participants," Professor Lou said.

"Given the growing ageing trend, it is time to reconceptualise social relationships and companionship. Traditionally, it meant spending time with certain people, in particular family members. But we need to admit that more older adults are spending more time alone and social robots should be designed and introduced properly to them to allow greater acceptance."



THE FEAR FACTOR

Professor Cora Lai Sau-wan of the School of Biomedical Sciences has deepened our understanding of where and how fear memories are stored in the brain – and shown how these memories could potentially be erased.



In the Hollywood movie, *Eternal Sunshine of the Spotless Mind*, characters get their memories erased to help them forget about bad relationships. It is one of Professor Cora Lai Sau-wan's favourite films and it has inspired her in ways that show how life can imitate art.

Using mouse models, Professor Lai and her team discovered new insights on how the brain responds to fear and how animals could be de-conditioned against a learnt fear response – essentially, have that memory erased – particularly during sleep.

The animals had listened to a tone that was followed by a physical foot-shock and had developed a fear response – freezing in place – whenever they heard the tone later even without foot-shock.

"Through that study, we basically discovered that we could target a fear memory and erase it. It's non-invasive, although it's still experimental at this stage," she said.

"The aim of our laboratory is to get a better understanding of how memory is formed, how it is retrieved, how it is consolidated or reconsolidated. Memory is like data in our brain and it affects our behaviour and our personality, but it's not well understood."

Branches, leaves and hotspots

Professor Lai's research on fear centres around the synapses of the brain, which change when we experience or learn something. Each of the brain's neurons has many synapses that communicate with other neurons. The

transmitted information is stored in the neuron's dendrites, which have many little protrusions, like leaves on a branch, called dendritic spines, where memories are stored.

During this memory-making process, Professor Lai and her team observed that the dendritic spines of animals undergoing fear learning respond differently depending on their location in the brain.

"It was puzzling because when fear learning occurs, there are fewer dendritic spines in the frontal cortex [which controls things like memory, emotions and physical movement], whereas in other cortical regions, there are more dendritic spines," she said.

To examine that further, the team tested fear extinction – as in her favourite movie – by training the mouse to unlearn the fear that had become associated with the tone. They played the tone repeatedly but without a physical shock, and the mouse brain responded differently. It formed more dendritic spines very close to where it had previously eliminated the spines under fear conditioning in the frontal cortex.

"Basically, that area is like a hotspot or plug. When there's a need, the dendritic spine is removed. Once that need is gone, it is re-plugged close to the same spot," Professor Lai said.

"It is believed that memories are not stored randomly on neurons but through memory allocation, so similar memories are stored on the same dendrites. This is exactly what we observed."

She also detected changes in dendritic spines in another area of the brain, the auditory cortex which processed the tone sound, but in reverse. Here, fear conditioning led to more spine formation, but this was eliminated with fear extinction.



Electroencephalogram (EEG), electromyography (EMG) and a miniature microscope are used to observe the calcium responses of neurons in the frontal cortex and their relation to sleep and fear learning in mice.

"Memory is like data in our brain and it affects our behaviour and our personality, but it's not well understood."

Professor Cora Lai Sau-wan

The role of sleep

A big question underpinning all of this has been the role of sleep. Sleep is known to enhance memory, but other researchers have produced contradictory evidence when it came to fear learning – some found that sleep enhanced it, others that it inhibited it.

Professor Lai and her team decided to look for clues in non-REM [rapid eye movement] sleep in relation to fear learning, but again the results were mixed. So they broke that down into slow-wave non-REM sleep, when the brain oscillation becomes very slow, and other non-REM sleep.

"And voilà, we found opposite events. The slow-wave sleep actually enhanced fear consolidation and the other stages inhibited it. We found this effect not only in the animal's behaviour, but in the dendritic spine plasticity," she said.

The results, recently published in *Advanced Science*, help explain why earlier evidence was contradictory. Professor Lai is now studying the mechanism to gain a deeper understanding of how and why the brain generates these different responses in fear learning.

The research holds promise for psychiatric applications. A number of human studies have shown that specific memories can be reactivated during sleep, in a process called reconsolidation. The hope is her research could be developed to help sufferers of post-traumatic stress disorder by deactivating memories. "Our laboratory is not working on humans but we're trying to look at the mechanism underlying that. That's our next target," Professor Lai said.

She added that the current work is not only about excitatory neurons, but also inhibitory interneurons which act like brakes on the input state. A number of psychiatric disorders arise from dysfunctions in the excitatory-inhibitory balance, so there is potential to open pathways to treatments for these conditions, too.

HEP TO A CURE

World-leading hepatitis researcher, Professor Yuen Man-fung, has made serious inroads towards a cure for some hepatitis B patients. He is also working to get more people tested so they can seek treatment for this silent but harmful virus.

Chronic hepatitis B infection can remain asymptomatic for decades, yet left untreated, it can cause severe damage to the liver and lead to life-threatening conditions such as cirrhosis and liver cancer, the third leading cause of cancer deaths in Hong Kong. About 410,000 people in Hong Kong carry the hepatitis B virus, as do more than 257 million globally. The World Health Organization (WHO) has called for its elimination by 2030.

A key contributor towards achieving that goal is Professor Yuen Man-fung, Chair Professor of Gastroenterology and Hepatology, and Li Shu Fan Medical Foundation Professor in Medicine.

Professor Yuen is the top hepatitis B researcher in the world, according to Expertscape based on publications between 2013 and 2023. He was one of the first in the world to develop a risk score for hepatocellular carcinoma in hepatitis B patients.

He also identified a treatment target by showing patients who spontaneously lost the surface antigen of the virus before the age of 50 had a significantly lower chance of developing serious liver disease.

That discovery led to the development of a new drug, bupirovirsen, that is undergoing a phase three clinical trial in centres around the world and offers hope of a cure for at least some patients. He is also investigating other treatments, including a promising combination of antiviral and immunomodulatory agents, and he has helped develop outreach programmes to offer testing and treatment in the community.

"We want to align with the WHO goal of eliminating hepatitis B in the world by 2030. Although this may take a few years longer, at least we need to move in that direction to diagnose and treat patients and decrease mortality related to viral infection," he said.

"They think they are fine, they have no symptoms, so therefore they are not hepatitis B patients. But this is not true."

Professor Yuen Man-fung

Promising early results

Bepirovirsen already showed in a phase two trial that it could functionally cure 10 per cent of participants, who had undetectable surface antigen of the virus after six months - this is 10 times higher than occurs naturally. Professor Yuen said they aim to push that rate to as high as 30 per cent within the next couple of years, meaning such patients would no longer need to take drugs every day for the rest of their lives to control the virus.

But even with that promise, there is the problem that people often do not know they carry the hepatitis B virus until their liver is damaged - the virus sometimes does not show up on standard blood tests.

Professor Yuen is therefore also working to improve detection of these hidden or 'occult' cases. He is collaborating on a project that has increased the diagnostic rate of occult hepatitis B infection from less than 20 per cent to 67 per cent.

He has also recently completed a study that confirmed the hepatitis B virus can integrate with a person's DNA, so even if all viable traces of the virus are killed off in a person's liver, the liver cancer process can still be triggered because the virus remains in their DNA.

"The integration process actually starts early in a person's lifetime, so we want to emphasise that we need to treat patients as soon as possible - when they are in their 20s or 30s - rather than wait for other indications. Some experts say we should wait until the virus reaches a certain level in the blood before treatment, but we believe it should happen before the integration process becomes more entrenched. Theoretically, this would decrease the chance of developing liver cancer," he said.

Combatting hepatitis C, too

An important factor in doing that is to make sure people are aware they are hepatitis B carriers. According to Hong Kong's Department of Health, nearly 40 per cent of hepatitis B carriers are unaware of their condition. "They think they are fine,

they have no symptoms, so therefore they are not hepatitis B patients. But this is not true," Professor Yuen said.

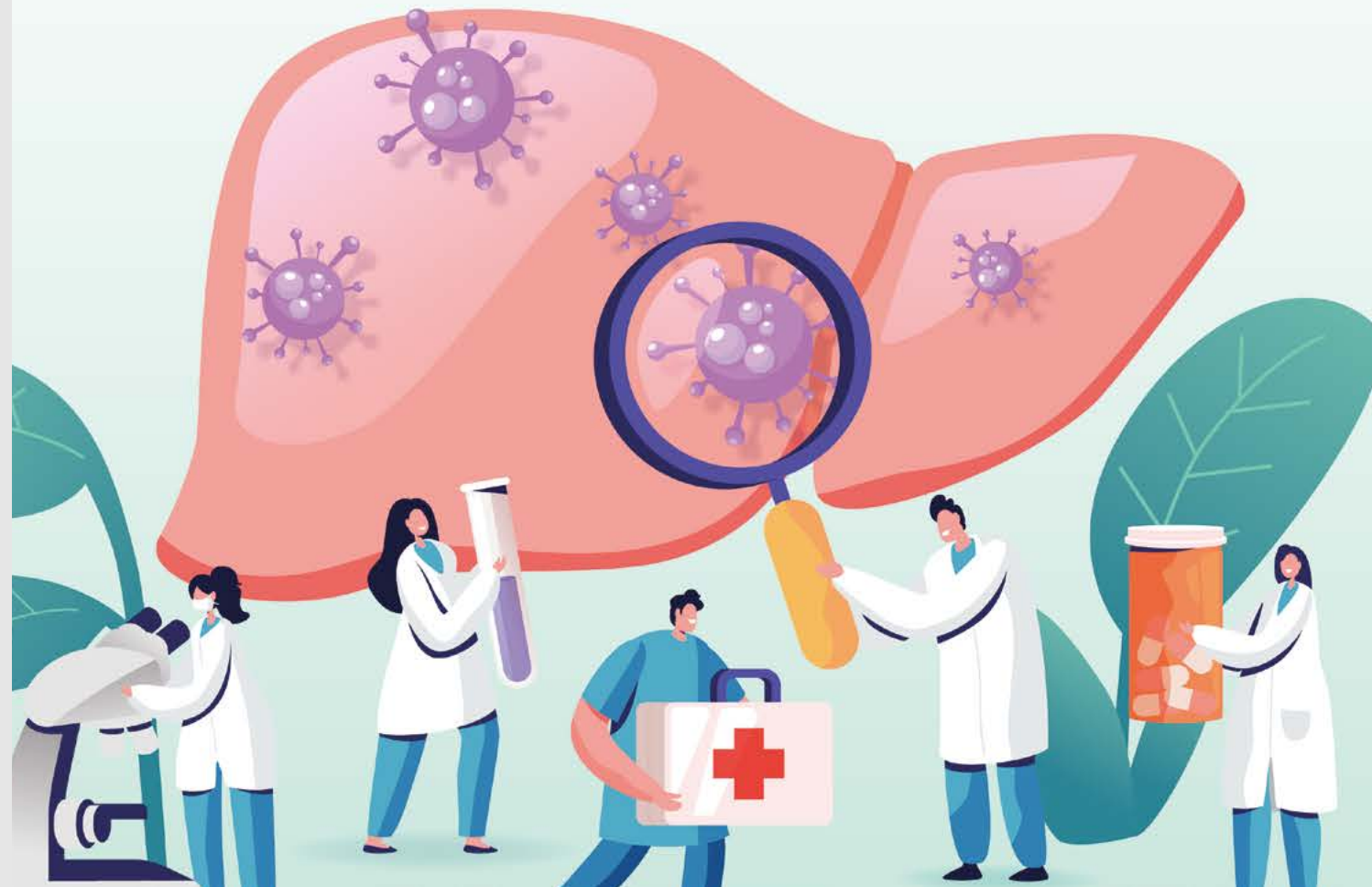
He recently teamed up with the Hong Kong Liver Foundation to bring testing into the community through a mobile truck that will spend the next five years travelling to each of Hong Kong's 18 districts to test people for the virus and make referrals if treatment is needed.

He has also been involved in programmes to treat another life-threatening infection, hepatitis C, in vulnerable populations. In one programme, he worked with different NGOs to screen and treat nearly 400 former intravenous drug users.

More recently, he has been working with the Correctional Services Department, the Hospital Authority and the Chinese University of Hong Kong in a programme focussed on prisoners. They are tested at prison and can receive treatment there, too. "Hepatitis C can be cured with a few months of treatment but if untreated, it will also cause liver damage," he said.



Professor Yuen with the liver health screening mobile truck.





MATERNAL INSTINCT

Researchers from HKUMed have found that extending Hong Kong's statutory paid maternity leave led to a significant improvement in maternal mental health. The findings have significant implications at a time when birth rates worldwide are falling and labour force shortages are a significant problem.

In July 2020, Hong Kong extended statutory paid maternity leave from 10 to 14 weeks to align with International Labour Organization standards. Not only was this a great day for new mums, but it also provided a rare opportunity to study directly and immediately the implications of such a change on the mothers concerned, with a particular focus on postnatal depression, if any.

The research team which undertook the research comprised experts from HKUMed's School of Public Health and School of Nursing, as well as collaborators from Singapore's Duke-NUS Medical School and Canada's University of British Columbia. Their study revealed a 22 per cent decrease in postnatal depressive symptoms among mothers and a 33 per cent reduction in mothers reporting that baby care interfered with their emotional well-being.

Significant benefits

Professor Quan Jianchao, Clinical Assistant Professor in the School of Public Health, and senior author of the study, said: "Even this modest change in policy, an

additional four weeks of paid leave, was associated with significant mental health benefits. Policymakers should consider extending paid maternity leave to international norms to improve mental health among working mothers and to support workforce retention."

For the study, the team used the policy enactment as an observational natural experiment to assess the mental health implications of this policy change on probable postnatal depression - that is, Edinburgh Postnatal Depression Scale (EPDS) scores of 10 or higher - and postpartum emotional well-being.

"The EPDS is widely clinically used and has been validated in Hong Kong," explained Professor Quan. "The reason we use the term 'potential' in our findings is that this is a screening tool. Postnatal depression (or indeed depression) is a clinical diagnosis - it can only be diagnosed by a physician, as opposed to diabetes or hypertension that is diagnosed by a laboratory test or measurement."

Using an opportunistic observational study design, the team recruited 1,414 survey respondents who had given birth either before the policy implementation during August to December 2020, or after the implementation, between December 2020 and July 2022. Participants had an average age of 32, for most this was their first child, and the majority had skilled occupations.

"Our results show that the policy was associated with a 22 per cent decrease in mothers experiencing postnatal depressive symptoms and a 33 per cent decrease in postpartum emotional well-being interference," said Professor Quan. "This was somewhat surprising given the modest length of leave extension, though it is hard to attribute the causality definitely in these natural experiments."

The study comes at a time of demographic challenges in East Asia when birth rates are falling, the proportion of elderly in populations is growing and many governments are seeking ways to encourage young people to have children.

In Hong Kong, only 52 per cent of women currently participate in the workforce, compared to 64 per cent of men, so retaining female employees is important to address the labour shortage. Women of child-bearing age (25-34 years old) have the highest workforce participation rate (80 per cent), making them the most likely to benefit from an optimal maternity leave policy.

Postnatal depression is a serious mental disorder which can affect mothers up to a year after childbirth. About 30 per cent of new mothers in Hong Kong experience postnatal depression, which is markedly higher than the

"Policymakers should consider extending paid maternity leave to international norms to improve mental health among working mothers and to support workforce retention."

Professor Quan Jianchao

global average of 18 per cent. The figure for Mainland China is 14 per cent and just 3 per cent in Singapore. Maternity leave policy could have important implications for public health, including improved maternal mental and physical health and higher breastfeeding rates.

18 weeks leave

"The International Labour Organization, which is part of the United Nations, actually mandates a minimum maternity leave period of 14 weeks and recommends increasing it to at least 18 weeks to ensure an adequate rest and recovery time for the mother," said Professor Quan. "In 2021, 52 countries met or exceeded this 18-week standard. The US is a notable exception/ outlier with no nationally mandated paid leave.

"Longer periods and more flexible arrangements such as shared parental leave (rather than separate maternity/ paternity) can also be considered. Many countries offer shared parental leave - Singapore announced on their National Day in August 2024 an additional 10 weeks of government-paid shared leave to bring it up to 30 weeks by 2026. Flexibility should be beneficial as people tend to make the best decisions for their circumstances but notably, men have higher labour force participation and higher wages so the costs may be higher."

Professor Quan pointed out that the Hong Kong Government has launched other family-friendly initiatives too, for example, a Newborn Baby Bonus.

The research findings were published in the healthcare journal *Health Affairs*.

INVISIBLE ENGINEERS

New findings highlight the critical role of invertebrates in breaking down forest litter and thereby helping sustain carbon and nutrient cycling.



Myrriad soil organisms beneath our feet play a vital role in supporting ecosystem services and sustaining our lives, but they often receive less attention from scientists and the public compared to the more visible ‘star’ species. A new study has revealed just how crucial invertebrates such as termites are, particularly in the world’s tropical and subtropical areas.

“Invertebrates are responsible for about a third of global forest leaf litter decomposition,” said PhD candidate Ms Zeng Xiaoyi from the School of Biological Sciences,

who led the study supervised by Professor Louise A Ashton. “In particular, those found in tropical and subtropical forests have a more substantial impact on this process compared to their counterparts in forests outside of these regions. As significant ecosystem engineers in the tropics and subtropics, termites play a crucial role in these decomposition processes.”

The team conducted a comprehensive literature search on databases like Web of Science and ScienceDirect, and initially yielded 2,278 articles. They finally included a

total of 60 articles, encompassing 476 observations across 93 study sites from all continents except for the polar regions. “Fortunately, the extensive work on the Global Termite Diversity Map by our collaborators – Dr Joel S Woon from the University of Liverpool and Dr Paul Eggleton from the Natural History Museum in London – provided us with an opportunity to analyse the relationship between termite diversity and the effect of invertebrates on forest litter decomposition,” said Ms Zeng.

The HKU team’s study showed that invertebrates contributed 31 per cent to global forest litter decomposition, and in tropical and subtropical forests their contribution was 1.4 times higher than in temperate and boreal forests. They also found that termites – often considered pests to humans – contributed to the greater decomposition in tropical and subtropical forests.

As well as termites, detritivore invertebrates such as earthworms, woodlice, and millipedes directly consume plant litter, and many invertebrates indirectly drive litter decomposition. “For instance, the activity of detritivores leads to litter fragmentation, thereby increasing the exposure of leaf litter to microbial decomposers,” said Ms Zeng. “Other invertebrates, including beetles, ants, mites and springtails, influence decomposition processes by mediating soil food webs and affecting soil physical and chemical properties, such as moisture and temperature.”

Sampling bias

Professor Ashton explained that one of the reasons the role of such invertebrates in the subtropics has often been overlooked is due to regional sampling bias. “There is a bias in ecology towards the temperate zone,” she said, adding that a recent study has also observed a significant taxonomic bias in biodiversity conservation research favouring vertebrates, which constitute 89 per cent of the most-

studied species, while invertebrates remain markedly underrepresented.

“However, these types of taxonomic bias have become better recognised recently and there are efforts to better understand the ecology of the tropics,” said Professor Ashton.

It is hoped the new findings can be used to improve the accuracy of Earth System Models in future. “While existing biogeochemical models typically incorporate climate, vegetation and soil characteristics to predict carbon and nitrogen turnover in terrestrial ecosystems, we are now advocating the inclusion

“Policies and scientific initiatives for soil animal conservation need to be more widespread. We anticipate that our study will reveal to the public the immense power of these ‘invisible’ creatures.”

Ms Zeng Xiaoyi

of invertebrates for both their direct contributions and their indirect effects stemming from their interactions with microbes, vertebrates and environmental variables,” said Ms Zeng.

“Secondly, we advocate for consideration of the regional variation that our study has revealed so as to enhance the precision of model forecasts. Finally, we suggest introducing invertebrates into Earth System Models by developing global invertebrate databases through combining traditional taxonomic and molecular approaches.”

Ecosystem services

The findings also highlight the importance of conserving invertebrate biodiversity and the valuable ecosystem services they provide. “The decline of many invertebrates, often considered as crop pests [for example, termites], is alarming due to the overuse of pesticides, further emphasising the need for their conservation,” said Ms Zeng.

“Policies and scientific initiatives for soil animal conservation need to be more widespread. We anticipate that our study will reveal to the public the immense power of these ‘invisible’ creatures. They are not only an integral part of nature but also a group that urgently requires our protection and conservation efforts.”

Moving their focus to the role of the decomposition process as the primary source of available nutrients for plants, the team will next investigate how invertebrates mediate plant growth through this pathway. They aim to employ stable isotope technology to track the nitrogen flux from leaf litter to living plant tissues so as to determine whether such knock-on effects vary across different climatic regions. Implementing this approach will enable them to identify the specific roles that invertebrates play in vegetation development and how these roles are influenced by climatic factors.

THE BIGGER PICTURE

Using an innovative combination of the Sentinel-2 satellite mission and its dynamic time-series capabilities, along with phenological observations, biological scientists have made a promising advancement in mapping plant functional traits from space.

“Our approach is novel in that we have demonstrated, for the first time, that time-series satellite-based multispectral data is nearly as effective as drone/airborne hyperspectral imaging for high-throughput foliar trait monitoring,” said Professor Wu Jin from the School of Biological Sciences, who led the international team of researchers.

Utilising high-resolution imagery from the Sentinel-2 satellite, which captures multispectral data at weekly intervals with a 10-metre resolution, the team recorded the reflections of light from plant leaves, and gained valuable insights into the physical and biochemical properties of the vegetation. They then compared their observations to the timing of phenological (that is, plant life cycle) events.

“By integrating the data from satellite imagery and phenological observations, the team gained comprehensive information about plant functional traits across high dimensions,” said Professor Wu. “Further, the free cost and global availability of the input data we used indicates that our successful technique provides the scientific community with a completely novel, freely accessed, and large-scale foliar trait data source, revolutionising conventional ways of monitoring Earth’s surface.”

Conventionally, scientists have relied on either field-based methods or drone/airborne hyperspectral imaging systems for plant functional traits monitoring. Field-based approaches are often time-consuming, resource-expensive, labour-intensive, and difficult to scale up to regional, continental, or global levels.

‘Foliar traits’ refer to the key characteristics or features of a plant’s foliage such as leaf morphology, colour, chemical composition and photosynthetic rates, which can reveal a lot about how a plant grows, how it uses water and nutrients, how it photosynthesises and how it might respond to different environmental conditions like drought

or high temperatures. In other words, these ‘essential foliar traits’ provide important information about a plant’s health, growth, and overall function in an ecosystem.

In addition to the main breakthrough, the team also found evidence suggesting that the leaf economics spectrum (LES) may be the underlying mechanism driving this technical success.

Strong correlation

“In our research, we found that the satellite-derived seasonal amplitude of the vegetation index, which can be viewed as a proxy for ecosystem-scale leaf turnover rate or leaf lifespan, strongly correlates with multiple essential plant traits of interest,” said Professor Wu. “This finding aligns with previous understandings of the LES theory. Moreover, in our final model that connects satellite-based time-series multispectral data for foliar trait prediction, we observed a significant role for the satellite-derived seasonal amplitude of the vegetation

“We have demonstrated, for the first time, that time-series satellite-based multispectral data is nearly as effective as drone/airborne hyperspectral imaging for high-throughput foliar trait monitoring.”

Professor Wu Jin

index, although its importance varies considerably among traits.”

The new regional plant trait dataset generated by this novel approach will provide scientists with a wealth of information about plant characteristics across a large geographical area, information which could be used to inform conservation strategies and efforts to restore or rehabilitate damaged ecosystems. Additionally, information on plant traits can also be used to model ecosystem processes, such as nutrient cycling and carbon sequestration, processes that play a critical role in mitigating climate change by removing carbon dioxide from the atmosphere.

“Through understanding how different plant traits influence these processes, scientists can develop strategies to enhance these natural climate solutions,” said Professor Wu. “The dataset could also help in predicting

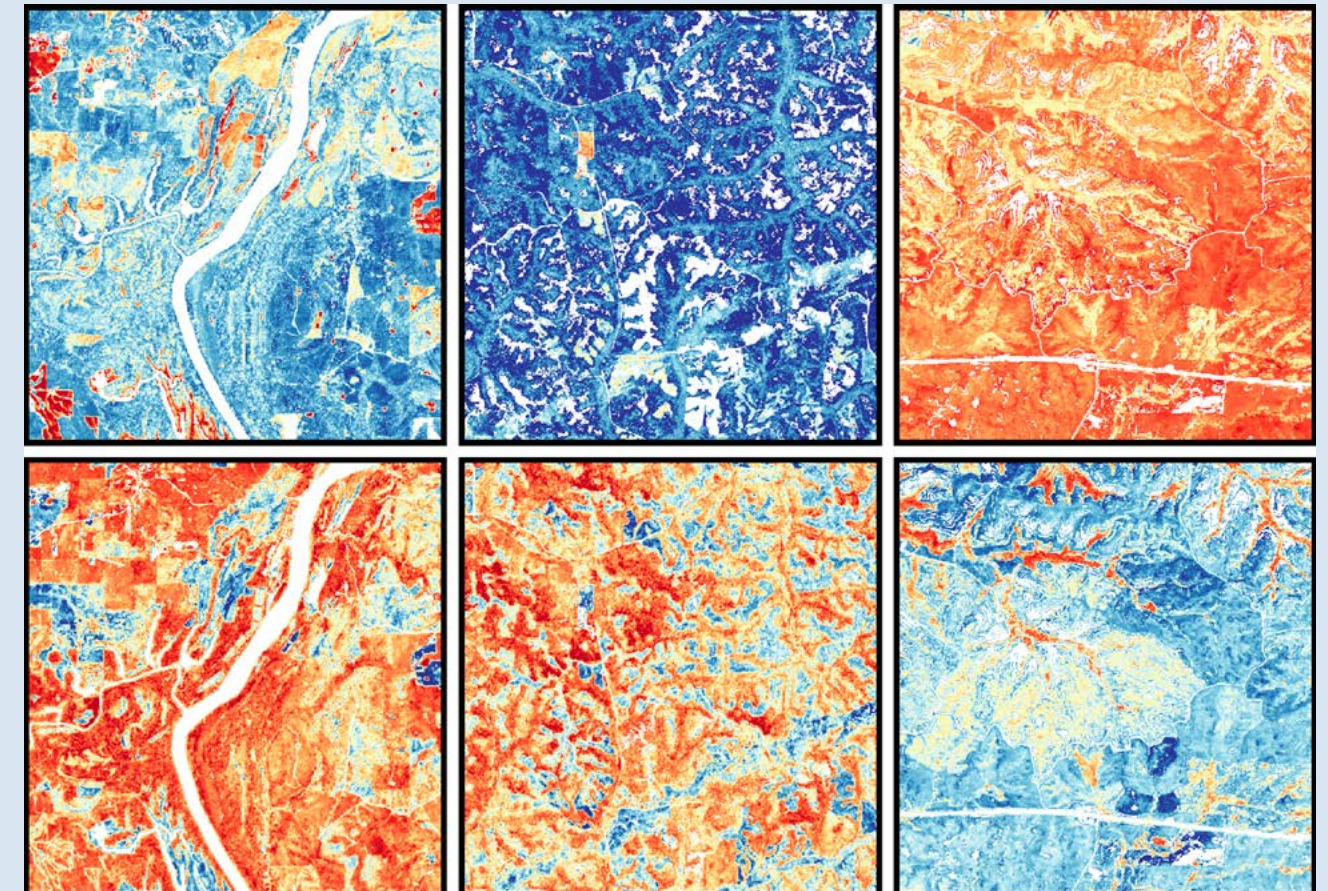
the spread of invasive species or the potential impact of pests and diseases on local vegetation, which can have significant implications for biodiversity, agriculture, and local economies. In essence, this new regional plant trait dataset equips scientists with essential data to inspire and generate novel knowledge needed to tackle environmental problems more effectively and design more sustainable landscapes for the future.”

The initial research using Sentinel-2 was done over ecosystem sites across the US, but in theory, the approach can be applied to any region across the globe. “We began our research in the US because readily available data allowed us to verify and refine our approach effectively,” said Professor Wu. “Our next step involves conducting extensive ground truth sampling in China and other regions worldwide. By doing so, we aim to demonstrate the versatility

and adaptability of our methodology. Ultimately, our objective is to make our approach globally applicable.

“By gathering data and validating our approach in various locations around the world, we can contribute to a more comprehensive understanding of ecosystem health, resilience, and vulnerability. This, in turn, can help inform effective strategies for conservation and sustainable management of ecosystems across the planet.”

The team also aim to build upon the technical advances of their current research, which was published in *Remote Sensing of Environment*, and move forward multiple further research foci that best leverage this technical advance. “Plant traits provide crucial baseline information to further guide effective nature-based solutions for climate change mitigation,” said Professor Wu.



High-resolution satellite-based maps with multispectral data.

STAR QUALITY

Astrophysicists develop new proposals for studying the earliest stars in the universe, uncovering secrets of its origin and offering deeper insights into the incredible journey from the primordial cosmos to the world we live in today.

First-generation stars, referred to as Population III (or Pop III) stars, are believed to be the first objects that formed out of the pristine gas a few hundred million years after the Big Bang. Direct detection of Pop III stars has never been possible but a team from HKU have discovered a novel method for hunting them which focusses on tidal disruption events.

It was the recent discovery of several galaxies and supermassive black holes in the very early phase of our universe that prompted the Department of Physics researchers - led by Professor Jane Dai Lixin, her postdoctoral fellow Dr Rudrani Kar Chowdhury and PhD student Ms Janet Chang - to explore the properties of the first stars.

"The discovery led us to think about the population of stars in those early galaxies and their fate in the event of close interaction with the associated black holes," said Dr Kar Chowdhury. "Theoretical studies suggest that the first stars in these galaxies had very different properties from the sun-like stars that we find around us in the local universe."

Knowing more about Pop III stars is important to the understanding of the complex distribution of gas, stars and galaxies in the later universe. "In the very early phase of the universe when Pop III stars were formed, only hydrogen and helium were present all over the universe. Hence, the main composition of these stars was also hydrogen and helium," explained Dr Kar Chowdhury.

"All other heavier elements that we find around us today started to form in the cores of the Pop III stars by means of nuclear fusion. Then when they ended their lives with explosions, called supernovae, these elements were distributed in the surrounding medium, thereby enriching our universe with all different types of elements. Afterwards, next-generation stars like our own sun started to form from the gas enriched with heavy elements. So, without Pop III stars, it would not have been possible to form our own sun and our existence on Earth."

The researchers' theory proposes that if a Pop III star enters into the vicinity of a massive black hole, it can be torn

apart into pieces by tidal force - an event known as a tidal disruption event.

Luminous flare

"After a tidal disruption event, some fraction of the disrupted stellar debris cannot escape the huge gravitational pull of the black hole and gets eaten by it," said Professor Dai. "Then by Einstein's general relativity theory, mass is energy, and part of the energy is used to form a very luminous flare. This flare can shine across billions of light years - it even outshines all the stars in the galaxy hosting the massive black hole. So, we can observe this very bright flare, and decode the star's information by analysing the properties of the flare."

"We further demonstrate that a large fraction of the flare emissions is redshifted to infrared wavelengths, and we believe that with our proposed technique and the identifying properties of Pop III stars, observers will be able to detect them using the current and upcoming powerful telescopes."

These are the existing James Webb Space Telescope and the upcoming Nancy Grace Roman Space Telescope (Roman), both of which are highly sophisticated infrared instruments which can peer into the very early epoch of the universe. Roman is scheduled to launch in 2027, and scientists are already planning different survey strategies for it. "We expect that a few dozen of these events will be detected by Roman with proper observation strategy," said Ms Chang.

Transient exploration

One such mission with Roman is Transient Exploration in the high latitude Wide Area Survey (TEWAS). Professor Dai and Dr Kar Chowdhury are both part of the TEWAS collaboration and will have immediate access to the data when the survey starts.

The researchers' proposal for understanding Pop III stars was published in *The Astrophysical Journal Letters*, and

"Understanding Population III stars is important to understanding the distribution of gas, stars, galaxies and black holes in the local universe."

Dr Rudrani Kar Chowdhury

has received wide acknowledgement from the international astronomy community.

Dr Kar Chowdhury said: "Understanding Pop III stars is important to understanding the distribution of gas, stars, galaxies and black holes in the local universe. Moreover, we can be confident about the existence of massive black holes at the very early stages of the universe that are otherwise too dim to detect directly."

"Additionally, Pop III stars are much heavier than the next-generation stars. Hence, astronomers believe that a fraction of these first stars ends up being heavy black holes in the early universe. These seed black holes eventually grow in mass to become supermassive black holes which are present at the centres of most of the galaxies in the local universe, including our very own Milky Way."

"Without a proper understanding of the Pop III stars, our knowledge about the local universe will be incomplete. This work has opened a new window to look for Pop III stars and lots can be done in this field in future," she concluded.

A conceptual image of a Population III star tidally disrupted and feeding a massive black hole in the early universe. (Courtesy of Jeff Streever from the Croucher Foundation)

PET PROJECT

Four-legged robots have a problem. What happens when one of their legs breaks or stops operating? Research by Professor Lu Peng is providing a solution that is also taking these robots further along the path to being truly interactive.

Professor Lu Peng of the Department of Mechanical Engineering is an expert in drones and ground robots. But after having children, he began to wonder how he could apply his skills to improve the life of his children. Why not a robopet?

Robots face similar control challenges to drones, but they could potentially be developed into a four-legged pet and monitor for his children, and have many other applications besides.

Since joining HKU in 2020, Professor Lu's laboratory has made good progress in that direction. He and his team have overcome a significant mobility challenge for four-legged - or quadrupedal - robots and are now focussed on enhancing artificial intelligence (AI) for these machines to make them more autonomous and intelligent.

"Our ultimate goal is to make a robot that can behave like a real dog and be interactive and accompany children and the elderly. But first, it is absolutely mandatory that it can

work in various terrains and environments. Otherwise, if you take it outside, it would fall all the time. Even in the home, it would collide with furniture," Professor Lu said.

Moreover, the robot needs to be able to continue operating when something goes wrong. That is where his research has made important contributions.

Fall detection

Professor Lu and his team decided to build a quadrupedal robot from scratch, a process that was difficult and time-consuming. They decided to use electrical motors in their robots, rather than hydraulic actuators which he previously worked on. Hydraulic actuators can generate much larger force and power. However, ensuring that they perform with a high degree of precision remains challenging. In contrast, the performance of electrical motors has improved significantly and there is growing interest in their use because they are more precise and quiet.

Nonetheless, walking robots operate on 12 electrical motors so it is easy to imagine mishaps and malfunctions as they move. The team focussed on developing an algorithm to address these mobility challenges and they made quick progress. First, they developed an algorithm that could detect and address motor failures autonomously, so the robot could keep moving when one of its legs fails, without falling down. And second, they designed a framework that could be applied to any kind of quadrupedal robot, no matter its shape, length, mass or other features.

"There are many different types of quadrupedal robots and it is very time-consuming to design controllers for each type. Now we have this framework that can be applied to any morphology," Professor Lu said.

With the locomotion challenge addressed, the team have turned to improving the agility of quadrupedal robots, such as enabling them to jump in any

"Our ultimate goal is to make a robot that can behave like a real dog and be interactive and accompany children and the elderly."

Professor Lu Peng



A quadrupedal robodog developed by Professor Lu's laboratory.

direction, and getting them to imitate the behaviour of another robot or animal. This work is nearing completion. They are also undertaking the more difficult task of embodying AI in robots.

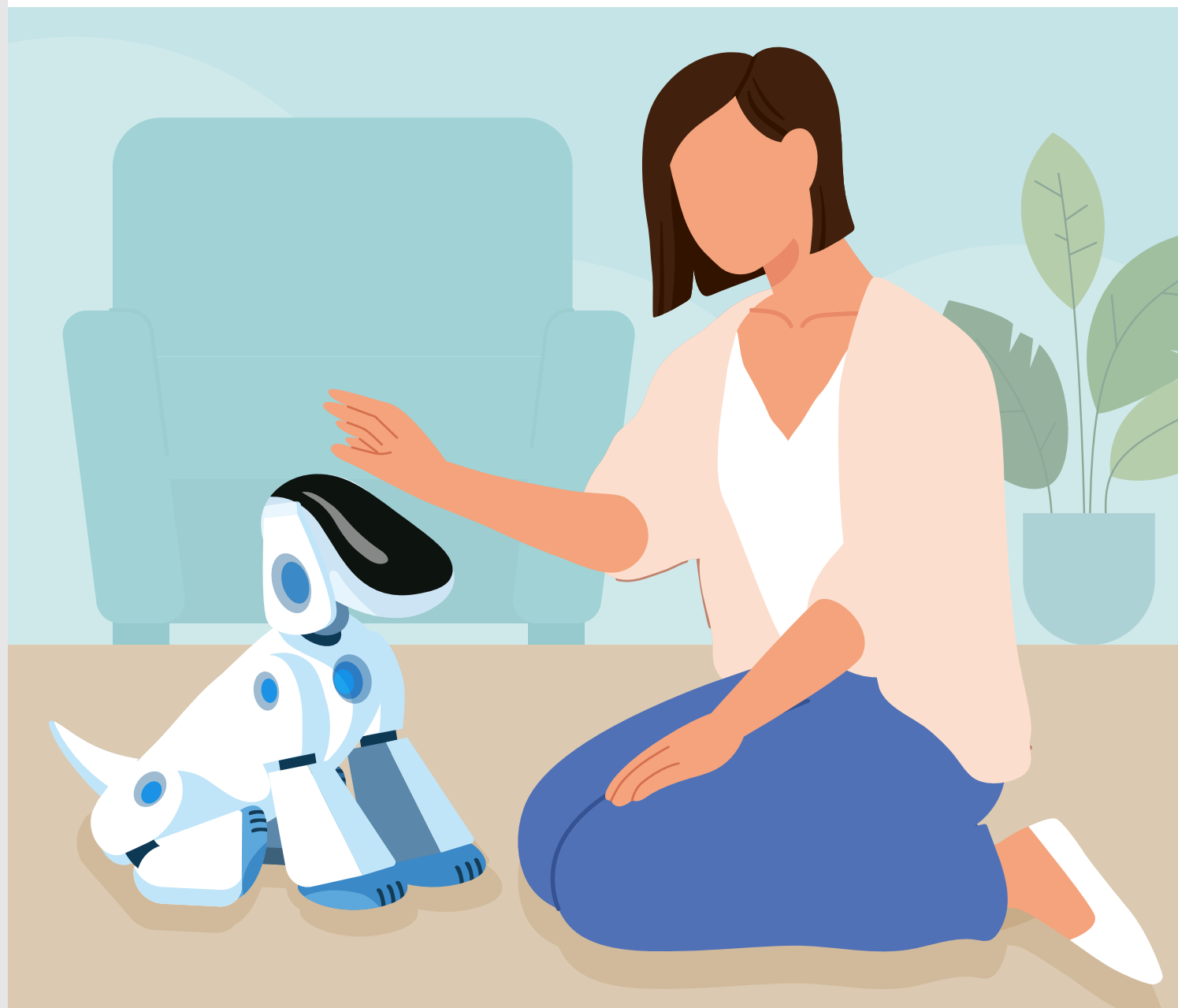
Grand challenge

Currently, robots are not intelligent - they have preset movements, such as turning or dancing, but they are not interactive. This can make them ultimately boring as pets or companions because their functions are limited.

"We want to take the next step to enhance the robot's autonomy so it can execute tasks and make decisions completely on its own. It is a sort of embodied AI. For instance, you could ask it to get a beer for you and it would process the order, make decisions and perform the task completely on its own," Professor Lu said.

"Enhancing the robot's intelligence is a grand challenge. It takes a lot of manpower, especially if you want it to do any kind of task. The research and industry are focussed on this now, and I think my team will make some progress soon."

This is not just in the interest of fun because a robodog or other animal would have benefits for both people and industry, he said. While children and the elderly could have a companion that could respond to them and protect them, for instance by sending out an alarm if they fall or get injured. The robots could also serve as guide dogs for the blind or be used in policing or in factory inspections. "Ultimately, we want to make a robot that can behave like a real dog. This could probably be achieved in the near future," Professor Lu added.



WHEN FOREIGN GOVERNMENTS MEDDLE IN ELECTIONS

Both the US and Russia have strong track records of meddling in foreign elections, including each other's. In a year when billions of people are voting, Professor Dov Levin offers a timely overview of the methods and consequences of such interventions.



"The problem is even somewhat more common now because there are more countries having relatively competitive elections."

Done because it works

Governments' interference in elections frequently works, he said. Professor Levin's research has found the assisted side gets an average three per cent bump over competitors, which is enough in many cases to swing elections.

Perhaps the most infamous modern case was Russia's intervention in the 2016 US election. It was meant to be secret. Russia spread disinformation about presidential candidate Hillary Clinton and hacked the Democratic National Committee's website, which turned up damaging information about Clinton. The latter was handed over to Wikileaks anonymously, which then published it on its website. Although the Russian source was later discovered, the desired impact on the US election was achieved.

"Surveys showed that people who checked those documents on Wikileaks were more likely to vote for Donald Trump and an analysis



A map of US and USSR/Russian partisan electoral interventions between 1946 and 2000.

of Google keyword searches found that many people in swing states checked these leaks. The swing was enough to give Trump an electoral college victory," he said.

That case was unusual because overt, public interference tends to be more successful than the covert, dirty-tricks kind, especially when the covert interference is exposed. Foreign powers may make public statements indicating who they would prefer in power alongside either threats – such as cuts to funding or halts to treaties – or sweeteners, such as the promise of more funding.

Surveys show that the citizens of intervening countries, such as the US, have no problem with electoral interventions by their own government elsewhere, even if their own country has been a target. Yet there are consequences.

Consequences for democracy

Electoral interference can increase domestic terrorism, which Professor Levin determined by combining data on interventions and domestic terrorism and controlling for other factors that affect terrorism. He cited the example of Italy in 1976, when the US publicly threatened to kick the country out of the North Atlantic Treaty Organization (NATO) if the

Communist Party won. The favoured Christian Democrats narrowly won, but people lost faith in the system and domestic terrorism increased by more than 50 per cent as a result.

The US also intervened in Russian elections in 1996 to successfully support Boris Yeltsin, an erratic alcoholic who had overseen an economic collapse, against a reformed Communist Party. That ultimately led to the rise of Vladimir Putin. Both countries are also known to have intervened in the 2004 Ukrainian election (the US-backed side won) and in numerous other elections around the world. During the 2019 UK elections, Donald Trump said the UK's trade agreements with the US would go more smoothly if Boris Johnson was elected.

When such interventions do not lead to domestic terrorism, they can nonetheless weaken democracy. Professor Levin found covert intervention by foreign states could increase corruption in the target country, thereby undermining public support for democracy and increasing support for leaders who do not care about democracy.

And if an intervention fails? Professor Levin found the intervened country usually does not retaliate and will rebuild relations with the intervening power. "Most times, they let bygones be bygones," he said.

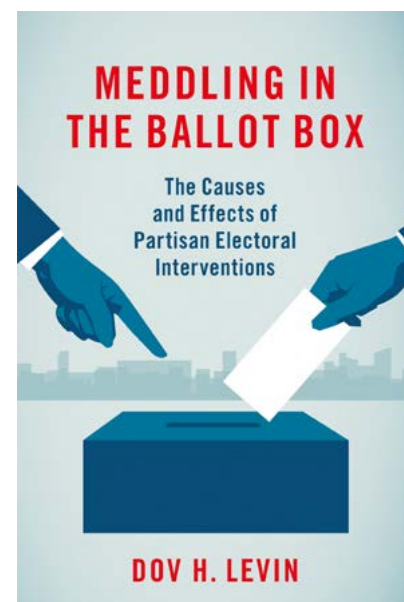
When Professor Dov Levin of the Department of Politics and Public Administration was embarking on his PhD at the University of California, Los Angeles in the early 2010s, he picked up a book from the library that would open a whole new field to him. The book concerned the 1948 Italian election, when the US intervened overtly and covertly to bring the Christian Democrats to power. To his surprise, Professor Levin discovered very little other research had been done on such foreign meddling in elections. That discovery became an opportunity and he is now one of the leaders in this growing field.

His book *Meddling in the Ballot Box: The Causes and Effects of Partisan*

Electoral Interventions, won the 2021 Robert L. Jervis and Paul W. Schroeder Best Book Award by the American Political Science Association, and is part of his ongoing research on interventions by the US and Russia, easily the most prolific meddlers in the world.

Drawing on multiple sources from the US, Russia and elsewhere, such as archival documents, newspaper articles and the memoirs of former Russian and US spies, Professor Levin has identified more than 180 post-World War II election interventions.

"I was surprised just how common such interventions have been and yet until the last decade, scholars largely ignored them," he said.



Meddling in the Ballot Box: The Causes and Effects of Partisan Electoral Interventions was published by Oxford University Press in 2020.



EASING CLINICAL NERVES

A new learning platform using Vicarious Learning Dialogue Videos (VLDV) in paediatric dentistry is helping facilitate clinical skill teaching through a flipped classroom approach.

Paediatric dentistry can be stressful for both patient and dentist – many children experience dental fear and anxiety, and providing dental care for youngsters can be particularly nerve-racking for undergraduate students.

To help students cope with the extra pressure of paediatric care, Professor Phoebe Lam and her team from the Faculty of Dentistry have developed e-learning and vicarious learning methods. “Our students, who are part of Generation Z, prefer to learn using e-learning methods,” she explained. “Vicarious learning through dialogue videos is an ideal approach for them as it allows for self-paced learning in a comfortable environment.”

The method involves observing and imitating the behaviours, actions and outcomes of others, such as teachers and peers, to enhance decision-making and psychomotor skills, consolidate knowledge, and make exploratory efforts. It enables students to develop and master clinical skills, helps prepare them for their own clinical practice, and increases their confidence in treating children.

“To develop the VLDV database, we recorded clinical videos of BDS [Bachelor of Dental Surgery] students as they first started treating paediatric patients. Consent was

obtained from the students and the parents,” said Professor Lam. “The VLDV record authentic treatment situations of undergraduates with their paediatric patients, focussing on chairside one-to-one learning dialogues when a teacher probes students’ understanding and leads them to solutions for problems and builds their clinical decision-making process.”

Common treatments

The content of the videos was based on the dentistry course syllabus, focussing on common operative treatments students will be performing. The videos were then uploaded to an online platform for them to watch before simulation classes and to discuss in group sessions. A crucial element is the inclusion of novel key decision point moments that require students watching to engage with important questions.

The programme also uses a flipped classroom approach – a teaching method where students watch pre-recorded lectures or videos before attending class. Then the in-class time can be used for higher-order levels of thinking, like discussions, problem-solving, and hands-on preparation on typodonts – the oral cavity model, upon which dentistry students practise.

“This approach allows students to learn at their own pace and better prepare themselves for the learning activities coming up,” said Professor Lam. “In the past, we used one-third of the time as didactic lecture and found students did not have enough time to process what they had to learn, which often led to confusion during tooth preparation on typodonts.

“However, with the flipped classroom approach, we move all didactic lectures to pre-course learning and start every class with a quiz. We discuss the answers and scenarios with students before moving on to tooth preparation. This way, they already have a greater understanding of the hands-on practice, are more engaged during class discussions and are better prepared for the hands-on activities.”

Since introducing the VLDV, the teachers have already seen an improvement in the quality of work students produce and a reduction in the time taken to complete tasks. Out of 13 videos uploaded on the online video platform – which is called Video Vox – 92.1 per cent (70 out of 76) of BDS students new to the clinic watched at least one video. The most viewed videos are about basic techniques, such as rubber dam isolation and cavity preparation.

Students have said they are utilising the VLDV for revision, skill refinement and preparation for assessments, often studying them prior to performing procedures in the clinic. They have found that vicarious

“Vicarious learning is particularly valuable in medical and dental education, where mistakes can have severe consequences for patients.”

Professor Phoebe Lam

learning through VLDV stimulates critical thinking, helps prevent errors and enhances self-confidence.

Realistic situation

“More than 30 students further participated in focus group interviews to reflect on the VLDV and evaluate their usefulness in learning,” said Professor Lam. The students described how the videos provided a more realistic clinical situation and helped them visualise what could not be simulated in the laboratory. They also shared that the VLDV helped supplement content that was not covered during their simulation laboratory. For example, when learning about pulpotomy, there was no blood in the simulation laboratory, but the VLDV taught them how to handle bleeding.

Additionally, some students noted that the VLDV helped them reduce mistakes by allowing them to see and learn from the errors made by the student operator in the video. “It’s a good lesson to learn from this happening,” one student remarked, and another said: “It’s a common mistake that I try to avoid in my own clinical practice.” Overall, the students felt that the VLDV were a valuable resource for enhancing their learning and improving their clinical skills.

“The platform has helped us create a more effective learning environment for our students,” said Professor Lam. “Vicarious learning is particularly valuable in medical and dental education, where mistakes can have severe consequences for patients. This approach enables students to learn from the experiences of others and avoid potential errors – ultimately benefitting patient care.”

A YEAR AT THE MUSEUM

The new 12-month Master of Museum Studies programme is unique in being based in a museum rather than a classroom – HKU's own University Museum and Art Gallery (UMAG). Its first cohort is graduating amid strong demand for cultural experts in the region.



Classes of the Master of Museum Studies programme are held inside of the University Museum and Art Gallery.

“This programme differs from other programmes in that it is really museum-initiated and museum-based, so our students have access to objects and galleries here.”

Dr Florian Knothe

at HKU come from varied backgrounds and they enriched our learning experience with different viewpoints on museum operations, art history, digitalisation, education and market dynamics.”

Mia Zhang Xinyi is an artist herself who wanted to understand how to better engage audiences and archive and display works. “The most memorable part was participating in the exhibition planning and curation for a workshop jointly organised by UMAG and the City University of Hong Kong. Our professors allowed us to truly enter the industry circle and apply our classroom knowledge in real-world contexts.”

For Dr Knothe, the programme fulfils his long-held goal of making UMAG a teaching museum. “Since I arrived in 2013, we have taught an undergraduate course and public programmes. During the COVID-19 pandemic, we developed an online teaching platform for secondary school children. Now, with the postgraduate degree, we have young adults with us every day. We’ve come a long way. Almost everybody at the museum is involved in teaching in one way or another,” he said.



Rachel Yan (third from right) with her internship co-workers during the 2024 Art Basel Hong Kong show week.

Hong Kong may be a financial centre, but it is increasingly a cultural one, too. It is the only Asian site for Art Basel; the M+ and Palace Museums both opened within the last four years; and there are growing numbers of public and private art events. With that activity has come a demand for professionals trained in managing and curating art exhibitions. HKU's new Master of Museum Studies, where classes are held in UMAG, is the only local programme to offer that training.

UMAG Director and part-time Associate Professor in the School of Humanities, Dr Florian Knothe, spearheaded the programme with the Faculty of Arts.

“This programme differs from other programmes in that it is really museum-initiated and museum-based, so our students have access to objects and galleries here. We have structured it more like an MBA [Master of Business Administration]

programme where half of the teachers are also professionals in the field and half are from academia,” he said.

Students learn from both academic literature and their teachers’ experience in the field. “For example, presenting art collections online, with digital photography and other resources, seems an easy option, but behind the scenes, it is very costly for museums – you need object handlers, a photographer, a collections manager to orchestrate the whole thing and researchers to provide information on each object. We try to bring these richer perspectives to our students,” he said.

East and West perspectives

The classes also explore contentious issues such as the impact on museums of social movements like Black Lives Matter and of climate change. The question of how to make museums more accessible is

also raised in the context of East-West differences.

“A lot has been done in the West to include minorities by providing exhibition tours in different languages and for those with physical disabilities. This area is a lot less developed in Asia so we speak to students about how hurdles are jumped or how systems could be put in place to be more inclusive here,” Dr Knothe said.

The first cohort of 47 students has just completed the year-long programme of a core course covering basic administration and curation, electives, and a credit-bearing internship over the summer. Students must also produce a dissertation.

Dr Knothe said the response to requests for internships showed strong demand for trained museum professionals. Government and private museums in Hong Kong, galleries and auction houses, and venues in the US and Mainland China all offered

spots and some wanted to employ students right away (they have to complete the credit-bearing internship first).

“It was an overwhelming response. Our partners said: ‘This is great, we finally have this programme in Hong Kong.’ We know that there is a growing museum industry that has been happening in Mainland China for a while and we have witnessed that here in Hong Kong. This is an opportunity for museums to gain experienced museum staff,” said Dr Knothe.

Fulfilling a long-held goal

The students themselves are also enthusiastic about the programme. Rachel Yan had a background in advertising but wanted to develop qualifications related to her interest in art and culture. “My experience with the programme has been very satisfying. The professors were supportive and I gained practical experience through a six-month, part-time internship with the Art Basel Hong Kong’s Operations Team, in addition to my summer internship. I feel I have been prepared to becoming an art and culture practitioner,” she said.

Li Hao had studied history previously and wanted to learn how to make it more interactive for the public, from both China and international perspectives. “My expectations have largely been met. The faculty



CLIME AND TIDE

In the glare of a Hong Kong summer, the temperature at the intertidal zone – where the land meets the sea – is really heating up. Researchers at the Swire Institute of Marine Science (SWIMS) are conducting long-term studies across the region to find out how the marine life is coping.

“At low tide, marine organisms are exposed to thermal extremes,” said Professor Gray A Williams, researcher at SWIMS and Professor in the School of Biological Sciences. “The rocks can heat up from around 28 degrees Celsius, which is when they are in seawater, to over 55 degrees Celsius when the tide goes out and this can happen in two hours. The marine creatures living on the rock heat up and start to lose water – basically, they’re cooking on the hot rocks.”

“This puts a huge physiological stress on these organisms, and we’re interested in the maximum heat they can tolerate, and asking what is the potential to increase that tolerance? How do they actually manage and cope with thermal stress?”

The study is not confined to Hong Kong’s shores: SWIMS has been collaborating with researchers from Singapore to Taiwan for nearly 10 years, looking at how high-shore snails use metabolic depression to combat high temperatures.

“A lot of data is building up now through these large-scale projects, linking different researchers throughout the region and also introducing these approaches to other areas such as South Africa, where we have deployed data loggers to measure shore temperatures and also recorded limpet thermal tolerance,” said Professor Williams.

“There is an assumption that places nearer the equator are the hottest, but we are finding that this is not necessarily so along the seashore. The pattern is not

latitudinal but varies according to local conditions such as the time of day that the tide is low.”

The main focus of the research is on extreme high-shore organisms such as oysters, limpets and small snails called periwinkles which exist at the very top of the tide, “almost on land but splashed by the sea”.

“Our researchers are discovering that each of the three organisms deals with the heat in a different way,” said Professor Williams. “We call it fight or flight responses – the snails can move so one of their choices is flight, to move away from the heat stress and hide in cooler areas.

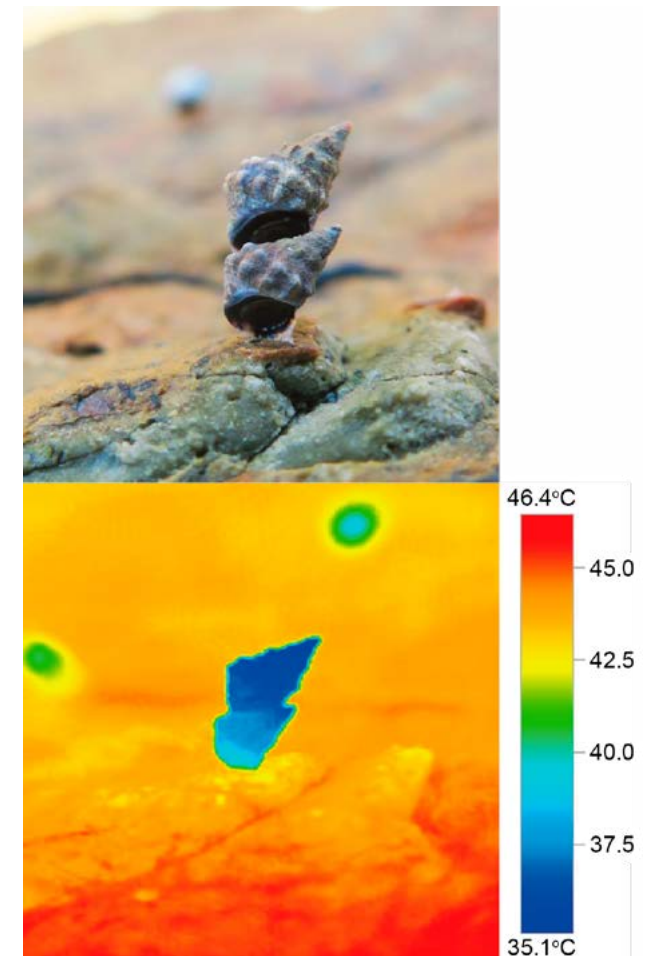
“Oysters are unable to move and limpets have limited movement, so their methods to beat the heat are different. Oysters form dense aggregations which we think helps them stay cool, and like the snails they can depress their metabolism during the hottest times, lowering their heart rates to save energy.

“Limpets are between the two, in that they can move but only do so in the winter when it is cool. To survive the summer, they basically shut themselves down for three months and go into aestivation – which is the summer equivalent of hibernation in winter – bears do it when the weather turns cold and limpets do it when the weather turns hot.”

Snail towers

Dr Sarah Lau, a researcher who studied the physiological and behavioural adaptations of periwinkles as part of the SWIMS research, said that, as well as flight, the snails employ simple fight behaviours to stay alive by regulating their temperature where they live, such as raising their bodies from the rocks and standing on top of each other to form ‘snail towers’.

“By doing this they are effectively reducing the amount of contact they have with the hot rocks,” said Dr Lau. “And then they’re also exposing themselves to moving



Towering – climbing and settling on others to form a stack – has been shown to be an effective strategy to mitigate heat stress.

air currents so that they can be cooled down more effectively. They can lower their body temperature from the surrounding rock by up to 10 degrees Celsius doing this, which can mean the difference between survival or death.”

Metabolic depression is another crucial survival trait for some intertidal species. Some periwinkles are able to depress their metabolic rates, so they can conserve energy to cope with prolonged, stressful periods of emersion. The collaborative project looked at how their use of metabolic depression varies across populations from Singapore to Taiwan, and to what extent such a trait is determined genetically and how much by environmental influences – that is, ‘nature versus nurture’.

With global temperatures continuing to rise, the next key question is to ask how effective these different strategies are. And in the future which of these species will be winners and survive, or losers and die off in hot areas? The findings of SWIMS researchers on the flexibility of these various strategies, such as conserving energy via metabolic depression, are optimistic: animals are not ‘prisoners’ to climate change and they are currently able to modify their behaviour and physiology to cope with the challenges.

“There is an assumption that places nearer the equator are the hottest, but we are finding that this is not necessarily so along the seashore.”

Professor Gray A Williams



A BIONIC SLICE OF LIFE

HKU scientists have recreated a liver tumour and its surrounding environment in a tiny cube using 3D bioprinting. The award-winning invention is expected to help doctors personalise diagnosis and treatment for individual patients and make new drug development faster and cheaper.

The pandemic had many downsides but for Professor Nancy Man Kwan, Chair Professor of Transplant Oncology and Immunology from the Department of Surgery and an expert in liver transplantation and disease, it offered a silver lining. Forced to halt her visits to conferences and meetings around the world and to stay put in Hong Kong, she used the free time to develop innovative technology that makes precision treatment possible for liver cancer patients and opens the path to new drug development.

The Bionic Liver-in-Cube was co-developed with engineer Professor Lu Jian at the City University of Hong Kong. It involves taking samples of liver patients'

tumours and the surrounding area, and bioprinting them into a cube where doctors can test out the best treatment for patients.

Such a device could offer much-needed hope to liver patients, who each tends to have different tumours and immune microenvironments that respond differently to treatment, making outcomes unpredictable even with the same drugs. About 80 per cent of the 1,800 new liver cancer cases diagnosed in Hong Kong each year are already at an advanced stage, and about 1,500 succumb to the disease annually. The lack of precision drug-screening means patients often undergo multiple treatment failures in the search for the right drug.

"Our invention could provide speedy and precise treatment options in the best interests of patients and significantly improve their quality of life by promoting early diagnosis and treatment of cancer and liver disease," Professor Man said.

Three innovations

The team developed three core technologies. One separates the cells and matrix protein by simultaneously extracting non-cancerous liver cells, tumour cells, immune cells and matrix proteins from the tissue of the liver patient. These can all differ from patient to patient, for instance, some may have better function of the immune T cells than others. This approach

enables the scientists to precisely characterise the tumour, such as the number of cells, immune status and tissue stiffness, and quickly screen drugs to find the most effective treatment and determine possible side effects.

The second innovation uses 3D bioprinting technology to fabricate a new model of the patient's tumour environment that combines their normal tissue, tumour tissue and vascular structure within the Liver-in-Cube.

The third is a unique microvascular system within the model to keep the environment fresh and allow for continuous drug tests to be performed and to evaluate the effects of different therapies on the bench.

"We can select the drug treatments, including immunotherapy for individual patients, because we can test it with the patient's immune cells in place," said Professor Man. "This could allow patients to quickly receive the best treatments for them with the least adverse effects and reduced chance of recurrence."

Before that can happen, though, regulatory approval is needed and that requires more data. Professor Man's team currently are collecting about five to eight samples from patients each month for the Liver-in-Cube. She has also been in contact with hospitals around the

"Our invention could provide speedy and precise treatment options in the best interests of patients and significantly improve their quality of life by promoting early diagnosis and treatment of cancer and liver disease."

Professor Nancy Man Kwan

region, including the University of Hong Kong-Shenzhen Hospital, which are interested in participating.

"We are currently doing a clinical feasibility study. That means we are collecting patient samples, doing the printing, and in the laboratory, we are trying different treatments. When we have enough data showing there is a match with patients' real situations, we can then do a clinical trial using the results to guide drug selection for future patients," she said.

Applicable to other cancers

The technology is also applicable to different cancer types and they recently started collaborating with a neurosurgeon on brain cancer. They have also started using the technology to look at different therapeutics, which is under patent application. A key attraction is that the Liver-in-Cube is much cheaper than organoids, which cannot mimic the immune system.

Professor Man's research is built on more than 20 years of experience in the cancer immune environment. As a surgeon-scientist, she aims to reduce cancer recurrence rates among both those who retain their liver and those who have liver transplants. She hopes the Liver-in-Cube will also help uncover the mechanism for tumour recurrence, as well as possible treatments.

"The dream is that we could have a tailor-made printing machine in the operating theatre, where we could directly print the material from the patient, then quickly do a drug selection right after surgery. So even before the patient goes home, we would have an individual regimen for them. That is the dream, but we start with the Liver-in-Cube first. At least we have great potential for drug selection and new drug development," she said.



Professor Man with the Bionic Liver-in-Cube, which won a Gold Medal and a special grand prize - Prize of the China Invention Association - at the International Exhibition of Inventions of Geneva in April 2024.



PEPPING UP THE POOCH

A play ball enhanced with saliva-test strips enables owners to assess their dog's mental well-being quickly and simply.

Dogs play a central role in many people's lives – not only as family pet, companion or exercise facilitator, but often as child substitute. Others have professional roles – be they sniffing out drugs or explosives, police dog or emotional support animal.

As part of the 2024 Pitching Corner hosted by the Advanced Biomedical Instrumentation Centre (ABIC), one of HKU's nine research laboratories established under the HKSAR Government's InnoHK initiative, research team members Dr Joy Wang Qiaoyi, Mr Chi Song and Dr

Eric Han Ziyu came up with the wellness ball idea. They wanted to develop practical biomedical devices that could have a positive impact on people's lives. In view of a fast-ageing society with a decreasing birth rate, leading many individuals to opt for companions like cats and dogs instead of having children, they began to question whether we were providing enough care for the health of pets who, just like humans, can experience emotional issues and stress.

"This thought marked the exciting inception of our project – 'Saliva Mental: Dog Wellness Assessment Ball' – which

has been under development for the past seven months," said Dr Wang. "The goal was to provide owners with a simple method for assessing the mental state of their pets in the hope of contributing to their overall wellness and enhancing the bond between pet and owner."

The concept explores a mental wellness solution featuring a play ball with saliva collection functionality. This design encourages natural interaction and potential stress hormone detection through the accompanying test strips. It is user-friendly and can be seamlessly integrated into the daily routine, enabling dog owners to easily assess and understand their pets' mental wellness.

"The technology employed for the saliva strips is a classic gold-colloidal method for detection," said Dr Wang. "This method allows us to measure cortisol levels, which are a stress biomarker. Since dogs naturally produce a significant amount of saliva, it provides an excellent medium for testing various biomarkers. The product is still in development and not yet a finalised solution.

"Apart from cortisol, the strips could further be adapted to test for the presence of viruses in dogs, assess their oral health, detect signs of inflammation, etc."

The saliva collection process is integrated into a toy-like ball design, an innovative approach designed to encourage dogs to engage with the ball and naturally deposit saliva while playing.

"In today's society, where many individuals live alone and worry about their pets' well-being while they are away at work, this ball serves as more than just a wellness assessment tool," said Dr Wang. "It will allow pet owners to gauge their dogs' stress levels and determine if they had a relaxing day. This fun aspect of the product also promotes interaction and bonding between pet owners and their dogs."

The project has been successfully accepted into the ideation programme of the Hong Kong Science and

"The goal was to provide owners with a simple method for assessing the mental state of their pets in the hope of contributing to their overall wellness and enhancing the bond between pet and owner."

Dr Joy Wang Qiaoyi



Dr Wang (centre) presenting the Dog Wellness Assessment Ball at the International Exhibition of Inventions of Geneva 2024, where it won a Silver Medal.

Technology Parks Corporation in 2024. Riding on existing manufacturing techniques, the project has the potential to be commercially viable in the near future with further technical refinement and business model development.

Breaking the mould

The team also feel there needs to be more awareness of the efficacy of saliva as a viable medium for assessing biomarkers. "Pet clinics predominantly rely on invasive and stressful blood draws, as they consider blood-based results as the gold standard," said Dr Wang. "To establish the credibility and effectiveness of saliva testing, further research is needed to establish correlations between biomarker levels in saliva and blood."

Additionally, the team recognise the importance of shaping public opinion. "Informing pet owners about the importance of early prevention and regular check-ups is crucial to avoid major health issues," said Dr Wang. "Our product may be viewed as 'avant-garde' in this context, as it emphasises proactive and preventive care to prolong the lifespan of pets. Changing the mindset of pet owners and highlighting the benefits of our solution will be instrumental in driving its commercial viability."

The project has attracted interest from other scientists and animal experts, one of whom suggested some rather more ambitious applications. "During a conversation with a zookeeper in Geneva, she inquired about the applicability of our ball to larger animals like lions, as collecting samples from them can be dangerous," said Dr Wang. "While our current focus is on dogs, the concept of utilising the ball for larger animals is an intriguing possibility for future exploration."

The 'Saliva Mental: Dog Wellness Assessment Ball' received the Most Favorite Pitching Award at ABIC's Pitching Corner event, for which eight projects from a multidisciplinary biomedical field were shortlisted and presented, highlighting scientific and technological breakthroughs and the potential for commercialisation and translatability.

A VOICE FOR THE DEAF

Hong Kong Sign Language (HKSL) is endangered, despite having about 6,000 users. A project at HKU is helping raise its profile and document, preserve and facilitate its use.

Parents of Deaf children often make a difficult decision about their child's education – the stigma attached to using sign language, and the paucity of schools for the Deaf – meaning they usually place their children in normal schools alongside hearing children. Unfortunately, that means Deaf students must rely on lip reading to understand what is going on – a huge challenge given Cantonese is a tonal language. As a result, their education and cognitive development are both hindered.

Professor Youngah Do, Associate Professor of Linguistics, became aware of the problem around four years ago, when one of her then-PhD students, Arthur Thompson, decided to learn HKSL for interest's sake. They are both phonologists, meaning they investigate the system of smallest units that make up language, such as the sounds 'c', 'a' and 't' for cat. Professor Do saw the possibility of doing this for HKSL, which has no official status or support.

"In sign language, words are produced through the ways you shape, place and move your hands, but sign languages are not universal and they can vary a lot. In Hong Kong, where there is no structured curriculum or government policies on sign language education, Deaf people may use different variants of HKSL, which could hinder communication among each other," she said.

"We realised that the most fundamental data about Hong Kong Sign Language was lacking, such as a database of the basic parameters of signs, unlike the British or American versions. So we decided to collect data as a very first step, not just for our research but for future generations of Deaf people."

Data collection

Professor Do and her team and a group of interested undergraduate students learnt HKSL over a year so they

could undertake the research. A curriculum was developed with the Deaf community and four of the students were also recruited for a case study in which they were recorded twice a week over 12 weeks learning to sign. "We understand a lot about how spoken language is acquired over time, but there is very little material for hearing people learning to sign. We want to see what it looks like in real time," Dr Thompson said.

The team also documented 'citation signs' – in effect, created a dictionary – on video with different members of the Deaf community, including 38 seniors. They were filmed signing a word in HKSL, while the equivalent in Cantonese was said aloud. Pairs of people were also recorded signing with each other to have more naturalistic data of the language, and Deaf signers were asked to explain why things were signed in certain ways to help understand the etymology.

Many of the elderly participants did not know how to use a computer, so training was also provided to allow them to join the online components of the research.

The collected data has been used to develop a model that can assist in training HKSL translators and



Members of the Deaf community were engaged in the building of the Hong Kong Sign Language database.

interpreters. It is also being used to build a natural language processing model – like a Google Translate for sign language. "Ultimately, if it's very successful, a Deaf person could sign in front of their phone and that would be translated to hearers, or vice versa," Professor Do said.

Improving communication

The impact of the work goes beyond research. Students and staff participating in the research have been motivated to use their new signing skills to help the Deaf community.

Dr Thompson co-produced a documentary about Deaf parents and their children, called *Bridge of Signs*, that received funding support from the Hong Kong Arts Development Council. Students served as docents at workshops hosted by Deaf artists, acting as interpreters to communicate between the artists and hearing members of the audience.

Students also supported first-aid services at two football matches organised for the Deaf by the Hong Kong, China Sports Association of the Deaf in early 2024. Aaron Chik Wing-cheung, who is Research Assistant of the Department of

Linguistics' Language Development Lab, was a driving force behind that. He has been a volunteer with Hong Kong St. John Ambulance for five years and is aware of the communication problems Deaf people encounter when they have a medical emergency.

"Being able to communicate with players at these events was incredibly rewarding. I could focus entirely on treating their injuries without the added stress of language barriers," he said.

Professor Do said their ultimate aim was to improve communication for the Deaf community. "The Deaf people we work with are excited that there are people interested in their language, because they've always been told not to use it," she said. "We are still at an early stage of our research, but I hope that our work lets people know that we should take this situation more seriously."

"The Deaf people we work with are excited that there are people interested in their language, because they've always been told not to use it."

Professor Youngah Do



Citation signs of Hong Kong Sign Language words were documented using handshape recognition. Here is an example of the citation sign of the word 'opportunity'.



Watch the trailer of Bridge of Signs

REELS OF INTEGRITY

Academy Award-winning documentary filmmaker, Professor Ruby Yang, is the new Director of HKU's Journalism and Media Studies Centre (JMSC). She is expanding its offerings, while sticking to her commitment to truth-telling and integrity.

You can take Professor Ruby Yang out of film, but you cannot take film out of Ruby Yang.

Professor Yang won an Oscar for Best Documentary Short Subject in 2007 for *The Blood of Yingzhou District* about the effects of AIDS on orphans in the province of Anhui in China. She was nominated again in 2011 for *The Warriors of Qiugang* about a village's response to chemical pollution. She has also produced award-winning documentaries in Hong Kong over the past decade and mentored young filmmakers.

So in June, when she was confirmed as the new Director of JMSC, she framed her role in terms she knows best.

"It's like producing a big-scale documentary, with a few new complications," she said, praising the support she has received from JMSC founder Professor Ying Chan and the Faculty of Social Sciences after she was made Interim Director in 2023. "It has been a hard learning curve, but I have got the job done."

That job has included launching a new Master's degree in documentary filmmaking, making preparations for new undergraduate programmes and features, and generally ensuring that students are prepared

to take on challenges such as artificial intelligence (AI) and the demands arising from social media.

She has also been absorbing the values and goals of the Centre, which are not far from her own values in filmmaking.

"Integrity is very important, whether it's in journalism or doing a documentary or in AI. Integrity means we tell the truth, we are honest, and we uphold our values," she said.

Shining a light

Professor Yang's values developed through a career that started in the US. She was born in Hong Kong, but her family emigrated there, and she ended up studying filmmaking at the San Francisco Art Institute in the 1970s. She became involved in the Asian American scene, which was exploring how to get their experiences and perspectives represented in culture.

Filmmaking felt the right fit for her for doing this. She started making her own films - her first was *Citizen Hong Kong* released in 1999 about the city reinventing itself - while also establishing a strong track record as a film editor, including for a series on the US Public Broadcasting Service, *Becoming American: The Chinese Experience*, that was led by acclaimed journalist Bill Moyers.

During the production of that series, she interviewed AIDS scientist David Ho and learnt about the AIDS challenge in Mainland China. This inspired her to move to Beijing in 2004, where she founded the Chang Ai Media Project with fellow filmmaker Thomas F Lennon to raise awareness about HIV-AIDS. This resulted in, among other things,

The Blood of Yingzhou District and HIV-AIDS public service announcements aired on Chinese television stations.

She also produced other documentaries about Mainland China's LGBT community and about Tibetan nomads and how basketball was leading them into modernity.

"As a documentary filmmaker, I want to tell a story and shine a light on issues that audiences may have not seen or been aware of before - to use media to advocate for something," she said.

Future focus

Professor Yang came to Hong Kong in 2014 at the invitation of Professor Ying Chan, just when she was thinking of returning to the US. She mentored JMSC students in filmmaking and received funding for the Hong Kong Documentary Initiative, which ran until 2019 and provided master classes and seed grants for a new generation of filmmakers.

She also made the film *My Voice, My Life* which followed 'band three' students who excelled in the arts but not academically. It won awards in Hong Kong and has been screened more than 400 times in local schools, and a sequel has been made. "I have really enjoyed teaching and mentoring students. This is why I've stayed," she said.

Professor Yang's artistry, integrity and commitment to storytelling make her a thoughtful choice to head the JMSC. Apart from the Master's in documentary filmmaking - obviously close to her heart - the Centre is preparing an undergraduate programme in strategic communications to equip students to articulate complex information and help counter fake news and disinformation.

AI courses have also become a core part of the Centre's regular programmes and there are plans to develop tracks in business journalism and possibly health communication. To that end, the JMSC has recruited two academic track professors (most of its staff are practice track) in data journalism and health communication.

The JMSC has also celebrated its 25th anniversary this year. "Things are developing so quickly. Our students have been very employable and now we want to prepare them with the skills they will need for the future workplace," Professor Yang said.

"Integrity is very important, whether it's in journalism or doing a documentary or in AI. Integrity means we tell the truth, we are honest, and we uphold our values."

Professor Ruby Yang

Going Viral

Professor Yuen Kwok-yung took a meandering path to become one of the world's top microbiologists. In his new autobiography, he reflects on that journey.

As a secondary school student, Professor Yuen Kwok-yung, Henry Fok Professor in Infectious Diseases, was a keen member of the astronomy club. Little did he realise that his fascination with the universe would lay the seeds for his future career at the opposite scale – as a microbiologist – with globally significant consequences.

Professor Yuen is the top microbiologist in the nation, according to Research.com 2024 ranking, and among the top 10 in the world. He and his team have discovered more than 100 novel microbes – fungi, parasites, bacteria, and viruses including SARS-CoV-1 that led to the 2003 SARS outbreak. He was the corresponding author of a paper on person-to-person transmission of the COVID-19 virus, SARS-CoV-2, that was named one of the 34 landmark papers in *The Lancet's* 200-year history.

His ability to wade into the unknown and painstakingly sift through life at the molecular level started way back in his skygazing days.

"There are billions of stars, and it takes a lot of effort to find the one you're interested in. You start from a bright one and move towards the less bright ones until finally you find it, like a diamond in a sea of sand. Today, instead of using a telescope, I use the microscope or genetic techniques to find new viruses and other microbes. That, to me, is basically the same as finding a star in the night sky," he said.

A fateful decision

The line between those two ends evolved in a slow, serendipitous fashion. Professor Yuen graduated from HKU's Medical Faculty in 1981 with a distinction in medicine. The natural next step would have been to join Queen Mary Hospital among the other top graduates. But he was persuaded to pursue a higher calling and spent the next six years at United Christian Hospital (UCH).

"One of my classmates challenged me that everyone with a distinction wants to go to Queen Mary, so Queen Mary doesn't need

"I didn't really aim for this path, it just happened naturally as time went by. And I love it."

Professor Yuen Kwok-yung

me. UCH at that time offered no housing allowance and no systematic specialist training, but it was in Kwun Tong where there were a lot of poorer people who needed good medical service. So I went there. It turned out to be the most fateful decision I ever made," he said.

Because the hospital was small, he had the freedom to try different specialties rather than focus only on one, and to give full flight to his deep sense of curiosity. Professor Yuen trained as a physician and then a surgeon, even though colleagues and bosses told him he was wasting his time.

"It was actually a blessing in disguise. Patients in all specialties can have infections so it put me in a very good position to manage these patients," he said.

Six years of regular night shifts took a toll on his health, though. In 1987, Queen Mary Hospital had three openings. He requested applications for all three but fate intervened again and he was only sent one – for clinical microbiologist. That became the jumping point for his hugely successful career. In 1997, he was the first to report that the H5N1 avian virus caused severe symptoms and high mortality in infected patients, then went on to his discoveries on SARS-CoV-1 and then bat SARS-CoV which is highly related to SARS-CoV-2.

Savouring the unpredictable

"I have never stopped doing coronavirus research since 2003. There are lots of SARS-related coronaviruses in bats. Everybody thinks after a pandemic is over, that's it. Sorry to say it is always the case that another will come back," he said.

Professor Yuen has repeatedly warned that we should prepare now for the next pandemic to avoid the whole-scale disruptions caused by COVID-19. He has never been afraid to speak out when he sees a need for change, even when it has made life difficult for him at times (he has received numerous death threats).

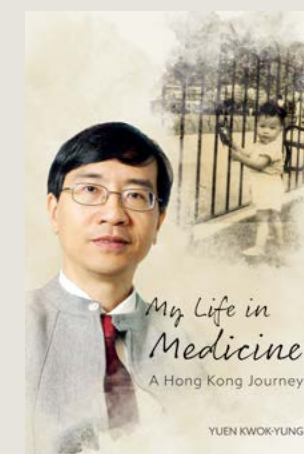


Professor Yuen (centre) with his parents outside HKU's Loke Yew Hall on his graduation day in 1981.

But the predictability that there will be another pandemic is not the only message of his book. He also wants readers to appreciate the unpredictability of life. "I didn't really aim for this path, it just happened naturally as time went by. And I love it," he said.

Professor Yuen decided to put things on paper after the sudden death of his friend, film director Alex Law Kai-yui, in 2022. He wrote the first draft over 14 days, drawing deeply on his memories of old Hong Kong. Professor Ying Chan and Gene Mustain, both retired from HKU's Journalism and Media Studies Centre, helped develop the draft into a book.

"I'm not young anymore so I felt I should write this before my memories fade. I'm so happy I did because I can feel those good old days. I can still smell the scent of my mother and the warmth of her back when she carried me around. My mother is my strength," Professor Yuen said.



My Life in Medicine: A Hong Kong Journey

Author: Yuen Kwok-yung
Publisher: Hong Kong University Press
Year of Publication: 2024



TIPPING THE SCALES FOR PUBLIC HEALTH

Pandemics, vaccination programmes and other public health measures cannot succeed without good legal regimes. Professor Eric Ip Chi-yeung presents the case.

In the early months of the COVID-19 pandemic, the UK government announced that it was “following the science” in implementing severe interventions. The approach sounded reasonable, but soon revealed serious limitations, particularly in regard to people’s freedoms and mental health. Similarly, in Hong Kong, stringent interventions, such as mandatory masking and quarantine, were initially appropriate, but over time, with vaccinations and community immunity, they seemed unduly restrictive.

Professor of Law and public health bioethicist Eric Ip Chi-yeung, who is Co-Director of the Centre for Medical Ethics and Law, argues that policymakers tend to forget that the rule of law is as important to public health as science, in his new book *The Law and Regulation of Public Health: Global Perspectives on Hong Kong*.

“My book has two general messages. The first is that all the incredible achievements in public health during the 20th century were made possible by law, whether it be criminal law to punish those who do not wear seatbelts or administrative law to empower certain public authorities to enforce sanitation policies, administer immunisation programmes, and so forth,” he said.

“The second message is that while we need the guidance of scientists in making public health decisions, to rely exclusively on them would be woefully inadequate. Science can’t answer the crucial questions that governments face such as the trade-offs in the social relationships between the individual, the population and the state. During a lockdown, an appropriate balance must be struck between respiratory health and other

dimensions of human flourishing, such as familial love, friendship, mental well-being, and economic stability.”

The Hong Kong case

His book outlines why and how the rule of law should be given its due place in protecting mental and physical health. Professor Ip chose Hong Kong as a case study because of the city’s remarkable legal history and effectiveness in achieving one of the highest life expectancies in the world.

Hong Kong’s first public health laws were introduced alongside those in Britain in the 19th century and expanded from infection control to communicable diseases starting in the 1930s. Infection control became the focus again after the SARS outbreak in 2003, which led to the adoption of the Prevention and Control of Disease Ordinance in 2008. This was put to full use during COVID-19 to mandate hotel quarantines, ambush lockdowns and the Vaccine Pass system.

“When society is largely healthy, we don’t notice public health law. But when something huge arises, such as a pandemic, suddenly we realise that it governs almost every aspect of our lives, including how many people we can meet in our own households, as the High Court puts it in an important ruling,” he said.

The book covers communicable and non-communicable diseases and other health issues, too, such as environmental health, occupational health, and tobacco control, and offers a systematic framework for evaluating public health law in any jurisdiction. Investigators need to understand the conceptual and historical foundations of local public health law and infrastructure, the freedoms and constraints on the state in containing infectious and non-communicable diseases, and the legal factors that affect public health.

Guiding principles

From there, Professor Ip expounds a list of principles to guide the development and application of public health law. For instance, when science and public health law conflict on public health interventions, the rule of law should claim supremacy. And when public health interventions designed to safeguard the right to health conflict with fundamental rights, there must not be a presumption that the intervention must prevail. “A very sick person can and should still enjoy the basic human good of friendship and familial love. We shouldn’t let any single right trump everything else,” he said.

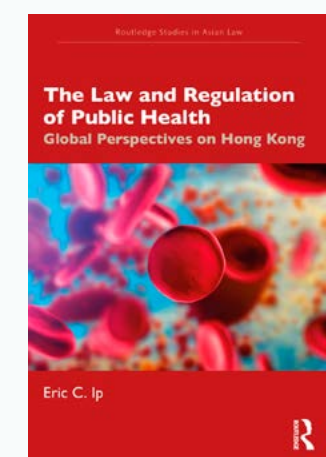
Public health law should be recognised to be as much a constituent of the common good as population health. Interventions should be proportionate. Stringent conditions should be fulfilled before declaring a public health emergency and these should be reviewed. There should be checks and balances on public health powers.

“When society is largely healthy, we don’t notice public health law. But when something huge arises, such as a pandemic, suddenly we realise that it governs almost every aspect of our lives...”

Professor Eric Ip Chi-yeung

Overly paternalistic public health measures that contravene constitutional rights and freedoms should be avoided – such as hypothetically banning sales of alcohol to people born after a certain year. The state has an obligation to support the right to life and health by maintaining social conditions conducive to these – for instance, by not isolating or creating difficult living conditions for the elderly, mentally unwell and other vulnerable populations during a health emergency.

Professor Ip acknowledged that public health emergencies require a rapid response. But in Hong Kong, “public health interventions should be regularly reviewed, not just by the executive but also by the legislature and even the judiciary, because they may no longer be relevant nor fulfil the requirements of the law when it comes to emergencies.”



The Law and Regulation of Public Health: Global Perspectives on Hong Kong

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