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CONNECTING THE DOTS

The interactions of human, animal and planetary health

VITAL SIGNS

Detecting potential stroke patients with a novel wearable device

NATURAL LIFE LESSONS FOR ALL

Discovering wonders at the Hong Kong **Biodiversity Museum**



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HKU scholars have produced world-leading research on COVID-19, but that is only one part of their contribution to the concept of One Health, which involves human, animal and planetary health.

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CONNECTING THE DOTS

A decade ago, the World Health Organization (WHO) and other international organisations endorsed the One Health concept – the idea that the health of people, animals and the environment are deeply interconnected and can only be optimised by collaboration between multiple disciplines (not just health), at the local, national and global levels. The hope was that such endorsement would give impetus to breaking down silos between medicine, veterinary science, engineering, environmental sciences and other disciplines, and get policymakers to think more comprehensively about the impact of their decisions. Unfortunately, as the COVID-19 pandemic and looming threats from climate change show, the message has thus far failed to penetrate. But at HKU, researchers are persisting with efforts to provide evidence and perspectives on One Health through their work on emerging infectious diseases and antimicrobial resistance, regulatory options and the mapping of disease outbreaks and environmental change.



THE 'ONE HEALTH' CHALLENGE

Health threats from animal and environmental sources are on the rise – not just from COVID-19, but antimicrobial resistance and other infectious diseases such as Middle East Respiratory Syndrome (MERS). HKU academics have been at the forefront producing collaborative, multidisciplinary research to identify and control these threats.



He specialised back then in mosquito-borne diseases, and Japanese encephalitis was on the rise in a region of the country. After much investigation, the cause was found to be a well-intentioned policy: the government decided to help poverty-stricken rice farmers by giving them pigs to raise. The combination of mosquitoes and pigs – which are often a vector of viruses between humans and other animals - "just lit the spark to the dynamite," he said.

"I'm sure the health department wouldn't have thought of this happening either. It just shows how these ecological balances can be upset by some of the most wellmeaning gestures."

Such interplay between humans, animals and the environment is at the heart of the One Health concept, which started to consolidate after outbreaks of H5N1 bird flu

and SARS (both centred in Hong Kong) and was formally endorsed by the World Health Organization (WHO), Food and Agriculture Organization and World Organisation for Animal Health in 2010. It has leapt up the agenda in the wake of COVID-19, which has been the latest and worst of recent viruses that threaten human health.

"For the last two decades, we have had a major, novel infectious disease threat almost every two or three years – SARS, swine flu, avian flus H5N1 and H7N9, MERS, Zika, Ebola and now COVID-19." Professor Peiris said. All have been traced to animal sources – birds. bats, pigs, camels and primates – but human interactions with these animals have created conditions that allow viruses to jump species.

"Previously, livestock was raised in a backyard. People had a few pigs or chickens and if a virus got into those animals and jumped to humans, it was a localised effect," he said. "Now, livestock animals are raised in the tens of thousands and shipped thousands of miles to market. You also have these game animal markets, which have become a huge trade because of greater affluence in China and parts of Asia, and you can have thousands of animals in the larger markets. That is, of course, how SARS managed to develop.

"COVID-19 really should be a wake-up call to the global community that humans are not

superhuman. The forces of nature are much more powerful than us and we tamper with this at our peril."

Viruses not the only threats

Professor Peiris and other scholars at HKU are at the frontlines trying to assess the threats emerging from the human-animalenvironment interface and propose ways to manage them. The concern is not confined to viruses but also antimicrobial resistance (AMR), which is developing more slowly than new viruses but has the potential to be very damaging to health.

AMR was identified by the United Nations Environment Programme (UNEP) in 2017 as one of the top six emerging issues of global environmental concern. Currently, about 700,000 people die each year because AMR has made antibiotics less effective against bacterial infections. By 2050, the number could be 10 million (twice as many as died of COVID-19 in its first 18 months) if nothing is done, according to a UK-commissioned report. A 2019 report by the UN's Interagency Coordination Group on Antimicrobial Resistance, titled 'No Time to Wait', also warned of the growing impact of AMR on the environment and ecological systems.

Professor Zhang Tong of the Department of Civil Engineering leads an ongoing

theme-based research project to investigate AMR flows from pollution hotspots to the environment, with a focus on sewage. He works in collaboration with HKU's School of Public Health and the Hong Kong Government and is also a member of an expert panel preparing a special report on the environmental impact of AMR for

a special session next year of the UNEP.

"It is impossible to completely remove antibiotics from wastewater so some inevitably escapes into the environment," he said – whether from human or animal farm sewage or the effluents of the pharmaceutical industry. The residual antibiotics may apply

selective pressure on bacteria, some of which will develop resistance to these antibiotics. "Eventually, there will be more and more superbugs."

He is in the process of collecting water and soil samples from multiple sites, such as hospitals, water treatment plants, farms, beaches and sewage treatment plants, with the aim of developing a local map of the current baseline conditions that can be used to monitor AMR progress in Hong Kong's environment and develop control strategies. The baseline will also be compared to other territories to see how Hong Kong fares globally.



Professor Malik Peiris (second from right) and his team found that novel coronavirus can infect the human respiratory tract even better than SARS-CoV.





COVID-19 really should be a wake-up call MALIK PEIRIS community that

"

PROFESSOR to the global

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An electron microscope picture shows that the cells from human bronchial tissue can be infected by MERS-CoV and the MERS-CoV can replicate in human respiratory tissues.

This detection work is made possible by DNA technology Professor Zhang developed to detect antibiotic-resistant genes in water samples, which has been widely adopted by researchers across the world. He has also applied molecular detection work to identify the SARS-CoV-2 virus that causes COVID-19 in local sewage samples.

Using an RNA-based technology he developed and working with HKU's School of Public Health, Professor Zhang and his team began to detect the virus last November, days before cases were confirmed. This led to the government introducing compulsory testing for places with positive signals from sewage samples. The team have since developed a method to identify variants of the virus.

"COVID-19 is an example of how we understand One Health from another angle. We see the flow of pathogen from human to environment. We can use information from one compartment to indicate the situation in another. The same thing applies to antibiotic-resistant genes. We survey the environment to not only look at the possible sources of AMR in humans and animals. but also as a reflection of what may be happening in humans and animals," he said.

Our gut contributions

One of Professor Zhang's collaborators has been Dr Hein Tun, a veterinary public health specialist in the School of Public Health who has multiple projects of his own on the nonhuman sources of human AMR.

For instance, an ongoing study is measuring AMR levels and transmission across beaches, healthy people, hospital patients, farms, rivers and creeks in Hong Kong, Mainland China and Thailand. So far, the data shows AMR levels are higher in animal production than in people. Dr Tun is also in the process of studying the levels and sources of AMR in hospital wastewater, which does not require special treatment in Hong Kong before being discharged into the sewage system, and how AMR may be transmitted in the household, such as via countertops or other surfaces.

"The One Health concept is very useful not only for COVID-19 but other types of diseases. Whether you look at the community level, the global level or the individual level, this concept can apply. You cannot stay away from the environment," he said.

Dr Tun's work on a particular type of AMR bacteria, ESBL-E, has been revealing of how environmental and human factors interact. The WHO has prioritised ESBL-E because it can transfer AMR to other bacteria, so if someone with ESBL-E in their gut is exposed to salmonella, it can transfer resistance to the salmonella, making it very difficult to treat it with antibiotics. In a study of 90 Hong Kong travellers that measured their gut microbiota before and after travelling, he found exposure to raw seafood was a factor in those who acquired ESBL-E after their trips (although about 40 per cent tested positive before travelling). People were also more likely to have ESBL-E if their gut lacked bifidobacteria, which are beneficial.

"This is why carriage of AMR bacteria is so important. If healthy people carry it in their gut, those bacteria can share the resistant gene to pathogenic bacteria and put their health at risk," he said.

Dr Tun also studied AMR in the wake of COVID-19 among some members of the traveller cohort. There was speculation that AMR would increase as people self-medicated with antibiotics, which the study seemed to support – participants had more AMR bacteria as well as chemicals related to masks in their guts. "We are trying to recall these participants to study the health impacts of this," he said.

"We need to think collectively, across different sectors and expertise, to have more of the multidisciplinary and interdisciplinary collaboration that we've seen with COVID-19. It's also important to have participation from the public," he said. Dr Tun has been



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Increased opportunistic pathogens and resistance genes in the gut microbiome during the first wave of COVID-19 in Hong Kong.



Professor Zhang Tong (right) giving a presentation to the HKSAR Chief Executive Mrs Carrie Lam, HKU Council Chairman Professor Arthur Li and HKU President Professor Xiang Zhang on the work of the Environmental Microbiome Engineering and Biotechnology Laboratory.



A conceptual model to demonstrate the evolution and emergence of antibioticresistant genes accelerated by selective pressure of antibiotics.

promoting citizen science in less-developed countries to involve residents in collecting data, such as exposure to animals and the environment, through their phones. "This way they can know what their risk is and what the problems are. They can have a sense of ownership of the data and findings."

Stark warning

That need for collective purpose is echoed by Professor Zhang and Professor Peiris. The concept of One Health should be an easy sell, Professor Zhang said. "Especially in China because Chinese philosophy tells us that everything is connected, that it's not separate." He sees the environmental sector as best placed to lead the way, such as through UNEP.

Professor Peiris, however, has seen firsthand the difficulties of having policymakers and businesses monitor and respond to health threats – in the lead-up to the H7N9 outbreak in China, the poultry trade had

Professor Peiris sees infectious disease threats in the wider context of the great challenges facing the planet and the similar urgent need to collaborate and break down institutional and other barriers in order to find solutions.

comes from camels.



Professor Zhang Tong (centre) with Laboratory Manager Ms Vicky Fung (left) and Research Assistant Professor Dr Yu Deng (right).



Extraction of SARS-CoV-2 RNA from sewage using an automatic extraction machine.

little incentive to monitor for viruses because any infections meant they would have had to cull their stock. Similarly with MERS, the camel industry in Saudi Arabia has been resistant to evidence that the MERS virus

MERS remains a pandemic threat. Recent research by Professor Peiris and international collaborators showed that it is present in camels across North Africa and the Middle East. It is still in a milder form than the Saudi Arabian version, but the worry is that it, too, could evolve to be more pathogenic in humans. "We have to be concerned because MERS is repeatedly jumping to humans. There is no reason why it cannot further adapt to become more efficiently transmissible to humans," he said.

"It's not just infectious disease. You can see issues of climate change, environmental pollution, loss of biodiversity – we are really rupturing the limits of sustainability of our planet. I think it's important for everybody's education, but particularly for medical education, for us to realise that it's not just about treating individual humans. We have to take account of animals and the environment, too. We have to be advocates.

"If we want human health to be better. we have to look after planetary health, environmental health and animal health," he said, adding this cautionary note: "Rene Dubos, a French microbiologist, said in 1959 that 'at some unpredictable time and in some unforeseeable manner, nature will strike back'. COVID-19 is a great illustration of that."



The One Health concept is very useful not only **DR HEIN TUN** for COVID-19 but other types of

diseases. Whether you look at the community level, the global level or the individual level, this concept can apply. You cannot stay away from the environment.



DISUNITY OF PURPOSE

Governance and laws relating to human, animal and ecological health are divided across the world, making it difficult to coordinate responses to emerging health threats. Dr Calvin Ho has been analysing the problem.

In 2007, the Indonesian government announced it would stop sending samples of the H5N1 avian influenza virus detected in its country to the World Health Organization's (WHO) reference laboratories. Its worry was that these samples, provided freely, would be used by pharmaceutical companies to develop vaccines the country could not afford. The situation prompted the establishment of a new international framework for data and pathogen sharing – but only for H5N1 and other influenza viruses with human pandemic potential.

Despite other circulating threats to human health, such as antimicrobial resistance (AMR) and emerging zoonotic diseases like the Middle East Respiratory Syndrome (MERS) coronavirus, there is as yet no comprehensive international framework for sharing biological materials and related data to address these concerns. Even the COVID-19 global pandemic has yet to motivate any change.

Dr Calvin Ho of the Faculty of Law, and Co-Director of the Centre for Medical Ethics and Law, has been looking at ethical and legal means to facilitate data and pathogen sharing for AMR and One Health research, and the development of appropriate countermeasures. AMR, which arises mainly from misuse and overuse of antibiotics and other antimicrobials, is a major concern because drug-resistant pathogens circulate among humans, animals and the environment and are projected to lead to 10 million additional deaths each year globally by 2050. Its growing threat prompted the WHO to endorse the One Health concept in 2010 and recognise that protecting and promoting human health is closely interconnected to animal and environmental health.

The WHO also adopted a global AMR action plan in 2015 to drive concerted actions across governments and the private sector but to date, the platform has not realised its aims. A key problem is that specialist bodies remain stuck in their silos, so laws and regulatory bodies on human, animal and environmental health are largely disconnected.

Fair share

"One of the big struggles is getting people to talk to each other. We can all cover our own specific fields well, but it is less clear how things work across the various domains," Dr Ho said.

He believes legal and regulatory levers premised on fairness and equity are necessary to break down the barriers and get all parties to share data and pathogens that are crucial to addressing AMR and future pandemics.

"We need good data to develop countermeasures and predictive modelling, so we can at least have a clearer sense of what is coming. But to get that data, and get people to share and work together, you need fairness. That's why laws and regulatory instruments at the domestic and global levels, especially the global level, are really important," he said.

While some places have made some progress – Hong Kong, for instance, has a strategic action plan on AMR for 2017–2022 – many governments elsewhere are stretched in terms of capacity and resources. "But AMR is not just a single-country issue, it is a global issue. Ultimately, with global travel and the world being very connected, you cannot isolate diseases – which is why collective action is really crucial."

At the international level, laws relating to public health do exist, but they are narrow in focus and there is nothing that addresses the interdisciplinarity of One Health. The International Health Regulations, for instance, govern the sharing of human health data while the Convention on Biological Diversity applies to the sharing of plant and animal data and materials. Yet viruses like H5N1 and SARS-CoV-2 (which causes COVID-19) are very likely to be from animal sources. "This just basically reflects the silo problem that we have," he said.

Limits of market-based solutions

Dr Ho believes reliance on the market mechanism is not sufficient for such a large and complex task, given there are often limited information and resources to work with. Without a formal plan for sharing global public health data, less-resourced countries are at a disadvantage.

Indonesia's worry about H5N1 vaccines is a case in point. In contrast, China was able to share data on the SARS-CoV-2 pathogen because it has the scientific and production capabilities to produce its own vaccine, so it did not need to worry about being left out. And, while biotech companies responded quickly to develop COVID-19 vaccines, these vaccines represent only a fraction of their business, which at its core is based on profit not equity.

"The values of the market are premised on efficiency and a narrow notion of fairness,

which is reasonable enough, but it cannot apply everywhere," he said.

Dr Ho sees an urgent need to start getting the infrastructure in place for collective action to address not only AMR and emerging zoonotic diseases, but the health impacts of climate change. This will be a huge challenge because of short-term thinking, the difficulties of getting people to work together at the international level, and the decline in multilateralism.

"It is not a rosy picture. Unfortunately, unless people are faced with very immediate and catastrophic events, we don't seem to know how to get our act together," he said.



The Centre for Medical Ethics and Law held a conference titled 'Tackling Antimicrobial Resistance: Meeting the Global Challenge of AMR' in collaboration with the School of Public Health.





DR CALVIN HO

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CHAIN REACTIONS

Professor Peng Gong, a geographer and environmental scientist, began applying his expertise to public health issues more than two decades ago when he focussed on tiny parasites. He has been scaling up ever since and today focusses on the One Health challenge from global climate change.

The H5N1 bird flu first jumped to humans in 1997 in Hong Kong, killing six of the 18 patients infected. But that was not the end of H5N1. In 2003 it resurfaced in humans and over the next few years was detected in wild birds in many regions around the world. For Professor Peng Gong, who has devoted much of his career to spatial modelling and identifying connections between the environment and disease, this proved to be a telling example of a One Health challenge.

While others focussed on the disease, he applied his expertise to understand the bigger picture by mapping the environmental factors behind the spread of H5N1 globally.

"We found that because of land use changes and climate change, the protected habitats

of wild birds were shrinking and so you had more birds using a smaller area. This helped facilitate the virus to pass between them and strengthened transmission of the disease. And because of the reduced habitat, it also brought them closer to poultry and duck farms that are run by humans, and infected these vulnerable birds," he said.

"Humans have been squeezing the living space for other species that have nowhere to escape to. With One Health, we need to take a systematic view – in Chinese, One Health is called 'Big Health' – because the health of the ecosystem is actually related to human health."

Professor Gong, who is concurrently Chair Professor in the Faculty of Social Sciences

(Geography) and Faculty of Science (Earth Sciences) and HKU's Vice-President and Pro-Vice-Chancellor (Academic Development), has been working on One Health issues for more than two decades. His expertise has been recognised by the prestigious health journal The Lancet, which recently appointed him as the only non-medical member of its international advisory board (previously he was an advisor on two specialty publications of The Lancet focussing on public health and planetary health).

Interdisciplinary collaboration

His interest in using a systems-based approach to analyse the interactions of the

Documenting Professor Peng Gong's field work on site where the team were conducting an environmental survey of snail density at Poyang Lake.



environment and health began in the 1990s with a mathematical model on the spatial distribution of schistosomiasis, a disease caused by parasitic worms that breed in both snails and humans and that can infect people through contact with contaminated freshwater. It can cause multiple health problems, particularly after prolonged exposure, and as a parasitic disease is second only to malaria in the devastation it causes around the world.

China is one of the countries affected by schistosomiasis, so Professor Gong first applied his mapping skills there, in collaboration with public health specialists from UC Berkeley, to show which areas were suitable for the disease to transmit or spread, which areas were difficult and which were impossible.

He subsequently used this approach to show how climate change is taking dengue fever-carrying mosquitoes beyond tropical regions (although this may be mitigated by the concreting of land and human management, which seem to be reducing mosquito populations and people's exposure to mosquito-borne diseases), and to study animal migration in Africa where human

activity and land management are reducing the animals' ranges.

"If you go to Africa, your heart feels heavy because these magnificent animals, like lions and zebras and wildebeest, are constrained to 100–200 kilometre ranges," he said.

Driver for change

The impact of humans on the environment, and the subsequent impact from the environment to human health, have also driven Professor Gong to study the effects of urbanisation. In a major paper published in 2012, he and his colleagues found rapid urbanisation in China was changing health patterns, such as increasing the greater proliferation of chronic and age-related diseases and illnesses related to pollution.

Professor Gong has more recently focussed on the interaction of health and climate change at the global level and is part of a team that produce an annual assessment for The Lancet on climate change mitigation and population health. The latest issue found health impacts were worsening, with disadvantaged populations especially vulnerable.



Representative spread routes of the H5N1 viruses in four years. Triangles and dots represent spatial-temporal cluster centres. The numbers on the triangles and dots are the reported months of the cases.

"Extreme weather, like heat and drought, and rising sea levels will all impact people's health," he said. "We hope that the focus on health can be a key driver to make people change their habits and make organisations and governments change policies so they can become more adaptive, mitigate climate change and reduce the impacts on people."



PENG GONG that have

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At Poyang Lake, Professor Peng Gong's team were conducting surveys related to avian influenza in wild water birds

A NEW ANGLE ON VIEWS

It's widely agreed that a view of nature is beneficial to our well-being. Now a new urban study uses open big data to see how view height is a factor too in high-rise cities like Hong Kong.

Inevitably, a view from a 30th-floor window is different to that from the second floor. But how do you monitor the benefits of either? In the time of COVID-19, 'view health' is particularly important as going outside may be restricted. Now a technological window of opportunity has opened, enabling researchers and urban designers to use big data to easily assess view health from any level.

It is common for big data sets to be collected and opened by various organisations using advanced information and communications technology (ICT) devices. Examples are the government's photorealistic City Information Model (CIM) of Hong Kong Island and Kowloon, and Tencent's/Google's Street Views for Hong Kong.

"However, to a certain extent, the big data is still 'data' rather than information – for example '0x5F889D-like RGB values of green pixels' – instead of 'two palm trees are here' – for computers and urban analysts," said Dr Frank Xue, Assistant Professor in the Faculty of Architecture's Department of Real Estate and Construction.

"The focus of our work is: first, to understand what geometries, semantics and objects are there; second, to quantify meaningful indices (information) for urban analysts; and third, to compute complex concepts (such as streets and environment) as highdimension vectors."

His team have now developed a method to transfer deep learning to assess the nature views (such as green, sky, water) at windows for high-rise high-density areas automatically. "The data source was the photorealistic CIM, surveyed and opened by the Planning Department of the Hong Kong Government in 2019; and the outputs enrich the open CIM with new semantics," said Dr Xue. "The accuracy was satisfactory on a pilot area in Central, while the processing time per window view was about 1 second on a desktop (Nvidia 2070 GPU) and 0.5 seconds on HKU's new Al-research platform."

The work with CIM also focusses on the Nature Accessibility Index (NAI) concerning nature view and nature accessibility, and Dr Xue's co-supervised PhD student Mr Eric Maosu Li has produced a study titled 'Save people from the concrete barriers – Integrated assessment of visual and physical accessibility to nature in 3D cities'. The research won the 2021 Esri Young Scholars Award.

Mr Li's study focussed on high-rises in an area of Wan Chai and combined visual Nature View Index (NVI) patterns with physical accessibility patterns, with the result being



Automatic window view captured by the City Information Model (CIM), which allows researchers and urban designers to use big data to easily assess view health from any level.



Ruttonjee Hospital (shaded in red) enjoys a higher Nature View Index than its surrounding environment in Wan Chai, thus potentially providing its patients and members with better view health.



The vertical development in Hong Kong captured by the photorealistic City Information Model (CIM), surveyed and opened by the Planning Department of the Hong Kong Government.

the NAI. "Our findings are useful for providing quantified evidence of the nature visibility and accessibility in a 3D city," said Mr Li. "The implications can be used to find new means for urban optimisation."

Town planning and policy

The research also highlights inconvenient buildings and promotes urban greenery management and self-greenery management in Hong Kong. The uses for this kind of big data research are numerous for town planning and government policy.

"Quantitative Nature View Indices can help the decision-making of architects, town planners, and designers," said Mr Li. "Architects used to apply qualitative judgment and domain knowledge to incorporate the views into their multi-criteria decision-making process. In the last decade, they have increasingly used drones

to capture the environment and quantify views; however, the drone-based NVI involves high labour costs, and is non-scalable and timeconsuming. Our CIM-based NVI has just been proposed for architectural space planning.

"From the perspective of the government, a Visual Impact Assessment report [Town Planning Board 2010] is required for new constructions in Hong Kong. But, it mainly concentrates on the interests of public places (from the outside). For example, will the building obstruct the site views of the harbour/ hills/skyline? The NVIs of windows and residents' exposure to nature have not yet been included."

This summer, Mr Li worked at Hong Kong's Urban Renewal Authority (URA) as an intern for two months. "The aim of urban renewal is to realise the sustainability and healthy development of the city," he said. "Our idea has attracted the URA's interest, since it can



Disparate nature views of 314 buildings in Wan Chai, with the darker colour representing higher quality.

help quantify nature views for large-scale areas automatically – which means at a low cost. However, at the moment they are still focussing on the more scientific utilisation of basic indicators such as building conditions. A city-wide NVI dataset could be helpful in the future."

This work is the beginning of Hong Kong's CIM enrichment and Mr Li is now working on new methods that are five to 10 times faster and even more accurate. His future work will also link to Al building optimisation for window views, including aesthetic attributes, nature attributes and cost attributes, and Al town optimisation for both visual and physical access to nature.



DR FRANK XUE



The focus of our work is: first, to understand what geometries, semantics and

objects are there; second, to quantify meaningful indices (information) for urban analysts; and third, to compute complex concepts (such as streets and environment) as highdimension vectors.



VITAL SIGNS

A wearable electrocardiogram (ECG) sensor with a novel high-performance memory transistor can detect atrial fibrillation and identify potential stroke patients.

The advanced device can pick up signals other sensors cannot and uses transistors to form an inverter capable of detecting strokes. Dr Paddy KL Chan, Associate Professor at the Department of Mechanical Engineering, leads the team which, in collaboration with Nanjing University, developed the device.

"The core breakthrough here is that our inverter uses a high-performance transistor, which includes high carrier mobility, ultralow contact resistance and sub-threshold swing," said Dr Chan. "These three parameters are the important indicators of transistor performance. It is not the ECG sensor but the transistor which is crucial in this device.

"We used two transistors to form an inverter. which has a unique function that can

amplify the signal while at the same time filtering out noise. Conventionally, as the electrophysiological signal from the human body is in the range of millivolt to microvolt, this weak signal would require a more sophisticated set-up to measure properly. But, if a device can amplify the target signal while at the same time suppressing the noise, it can significantly improve the quality of the data and make it suitable to be measured by a basic – or even portable – set-up."

Powered by a simple button battery, the device can be worn by patients night and day, and even in the shower. The signal amplification is outstanding, with a high gain of more than 10,000 which enables it to detect electrophysical signals – known as the f-wave – with a frequency of between 300

and 600 beats per minute, which indicates atrial fibrillation.

"The f-wave can be considered as the 'signature' of patients with atrial fibrillation," said Dr Chan. "The capability to detect the high signal is down to the organic field effect transistors (OFETs) having an ultra-low sub-threshold swing. This enables our ECG sensor to pick up signals from patients which conventional sensors cannot.

"The sub-threshold swing is a vital parameter in transistor or inverter operation as it implies how much voltage change is needed to turn the device from the 'off' state to the 'on' state. Our record low sub-threshold swing device ensures low operating power and high sensitivity."







Dr Paddy KL Chan's team have advanced the application of the monolayer organic field effect transistors (OFETs) to flexible substrate for wearable electronic applications.



Dr Paddy KL Chan's team succeeded in adding 'memory' or collected signal information to an organic transistor, which paves the way for advanced machine learning to mimic human brain functions.

Miniaturisation

Dr Chan's research team have been focussing on organic field effect transistors for more than 10 years, and one of their main aims has always been to advance the miniaturisation and contact effect in these devices.

"Developing high-performance devices to be wearable electronic applications has been a clear goal for me and my group," he said. "This is why in 2016, we developed a saliva glucose sensor and temperature sensor; in 2018, we developed a C-reactive protein sensor on a medical catheter and also a flexible optical sensor; and in 2020 we developed a conformal skin heater and tissue impedance sensor."

His initial breakthrough in developing the staggered structure monolayer OFETs – the material used in the latest experiment – was published in Advanced Materials in 2020, and a patent was filed for the innovation in the US. In this latest work, his team have advanced the application of the monolayer OFETs to flexible substrate for wearable electronic applications.

When the team started working on this particular ECG sensor, a colleague of Dr Chan's in Nanjing University sent his PhD student to HKU to join the team for 18 months to learn the skills to make high performance transistors.

"This student, Zongzong Lou, worked closely with my students - especially postdoctoral

fellow, Boyu Peng – on developing the high-gain low-voltage sensor," said Dr Chan. "When they showed me the performance of the integrated device one evening, I knew we had achieved exactly what we needed for sensing electrophysiological signals from the human body. After that, we started to perform a lot of tests, not only ECG but also including electromyography and electroencephalography."

The team would like to see the device in public use, and to that end they are working to bring it from laboratory scale to mass production scale. "But first we will work on making the device even smaller," said Dr Chan, "and instead of using one inverter we plan to use a more advanced and sophisticated circuit to do the electrophysiological signal sensing."



Devices and Physics.



DR PADDY KL CHAN

The f-wave can be considered as the 'signature' of patients with atrial

fibrillation. The capability to detect the high signal is down to the organic field effect transistors (OFETs) having an ultra-low sub-threshold swing. This enables our ECG sensor to pick up signals from patients which conventional sensors cannot.



Dr Paddy KL Chan (centre) and his research team in the Laboratory of Nanoscale Energy Conversion

CLICKING WITH THE RIGHT PEOPLE

Everyone knows social connections can open doors. Dr Feng Shihui argues this could also apply to connections made virtually through digital technologies, without ever meeting face-to-face.



"Because of digital technologies, our world is expanding significantly. We not only have chances to know people in our school, workplace or neighbourhood, we also have chances to make connections virtually. And those virtual connections could also have a significant impact on our development," she said.

Dr Feng's key interest is in network effects on student development. She has been studying the theoretical and practical implications of this new form of social capital mediated via digital environments within the context of education.

She points out that digital social capital is unique because it brings a global perspective at a critical time for young people. "They are in the process of getting an understanding of the world and while local support is very important, it's also important for them to develop some digital connections with others who can show them more of the world," she said.

Digital social capital has the potential to impact students' academic development, socio-emotional well-being and sociopolitical participation. However, whether or not digital social capital can benefit student development highly depends on their use of digital technologies.

"It sounds simple – give the same digital technology tools to all students and the world will become equally open to all of them. But the question here is not only about accessibility, but also how they use technology to make social connections beyond their offline social circles, and access social resources in a global context, beyond pure entertainment," she said.

Indeed, a 2019 study she did found students who made greater use of Facebook or the internet for entertainment had a higher tendency to be distracted during academic tasks.

Making students aware

"Awareness is the first important step," she said. "It is critical to raise the awareness of this new form of social capital among students, teachers, parents and other stakeholders in educational systems so they can effectively provide guidance and interventions to help students develop a healthy use of digital technologies. A collective effort among these stakeholders is needed to help students actively develop their digital social capital."

Dr Feng noted that the multifaceted nature of digital social capital is a challenge to researchers, but she is working with collaborators to further define and quantitatively measure it. These measurement methods are critical for improving understanding about the formation and influence of digital social capital.

"Digital social capital provides an important theoretical lens for helping us understand the effect of digital technologies on student development. But how do we measure digital social capital? And how do stakeholders in educational systems help the digitally disadvantaged students develop their digital social capital? These are some important questions to be addressed while studying this topic," she said.

While digital social capital is still a developing concept, Dr Feng has also started exploring the interaction of offline and online social connections on student development.

A recent study of students in Mainland China looked at how offline social connections



affected their online and offline civic engagement, such as online voting, helping out at school and in the community, raising money for charity, buying products because of a company's social values, and discussing public issues with others. Students' weak ties with teachers or peers exerted greater influence than their strong ties with close friends or family members, which was in line with the theory of weak ties and further confirmed that students' social connections matter.



DR FENG

SHIHUI

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and the world will become equally open to all of them. But the question here is not only about accessibility, but also how they use technology to make social connections beyond their offline social circles, and access social resources in a global context, beyond pure entertainment.





Along with her study of social capital theory, Dr Feng is also interested in the mechanisms underlying the development of social connections – why are certain people connected and others not?

A study she published last year found that in interdisciplinary research collaboration, researchers prefer to connect with others who have similar interdisciplinary research profiles. This contrasts with the typical assumption that researchers with different backgrounds collaborate in interdisciplinary research. 'Homophily' – the concept that people

Social connections in the research world

prefer to make connections with others of similar characteristics – still prevails in this context.

"In interdisciplinary research, researchers tend to have diverse experience in multiple disciplines. In this sense, interdisciplinarity is primarily manifested at the individual level, rather than the pair or group level as one might expect," she said. "This shows that it is important to provide interdisciplinary training in universities."

SOCIAL MEDIA AND THE WORKPLACE

Social media is not only blurring the lines between home and work, but reinforcing workplace hierarchies, finds Dr Tian Xiaoli who has been researching social interactions online.

It is Chinese New Year, you are enjoying a meal with family when suddenly your phone pings. Your boss has sent you a virtual red packet on WeChat. Do you tuck the phone in your pocket and turn your attention back to your family, or respond right away? Increasingly in Mainland China, the only safe answer is the latter.

As Dr Tian Xiaoli of the Department of Sociology has discovered in a study of WeChat use among urban middle-class workers, these workers face immense pressure to engage with their supervisors on the app in their private time about matters unrelated to work – but still with a workplace purpose.

"Most of the social interaction on WeChat is not about productivity but about maintaining the workplace hierarchy," she said.

Showing deference to bosses might seem unsurprising, but her research has found fundamental differences between online and face-to-face engagement that are adding to workers' burden, starting with the lack of physical presence and boundaries.

"Your supervisor can message you anytime, anywhere. I heard many stories about workers who felt compelled to reply immediately to messages from supervisors, even at night," Dr Tian said.

Failure to respond is 'intolerable'

Digital media also means past interactions are recorded, so your boss can refer back to who said what, when they said it, and who neglected to respond. Some workers told Dr Tian they were pulled aside by their bosses because they did not respond to trivial messages and were told they needed to acknowledge all messages s/he sent. "Even small, trivial interactions are easily recorded and traceable and can be referred back to with accuracy. This is very hard to achieve face-to-face." she said.

A third unique feature of online interaction is that it is 'n-adic', which means it is impossible to know the number of participants in a chat because anyone can jump into a past interaction at any time and read the exchange, including a boss's boss. This helps explain why bosses are so keen for their workers to respond to them – they want their own bosses to think they are in control of their team.

"One manager summarised it well. He said it's intolerable if someone does not reply to a message because this is about group solidarity. By showing loyalty to the group leader, you are showing loyalty to the group instead of just thinking of yourself," she said.

All this takes a toll on workers. Many of her respondents felt their private lives were being invaded because their supervisors did not respect work hours. She likened the interactions to an all-seeing panopticon. "There is no escape in time or space. Since messages are automatically recorded, you're under constant and permanent observability," she said.

"This enforces workplace hierarchy because even the language used shows deference – the boss is addressed by their title and what they have said is acknowledged."

Going through the motions

Dr Tian found that workers have developed strategies to cope with these pressures. The most popular is 'cynical performance of compliance', where workers do not believe they are inferior but go through the motions expected of them; some even use this to gain advantage in the workplace. A small number refuse to comply, although they tend to suffer consequences. One woman who refused to show deference to her supervisor believed this was why she failed to receive a year-end bonus and promotion. There is also a small group who comply because they genuinely believe they are inferior – usually those new to the group who feel they have much to learn.

Unfortunately, these interactions seem here to stay. WeChat has more than one billion active users and people constantly set up groups to organise social events, such as work dinners or outings. "The workers understand that even if they change jobs, it won't make much difference. The situation will be the same there." she said.

There was an upside, though, as some found it easier to express deference online with an emoji or a few words of text than to do so in person. However, WeChat may only be the beginning of workplace surveillance.

Dr Tian is now looking at DingTalk, the most popular e-work app in China. It 'dings' reminders and will even phone users if



Dr Tian Xiaoli looks into the use of DingTalk, one of China's most widely used workplace apps, with 500 million users.



they fail to respond to a message within an appropriate timeframe, can track an employee's movements in real time, has a punch-clock app that requires workers to smile when they clock into work, and another function requiring workers to submit daily summaries of their work activities for others to read and comment on. Not surprisingly, Dr Tian said: "DingTalk has the reputation of being the most hated app in China."



DR TIAN XIAOLI

There is no escape in time or space. Since messages are automatically

recorded, you're under constant and permanent observability.



SIMPLE MATERIALS, COMPLEX OUTCOMES

The Faculty of Architecture's new Building Simplexity Laboratory has been created based on the philosophy that simplicity in construction can still facilitate spatially complex systems, and in this age of post-digital architecture, simple algorithmic design procedures can lead to complex geometrical built forms.

"This philosophy allows for interesting research in multiple areas including bamboo, engineered wood, Augmented Reality (AR), and many more," said the Laboratory's creator Dr Kristof Crolla, Associate Professor in the Departments of Architecture and Civil Engineering and head of the architecture practice Laboratory for Explorative Architecture and Design (LEAD), who has long been an advocate of bamboo as a versatile, and often underrated, construction material.

"Bamboo is spectacular, unique, cheap, pliable and sustainable. Traditionally it is used in construction extensively in places it grows, but not in so-called developed countries," he said. "There is a great tradition of bamboo craftsmanship in Hong Kong, but usually for temporary structures such as Cantonese opera theatres and scaffolding. But, if treated for biotic attack and protected from rain and UV light, bamboo lasts and is suitable for permanent structures."

LEAD is about to embark on building a bamboo project in Anji, China where Dr Crolla will also be a judge in a bamboo competition that will see seven more student projects built. There are also engagements with Yangon, Myanmar, to push for the construction of bamboo community projects there.

This summer, a course in creating complex bamboo structures enabled students to

work using computational design tools employing digital physics-simulation engines. These tools allow users to simulate the bending or load-carrying behaviour of bamboo ahead of time so that designs can respond to it from the conceptual stage onwards. The team are looking into how AR technology can use headsets to instruct holographically on site.

Holograms

His HoloLab at HKU uses AR-driven holograms to make building non-standard shapes easy, for example with bamboo. In March, Dr Crolla chaired a conference with several workshops, including one on AR

LEAD's award-winning YEZO cabin in Hokkaido, Japan is environmentally low impact and was developed using an evolutionary algorithm. (Courtesy of LEAD)



for complex bamboo structures. "It enables direct communication between digital design models and on-site construction via holographic visual guides. Feedback systems between both allow for the production of designs in which materials can be used to a greater performance level."

It pains Dr Crolla that bamboo is not viewed in Hong Kong as a viable material for permanent structures. He also thinks there is a misconception over bamboo's value, partly because there has been little evolution in the craft. "The craft of scaffolding is vanishing as few youngsters want to get involved in it," he said.

He has been working with local craftsmen since 2012 when his team co-designed the award-winning Golden Moon construction in Victoria Park, followed up by the ZCB Bamboo Pavilion in 2015. One of the most exciting parts for him has been communicating with the Cantonese craftsmen – they don't speak each other's language but digital tools have made it possible for them to create a workflow and drawing notation system that allows them to communicate the design intent on site practically and translate the digital model into a buildable structure.

"Now we're continuing to hack this design and deliver process further to encourage wider use of bamboo and evolve it for more uses," said Dr Crolla. "We are also creating a digital design tool manual for the development of bending-active bamboo shell structures, covering design tools and techniques that link to practical on-site construction requirements."

The Building Simplexity Laboratory is now applying its philosophy to engineered wood too. "It's cheap but elegant," he said, "and digital technologies have provided new, practical opportunities for its use."

A recent project is YEZO, a cabin in Hokkaido, Japan, which has won multiple awards and attracted interest globally. Its gracefully curved glue-laminated rafters and roof make it environmentally low impact but the essence of the project centred on an evolutionary algorithm that allowed the production of many of these varying curved rafters from a single mould, thus reducing financial and labour costs.

Another project involving engineered wood is being set up by Dr Crolla in collaboration with student Gary Fung Ka-chun. His thesis project, 'Simple Assemblage', offers a solution for renovating/ repurposing Hong Kong's many abandoned buildings in rural areas. It comprises an innovative timber building system that provides economically and ecologically sustainable architectural solutions using the latest digitech to design and manufacture elegant and durable wooden structures with low-tech construction systems suitable for easy local assembly.

"What is great about this is its flexibility and how the system is overhauling the usual 'design-bid-build' architecture construction



Proposal for the conversion of an abandoned school in Yuen Long using the 'Simple Assemblage' procedure. (Courtesy of Gary Fung Ka-chun)

format," said Dr Crolla. "The project's design uses low-carbon materials like cross-laminated timber and employs geometries at the design stage that will minimise material use during construction and energy consumption when the building is in operation.

"Like bamboo, engineered wood is relatively affordable, hardwearing, sustainable and flexible. The government wants to find economical ways to renovate and repurpose abandoned buildings on Lantau, such as schools and community halls, and 'Simple Assemblage' offers a great potential solution."





There is a great tradition of bamboo craftsmanship in Hong Kong, but

DR KRISTOF CROLLA

usually for temporary structures such as Cantonese opera theatres and scaffolding. But, if treated for biotic attack and protected from rain and UV light, bamboo lasts and is suitable for permanent structures.

Photo credit: Diana Jou





Scale model of one of the complex bamboo structures from the summer workshops.





A basking Okada's five-lined skink (Plestiodon latiscutatus) on Hachijo-Kojima Island. (Courtesy of Masami Hasegawa)

LEAPIN' LIZARDS

The presence of predators and climatic warming are raising the temperature of lizards on Japan's Izu Islands – perhaps enhancing their chances of survival. A 40-year study, begun on the Izu Islands in the early 1980s, has shed light on how lizards preyed upon by snakes are active at higher body temperatures than lizards living on islands with no snakes. The study also found significant climatic warming through the 40 years and that lizard body temperatures had increased accordingly. This suggests firstly that lizard thermal biology is highly dependent on predation pressures and secondly that such ectothermic predator-prey relationships may be changing under climatic warming. In short, the lizards predated by snakes can run at higher temperatures, thereby eluding the snakes.

Unusually, the study has been ongoing for four decades, and was begun by Professor Masami Hasegawa of Toho University's Department of Biology in Japan. He was joined more recently by Dr Félix Landry Yuan, then a PhD student from HKU's Research Division for Ecology and Biodiversity in the Faculty of Science, and PhD candidate Shun Ito from Tohoku University's Graduate School of Life Sciences. Their research was supervised by Professor Hasegawa and HKU's Dr Timothy Bonebrake.

Said Dr Landry Yuan: "I first reached out to Professor Hasegawa near the end of my MPhil studies in 2015 to discuss potential PhD projects regarding prey-predator relationships between lizards and snakes on the Izu Islands. After many years of planning, I officially began collecting data with Professor Hasegawa in 2018 as a part of my PhD studies."

In addition to measuring body temperature in 2018 and 2019, Dr Landry Yuan's research included racing lizards down a portable racetrack to measure the speed at which they ran at different temperatures.

"The idea for a portable racetrack came about as a solution to conveniently measure sprint speeds in the field, without having to bring lizards back to a laboratory," said Dr Landry Yuan. "Getting lizards to race is easy and requires very little convincing. I would simply place an individual at the mouth of the racetrack for it to instinctively run forward." The team analysed the thermally-dependent running speeds of more than 150 lizards across the islands, and established how predation by snakes affected lizard thermal biology. They also considered the likely consequences for their fitness.

Dr Landry Yuan found that optimal temperatures were higher for lizards on snake-inhabited islands, while Shun Ito discovered differences in the lizards' hind legs length that may also improve their chances for survival. They concluded that higher body temperatures and morphological differences help the lizards run faster and better escape the snakes.

Ectotherms and environment

"The lizards are ectotherms," said Dr Landry Yuan, "which means their body temperatures follow the environment. As ectotherms, their bodily functions, including running, are therefore also dependent on body temperatures. In this way, higher body temperatures allow for better performance, but only up to an optimal peak, after which hotter temperatures actually decrease performance.

"Since snakes are ectotherms, just like lizards, they depend on environmental temperatures to regulate their bodily functions. For lizard populations having no exposure to snake predators, the body temperatures they prefer could be similar to that of snakes. With snakes present on some islands, the lizards there would presumably have adapted by choosing warmer temperatures to avoid the same temperatures sought by snakes. "This has important implications because lizards on snake islands are already adapted to hotter temperatures, so the ways in which they are going to be affected by further climate change should be different than for lizards on snake-free islands."

The Izus are a group of volcanic islands stretching south and east from the Izu Peninsula of Honshū, Japan, and part of Tokyo prefecture. They are a model island system and have been compared to Galapagos for the unique research properties they offer. In addition to Professor Hasegawa's lizard and snake surveillance across the islands every year, some are important nesting sites for threatened bird species, as well as crucial research sites for marine systems.

"With a low number of reptile species, we can explore the direct, evolutionary impact of predation by one snake species on one lizard species without the complexities of multiple predators, prey or competitors," said Dr Landry Yuan.

"I mainly measured lizard sprint speeds on Kozu and Hachijo-Kojima Islands. I measured lizard body temperatures on those two islands, as well as Niijima. Professor Hasegawa had also previously collected data on those islands, as well as Miyake, Mikura, Oshima and Toshima. Of these islands, snakes live on Kozu, Mikura, Oshima, Niijima and Toshima, while Hachijo-Kojima and Miyake are free of snakes."

"This was a really fun and insightful collaboration between HKU and Toho



A Japanese four-lined rat snake (Elaphe quadrivirgata) on Kozu Island.

University," Dr Bonebrake noted. "By combining our expertise in global change biology, predator-prey interactions, and island biogeography, the work demonstrated how all of these things can come together in novel ways."

Dr Landry Yuan concluded: "This is, as far as I am aware, one of the few studies explicitly outlining the effect of predation by a snake on the thermal adaption of a prey lizard. With our data also showing changes in lizard body temperatures with climate change over the course of the past four decades, our research has significant implications for our understanding of how prey-predator relationships could affect ectotherm species' response to future climate change."



DR FÉLIX

This has important implications because lizards on snake island

LANDRY YUAN on snake islands are already adapted to hotter temperatures, so the ways in which they are going to be affected by

further climate change should be different than for lizards on snakefree islands.





Dr Félix Landry Yuan searching for lizards on Hachijo-Kojima Island. (Courtesy of Masami Hasegawa)



THE APPEAL **OF MACHINE** JUSTICE

Jurisdictions around the world are increasingly using artificial intelligence (AI) to help mete out justice, nowhere more so than in Mainland China. Legal scholar Dr Benjamin Chen has been studying the drivers and implications of this trend.

A litigation services terminal in the case acceptance division of the Shanghai No.2 Intermediate People's Court.



The Chinese judicial system has put millions of case judgements online and installed machines in courthouses that tell would-be litigants their chances of success. In one sense, this puts legal matters in the hands of ordinary citizens. But at the same time, Al-mediated justice also serves the needs of the Chinese Communist Party (CCP), says Dr Benjamin Chen of the Faculty of Law.

Dr Chen and his collaborator Dr Li Zhiyu of Durham University have explored the implications behind the fervent embrace of AI and information technology in the Chinese legal system. "We're not saying that technology is being intentionally deployed to achieve the results we describe, only that technology has grown out to fill gaps and respond to tensions latent in the Chinese legal order," he said.

They have identified three such tensions where an AI solution has appeal. The first is quite simple: it addresses the heavy caseload that has arisen from government efforts to professionalise the courts by weeding out under-qualified judges. "In the past, just about anyone could be appointed a judge," he said. "Judicial reforms have culled the ranks but that means there are fewer judges and they are increasingly overworked. Technology is supposed to alleviate this."

The second tension relates to strains between social harmony and the law. Law-based order was restored following the Cultural Revolution. But the insistence on legal rights and procedure sometimes worsened social conflicts rather than resolving them, so the government started



The digitisation of the Chinese judicial system has made judicial documents more transparent and accessible to ordinary citizens. The Hangzhou Internet Court Real-Time Big Data Statistics Platform is one example.

promoting social harmony and encouraging mediation rather than adjudication. However, the judges were also given guotas, which incentivised them to badger and bully parties into settlement.

Deterring self-help

The machines outside courts address the tension between social harmony and rule of law by giving people a seemingly more objective reading of their chances of success if they litigate, based on an algorithmic analysis of previous judgments.

"The official narrative for why the machines are there is access to justice. But the technology also encourages parties to settle by bargaining in the shadow of the law. This responds to a deeper problem confronting the Chinese legal system in which the partystate wants to operate through law, but it does not want people to be too litigious and it wants to maintain social stability," he said.

The third tension relates to party hegemony. "In very simple terms, law is very useful for deterring self-help and channelling disputes off the streets and into the courts. The CCP has done a lot to raise legal consciousness among people. But the flip side is that while the party-state encourages people to invoke their rights, it does not want them banding together. If they become organised, they represent more of a challenge to the party's control over social discourse.

"This is a very interesting area where technology comes in. We're not claiming it is intentional, but one consequence of

making law accessible to the masses is that it removes the need to consult lawyers, NGOs, friends and family members, which might bring people together and create a kind of group consciousness."

Double-edged

Dr Chen and Dr Li tested the appeal of legal technology in an online survey of about 1,000 netizens in China and interviewed 100 prospective litigants who had sought legal aid. Netizens were generally aware of the digitisation of the legal system and thought it could improve its legitimacy. The legal aid seekers were less aware but were enthusiastic about giving the technology a try. However, in both groups there was still a preference for human advice.

"The use of technology in the legal system can be double-edged. On the one hand it expands access to justice which is a kind of democratisation. On the other hand, lawyers may be cut out of the process," he said, which has broader implications. "Because lawyers are agents of change in the law, the extent to which they are disintermediated could rather profoundly change how the legal system works.

"This is a concern not only for the use of legal technology in China, but more broadly, if we are going to think 50 years ahead about legal systems as a whole."

In any case, the adoption of algorithms in the justice system will depend largely on people's faith that they are fair. Dr Chen is also putting finishing touches to an experimental study

in the US that asks what ordinary citizens think about machine justice. It found human judges had a procedural justice advantage over AI, but if people were allowed a hearing before an AI judge whose decisions were also interpretable, then the perceived fairness of the process was equivalent to an un-interpretable decision by a human judge handed down without a hearing.

"One note of caution about studies of lay perception is that people's beliefs can be wrong and machine justice could actually be unfair. But people like to feel they are being heard and that is something we should take into account when imagining the future of adjudication," he said.



DR BENJAMIN

CHEN



We're not claiming it is intentional, but one consequence of making law

accessible to the masses is that it removes the need to consult *lawyers, NGOs, friends and family* members, which might bring people together and create a kind of group consciousness.



ZOOMING ACROSS THE WORLD

Overseas exchanges have been curtailed by the pandemic but that has not prevented teachers in the Faculty of Arts and the Faculty of Business and Economics from offering students an authentic, cross-cultural learning experience.

For Spanish lecturer Dr Mercedes Vázquez of the School of Modern Languages and Cultures, the COVID-19 pandemic ruled out a crucial part of her programme – trips to Spanish-speaking countries where students could apply their language and intercultural learning. So she came up with the next best thing and, in the process, inspired an unusual collaboration with the Faculty of Business and Economics (FBE).

Through Zoom, students in her business Spanish course met with peers at the lcesi University in Colombia over a full semester. They spoke regularly and collaborated on a proposed investment project for Hong Kong and Colombian investors – work that was assessed not only on outcome but on teamwork. "We did not accept a project that had one group do part A and another group do part B. Teamwork is not based on different contributions but on interaction, and in the pedagogy of languages, we are very aware of that," she said.

As a result, the students learned about each other's cultures even though they sat on opposite sides of the world and they developed what Dr Vázquez termed "intercultural competence" in dealing with each other.

"Asian students are more reluctant to talk, while Colombian students talk all the time. And Hong Kong students expect immediate replies to e-mails which may be too demanding from a Colombian perspective and also difficult because there are electricity or internet cuts. We worked on respecting each other's cultures and what aspects could become problematic," she said.

"Intercultural competence is not spontaneous. As we know, migrants may live in a country for 20 years but still don't understand or behave in ways that are respectful to locals. I argue it is a very important thing to teach."

Keen for more

The programme was developed with Professor Vladimir Rouvinski of Icesi

University's Department of Political Studies and its success reached Dr Olivia Leung of the FBE, who thought it had potential to enrich her students' learning.

Dr Leung adapted the Zoom approach into a more informal exchange that took place over reading week in March 2021 and let students take charge of the interactions. (Students from Dr Vázquez's and Professor Rouvinski's classes also joined.) The students met for one hour each day to get to know each other and discuss topical issues such as the Chinese and Colombian economies. The teachers also organised a debate on vaccine distribution, but otherwise stayed out of the sessions where students were free to choose the topics of discussion.

"I think this was very important because it showed them respect and at the same time, they did not have to feel they were being monitored," Dr Leung said. "They really appreciated that this was not a lecture or classroom setting and they had the freedom to get to know each other. Students joined voluntarily so I think they were very selfmotivated. Students got to experience the fruits of being an active learner, rather than working hard just for a grade."

Her students were enthusiastic afterwards to continue the exchanges beyond the one-week session. "The students were really into it and wanted to build more networks, not just over Zoom so they can continue activities together online," she said.

Lesson for the future

Dr Vázquez's students similarly gave positive feedback. Gabriella Tse, a BA&BEd (Language Education – English) student, joined in her final year having done a summer course in Spain previously and wanting to use Spanish in more formal and professional contexts. She also appreciated learning more about Colombian culture, including their focus on conversation. Her Colombian groupmate Fabio would spend the first half hour of meetings talking about things not relevant to the meeting.

"Although it was frustrating at first, I understood that this was part of the culture of being friendly with colleagues. He was also super helpful sharing his knowledge and experiences. That was a lesson that I'll bring to my jobs in future," she said.

While she missed the immersion of doing an overseas exchange, "I also appreciate the flexibility of being able to communicate with someone literally on the other side of the world. Most of the time we don't have the resources or conditions to just travel to an exchange destination in person."

Moving forward, Dr Leung is looking at the possibility of running the informal





HKU students Jack (top left) and Gabriella (top right) talking to their Colombian groupmate Fabio (bottom) via Zoom.

exchange over a whole semester and expanding interaction opportunities for students. Dr Vázquez is considering including an online component in a new major under development.

"The pandemic has shown us that very fruitful, large changes can happen just with a connection to the internet. I know we all have Zoom fatigue and nothing substitutes for a physical exchange, but at least we can still get great benefits and we don't even need to invest much in the technology," Dr Vázquez said.



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with a connection to the internet. I know we all have Zoom fatigue and nothing substitutes for a physical exchange, but at least we can still get great benefits.



Gabriella (first from right) has been to Spain for a summer course previously. She joined the programme to meet with peers at the lcesi University in Colombia through Zoom hoping to use Spanish in more formal and professional contexts.



ADVANCED AND AFFORDABLE CARE

The Faculty of Dentistry's new Multi-Specialty Clinic is training a new generation of specialist dentists and also rendering complex treatment affordable to the general public.



The Multi-Specialty Clinic provides students with clinical training opportunities and the public with affordable specialised dental treatment.

Opened in autumn last year, the state-ofthe-art Institute for Advanced Dentistry -Multi-Specialty Clinic (IAD-MSC) is Hong Kong's only training facility that provides advanced clinical training for gualified dentists pursuing taught postgraduate (TPG) training in the dental specialties of the College of Dental Surgeons of Hong Kong.

"The overall plan is to work in tandem with local general dentists," said Professor Thomas Flemmig, Dean of Dentistry. "We're training specialists and providing specialty dental care to patients. We work closely with dentists practising in Hong Kong,

so that together we can provide the best comprehensive care.

"Hong Kong now has three tiers of care: primary care provided by local general dentists; secondary care provided by the specialists we are training at the IAD-MSC; and tertiary care provided by hospitals to which we refer patients."

"We will also make sure that specialist-level care is available at an affordable price to the public," said Mr Eric Tsui, Director of the IAD-MSC. "Costs are significantly lower than the going rates in Hong Kong. It is important to note that while the Clinic operates on a notfor-profit basis we must recuperate patient treatment costs. It does need to pay for itself."

Essential service

At the same time, Mr Tsui sees the Clinic as an essential service in Hong Kong. "In the larger context, there are approximately 32 dentists per 100,000 people in Hong Kong which is pretty low compared to other modern cities - and there are even fewer dental specialists.

"The Hong Kong Government does not fund advanced dental care for the public but we want to enhance access to high-quality



The Multi-Specialty Clinic is equipped with modern state-of-the-art facilities and equipment so that students can learn to provide the most advanced dental treatments to their patients.



From left: Dr Katherine Leung, Associate Dean of Dentistry (Taught Postgraduate Education); Professor Thomas Flemmig, Dean of Dentistry; and Mr Eric Tsui, Director of the Institute for Advanced Dentistry – Multi-Specialty Clinic.

specialist care in Hong Kong. The Clinic welcomes referrals from public and private dental clinics."

The Institute for Advanced Dentistry was approved in 2017. In addition to the training programmes in the Multi-Specialty Clinic, it houses the Faculty's research postgraduate (RPG) programmes, the Global Dental Campus and the Oral Health Research and Innovation Initiative. The University needed to expand the IAD-MSC out of the Prince Philip Dental Hospital, the Faculty's main teaching and learning hub, and it was also seen as an opportunity for TPG clinical innovation

Located next door to HKU's main campus, the 15,000-square-foot Clinic has an impressive suite of facilities including 45 dental chairs, all of which have state-of-the-art equipment for digital dentistry. There are operating facilities, 2D and 3D radiography, an advanced dental laboratory, and a central sterile supply unit of modern hospital standard.

The Clinic offers training in seven disciplines -Endodontics, Implant Dentistry, Oral and Maxillofacial Surgery, Orthodontics and Dentofacial Orthopaedics, Paediatric Dentistry, Periodontology and Prosthodontics. Resident dentists are taught by clinical experts. Other TPG programmes of the Faculty include Community Dentistry and Dental Materials Science.

"Full-time professors and honorary clinical staff work closely together to achieve clinical excellence," said Professor Flemmig. "One out of every 10 practising dentists in Hong Kong is involved."

Positive clinical practices

Dr Katherine Leung, Associate Dean (Taught Postgraduate Education) pointed out that, along with HKU's Faculty of Dentistry – the only dental school in Hong Kong – the new Clinic is "a leading centre for postgraduate dental education and training globally, offering unique opportunities for students to learn specialist knowledge, implement innovative research and translate both into positive clinical practices for the benefit of individual and public health.

"Students admitted to our three-year Master in Dental Surgery programmes are dentists who have gained at least one year of clinical experience after their undergraduate education," she added. "Apart from acquiring advanced clinical skills, they are also trained in research and teaching."

The Clinic follows international standards, and the Faculty is looking to expand it to HKU's Shenzhen campus in the Greater Bay Area in the near future.

About 100 masters degree students are currently undergoing training at the IAD- MSC. Of those, two thirds are locally trained graduates and one third are non-local mainly from Southeast Asia (Malaysia, Singapore, etc) and other cities in China, as well as the Middle East, Russia, the UK and Australia.

In summary, Professor Flemmig said: "The training of dental specialists at the IAD-MSC will improve access to high-quality dental care and advance the oral health and wellbeing of the people of Hong Kong."





public but we want to enhance access to high-quality specialist care in Hong Kong. The Clinic welcomes referrals from public and private dental clinics.



NATURAL LIFE LESSONS

The Hong Kong Biodiversity Museum houses a vast collection of specimens of our hugely varied natural heritage, and was opened with a mission to promote wider understanding of conservation and research into local and regional biological diversity.



Some specimens are displayed up close on microscopes for visitors to observe them directly.

While space at the Hong Kong Biodiversity Museum (HKBM) is limited, the collections are not, with nearly 10,000 specimens – animals, insects, marine life plants and fungi – on display to the public and around 20,000 specimens being readied for future inclusion.

"Ultimately, this is probably now one of the largest collections in Hong Kong, if not the largest," said Museum Director Dr Benoit Guénard, who is Associate Professor at the School of Biological Sciences (SBS). "But overall, it represents only a small subset of all the amazing species that can be found in Hong Kong and elsewhere in the world.

"Establishing such a collection is needed for everyone to appreciate the life surrounding us, and also for current and future researchers to have access to a comprehensive biobank for their studies. Just earlier this year, four new species of ants were described from Hong Kong, with some based on specimens that had been collected nearly 30 years ago and were preserved at the HKBM."

When he joined HKU in 2014, Dr Guénard was surprised to see that Hong Kong did not have a natural history museum. However, the School of Biological Sciences had a collection that had been sitting in a room for a couple of decades, while hundreds of other specimens were scattered around the building. He started to gather these specimens, while adding new ones generated by SBS's research programmes to establish a more comprehensive collection. Progressively, other colleagues such as Professor Yvonne Sadovy and Dr Billy Hau, joined the efforts to develop the Museum and thanks to funding from the Environment and Conservation Fund a couple of curators were hired in late 2020 and early 2021. While opening during the pandemic was risky, the Museum has been fully booked and nearly 4,500 have visited on site since its public opening in May this year, plus many more have made virtual visits.

Key players

"Museums are key players for understanding biodiversity and how it changes," said Dr Guénard. "By collecting samples and preserving them in a collection we are able to go back in time and check what species

Since its opening in May 2021, the Hong Kong Biodiversity Museum has been fully booked and nearly 4,500 have visited on site.



were present where and when. We can also deposit new collections which can be used in the future for taxonomic revisions and other studies.

"The Museum is also very important for teaching – having the opportunity to manipulate, touch, see and sometimes smell an organism is a unique experience. It helps you understand and relate the theory you learn on a course with the practice, where you can observe the specimens directly and compare."

This summer the HKBM offered undergraduates from HKU and other universities the chance to do internships, and to learn how to curate specimens. Some are now helping provide tours of the Museum, while others – alongside graduates and academics knowledgeable about particular organisms – have also assisted in verifying the identifications of hundreds of specimens.

One of the goals of the HKBM is to let people see organisms in a way they have never seen before. "For example, ants – one of the most common insects, yet people tend to sum them up as the 'small black one' or the 'big red one," said Dr Guénard. "But in Hong Kong we have more than 300 species of ant and in the Museum we display some of the diversity up close on microscopes for people to observe them directly as well as on posters." Other sections include the extensive bird collection, primates, rodents, pangolins from all over the world, alongside local and smaller vertebrates which are preserved in glycerol. "This displays their external morphology but, for those interested in looking at their internal morphology, there are numerous bones – skulls, skeletons *etc* which help you understand their evolution and diversity," said Dr Guénard.

The majority of the specimens originate from Hong Kong or Southeast Asia, but you can also discover a hippopotamus from Uganda, a lungfish from Australia, some baobab seeds from Madagascar, and a golden tamarin from South America. "We may be offering one of the few opportunities to travel all around the world currently available in Hong Kong," he added.

One of the most extensive collections is insects, Dr Guénard's particular area of interest. "Over a million species have already been described globally, but possibly 4 million have yet to be described, so there is a lot of work that can be done in insect research. I am an entomologist, so I find these collections fascinating.

"Seeing the enthusiasm of the public for visiting the HKBM over the past six months, and the potential educational outcomes it generates – both within and outside

Undergraduates from HKU and other universities were offered internship opportunities at the Hong Kong Biodiversity Museum last summer; many chose to stay as helpers to provide guided museum tours.

the university walls – for the research and protection of biodiversity, it is clear that Hong Kong deserves a new institution dedicated to the diversity of life. "



DR BENOIT GUÉNARD

"

The Museum is also very important for teaching – having the

opportunity to manipulate, touch, see and sometimes smell an organism is a unique experience. It helps you understand and relate the theory you learn on a course with the practice, where you can observe the specimens directly and compare.





Learn more about the Hong Kong Biodiversity Museum

TWITTER ALERT

Given social distancing, more and more people are leaving the city at weekends and heading for the countryside. A new bird-watching app could help them not only get next to nature but get to know it too.

Developed by the School of Biological Sciences (SBS) and Hong Kong Bird Watching Society (HKBWS), HKBirds is an iOS app designed to help users observe, identify and record birds, and to share their findings too.

Principal Lecturer Dr Billy Hau coordinated the project and explained that a large part of the incentive was to make people look up from the flat screen of their mobile phone and observe nature as it is, while also recognising that inevitably nowadays they will return to the flat screen for information and sharing.

"The aim is to promote the appreciation of the birds of Hong Kong, and the target audience is the general public and school students," said Dr Hau. "Under COVID-19, more people are going to the countryside. We hope that the app will facilitate the public to know more about the birds of Hong Kong. In addition, they can record and share what they

find, making it a great platform for learning and knowledge exchange."

The SBS is a long-term partner of HKBWS – indeed, many graduates work there - and they have collaborated frequently in the past. Pictures on the app came from the HKBWS archive, contributed by the society's members. The text was drafted by the project team, based on an older version of the app and the HKBWS archive, and tech know-how was provided by HKU's Department of Computer Science.

Song, habitat, morphology

HKBirds is available for free download worldwide and includes information on the appearance, song, habitat and morphology of the birds themselves, as well as information on migration habits, tips and code of conduct for responsible bird watching. There are also

directions to the best places to visit to see birds in Hong Kong.

"The response has been very good," said Dr Hau. "The app was launched on June 28 and more than 1,600 downloads were recorded in the first five days. The app ranked second and third in the Reference Category of iPhone and iPad App Store respectively on July 3, 2021, and the app is rated 4.9 out of 5 in the App Store.

"Statistics show that, in addition to Hong Kong, the downloads came from various places including Japan, Taiwan, the US, the UK, Macau, Mainland China, Canada, Australia, Singapore, Malaysia, Panama, New Zealand and Italy."

For the future, the HKBWS will maintain and update the app. Dr Hau and his team are currently discussing the possibility of developing an Android version.





We hope that the app will facilitate the public to **DR BILLY HAU** know more about the birds

"

of Hong Kong. In addition, they can record and share what they find, making it a great platform for learning and knowledge exchange.





Download the HKBirds mobile app

HEALING THROUGH THE ARTS

Research at HKU is showing how dancing, painting, sculpting and other expressive arts can mitigate depression and behavioural problems among both the young and the old.

Pummelling, squeezing and moulding clay into shape, splashing paint across a canvas or moving freely to music should instinctively feel satisfying. Professor Rainbow Ho Tin-hung of the Department of Social Work and Social Administration has put that insight through a research lens to produce scholarly evidence of the benefits.

In a 2017 randomised controlled trial (RCT) with her then-PhD student Dr Joshua Nan Kin-man. for example, she found clay art intervention could reduce symptoms and improve wellbeing among 106 adult outpatients suffering from major depressive disorders. The success of that study inspired her to dig deeper into other expressive art therapies and different groups, ranging from children to the elderly who have conditions such as intellectual disabilities, dementia and HIV.

"Artistic expression plays an important role in how we make sense of the world and understand and communicate with others," she said. "In 2019 the World Health Organization

published its first report on how art can impact health and well-being, which is an important backbone to our work. It documented how art can help in health prevention and promotion, management of conditions, and treatment."

Working with colleagues from the Centre on Behavioral Health, Professor Ho studies arts therapy in a Hong Kong context. Following the clay study, she conducted an RCT on dance movement therapy for older adults with mild dementia. The 204 participants were assigned to dance therapy, exercise or no intervention. While the first two groups performed best, the dance group had a significant reduction in their depressive mood and sense of loneliness. "They also had better cognitive improvement. These effects were unique to the dance therapy group," she said – so it was not movement alone that was helping them.

Distancing difficult emotions

Another RCT used music to manage behavioural and psychological symptoms in 73 elderly Chinese with moderate dementia. The results again were encouraging, with participants showing reductions in agitation, general unhappiness and frustration (dysphoria).

Professor Ho and her team also found expressive arts therapy helped people living with HIV find meaning in life and improve their guality of life and mood, and helped foster behavioural and emotional well-being among adults with intellectual disabilities.

Children benefit from expressive arts therapy, too. A study of 213 primary school children with special educational needs found the therapy reduced their emotional difficulties, hyperactivity and peer problems, as perceived by their parents and teachers. Another study of parent-child dyads found a positive effect of play-oriented arts on parents' moods and children's social behaviours.

"The channel of arts is not purely based on verbal ability or cognitive functioning,



Dance and movement can be engaged as effective non-verbal interventions. The elderly express, communicate and engage in healing through their bodies in the dance movement therapy group.



Professor Rainbow Ho's research showed that children also benefit from expressive arts therapy.



Artistic expression plays a vital role in health and well-being. Professor Rainbow Ho promotes expressive arts therapy beyond academia and in the community via different outreach programmes.

so it can facilitate communication and expression," she said.

Professor Ho has also been exploring the question of how art effects change, as part of a team of international creative arts therapy researchers. Their findings were published this summer.

"There are some common effects across the art forms, such as the therapeutic relationship alliance that occurs between the therapist and the client and the use of symbolism to help people distance themselves from difficult emotions and look at things from different angles," she said. Her own contribution to the paper focussed on dance and suggested moving together in a group could enhance togetherness and reduce the sense of loneliness.

Benefits to social well-being

Professor Ho has herself experienced the benefits of expressive arts. She began dancing as a child and still participates as a judge in international DanceSport (ballroom dancing competitions). Dancing also led her to focus on anatomy for a Master's in biomedical sciences (she also has a PhD in social work).

"I have experienced how art can help me. When I'm tired or not in a good mood, I dance and feel much better. Dancing also helps me focus and be more flexible in both my body and mind. And I see people around me benefitting from the arts as well," she said.

That intuitive understanding has motivated her to promote expressive arts therapy beyond academia and in the community. She led the launch of a Master of Expressive Arts Therapy programme at HKU in 2013, the first of its kind in the region, which admits about 25 students each year.

She has also developed outreach and train-the-trainer programmes benefitting thousands of recipients and involving multiple collaborators in the community,



Many participants benefitted from the train-the-trainer programmes organised by the Centre on Behavioral Health.



such as the Hong Kong Jockey Club, Sovereign Art Foundation, Robert H N Ho Family Foundation and Keswick Foundation, and led a project using expressive arts for substance abuse rehabilitation that was supported by the Beat Drugs Fund. She has also promoted arts and well-being in speeches delivered around the world. Her work earned her the 2021 Faculty Knowledge Exchange Award.

Given all the benefits, Professor Ho would like Hong Kong to recognise the expressive arts therapy profession and follow other jurisdictions, particularly in Europe, where arts activities are prescribed as a form of medicine or treatment. "Many of us are experiencing distress, in particular after the social unrest and the social restrictions under the pandemic. People are looking for something that can draw them together. The arts are very good at rebuilding collaboration and benefitting social well-being," she said.



PROFESSOR RAINBOW **HOTIN-HUNG** *it can facilitate* communication and expression.



USING AI TO PREDICT TRAFFICKING SENTENCES

Computer Science and Law have joined forces to produce a predictor which uses artificial intelligence (AI) to calculate the likely sentencing for drug trafficking.



Under the auspices of the Law and Technology Centre, the research team led by Professor Ben Kao of the Department of Computer Science and Professor Anne Cheung of the Faculty of Law have developed a Stage-1 model of HKU AI Lawyer, which can predict sentencing associated with eight different types of dangerous drugs. Users simply provide information, in the form of answering four straightforward questions, and the AI Lawyer will predict what sentencing will be, as well as breaking down individual factors that will lead to the sentence.

"We wanted to find an answer to the challenging issue of how legal knowledge that is embedded in previous court judgments can be captured and modelled using machines," said Professor Cheung. "Lawyers have to familiarise themselves with previous court cases or 'precedents' which serve as important guidelines to future cases. In Hong Kong alone, there are more than 80,000 historical judgments.

"Although there are guidelines on determining prison term 'starting points', these starting-point penalties have to be adjusted based on various mitigating and aggravating factors specific to each case. Predictions are more difficult for more complicated cases, such as those involving multiple drug types."

It would be a Herculean task for a human lawyer to recall all relevant precedents when he or she is researching and preparing for a new case. The team therefore took on the task of studying how to train a machine to comprehend and memorise court judgments using Al techniques and to reason based on the logic discovered from judgments.

The workings

Asked to describe how it works, Professor Kao said: "In a nutshell, the AI component of the sentencing predictor was taught two kinds of knowledge, one provided by law experts and another by computer science experts. First, our law experts provided the basic framework and logic of drug-trafficking sentencing. This knowledge includes: the basic sentencing guidelines for determining starting-point penalties based on drug type and weight; the aggravating and mitigating factors that a judge would usually consider in sentencing; guilty-plea penalty discount; and the legal principles judges usually apply for more complex cases such as those that involve multiple drugs.

"Based on this framework, our Al experts determined how each element is assessed quantitatively in terms of a prison term (in months) and how the prison term is adjusted based on the aggravating and mitigating factors (again, quantitatively). This is achieved by applying neural network techniques with the machine reading and understanding around 3,000 drug-trafficking court judgments that were published from 1998 to 2019. The machine then deduces the computation of final sentences mimicking the decision of a human judge. Also, given a scenario (in terms of drug dealt, mitigating and aggravating factors), the machine would try to recall any precedents that are similar to the given scenario, and retrieve those cases (if any) for the user's reference."

From the users' point of view, the four questions they must answer address the following: drug types and weights; whether the defendant pleads guilty; aggravating factors; and mitigating factors.

In order to demonstrate the feasibility of the idea with real cases and applications, the team worked closely with an NGO, the Hong Kong Federation of Youth Groups (HKFYG), which has a Youth Crime Prevention Centre that provides counselling to young people, particularly those at risk of drug-related crimes.

"Social workers need to know about sentencing for drug offences so they can educate young people on the serious consequences of drug trafficking and help young offenders plan their future as they face jail time in correctional institutions," said Professor Cheung.

Although social workers from the HKFYG occasionally consulted lawyer colleagues about potential penalties and consequences of drug-trafficking offences, most of the time they simply acquired the knowledge themselves from cases which they had handled, previous judgments and newspaper reports.

Target drug trafficking

The AI Lawyer started with drug offences for several reasons. First, sentencing guidelines for drug-trafficking cases are guite clear, making it easier for a machine to capture the underlying sentencing logic. Second, drug-trafficking cases are the most numerous among all criminal judgment topics, and since the AI techniques the team employed are data-driven it made sense to start with offences for which there is more data. Third, through the youth crime prevention programme, the team were able to work with HKFYG to develop a sentencing predictor for HKFYG workers – a very useful and meaningful application of the work.



Professor Anne Cheung (left) and Mr Michael Cheung (right) from the Faculty of Law and Professor Ben Kao (centre) from the Department of Computer Science presenting the HKU AI Lawyer: Sentencing Predictor for Drug Trafficking.

s Based HKU A The team are now working on applying Al to personal injury (PI) cases too, with the objective of training the machine to assess PI compensation. "We believe that it would be useful to the public as PI compensation computation is rather complex – there are more varieties in injuries than in drug offences," said Professor Cheung.

The predictor is already online and open to the public, and the reaction has been good. "On average, the predictor is consulted about 50 times daily, or more than a thousand times per month," said Professor Kao.





Social workers need to know about sentencing for drug offences so

PROFESSOR sentencing for **ANNE CHEUNG** drug offences so

they can educate young people on the serious consequences of drug trafficking and help young offenders plan their future as they face jail time in correctional institutions.

Photo credit: Tai Ngai Lung





Learn more about the HKU AI Lawyer



Based on the drug type and amount, guilty plea, aggravating and mitigating factors, the HKU AI Lawyer can predict sentences in drug-trafficking cases.





HKU has undergone enormous changes to its physical campus and teaching and research programmes over the past decade – changes that are still unfolding. Less visible but just as profound have been the changes to its Libraries.

Far from being simply places of books and tables, HKU Libraries have been transformed into dynamic settings, with a wide variety of seating options, rooms for individual and group study and students with special needs, new technologies such as virtual reality and 3D printing, and a huge expansion in e-resources, such as the increase in e-books from about one million in 2006 to more than 7.8 million as of 2020–2021.

Stepping into the driver's seat to propel even further change – not only in the Libraries but IT services across the whole University – is Ms Flora Ng, HKU's new Chief Information Officer (CIO) and University Librarian who has more than 30 years' experience leading digital transformation in companies such as Johnson & Johnson in the US and Singapore, General Motors USA, and Dairy Farm in Hong Kong.



Ms Flora Ng (left) with HKU's first female librarian Dr Kan Lai Bing (centre) who served from 1983 to 1997, and Dr Esther Woo (right), Director of Library Services and Fung Ping Shan Librarian.

DIGITAL TRANSFORMATION

T L T T T

The new Chief Information Officer and University Librarian, Ms Flora Ng, is spearheading a new wave of rapid digitalisation in the University's Libraries and Information Technology Services (ITS).



The Common Core, Faculty of Education, Sau Po Centre on Ageing and the Libraries coordinated a tai chi project at the Tech@Ingenium in the Main Library with the assistance of video and virtual reality (VR) motion capture.

"Both Libraries and ITS have common themes. They both serve the whole University and they both need to simplify and improve their services. Through my position, I'm able to fast-track collaboration and interaction. The speed of change will be a lot faster on both sides," she said.

The modernisation drive that has been underway will be accelerated, including the expansion of digital scholarship services and lending services and the digitisation of the collection, especially Special Collections which include unique and rare materials. The idea is to upload these and make them accessible for teaching and research, while preserving the integrity of the physical books.

Digitised profiles

Digitalisation of researcher profiles is also on the roadmap. The HKU Scholars Hub provides information on each scholar, such as educational background and publications, that is accessible to the public, but Ms Ng talks of plans to create a new platform that also dovetails with the University's aims. Currently, certain information on scholars such as research grant details is held on a separate platform run by ITS.

"We are working with senior management to create a researcher profile platform that's dynamic and real-time, and that will help us better identify top talent at HKU," she said.

The University Libraries are also working with other non-academic units to establish the GLAM Lab – for galleries, libraries, archives and museums – that will make these resources more fit for purpose in terms of teaching and research.

Dr Esther Woo, the Director of Library Services and Fung Ping Shan Librarian, has played a major role in implementing some of these changes to date, including physical renovations. "We have changed our role quite a bit in recent years, supporting more e-learning and collaborative activities. So the renovation of our facilities has helped us deliver all these new services more effectively," she said.

As with digital capabilities, more changes are planned to physical spaces, including a revamp of the first floor to unify the Special Collections and University Archives and ensure they have the correct humidity, insect control and other physical conditions to preserve rare books and collections.

11 Through my position, I'm able to fast-track collaboration and interaction. The speed of change will be a lot faster on both sides. **J**

MS FLORA NG

Anniversary celebrations

"We are on two extreme ends," Ms Ng said. "We treasure all the rare books and collections that we have and we must preserve them for future generations. On the other hand, we are really pushing the virtual agenda and digital side. In the middle, there is also a large set of physical spaces that we have and that we must deal with effectively."

Looking further down the road, Ms Ng will also be involved in helping develop digital services for HKU's new campus in Shenzhen, which is still in the early stages of planning. "It's a greenfield opportunity to build a next-generation campus from a technology perspective," she said.

In the meantime, there are two major celebrations to organise for next year when the Main Library marks its 110th anniversary and the Fung Ping Shan Library, which houses the University's East Asian collection, its 90th anniversary.

The Library Public Relations and Development Manager, Mr Gary Chin, pointed out that many students have fond memories of their time in the libraries – and sometimes something more. "We have actually had a request to take wedding photos in the library because the couple met here," he said. "It leaves a lasting impression."

Ms Ng invites students, staff and alumni to send in their favourite memories of the libraries for the anniversary publications, adding: "HKU is a great place and I encourage all of our stakeholders to support us in helping us maintain this legacy."

MUSEUMS OF REMEMBRANCE **AND FORGETTING**

The National Mall in Washington DC houses dozens of museums and monuments that venerate America's past. But until this century, the dark histories of African Americans and Native Americans were largely ignored. Dr Tim Gruenewald argues that attempts to right that wrong have been falling short.

National Museum of African American History and Culture in front of the Washinaton Monument.



Museums tell a story as much by what they omit as what they contain.

The National Museum of American History includes displays of all aspects of the country's past and welcomes about three million visitors a year. But two key groups -African Americans and Native Americans have been highly marginalised.

The museum did not hold a comprehensive exhibition on slavery until 2012 and still does not address the ejection of Native Americans from their land, as Dr Tim Gruenewald, Programme Director of American Studies in the School of Modern Languages and Cultures, argues in his new book, Curating America's Painful Past: Memory, Museums, and the National Imagination.

This shortfall inspired the opening of the National Museum of African American History and Culture in 2016 and the National Museum of the American Indian in 2004, which were meant to spotlight their place in American history. However, he argues they also fall short because their remembering is largely disconnected from the present day.

While the new museums are state-of-theart, have striking displays and celebrate the cultures they represent, they leave key figures untouched, particularly George Washington, and hold back from linking the wrongs of the past to those of the present day, such as racial inequity in the criminal justice system.

"I'm not against forgetting - to the contrary, I don't think it is healthy to remember the trauma forever and ever. But you cannot suppress past collective violence before the problems have been dealt with. At the societal level, there is an obvious connection between the past and the present. But in the political realm, it is a different story because once you acknowledge the link, then you have to do something about it," he said.

Egregious omission

The African American museum does not pull punches about the past and draws on the example of the nearby United States Holocaust Memorial Museum to explicitly show the horrors of slavery and the pain of segregation.

However, Dr Gruenewald said: "It finds a way to tell this story that does not disturb the secular religious space of US nationalism on the Mall."

Washington was a major slaveholder, but this is not explored anywhere on the Mall, including the museum. "Washington is the most egregious omission in that context. We're in Washington DC, the museum is next to the Washington monument, and this other version of American history leaves out the biggest name in town who also happens to have been one of the larger slaveholders of his time," he said.

Thomas Jefferson's slaveholding and racism are addressed, but his iconic phrase also receives the largest display - "All men are created equal", from the Declaration of Independence, is visible over four storevs. The historical exhibition concludes with Barack Obama's inauguration and Oprah Winfrey's success as a female billionaire.

"The exhibition doesn't hide anything about slavery, but what is the turning point in that story? It's the Declaration of Independence," which was written more than 85 years before the American Civil War that ended slavery.

"The dark past is embedded in a narrative structure that salvages the founding core ideologies of the national American imagination of equality, freedom and



A display on American Indian Wars and forced relocation at the National Museum of American History.

progress, and implies that it got better after the founding moment," he said. "But that is not the whole story. Slavery expanded after independence and racial inequality persists until today, which I would argue has been marginalised in the museum."

Burden of remembering

Likewise, the Native American museum is soft on Washington. The museum had a somewhat controversial start because its displays were based around indigenous storytelling and mythology, not a traditional linear narrative of their history – partly due to their fraught relationship with museums which in the past have depicted Native American mannequins in dioramas "like stuffed animals," he said.

But although recent displays have more directly highlighted the death, destruction and displacement they experienced under white men over 400 years, they also stop short at Washington.

"Washington is presented as the honest broker. The villain is Andrew Jackson [US is mostly a positive figure. We don't have to change the discourse on the Mall," he said.

president from 1829 to 1837] who expanded the policy of forced displacement. So again, they have done this in a way that leaves the larger national imagination intact. Washington Dr Gruenewald said he did not want to detract from the achievements of the two museums in celebrating their respective cultures. But as a scholar of public memory, it was important to consider how the past was remembered and connected to the problems of the present day.

"It should not be the burden of the African American and Native American museums to remember slavery and forced displacement those communities know their past. It seems to me it should be the task of the country as a whole. And if any one group should do more then it's the majority, the descendants of the perpetrators, who should have the burden to remember," he said.





l'm not against

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A sculpture of Thomas Jefferson at the National Museum of African American History and Culture.



Curating America's Painful Past: Memory, Museums, and the National Imagination Author: Tim Gruenewald Publisher: University Press of Kansas Year of Publication: 2021

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PAINTINGS FROM MYANMAR'S LOST TRANSITION

Myanmar's move towards greater openness crashed to a halt early this year with a military-led coup. But some of the fruits of that decade-long flowering are preserved in a large collection of paintings from the period held by HKU's Vice-President and Pro-Vice-Chancellor (Teaching and Learning), Professor Ian Holliday, and showcased in a new book.

Myanmar's tumultuous history has not only been a major research focus for Professor lan Holliday, it has impacted him personally. When the country began to open up just over a decade ago, he was Dean of Social Sciences at HKU. Given the significance of the changes at that time, he decided to step down from that post and focus on studying the country's transition.

He made multiple visits to Myanmar, meeting with leaders such as Aung San Suu Kyi (including hosting a 2011 video dialogue with her and HKU members) and connecting with various leaders of civil society in places such as Pansodan Gallery in Yangon, a combination of teahouse and art gallery. Artists naturally hung out there and as he chatted with them about their work, he started to buy a few pieces.

Before he knew it, he was building a solid collection of art from Myanmar's transition period – and more. "As I started to buy more pieces, I realised they could make the transitional period accessible to the wider

world, where the Burmese language can be a barrier," he said. "People can easily engage with these paintings that have been produced by Myanmar artists."

Professor Holliday now has hundreds of paintings and has staged about 25 exhibitions in Hong Kong, Singapore, Australia and the US, including some still on display in HKU's Main Library. To expand the audience, he recently produced a book, Painting Myanmar's Transition, with research postgraduate student, Aung Kaung Myat, who is from Myanmar.



Professor Ian Holliday (right) and Aung Kaung Myat (left).



Professor Ian Holliday (left) and Aung Kaung Myat (centre) at the Painting Myanmar's Transition Book Talk held at HKU's Main Library.



Painting Myanmar's Transition presents paintings by, and concise companion interviews with, 80 contemporary Myanmar artists during a period of significant reform.

Eighty artists were each asked to select one painting from Professor Holliday's collection and answer three guestions - why they chose this painting, whether life had changed for them as a painter over the previous decade, and whether they felt Myanmar had changed.

Time capsule

The interactions with the artists date from 2020, before the coup, which gives them great poignancy. The book provides context in the introduction and analysis in the conclusion.

"This book is like a time capsule because there is such a big difference between what is going on right now and what went on in the recent past," Aung Kaung Myat said. "Most of the artists reflected on the transition period as very positive and looked forward to the future. A few religious and ethnic minority artists were more critical, but overall, even they accept it was positive change."

The artists also mentioned improvements to their lives over the previous decade, the greater ease in staging exhibitions and selling paintings, the growth in interest in Myanmar art, and the rise of the domestic collector. A number of them mentioned the importance of education to the country's future.

The artists themselves were aged from their 30s to the 70s, included professionals and amateurs and represented a wide range of artistic styles. Some were disinterested in politics and stuck to traditional Burmese painting themes of Buddhism and landscapes, while others responded to the transition by producing art with political themes. Some artists have been contacted since the coup, but Professor Holliday said it is impossible to say whether all of them are safe.



Painting Myanmar's Transition Year of Publication: 2021





"If you think about Pansodan Gallery, where I met artists and we talked about their art, and also political figures to talk about politics, that whole world has been swept away," he said. "We thought this book would be about an ongoing process that would continue into the 2020s. Instead, we captured something which is basically over."



Editors: Ian Holliday and Aung Kaung Myat Publisher: Hong Kong University Press



basically over.

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We thought this book would be about an **PROFESSOR** ongoing process **IAN HOLLIDAY** that would continue into the 2020s. Instead, we captured something which is



ART FROM ALL ANGLES

Science, Technology and the Arts combine in a new interactive initiative – STArts – at the University Museum and Art Gallery (UMAG) to make the museum learning experience more dynamic.

Named UMAG STArts, the initiative comprises a series of programmes that link with the Museum's permanent collections and highlight interdisciplinary studies of art history, novel technologies and conservation and their multiple crossover points within science, technology and arts.

"We are a university museum, so fundamentally we want to teach and share knowledge," said UMAG Director Dr Florian Knothe. "Each programme features an art-related theme – a technique, medium, material, or genre – and will be a dynamic museum learning experience that is different to the traditional mode of art exhibitions.

"I studied both object conservation and art history and see the development of technical art history as a hugely important part of art education in our field. UMAG has an interesting collection to support this effort: we teach more materials and techniques and make our students and the general public aware of the science and technology involved in art making – something your typical art history lecture does not confer."

The first programme, *Learn with UMAG*, kicked off with painting, and was centred around a recently acquired work by Hong Kong artist Ng Lung-wai who employs a striking 'folding paint' technique, partly inspired by the traditional art of paper-folding. *Painting Across the Threshold* included an interview with Ng, discussing how he made paper boats as a boy and developed this into a colourful and thoughtful work in which "the little vessels symbolise a voyage of blessings".

Currently running is the second programme, *Celadon Ceramics*, based around the

Museum's extensive collection of green ware. "STArts aims to introduce topics – like our present discussion of green ware – to scholars, students, and the general public alike," said Dr Knothe. "The programme includes different topics that introduce the making of historic and contemporary artefacts in ceramic, bronze and silver, textile, glass, and lacquer, *etc*, to discuss the material culture of art by examining different art forms and time periods."

New Study Gallery

The green ware is displayed in the newly refurbished Study Gallery and via a virtual exhibition, which includes a 3D Gallery presenting three-dimensional artefact models. UMAG's collection spans a period of more than 1,500 years of celadon's history, from the early lead-glazed pottery



The green ware displayed in the Glazed and Fired exhibition in the newly refurbished Study Gallery.



A virtual 3D Gallery lets the viewer examine three-dimensional artefact models.



Painting is the theme of the inaugural section of UMAG STArts in which Hong Kong artist Ng Lung-wai demonstrates his signature 'folding paint' technique.

of the Han dynasty (202 BCE–220 CE) to the highly-prized Guan wares of the Song dynasty (960–1279 CE).

The new Study Gallery was designed specifically for STArts. Dr Knothe said: "When the Museum's historic Fung Ping Shan Building was renovated, I decided to move our departmental library, which occupied the space for many years, to create a new public gallery and thereby not only give the public even more access to our 1930s building, but also create a physical space for STArts (in parallel to our digital portal and online exhibitions). This new Study Gallery is both a display area and a classroom. We schedule exhibitions as well as classes we teach for the Faculty of Arts and the Faculty of Education in this intimate space."

Following the latest exhibition *Glazed and Fired*, the next presentations will be *Cast and Chased* then *Woven and Encrypted* to discuss the materials and techniques in the making of metal and textile objects. "As with our larger public exhibitions, the variety of subjects is hugely important to us and allows us to accompany the exhibitions with education programmes that include lectures, demonstrations, guided visits and workshops," said Dr Knothe.

STArts has been very well received so far. "The interdisciplinary character and the opportunities to also work on and off campus with a cross-faculty approach are innovative and – I am happy to say – of interest," said Dr Knothe. "Initially, we had a UGC [University Grants Committee] teaching and learning grant to get us started (no pun intended) and this year we won a GRF [General Research Fund] grant. Both funding schemes allow us to use external money to develop advanced, applied and solution-oriented teaching models."

Now that STArts is up and running, Dr Knothe wants to develop the platform collaboratively. "We advanced several of our own ideas to get the academic model going and look forward to more collaboration on and off campus with departments interested in art, science, and technology, and, of course, with everybody else who joins us to think outside the box!"





As part of the Painting Across the Threshold exhibition, Hong Kong artist Ng Lung-wai hosted workshops which gave participants a glimpse into Ng's creative practice, in addition to learning how to fold paint under the artist's tutelage.



DR FLORIAN KNOTHE

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Each programme

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a technique,

Learn more about UMAG STArts



In Conversation with Ng Lung-wai

HONG KONG ART TIMELINE: 1935 - 2020

A BRIEF HISTORY OF ART

Hong Kong's art history may be relatively young, but a new art timeline gives it perspective and shows its relevance.

"Chronology is our mental scaffolding for organising historical reasoning. It provides us with a strong sense of the continuity and incidences of time in order to understand historical causality," says the introductory page of the Hong Kong Art Timeline, a project put together by the Art History Department in collaboration with Asia Art Archive.

The aim is to provide a brief overview of selected happenings in Hong Kong art history and it is the first project of its kind to provide a temporal map showing these events social and political as well as art-related from the 1930s to present day.

Timeline supervisor Dr Yeewan Koon, Associate Professor and Chair of the Department of Art History, said the project came about, partly, because of COVID-19. "Usually for my Hong

Kong Art Workshop, I do a 'speed-dating O&A at Art Basel Hong Kong' but this year Art Basel Hong Kong was cancelled. I had to revamp the class and came up with this idea of timelines, which evolved into a digital platform," she said.

The project is made up of the 'Mothership', which is the timeline itself, plus 'Satellites' which are case studies by students from the Department's Hong Kong Art Workshop class. "The purpose of the Satellites is to provide insights into the inconsistencies, overlaps and disruptions that have occurred along the way and which cannot be shown on a linear timeline alone," said Dr Koon.

Their areas of focus are: independent art spaces in relationship to activism; women artists as institutional builders; minorities in Hong Kong's art world; the development of art criticism: and the relationship between grassroots art education practices and local knowledge.

Frustrations

While COVID-19 may have been the unexpected spark that got the project up and running, seeds for some kind of timeline project were sown as early as 2015 at a workshop on Teaching Hong Kong Art History held at Asia Art Archive, during which several scholars expressed their frustrations over how some people consider teaching Hong Kong art history to be problematic.

Explained Dr Koon: "As the field of Hong Kong art history is relatively young,



Dr Yeewan Koon (left) introducing the Hong Kong Art Timeline in the Hong Kong Art Workshop.



The Hong Kong Art Timeline is an interactive online project on the development of Hong Kong art. All entries are categorised and colour coded. Users can expand or compress the timeline with the magnifying glass at the top right corner, and click on the entries to learn more about them.

there are some who believe that it is impossible to teach – or at least teach in the conventional methods of survey art courses. There is simply not enough secondary research on the subject.

"There was also a debate regarding who gets to write a survey history of Hong Kong art or whether we need a survey book in order to study Hong Kong art," she continued. "Art history survey books form canons and narratives of a linear development of styles. This is an approach that has long been guestioned by many art historians (not only in Asian art) and is once again under the spotlight as debates continue regarding the decolonisation of art history in the classroom.

"Canons tend to exclude more than they include, and there is a long history of bias that favours male artists and values that reflect structures of power. For Hong Kong art, there are concerns that without some sort of foundational entry point, such as a survey text, how can students and nonspecialists learn about Hong Kong art?"

The social and political events on the timeline were chosen for their relevance to shaping the Hong Kong art world and include the creation and development of museums and galleries, government policies, art schools and changes in financial and education sectors. There are currently more than 400 highlights and these will continue to grow as new events take place.

Putting it together

Dr Koon supervised the project, supported by Michelle Wong from Asia Art Archive, but she also gives much credit to two students. "The technical and hard work was done by students Yi Ting Li and Nicole Nepomuceno," she said. "They did the heavy lifting and I am incredibly proud of them. Other students also contributed with their projects. Overall, it was a small team and we worked hard to produce this because we believe this is an invaluable tool for lots of people."

Asked how the timeline would grow and whether there will be more Satellites, she said: "We will be hosting a workshop with invited guests from different institutions to discuss this question. But yes, there will be more Satellites – the aim is to grow those in the future. Each of those Satellites has bibliography and has questions that open up the possibilities of future research."

In conclusion, Dr Koon expressed her aspirations for the project: "I hope the timeline will be useful for anyone interested in Hong Kong art and Hong Kong. And I

Satellite Timelines



hope other institutions will contribute to the timeline too so that it can grow. Far too often, we are reinventing the wheel because we are not sharing our research. I hope this project can facilitate more networked conversations and research."

QQ



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DR YEEWAN KOON

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