BULLETIN

THE MIXED BLESSINGS OF BIG DATA

HKU Scholars Explain the Pros and Cons

The Sun Room Project
Saving traditional architectural crafts

Life on Mars
The red planet holds clues to life on Earth

Contents

THE MIXED BLESSINGS OF BIG DATA

Big data offers tremendous opportunities for expanding knowledge and the ways we gather and use it, with benefits to health, learning and all sorts of human pursuits. However, there are also risks to privacy and governance by making so much personal information openly available. Research at HKU offers examples of both the potential and pitfalls of big data.

> **"** Big data and deep learning are very closely related. Big data is why deep learning has been doing so well. **"**
>
> **Professor Francis YL Chin**

THE DEEP LEARNING CURVE

Big data is important not only to human researchers, but also to the artificial intelligence that computers acquire through deep learning. Emeritus Professor of Computer Science Francis YL Chin has jumped at the chance to be part of the big data revolution.

Constant learning has been a necessity throughout Emeritus Professor Francis YL Chin's professional life, driven by never-ending evolution in computing technology. When he retired from HKU in 2015, one might have thought it would be time to take a breather. But the exciting developments of the past few years have been too irresistible a draw. Not only is technology constantly improving, but machines are showing the potential to progressively learn. At the heart of this revolution is big data.

"Big data and deep learning are very closely related. Big data is why deep learning has been doing so well," he said.

Big data is simply a huge volume of data. Consider that 20 years ago computers had at most one gigabyte (GB) of storage. Today a single USB flash drive can contain up to one terabyte (about 1,000 GB) or more. The increase in data and advances in computing technology have opened new possibilities.

"Before we had big data, we used rule-based learning for computers. We told the computer what to look for. It's like what humans do when we learn another language: we study the grammar and other rules," he said.

"But we don't learn our native language this way. Instead, we're exposed to the language so much that we pick up the rules implicitly without much thought to what those rules are. This is what we're doing with machine learning."

For example, to get a search engine to recognise images of cats, a programmer would previously have had to input characteristics like four legs, tail, pointy ears and whiskers. It is now possible to learn without being given these

Professor Chin giving a talk on 'How Deep Learning Improves Our Health?' in the Hong Kong Science Museum during the HK SciFest 2017.

characteristics – the system scans thousands of photos, some of which might be labelled as cat photos, comes to learn the defining characteristics of cats, and groups them together. It keeps refining its search results so even photos in which some features are hidden will still pop up in searches. "Right now there are so many photos and articles on the internet that you don't want a human to label them all because that would be a lot of work. Unsupervised learning, where the data is not labelled, is a product of big data," Professor Chin said.

Jump on it

Machine learning through big data is expensive, though, particularly because much of it is not in the public domain. Internet firms such as Google, Amazon, Facebook, and Alibaba collect enormous amounts of data about pages visited, searches and so forth. Their in-house researchers, who have access to this data, are also producing some of the most significant research in the world.

This said, Professor Chin pointed to the recent program AlphaGo Zero, developed by a Google subsidiary, which taught itself how to play the game Go without any data apart from the rules of the game. A previous version had used data from more than 100,000 games to learn the game. The success of AlphaGo Zero makes sense considering that a child does not need to see millions of cat photos to understand the concept of a cat.

But most machine learning still depends on big data and this is where Professor Chin hopes to make a mark.

In one project, he is working with a Baptist University scholar to identify significant features

from images of about 20,000 antique bronze mirrors, as well as matching mirrors with similarities, using computer technology.

In another, at Hang Seng Management College, he is looking at numerous examples of Hong Kong students' English writing to highlight similar mistakes, make suggestions for correction and identify good writing. "The mistakes Hong Kong people make in learning English will be different from the mistakes made by students in other places, like India. We're using linguistics and natural language processing to learn what mistakes are made and why," he said.

A third major project, also at Hang Seng Management College jointly with Alpha Financial Press, involves machine translation of business documents, especially for initial public

offerings (IPOs), a very targeted but lucrative market. IPO documents must be filed with regulators in both English and Chinese, and are usually first written by lawyers in English. The translation turnaround time is very tight so it is an expensive task. It also cannot be done through Google or other online services, even if they were proficient enough, because of confidentiality issues. So Professor Chin and his team are training computers to do the translation by feeding them reams of IPO and other business documents.

"We think we can do better than Google," he said. "The technology is moving very fast. We need to jump on the bandwagon." ■

Source:	under the arrangements currently in force , the aggregate emoluments payable by our group and benefits in kind receivable by our directors for the year ending 31 december 2013 are expected to be approximately rmb3, 20 4,000 .
Our translation:	根據現時生效的安排，截至二零一三年十二月三十一日止年度，本集團應付予董事的酬金總額及董事應收的實物利益預期約為人民幣3,204,000元。
Human translation:	根據現行安排，截至2013年12月31日止年度，本集團應付董事的薪酬總額及上述董事應收的實物利益預期約為人民幣3,204,000元。
Google translate:	根據現行有效的安排，我們小組的應付和實物我們於截至2013年12月31日年度的董事應收款合計薪酬福利預計約為人民幣30,20 4000元。

Professor Chin and his team are training computers to do the translation of financial documents by feeding them reams of initial public offering and other business documents.

> **"** If we did these studies on 500 people and tried to infer an association, it would be very difficult to influence planners, policy-makers and politicians. But detailed country-wide studies are more reliable and generalisable. Hopefully they will look at the science and be convinced. **"**
>
> **Dr Chinmoy Sarkar**

CITIES THAT MAKE YOU WANT TO GET ACTIVE

The associations between walkability, greenness and density and public health have been demonstrated in studies by HKU and Oxford academics that use big data to provide the evidence.

Dr Chinmoy Sarkar in the Faculty of Architecture's Healthy High Density Cities Lab, HKUrbanLab, works at the interface of two disciplines, urban planning and medicine, a unique combination that he believes has the potential to improve public health.

"We have growing pressures in cities with ageing populations and spiralling health expenditures from chronic disease. If we can make small tweaks and retrofits to the built environment design, we can produce small but nonetheless significant effects on our health. In a city of millions, that can save billions of dollars incurred in health expenditure," he said.

With the aim of designing active-living environments, he has used big data to show how the built environment has direct impacts on physical activity and on people's health more generally.

In studies he conducted with Professor Chris Webster, HKU's Dean of Architecture,

Professor John Gallacher of Oxford's Department of Psychiatry and Honorary Professor of Architecture at HKU, and other scholars, Dr Sarkar has provided evidence of impacts in the UK, and is now preparing to do the same in Hong Kong and Mainland China.

For the UK studies, the researchers drew from a huge biobank of half a million people in 22 cities to develop a detailed database, the UK Biobank Urban Morphometric Platform, comprising health-influencing built environment metrics of density, street layouts, salutogenic greenery, amenities such as fast food outlets and sports facilities, measured in relation to where the people reside.

Links with weight outcomes and physical activity

In one study, Dr Sarkar and his colleagues compared urban density with weight outcomes. They found that at densities below about 1,800 units per square kilometre, people had

10 per cent higher odds of obesity and 14 per cent higher odds of reporting low physical activity. If they lived in neighbourhoods with densities of 1,800 units or higher, they had nine per cent lower odds of obesity and five per cent lower odds of reporting low physical activity.

Estimated BMI on either side of turning point a
<=1800 units/sq km   0.19* (0.14 to 0.24)
> 1800 units/sq km   -0.22* (-0.25 to -0.20)

HealthyHKDCities, HKUrbanLab
© Chinmoy Sarkar & Chris Webster

Dr Sarkar and his team compared urban density with weight outcomes. The study shows that at densities below about 1,800 units per square kilometre, people had 10 per cent higher odds of obesity. If they lived in neighbourhoods with densities of 1,800 units or higher, they had nine per cent lower odds of obesity.

"There has been some resistance to suburban densification in the UK, so this study shows that it can be a public health opportunity to be embraced, especially by creating active and multifunctional spaces," he said.

Greenness also matters. Using high-resolution photos of neighbourhoods taken from the sky, the researcher showed that increased greenness within 500 metres of one's home was associated with 3.2 per cent lower odds of obesity and four per cent higher odds of reporting more than 30 minutes of walking.

Another study of 15,000 people in London and involving the London Travel Demand Survey, found the density of trees and street-level accessibility were associated with higher odds of walking. Another five-year study of London found street accessibility and morphology to have a significant effect on the odds of being killed or severely injured in a traffic accident.

And yet another, soon-to-be-published study has found a link between the walkability of the built environment and blood pressure.

"If we did these studies on 500 people and tried to infer an association, it would be very difficult to influence planners, policy-makers and politicians. But detailed country-wide studies are more reliable and generalisable. Hopefully they will look at the science and be convinced," Dr Sarkar said.

Optimising the environment for health

The UK is not the only focus. Hong Kong has The FAMILY Cohort, a territory-wide study to understand the health, happiness and harmony at individual, household and neighbourhood levels, of 46,000 participants and the HKU's Architecture and Medical Faculties are collaborating on a series of studies to decipher evidence here.

In addition, Oxford University has a biobank of half a million people in 10 Chinese cities. Professor Webster, Dr Sarkar and colleagues plan to discern associations between the built environment and health in fast-urbanising Chinese cities.

Each place is expected to have its own issues – in the UK and North American cities, greater density may be a boon to public health while in crowded Asian cities like Hong Kong, a different outcome may prevail. The point at this stage is to gather to see what the associations are between exposure, behaviour and health in large-scale health cohorts around the world.

Dr Sarkar hopes that ultimately the findings will encourage planners to design and configure cities that are health-promoting and encourage people to walk throughout their lives so they can reap the health benefits. He also hopes planners will think in terms of reducing exposure to negative externalities, such as traffic pollution, and regard features such as parks as more than recreational add-ons.

"The effects of design interventions may seem small, nonetheless, active environments also encourage more social interactions – the effects are significant and pervasive. If we can design

environments that encourage healthier behaviour and lifestyles, it would contribute to reducing our growing burden of chronic disease and health expenditures and enhance mental capital," he said. "That's our goal: optimise the built environment, minimise negative exposures and develop predictive models of urban scenarios and population health outcomes." ■

Healthy Cities: Public Health through Urban Planning is co-authored by Dr Chinmoy Sarkar and Professor Chris Webster, HKU's Faculty of Architecture, and Professor John Gallacher, Department of Psychiatry, Medical Sciences Division, University of Oxford.

Betweenness R400 m
Low
High
GLA boundary

Betweenness R3000 m
Low
High
GLA boundary

HealthyHDCities, HKUrbanLab
© Chinmoy Sarkar & Chris Webster

Network modelled street-level movement density (betweenness) at spatial scales of 400m and 3,000m for Greater London.

BIGGER IS NOT ALWAYS BETTER

With big data, the quality of the input matters as much as the quantity, says Professor Shen Haipeng, who has applied data analytics to fields as diverse as bank call centres and precision medicine.

> **❝** [I]t's not size that matters, but whether the data collected comes from the targeted population that you want to study. If it is, then 50,000 responses can give you the better answer than 2.4 million. **❞**
>
> **Professor Shen Haipeng**

In the 1936 American presidential election, the magazine *Literary Digest* conducted the largest-ever poll at the time. It mailed out 10 million questionnaires, got a 24 per cent response rate, and confidently predicted Republican challenger Alfred Landon would defeat Democrat President Franklin Roosevelt by 57 to 43 per cent. They could not have been more wrong: Roosevelt won 62 to 38 per cent.

Professor Shen Haipeng of the Faculty of Business and Economics likes to cite this example because it highlights a problem that exists in big data even today. The reason the pollsters got it wrong was because their sampled population was heavily weighted to wealthier and therefore Republican voters. In contrast, a much smaller but more representative poll of 50,000 people by Gallup correctly predicted the outcome.

"The message is that it's not size that matters, but whether the data collected comes from the targeted population that you want to study. If it is, then 50,000 responses can give you the better answer than 2.4 million," he said.

Professor Shen trained as a data scientist and has been handling big data for years in the vastly different fields of bank call centres, precision medicine and hospitals.

His early research involved working with the customer service operations of FleetBoston Bank in the US to track patterns as customers moved through the system and identify bottlenecks and imbalances. This research also revealed that employees were gaming the system to increase their tally of customers by hanging up a few seconds into calls, that VIP customers tended to be willing to wait longer when on hold, and that customers of all types tended to hang up after 60 seconds, when a recorded message asking them to keep waiting in fact reminded them that they were on hold. "This work showed how, with a large volume of data and simple analysis, you can reveal different human behaviours," he said.

Professor Shen might have restricted his investigations to more traditional business subjects but in 2006, during a visit home to Beijing from his job in the US, his father fell ill. He realised he did not know any medical experts there who could advise him about his father's care so when he returned to his job – at the University of North Carolina-Chapel Hill – he began to seek out potential collaborators in medicine.

A second expertise

He attended a conference of top neurologists and offered his expertise in data analytics, and established fruitful collaborations with Chinese and American scholars in precision medicine, in particular strokes.

This work has combined targeted studies and trawls through existing data to see what could be gleaned from information on patient demographics, diagnoses, medical histories, laboratory results and so forth. "This is a second generation attempt to extract value from data already collected and leverage the big data platform. The benefit is that you increase the dimensions you measure and the sample size," he said.

In one project, Professor Shen and his collaborators analysed multiple databases to identify stroke patients who were at risk of recurrence because their nighttime or early morning blood pressure spiked. In another project, they showed that treating stroke patients with both aspirin and blood thinner was more effective than aspirin alone. This was incorporated into medical guidelines for stroke patients in the US and elsewhere.

Professor Shen is also part of a RMB20 million national key project grant to devise a data-supported system for improving the care of stroke patients in China. The goal is to enable physicians to input patient characteristics and see which treatments have worked in patients with similar characteristics. This would be particularly helpful in lower-tier hospitals where doctors may not have the training or resources of top-tier hospitals.

He has also managed to connect his two fields of work, albeit indirectly, by applying the method he used for mapping the call centre to the movement of patients through a hospital in China. A bottleneck was identified between the emergency room and imaging department, which was subsequently found to be due to crowded corridors. The hospital opened an underground passage to the imaging department, which solved the problem.

"The overarching theme that ties my work in neurology, business analytics and machine learning together is data-driven decision-making and using that to improve the efficiency and quality of services," he said. "Big data is the future because whoever has the best quality data will have the best AI [artificial intelligence] applications" – the accuracy of which would put the human editors of *Literary Digest* to shame. ■

Database	Sample
Demography	1.4 mil
Behavior	>1 mil
Diagnosis	25,000
Blood	2,000
Genetics	2,100
Imaging	0.9 mil
Medical Hist.	0.9 mil
Follow-up	0.15 mil
Cognitive	16,000

Big data view of multiple databases about stroke patients. Medical data was obtained from neurological studies in three groups.

> **There is a misunderstanding about big data among some scientists who think it is this wonderful resource and we no longer have to collect our own information. That's not true. It's advantageous to have both perspectives.**
>
> **Professor Ben Cowling**

A HEALTHY BALANCE

Big data can suggest the bigger picture of public health, but it still cannot match the rich information that comes directly from each patient.

Professor Ben Cowling of the School of Public Health is an expert in the spread and prevention of infectious diseases. To understand the trends, he draws in part on electronic hospital records from the Hospital Authority which hold millions of pieces of data. But, as he has found, there are limitations to what even a rich trove of data can tell you.

On the one hand, he has been able to reveal the impact of influenza on the hospital system. His studies of hospital records have shown that when flu activity increases, so do admissions of pneumonia, lower respiratory chronic diseases such as asthma, and heart attacks and heart disease. "A viral infection has a lot of knock-on effects on people's health," he said.

Big data has also enabled him to study antibiotic prescriptions in the hospital system, using a dataset of about 36 million prescriptions over 15 years. This showed that prescriptions were rising for the more potent, last-resort antibiotics.

"With a dataset like this, while we can't evaluate whether the antibiotic use was appropriate in individual cases, we are able to flag a concern," he said. "More antibiotic use means that resistance has a higher chance to emerge, so is there a better way to manage the use of antibiotics in hospitals? Although already the hospitals are quite careful."

The limitations of big data is why Professor Cowling also works with smaller cohorts to get detailed answers from individuals. An example of this is his ongoing research into the effectiveness of flu vaccines.

Caution needed

Hospital records ostensibly show how many people are admitted with flu, who was vaccinated, and the laboratory results of swabs

Through the 'Integrated Programme for Influenza Prevention among Community Elderly', the team aims to share their experience and achievements with the elderly in Hong Kong, enhance their ability to prevent influenza and identify the most suitable vaccination strategy for them.

taken from each patient. However, this information may not always be accurate. In patients who arrive more than four or five days after the onset of symptoms – perhaps because their condition has worsened into pneumonia or a bacterial infection – the flu virus will likely not be present in their swab because the body will have fought it off.

Moreover, the history of vaccinations may not be complete, particularly if the patient is admitted with a serious condition and the doctor is pre-occupied with more urgent and

complicated issues. In such circumstances, it will not be possible to accurately gauge the effectiveness of the flu vaccine.

To overcome these problems, Professor Cowling and his team interview each person in their study cohorts, which can mean up to 1,000 people, to ensure there are no false negatives of flu infection or incorrect information. Typically, they find the vaccine to be about 50 per cent effective, although this changes each year with each new vaccine strain or outbreak and tends to be lower after repeated vaccinations.

"There is a misunderstanding about big data among some scientists who think it is this wonderful resource and we no longer have to collect our own information. That's not true. It's advantageous to have both perspectives on things like influenza, so we can see what happens at the population and the individual level. But in general we need to be quite cautious about what we can and cannot learn from big data," he said. ■

Integrity and data management go hand in hand at HKU

In academia, as the generation and analysis of big data have become the norm, there has also been a demand to demonstrate inputs to research are acquired in ethical ways, and the results are reproducible. HKU has taken a number of steps to stay ahead of the curve and ensure the data produced by its scholars is properly acquired, stored and accessible.

The key depository is the HKU Libraries, which has set up a website with information about data management, forms and informational videos. The University has also organised talks for different groups on campus and

workshops for staff and students with overseas experts.

As of September, 2017, all MPhil and PhD students who enrol at HKU must produce data management plans before their degrees will be confirmed. Recipients of General Research Fund grants also have to produce such plans before the University will release their funds.

All data collected must include consent forms, which could make using certain kinds of big data a challenge for researchers. But there are still many options for using big data, as exemplified

by the work of Professor Cowling and other examples described on these pages.

Professor Danny Chan, S Y and H Y Cheng Professor in Stem Cell Biology and Regenerative Medicine, of the School of Biomedical Sciences, who is part of the HKU team promoting responsible conduct of research, says data management and research integrity are intertwined. "In many cases around the world, where there are allegations about responsible conduct and research, it often comes down to aspects of improper data management," he said.

Responsible Conduct of Research is promoted throughout HKU's academic community. (Left) President Peter Mathieson speaking at a seminar on Responsible Conduct of Research. (Right) Various initiatives have been introduced to enhance awareness and enable the sharing of values and best practices, including a research ethics course for research students, and Responsible Conduct of Research seminars for staff.

IDENTITY

BIG DATA'S DARK SIDE

The aggregation of big data can be put to some amazing uses. But there are also risks for the individual.

❝ When you're basically saying to a computer, 'here is all the data, make the best decision for me' without understanding how that decision is reached, whether it is fair, whether it has unintended consequences, then you have really very challenging questions. ❞

Professor John Bacon-Shone

How can individuals be protected when their personal data is constantly being collected for uses that may not be apparent until some future date? And when it may not be obvious who is collecting that data?

As giants like Google, Facebook, WeChat and Alibaba track their users every minute of the day, these questions are rising high on government agendas around the world. In little more than a decade, most people now share personal information in order to gain access to services – whether socialising, shopping, seeking entertainment, or checking up on their health. Even our whereabouts can be tracked at every moment if the location service on our phones is turned on.

That goldmine of information is being used by both businesses and governments to make decisions about individuals and groups, such as how much to charge certain users for services, whether to deny them access and what trends are revealed by their data. And therein lie several problems.

First, the story told by big data may not be an accurate one. Professor John Bacon-Shone of the Faculty of Social Sciences, a statistician with an interest in big data and privacy who also advises the Hong Kong Government on the issues, cites the example of the Google Flu Trends web service which aggregated search queries about flu to predict outbreaks. "The problem is, it's just an association, not causation, and it doesn't work well at prediction. If you have a different type of flu, the whole thing falls apart," he said.

Big data may also contain coding mistakes or built-in biases. Another example cited by Professor Bacon-Shone concerns decisions in the US on who should be granted bail. When African Americans were shown to be less likely to get bail after controlling for other factors, the decision was computerised. But the data fed into the computer came from past

decisions. "The inputs already had bias in them. So you end up replicating the bias," he said.

A third problem is that even when data is anonymised for the sake of privacy, it may be possible to re-identify a person because the data retains telling details. For example, hospital data about accident casualties will include the date, time of admission and condition, and inferences could be drawn about the identity of a patient. More worryingly, with big data crunching DNA information, it is becoming possible to predict a person's hair colour, eye colour and even surname based on a sample of their DNA. "There are people who have been foolish enough to put their full DNA profiles in the public domain. DNA has the potential for massive health benefits but also for massive risks," he said.

All of this seems to cry out for regulation. But this, too, is problematic.

Traditional regulation out of step

Personal data protection laws typically require banks and other institutions to keep accurate up-to-date information and disclose how it will be used. But when the technology is changing rapidly, with new and unanticipated uses becoming possible, this may no longer be sufficient.

Professor Anne SY Cheung of the Faculty of Law has been studying privacy and personal data protection and is co-editor of the 2015 book *Privacy and Legal Issues in Cloud Computing*. "Recent legal reforms and position papers from

Professor John Bacon-Shone speaking at the Symposium on 'Data Protection Law Development in the Information Age' at the City University of Hong Kong in September, 2016.

(Courtesy of Tai Ngai Lung)

> " We should be talking about the ethical use of big data and artificial intelligence because the law is always behind the technology. "
>
> **Professor Anne SY Cheung**

the European Union (EU), the UK and the US have raised concerns about the problem of profiling, predictive decisions and discrimination, and the harm that may result from that. This is because the use of big data is very different from our traditional understanding of how to regulate personal data.

"The traditional approach is essentially one of notice and consent: the collection of personal data is allowed only for a specific and limited purpose. But in the age of big data, the more data one has, the more accurate and arguably useful one's conclusions will be. So the collector tries to collect as much data as possible and only after they have it and have done their analysis, will they find correlations and identify the purpose," she said.

It can be difficult to control the use of personal data in these circumstances. The EU will implement a new regulation in May, 2018 on profiling and the use of anonymous data. Among other things, for decisions made about EU citizens using data collected through automated processes, the individual will need to be notified and will have the right to correct or object.

However, this only applies to EU citizens (including those working abroad) and in specific areas such as employment and credit scoring. There are still grey areas.

Professor Cheung cites the example of 'well-being' apps that track physical activity and other data on individuals. In the United States, one employer encouraged employees to use such apps and tied this to the health insurance

premium it offered its staff. Health data is regulated in the US but not well-being data. The case has ended up in court. "If I'm very concerned about my privacy and don't want to join such a scheme, would I be punished by having to pay more for my insurance?" she said.

Ethical, risk-based approach needed

Professor Bacon-Shone sees two key issues at play with big data use: transparency and fairness. Transparency means allowing people to correct incorrect information about themselves and making it clear how decisions are made, while fairness means avoiding situations like the US bail example. Importantly, it is not only individuals who face unfair decisions – groups can be targeted, too. For example, Mac computer users will be shown more expensive hotel options when they visit the travel website Orbitz than will PC users.

"When you're basically saying to a computer, 'here is all the data, make the best decision for me' without understanding how that decision is reached, whether it is fair, whether it has unintended consequences, then you have really very challenging questions. These are ethical questions, not just technological," he said.

Professor Cheung concurs. "We should be talking about the ethical use of big data and artificial intelligence because the law is always behind the technology," she said.

"I've been arguing we should move to a risk-based or harm-based regime instead of just

focussing on notice and consent – looking at the use of such data, the risk level, how likely it will be shared with a third party, who will be the downstream party. We should be targeting those uses rather than just seeking broad consent, and we should be getting more specific in terms of the possible usage and the context of that usage."

Individuals also need to learn to protect themselves. Professor Cheung herself does not use her real name or put much personal information on Facebook (although Facebook managed to correctly guess her secondary school from the data on her friends). She does not use WeChat, electronic wallets, well-being apps or, for the most part, location services. Her friends have told her that she is being too cautious and that privacy is dead. "I don't know how long I can resist this trend," she admitted.

"Most people embrace technology and the conveniences and advantages it brings. Of course, big data and artificial intelligence do have advantages that we cannot deny. But in terms of potential risk to the individual, it depends on awareness and education, a discussion about the issues and the approaches of leaders in both government and industry," she said. For, as the sidebar on China shows, big data not only raises challenges related to privacy, but also governance. ◼

China: Big data, big brother?

The use of big data in China is of an altogether different level of concern from commercial uses of personal information. The central government is in the process of rolling out a social credit system that draws on big data to rate each individual's reputation based on their political leanings, purchase history, social interactions and other factors.

"China is like a big data laboratory," said Professor Cheung, who has been studying the situation there with colleague Dr Clement Chen. "Arguably, there is 360-degree surveillance watching individuals and gathering data. They have real-name registration [for mobile and internet services] and close connections between the government and the banking system and internet companies."

The social credit system was announced in 2014 and although it will not be fully

implemented until 2020, Professor Cheung and Dr Chen have already found that individuals suffer consequences for a low score.

On about five million occasions (as of August, 2016), 'judgment defaulters' who defied unspecified court orders were blocked from buying airline tickets. Such individuals were also stopped from travelling on high-speed trains. Low-scorers have also been barred from employment in the civil service and public institutions, and even their children can suffer by being disqualified from studying in private schools.

China does not have a law to protect personal data. Provinces and cities are also introducing their own scoring systems in addition to the national one and it has been suggested that people even be scored for filial piety – how well they take care of their parents. "How would they know? We don't know. It could be from

neighbours, your parents or travel tickets you purchase," Professor Cheung said.

"This is more than a privacy issue, it is a governance issue, too, because it concerns the relationship between the citizens and the State. Some scholars agree with the government rhetoric that this is to restore trust and sincerity in China after corruption and dishonesty got out of hand. Some say China is the real Orwellian state, with big brother and small brother watching together, which one cannot escape because people use their phones and the internet and there is real-name registration. It's unresolved, which makes it interesting and challenging to study."

(From left) Dr Gao Peng, Post-doctoral Fellow, Dr Richard Kao Yi-tsun, Associate Professor, and Professor Yuen Kwok-yung, Henry Fok Professor in Infectious Diseases, Chair Professor of Infectious Diseases, Department of Microbiology at the press conference presenting their research findings.

DISARMING THE GOLDEN INVADERS

Microbiologist Dr Richard Kao Yi-tsun and his team have developed a novel approach to antibiotic-resistant bacteria that keeps the bugs alive but makes them vulnerable to attack by the human immune system.

Antibiotic-resistant superbugs kill more than 700,000 people each year and in 2016 the United Nations declared them a threat to global health security. Yet apart from educating doctors not to prescribe antibiotics indiscriminately, and asking patients not to demand them for inappropriate reasons, there have not been effective solutions to the problem. Dr Richard Kao Yi-tsun and his team hope their discovery will be different.

They spent eight years pursuing a line of research that seeks to alter rather than kill off bacteria. Their target was *Staphylococcus*

aureus – a type of bacteria that lives on the skin of 30 per cent of people, becomes harmful when it invades through wounds or other opportunities, and has also evolved the strain methicillin-resistant *Staphylococcus aureus* (MRSA), a superbug found in most hospitals around the world.

Dr Kao said they were motivated by the simple fact that antibiotics only seem to help resistant forms thrive. "When you use powerful antibiotics, there will always be some that survive because of random mutations in the genome. It might only be one in a billion, but

they double in number every 20 minutes so you could very quickly have an antibiotic-resistant population. Basically, antibiotic use may be selecting those bacteria that cannot be killed by that drug," he said.

Instead, he and his team have deployed a method based on chemical genetics, a relatively new field that uses molecules to change the genomes of organisms.

Their target was the golden pigment of *Staphylococcus aureus*, which acts as a shield to protect it from attacks by the human immune

> " We can use non-antibiotic compounds to control the disease and not kill the organism. This means less chance of getting resistant bacteria, which is a major advantage. Because we know that when any new antibiotic comes out, very soon afterwards you will have resistant bacteria. "
>
> **Dr Richard Kao Yi-tsun**

system, in particular reactive oxygen species (ROS) that are produced by nutrophils and other immune cells. Previous researchers had shown that changing the pigment to white would disarm the shield and make the bacteria vulnerable to ROS.

A lot more competition

Using high throughput screening, they tested 50,000 different compounds and selected several likely candidates for further testing. The best succeeded in turning the golden pigment of *Staphylococcus aureus* white. "Once the bacteria lose the ability to produce the pigment, they have trouble infecting wounds in humans or animals because the immune cells are able to engulf them. So we're not changing anything in the body, we are just letting the body do its own work by making the bacteria vulnerable," he said.

This approach has a major global advantage beyond the health of the host because it could

reduce the proliferation of resistant bacteria – a problem that has developed not only from antibiotic prescriptions for health problems but also the widespread use of antibiotics in farming. "Because we are not killing off the bacteria, those that develop antibiotic-resistant become just one in a billion individual bacteria. Otherwise, if you kill off all of their competitors with antibiotics and they become the sole survivors, they will quickly expand into a huge population," Dr Kao said.

The results were published in the top microbiology journal *mBio* in September, 2017 and have attracted interest from pharmaceutical companies, who want to explore how to take this laboratory-based discovery to the next stages of testing and turn it into a drug. This will take several years to happen but the first important steps have been taken.

Dr Kao sees their success as an encouraging development for chemical genetics, which he first became interested in nearly two decades

ago while doing his post-doc at Harvard. Professor Stuart Schreiber was pioneering the field and one of the people in his laboratory was Professor Dan Yang, who is now Morningside Professor in Chemical Biology and Chair Professor of Chemistry at HKU. She and Dr Kao have become close collaborators in applying chemical genetics to SARS, influenza and bacteria.

"Mainstream research is still trying to find more antibiotics and this is also important. I'm not saying our compound should replace antibiotics, I'm just proposing a new alternative way to let people consider that besides killing bacteria with conventional antibiotics, we can use non-antibiotic compounds to control the disease and not kill the organism. This means less chance of getting resistant bacteria, which is a major advantage. Because we know that when any new antibiotic comes out, very soon afterwards you will have resistant bacteria," he said. ∎

Control	250	100	25	10	2.5	1

Compound NP16 (uM)

Using increasing concentrations of NP16 can reduce the production of Staphyloxanthin in methicillin-resistant Staphylococcus aureus.

THE MARTIAN QUESTION

Infrared remote sensing data returned from Mars suggests that the planet may hold key information on the origins of life, clues that are no longer preserved on Earth.

A false colour image of bedrock in the Eridania region shows altered volcanic-sedimentary rocks from nearly four billion years ago. The mottled colour patters correspond to different alteration minerals that formed from interaction of seawater with hot rock. Dense networks of veins in the rocks formed from hydrothermal fluids flowing through the bedrock.

Earth-like deposits which formed nearly four billion years ago on the seabed of the ancient Eridania basin on Mars, may hold clues to the origins of life on Earth. Geologist Dr Joseph Michalski in the Department of Earth Sciences detected the minerals using images and infrared

> " The [Eridania] basin is incredibly unusual… this is an active sea and the minerals we are detecting are extremely old and analogous to similar ancient minerals on Earth. "
>
> **Dr Joseph Michalski**

spectroscopy from satellites in orbit around Mars and discovered they were similar to deposits found on the seafloor of early Earth billions of years ago.

The finding alone is significant, but what gives it extreme value, said Dr Michalski, is that "ancient rocks like these are better preserved on Mars than on Earth because our planet has plate tectonics, which recycle the crust while Mars does not. Any further understanding of the actual origins of life or prebiotic chemistry from such rocks on Earth is severely hampered because they have deformed physically over billions of years. Ancient rocks on Earth are like a wall that's been graffitied over a million times – there are too many layers to find the original. The Mars deposits are more pristine and, therefore, could provide a window into the long lost geologic record of the early Earth."

The deposits were discovered using infrared data from the Compact Reconnaissance Imaging Spectrometer for Mars (CRISM) instrument. CRISM has been in orbit around Mars since 2006 and NASA makes the data from this infrared camera freely available to anyone. It is capable of detecting light in >500 wavelengths – most of them invisible to the human eye.

By measuring the way infrared light reflects off the Martian surface they were able to identify specific minerals on Mars via their unique fingerprint in the infrared spectrum. The team also used remote sensing measurements of heat radiation, reflected lasers and high-resolution visible images to study the properties of the planet's surface.

On Earth, geologists study the chemistry and mineralogy of rocks, their age relationships and context to interpret how the environment has changed through time. Dr Michalski and his team do the same type of geology, but on Mars. They described the origin, age and composition of rocks in the Eridania region of Mars and concluded that these materials formed in a seafloor environment. They show that these rocks compare to those formed in the seafloor on Earth – an environment thought by some to be the crucible of life on our planet, nearly four billion years ago.

"In the planetary sciences, there are many different experts in their own particular fields, but sometimes they stay in their own areas and don't communicate ideas and discoveries to each other," said Dr Michalski. "I cross sub-disciplines and link sub-subjects and so I was able to join it all together by studying the minerals and putting them in a geological context."

The findings have been published in *Nature Communications*, and his team of students are currently continuing the research, mapping the finer details and further testing the seafloor hypothesis.

Asked the sixty-million-dollar question, does this mean there is life on Mars? Dr Michalski raised his eyebrows. "There is fascination with Mars – whether it's about life on Mars angle, little green man, press excitement when the possibility of water there was discovered, or speculation about its suitability as the planet humans move to when we've destroyed this one – but most of this interest is misdirected.

"What is interesting, scientifically, is that Mars is the most Earth-like planet we know – it has volcanoes, sand dunes and dried-up river channels. These features were first discovered in the 1960s and that has driven Mars research ever since. In the 1990s, a fleet of spacecraft from NASA and Europe were sent to look at Mars, and now scientists are receiving a lot of high-quality data on the planet's climate, make-up, *etc*."

The Eridania basin was first mapped in 2003 by American scientist Dr Ross Irwin III who ascertained that it is a massive sea with a big channel running to it. The basin is about three times the size of the Caspian Sea, but since Mars is smaller than Earth, Eridania is relatively bigger in ratio to the size of the planet.

Active chemistry

"It's a vast closed sea filled with a huge volume of water which probably has hydrothermal activity – and the elevated temperature means more active chemistry is going on," said Dr Michalski. "The basin is incredibly unusual: there is no global ocean on Mars, as was previously thought, but this is an active sea and the minerals we are detecting are extremely old and analogous to similar ancient minerals on Earth.

"So, there may not have been life there, but we still have a huge amount to learn from this. The indications are that if we could go there we would find traces of organic chemistry. On Earth, there are a number of ideas for how abiogenesis – the formation of life from abiotic chemistry – occurred. These theories lead us to hydrothermal settings, with chemistry similar to that in these newly discovered deposits on Mars. The rocks on Mars could provide invaluable insight into how pre-life chemistry leads to the formation of life."

Asked when going there may be an option, Dr Michalski said: "We could get a human to Mars 20 years from the time we decide we wish to do so. The timeframe is a proportional to our financial investment and tolerance of risk. Right now, people are risk-averse and generally opposed to spending funds in space. So, we aren't going to Mars until those things change a bit." ∎

This schematic diagram shows a cross section of the ancient sea in Eridania, Mars. An ancient sea over 1km deep might have been ice covered, but at the floor of the sea would have been an active hydrothermal system with chemically rich waters. Such an environment is akin to that where life is thought to have originated on Earth.

The tightly packed apartments in the urban village.
(Courtesy of Qi Fan)

> " The buildings are homogenous and artificial and crowded, and all the roads are covered in concrete. This is a very stressful environment. As a landscape architect, I thought what can we do to improve this? "
>
> **Dr Bin Jiang**

FACTORIES FIT FOR HUMANS

The hard, sharp, straight configuration of modern factories is efficient for producing and moving goods as quickly as possible, but it also takes its toll on workers' psyche, according to new research that advocates for more humane designs.

Factory conditions in China have been under a harsh spotlight over the past few years, particularly after a spate of suicides in the 2010s at Foxconn, the world's largest electronics contract manufacturer. In response, and on the back of scholarly studies and media scrutiny, workers' wages have been improved and mental health support provided. But Dr Bin Jiang in Landscape Architecture wondered if the environment might not be a problem, too.

He took as his reference point a Foxconn factory settlement in Shenzhen that accommodates up to 60,000 people onsite and in a nearby urban village. The village consists of 'hand-shake' buildings, so named because they are tightly packed together and contain small apartments accommodating six to 10 people. The people often work 10-hour shifts, six days a week.

"The factory itself was designed for manufacturing and logistics but not for humans. The buildings are homogenous and artificial and crowded, and all the roads are covered in concrete. This is a very stressful environment. As a landscape architect, I thought what can we do to improve this? We're not economists or politicians and we cannot change the economy system, but maybe we can do something from our perspective," he said.

He steered his students and research to this goal, gaining unprecedented access to the Foxconn industrial park in the Longhua District, Shenzhen, and through interviews, questionnaires and an interactive design process, showed a connection between the physical environment and workers' mental health status.

The work started about three years ago when Dr Jiang arranged for each student to shadow a worker during repeated visits over a semester and see the site through the workers' eyes. Students and workers then collaborated on ideas for improving the urban space and landscape. "This was a special practice, different from the conventional top-down process. We set it up to be participatory so the workers worked with the student designers to create design solutions," he said.

For example, one worker liked to spend time by a nearby river to listen and watch its flow. This inspired the student to create a shiny flexible structure that could be set up by the river bank, reflect the sunset and sky, and be reconfigured into a theatre, exercise frame, bench or other uses.

Another project focussed on the area immediately around the factory, where workers crouched against walls during their breaks. The road there has a fenced-off central median with trees. Students proposed opening this up to the workers, laying soft surfaces on the ground such as wood, sand and grass, and using restorative colours to provide a peaceful and relaxing place for taking short breaks. This design won a silver award in the 2017 Asian Design Award.

The impacts on mental health

On the research side, Dr Jiang asked 100 factory workers to take photos with their phones of places they felt affected their mental state positively or negatively. He and his team then met with each worker, asked them to select the three most important photos and interviewed them about their choices. The workers also completed a questionnaire on their levels of anxiety and stress and their degree of preference for each place they photographed.

The data was then collated to discern the different impacts on mental health. Socio-demographic factors such as age,

Participatory design workshop in October, 2017 in which each student from HKU built a partnership with a worker from Foxconn.

gender and education explained 11 per cent of the mental health outcomes. When this was added to work-related factors such as job satisfaction, position and whether they worked the day or night shift, it explained 21 per cent outcomes. But when environmental factors such as having adequate natural distractions, a sense of control, and room to move and exercise were added in, the correlation shot to 84 per cent.

"People don't think the landscape, the plaza, the street are very important to mental health. But our research shows that to some level it is more important than conventional factors," Dr Jiang said.

Workers told the interviewers that they wanted more space for small-group gatherings, more

natural light, more opportunities to gaze at the sky and river, and more variety of colours than the grey steel, concrete and other artificial materials they stared at all day.

The findings have been shared with the factory, local community and government and, after initial scepticism, they are slowly starting to take notice. "It will take time to change things," Dr Jiang said. "The important thing is that this is not just a problem in China – it is an international problem. The economy and salaries are growing in China and manufacturers will move to cheaper places where other workers will experience the same conditions. We have given strong evidence to show that if you can't increase the salary, please create a better working environment for the workers." ■

Workers sitting beside dangerous alkali tanks to take a short break in the factory.
(Courtesy of an anonymous worker)

A design proposal by student Su Shanshan, who found the fenced planter is the only chance for creating more resting space in the middle of factory studios.

The team at HKU's Department of Surgery.

THE HEART OF THE MATTER

Research teams from the Mechanical Engineering Department have made innovative advances that will aid two different medical procedures for heart patients – cardiac catheterisation and complex cardiac surgery.

Dr Ka-Wai Kwok, Assistant Professor in the Department of Mechanical Engineering, has been working with two teams on different projects. His innovative work for cardiac catheterisation involved designing versatile actuators capable of operating in an MRI (Magnetic Resonance Imaging) environment, without adversely affecting the MRI quality.

"Since MRI is a diagnostic technique that uses strong magnetic fields and radio waves, the actuators cannot have any ferromagnetic materials in them, nor can they have a conventional motor," said Dr Kwok.

What the team has come up with is an MR-safe robot for use in cardiac catheterisation. It is driven by a new form of actuator, which is capable of moving or controlling the mechanism precisely, and is operated by a source of energy – in this case hydraulic fluid pressure.

"In simple terms, an actuator is a mover," said Dr Kwok. "We have invented a motor that uses water – that is, hydraulics – which gives you very good control. Actuators act as a key component of any robotic device. In MRI environments, electromagnetic (EM) and electrically conductive components that induce EM interference have to be handled with caution. Our research focussed on intrinsically MR-safe actuators driven by other energy sources, such as pressurised fluid flow commonly available in clinical settings. Motors

Dr Kwok's team awarded the Best Live Demonstration Prize at the Surgical Robot Challenge 2016 in London.

> " Intra-operative MRI [Magnetic Resonance Imaging] provides fast and high contrast soft tissue images without emitting radiation. During ablation any physiological changes in tissue can be easily distinguished and physicians can therefore monitor the ablation progress and reduce the chances of arrhythmias recurrence. "
>
> **Dr Ka-Wai Kwok**

in the control room, outside the actual MRI facility, drive the robot in the MRI room via several 10-metre long hydraulic tubes."

This is the first robot in the world that is capable of controlling a cardiac catheter while under the MRI environment. HKU's Technology Transfer Office has registered the patent on the invention.

"Usually, for cardiac catheter procedures, surgeons have to look at many screens," said Dr Kwok. "They use a catheter tip to burn on the inner surface of the left ventricle, but they tend to make conservative burns as they can't see what they are doing and if they burn too much it could result in perforation, and that would be disastrous.

"One plausible way to see what you are doing in real-time is with MRI, which tells you how tissue has changed, and provides good intra-operative feedback. But you can't have screens to display the information in the MRI facility unless you have EM shields over them, which cost US$30,000–40,000 each. This is one of the main reasons why we need the catheter robot, and why we must be able to tele-operate it outside the MRI room.

"Intra-operative MRI provides fast and high contrast soft tissue images without emitting radiation. During ablation any physiological changes in tissue can be easily distinguished and physicians can therefore monitor the ablation progress and reduce the chances of arrhythmias recurrence."

When developing the MRI robot, they made several factors priorities. "We wanted it to have good actuation – so we used hydraulics; good sensing, so the robot has a kind of GPS inside the scanner via real-time MR-based positional tracking units; and good interfacing in the form of visual feedback. We were able to put tracking units on the catheter tips, by which the

surgeon can trace where the tip is and at the same time monitor if the burn is good."

In London last year, his team showed the robot at the Surgical Robot Challenge 2016 and won the Best Live Demonstration Prize.

3D printing to aid surgery

A second project, which introduces three-dimensional (3D) printing to aid cardiac surgery, is also gaining attention. "For this research we are the end-users, prototyping for rehearsal prior to surgery," said Dr Kwok. "The Cardiology Division in the Department of Medicine and Therapeutics, at the Chinese University of Hong Kong (CUHK) approached us about introducing 3D printing technology as a means to practise complex cardiac procedures before carrying out the real operation."

This involved using a 3D printer, capable of producing soft materials to form models of parts of the heart which can be used in cardiovascular surgery planning. By making silicone-based 3D models of the heart structures the cardiologists can personalise the planning for a cardiovascular implantation for each patient. The models were made using echocardiographic data of the patient's heart.

The teams from CUHK and HKU used the technique last year on a complex case of a 78-year-old woman who needed Left Atrial Appendage (LAA) occlusion. Transesophageal echocardiography had shown that the patient had a double-lobed LAA that would make the occluder implantation more difficult as it would be necessary to occlude the ostia of both lobes with a single device.

They simulated the whole procedure using a 3D silicone LAA model which was made to measure using data from the patient's transesophageal echocardiography. This enabled the cardiologists to work out the ideal position to implant the LAA closure device, thereby reducing the risk of procedural complications or failure. The procedure was successful and the patient is in good condition.

"We hope that using advanced geometric modelling and 3D printing in this way will add to the cardiologist's confidence in performing safer, more accurate and effective cardiovascular intervention procedures," said Dr Kwok. ■

A joint research team from the Chinese University of Hong Kong and HKU is the first in Hong Kong to introduce 3D printing technology to complex cardiac procedures for enhancing procedural efficacy and safety.

3D soft silicone-based models of complex cardiac structures.

STUDENTS OUT OF SYNC

Universities around the world have been opening their doors and encouraging local and non-local students to study together and become friends. But despite their best efforts, a barrier lies in the way: these two groups lead very different lives.

Local and Mainland students tend to segregate themselves on university campus mostly because they have different daily life schedules and hence have little opportunity to have cross-group interactions.

> " It's very simple: put them together for a prolonged period of time, preferably in a challenging environment, and they will become close friends, they will fall in love with each other. "
>
> **Dr Tian Xiaoli**

When Dr Tian Xiaoli joined HKU's Department of Sociology from the United States six years ago, she encountered a puzzling situation. Despite the increase in Mainland student numbers on local university campuses, and the efforts of universities to promote cross-group interactions, local and Mainland students were segregating themselves. To a sociologist, it was a natural and fascinating phenomenon to investigate.

Were political or language differences dividing them? Dr Tian suspected something more basic was at play. In research spanning the Umbrella Movement and other political events in Hong Kong, she found the main reason students occupying shared space on campus did not mix was because, paradoxically, they had little opportunity to do so. They keep different hours, different mealtimes and different habits.

"This is a problem that is not unique to Hong Kong," she said. "On most campuses, international students will only interact with international students. Even students from the same cultural background – for example, British students studying in Canada – have been shown to talk mainly to other international students, not local students. So this is more of a local versus non-local problem."

Dr Tian's conclusions were drawn from two studies, one looking at the differences in how local and Mainland students use social media

and the other at their interactions and attitudes towards each other.

The social media study found Mainland students tend to use RenRen and WeChat more than Facebook and are more concerned with seeking practical information such as where to get the cheapest train tickets or find a good place to live in Hong Kong. Local students are far more likely to be on Facebook keeping in touch with people in their network or for entertainment. So online, they have different purposes.

In the second study, Dr Tian interviewed 80 students from four Hong Kong universities, including HKU, who were evenly split between local and Mainland students. She wanted to know whether, how and why they interacted with each other and, revealingly, found that local students not only had limited contact with Mainland students, but: "Many of them said they don't talk to other local students either. They feel a low sense of belonging to their university and a higher sense of belonging to their high school because they were always together with their classmates, in class and leisure time. This pushed me to focus on their daily routines."

She found that Mainland students, being from out of town, tend to live close to campus and are more focussed on academic work because they have fewer ties in the community. Local

students tend to leave campus right after class and return to their home-based community.

Parallel lives

Even when they live together in the residential halls, Mainland students tend to eat dinner, sleep, and get up earlier than locals. Different daily life schedules are the most prevalent source of conflict for the hall residents, and many students interviewed blamed their different schedules for the lack of cross-group interaction. Dr Tian came across one Mainland student who did not see her roommate, a local student, for one month because one of them was always asleep when the other was up.

Dr Tian also considered whether language, lack of motivation and discrimination were keeping the students apart, but found these to be less convincing explanations. Mainland students who speak Cantonese said they were still more likely to socialise with other Mainland students, and discrimination, while present, was modified towards fellow students.

"The conflicts between Mainland China and Hong Kong have been increasing, so I asked local students about that. They thought new immigrants and tourists were no good, but they had quite positive things to say about their Mainland classmates. So while general discrimination is strong, when it comes to the individual person, it could be different," she said.

Segregation was not the whole story, though. Dr Tian also looked at when and how students from the two groups developed friendships, and found daily routine, again, to be the most important factor. When students go on university trips abroad, for instance, they tend to form close bonds because they are spending a lot of time in close quarters.

"It's very simple: put them together for a prolonged period of time, preferably in a challenging environment, and they will become close friends, they will fall in love with each other," she said.

Dr Tian interviewed university administrators who confirmed her observations and who were as puzzled as she had been about why students did not interact. She offered some solutions. Apart from trips abroad together, they should have multiple points of contact during their daily lives, including leisure time and meals. "The other thing is against the current trend of a flexible curriculum, but I found students who have to take more required courses together for a longer period of time, like architecture and translation, have more inter-group interaction," she said. ∎

Mainland and local students have different purposes using social media. Mainland students tend to use it for seeking practical information; local students, for networking and entertainment.

Professor Chen Zhiwei (right), Director of the AIDS Institute and Professor of the Department of Microbiology, and Dr Allen Cheung Ka-loon (left), Post-doctoral Fellow of the Department of Microbiology, at the press conference.

NEW PATHWAY, NEW POSSIBILITIES

As HKU's AIDS Institute reaches its 10th anniversary, the team has made a major discovery that could lead to a new immunotherapy to reinforce the fight against 'the incurable disease of the century'.

There are two parts to the discovery: a new Δ42PD1/TLR4 immune pathway that appears to account for acute gut inflammation in HIV-1 patients, and the development of an antibody to fight this pathway which they have tested on mice.

Professor Chen Zhiwei, Director of the AIDS Institute and Professor of the Department of Microbiology, said: "The path to the discovery began in 2013 when our team was working on a PD1-based AIDS vaccine. We asked ourselves: 'if we deliver HIV antigen into dendritic cells by fusion with soluble PD1 protein, can we induce stronger anti-AIDS immunity?'"

Two papers were published on the work – the first in the *Journal of Clinical Investigation*, the second in *Cancer Research*.

The idea, called the dendritic cell targeting vaccine, was sparked from work done by Professor Ralph Steinman, Nobel Prize winner

for Medicine in 2011, with whom Professor Chen worked in an AIDS vaccine consortium while at the Rockefeller University in New York. "We used a similar idea to him but in a different way. Students amplified two soluble PD1 products instead of one – alternative splicing at the level of messenger RNA – and thus accidentally discovered a novel isoform of PD1, namely Δ42PD1 [published in *Molecular Therapy*]."

The team is the first in the world to work on Δ42PD1, and discovered a new immune Δ42PD1/TLR4 pathway that accounts for gut-associated inflammation during acute HIV-1 infection. The findings also demonstrated that by blocking this pathway it is possible to prevent HIV-1-induced mucosal damage. "We believe this pathway is also important for other inflammatory diseases not limited to HIV-1," said Professor Chen. "We hope to develop the antibody as a new immunotherapy to benefit patients quickly."

Initially, they were aware of the sequence of the isoform, but didn't know what it was for. They made an antibody that only recognised this isoform, tested it on HIV patients and found this molecule had higher representation in V™2 T cells. Tests on both acute and chronic patients recorded high levels of this type of cell, as well as two other proteins – CD103 and CCR9 – that would guide the cells homing into the intestines.

Reducing gut damage

The concept was tested using mice by intravenously injecting HIV-induced human V™2-induced human V™2 T cells. "We gave it a fluorescent label so we could see where it went," said Professor Chen, "and it moved to the small intestine and led to a major alteration of mucosal cells, including gut damage. We then looked into the mechanism. This is the first human protein identified on a human cell type, which can trigger the gut inflammation through the interaction between Δ42PD1-positive V™2 T

and TLR4-expressing cells. Excitingly, one of our Δ42PD1 antibodies reduces gut inflammation and damage significantly."

Now this research has been published as the lead article in *Nature Microbiology*. Professor Chen also presented the work at the Global Virus Network meeting in Melbourne in September, 2017. He was invited by Professor Robert Gallo, who co-discovered HIV-1 in 1983, and Professor Sharon Lewin, who heads the Peter Doherty [Nobel Medicine

winner in 1996] Institute for Infection and Immunity.

For the research, HKU collaborated with a team from the City University of Hong Kong and three hospitals in China, including the Shenzhen Third People's Hospital, to obtain enough human specimens of infected cells to confirm their hypothesis.

His team is now applying for government funding and private donations to humanise the

antibody, and not only for HIV but other mucosal inflammatory diseases such as colitis and even cancer. "This pathway plays an important role in several different cancers, including liver cancer," said Professor Chen. "In preliminary research into HCC (Hepatocellular Carcinoma), the most common type of primary liver cancer in adults we have used the HUH 7 hepatocarcinoma cell line in mice so a tumour grows rapidly, then injected the Δ42PD1 antibody and the growth of tumour stopped. It all relates to the Δ42PD1/TLR4 pathway."

In conclusion, he added: "This is the 10th anniversary of our AIDS Institute and it is a wonderful time for us. Our productivity is excellent and we continue to have our world-class output published in high impact journals despite the fact that AIDS research is extremely competitive." ∎

> "We believe this pathway is also important for other inflammatory diseases not limited to HIV-1. We hope to develop the antibody as a new immunotherapy to benefit patients quickly."
>
> **Professor Chen Zhiwei**

The discovery that gut inflammation can be prevented by blocking Δ42PD1/TLR4 pathway.

Professor Chen presenting the work at the Global Virus Network meeting in Melbourne in September, 2017.

The team's findings have been published in the October 2017 issue of *Nature Microbiology* (Volume 2, Number 10).

The Sun Room is an in-situ composite woven bamboo shell, which explores the potential of digital design and fabrication techniques to reinvigorate traditional craft.

> 66 China is modernising so drastically, so fast, and I don't think people really understand what we're losing, although they have an idea that we're losing something. Our goal is to mine these crafts and trades and pieces of culture for their usability and potential to add diversity to the built environment, and use them as a resource. 99
>
> **Mr Donn Holohan**

PAST AND PRESENT MEET IN THE SUN ROOM

Traditional architectural crafts and practices are dying out in China. A project in the Faculty of Architecture is trying to save them.

Peitian village in Fujian province used to have 'tea houses' dotted around its countryside. In these shelters, made from timber, clay, straw and other materials and often ornately decorated, farmers would eat lunch, take cover from the rain or sun, store materials, or simply gaze upon the scenic fields and hills. The bucolic image changed with the advent of cheap concrete and steel that saw the traditional tea houses replaced with concrete boxes. But in 2017, Donn Holohan and his students attempted to turn back the clock with the help of an 85-year-old craftsman.

They paid three visits to the village to re-construct a tea house – which they dubbed the Sun Room – using a combination of computer and robotic inputs and the dying craft of bamboo weaving.

"The Faculty of Architecture has been doing reconstruction projects in Peitian for several years and we have come to understand that aside from the pressing issue of village regeneration, there is an equally urgent crisis underway – the decline of traditional crafts and trades and the significant loss of intangible cultural heritage that that represents," Mr Holohan said.

"Our primary driver with this project is to look at how we can preserve that craft and heritage, modernise it and add value to it."

The project also provided experiential learning for 64 first-year students and two postgraduate students, who were tasked with building a simple structure that nonetheless involved a number of complexities.

First was the site. In deciding the layout of the tea house, they had to be careful not to block the views of tombs and ancestral holds in the area. "There were a lot of debates with the village head and the community about the placement. Their requirements were very

codified and indecipherable, but that was more about trying to reach a consensus and involve as many people in the process as possible. This is something we don't often do in Western architecture," Mr Holohan said.

Second, the design had to be easily reproducible in other contexts. After students helped form the site with a concrete base and stone wells, they returned to HKU and were involved in figuring out the design using CAD software. The Faculty's robotics laboratory was used to manufacture the frame, which was put together by students during a second visit to Peitian.

Weaving in tradition

That left the defining touch: the bamboo weaving. The 85-year-old was the only one in the village who was skilled in splitting the bamboo, preparing the canes and weaving them together. Mr Holohan and a small team sat alongside him to study his craft. "We had to learn these skills and figure out how to simplify them so we could train others," he said. The meeting of two worlds – modern international architects and village craftsman – was not always easy. "There was a language barrier and he just wanted us to be quiet and do the work.

He was doing it the same way it had been done in the past, so when we wanted to change the scale, from a basket or mat to 55 square metres of material, it was a bit of a shock to him."

However, the experience also inspired the bamboo weaver to take on apprentices in the village, who then helped train students.

Yongki Sunarta was one of those students and said he enjoyed learning about the philosophy underpinning the village's architectural structures and the hand-on practicalities of construction work. "This was also about teamwork and hard work – it's really important to communicate with each other on projects like this, otherwise they simply won't work," he said.

The villagers have shown their appreciation by sending Mr Holohan videos on WeChat showing them having parties in the Sun Room, in addition to its other uses as a peaceful shelter in Peitian's valley – thus fulfilling the goal of breathing new life into old architectural forms.

"China is modernising so drastically, so fast, and I don't think people really understand what we're losing, although they have an idea that

we're losing something. Our goal is to mine these crafts and trades and pieces of culture for their usability and potential to add diversity to the built environment, and use them as a resource. Otherwise they will just disappear," he said. ∎

The Sun Room is a community space that provides a respite for villagers who work the land in the hot growing season. The form and siting of the shelter are carefully considered to maximise ventilation and view and to respect protected viewsheds that are a major feature of the landscape.

The Sun Room project took more than 60 HKU students to southern Fujian to aid in the construction. Students and local villagers worked with the last remaining bamboo weaver in Peitian village to re-learn, adapt, and evolve this traditional process.

A series of dissemination seminars were attended by hundreds of teachers, all coming to learn more about the tiered intervention model so as to enhance learning and teaching effectiveness of writing instruction.

> " Working together with teachers was a great learning experience. It gave us insight into what is actually going on at classroom level and the practical problems teachers face in dealing with students of similar age but different writing ability. "

Dr Patcy Yeung Pui-sze

MAKING THE PEN MIGHTIER

Researchers in the Faculty of Education have come up with recommendation to help children experiencing difficulty with Chinese writing. Their work received the Faculty Knowledge Exchange Award 2017.

The team's aim was to undertake a comprehensive study to develop and implement a tiered intervention model on writing instructions to support struggling Chinese-language writers in the upper primary grades. The resulting report, named *Supporting Struggling Writers: From Theory to Practice*, was cited by the awards board for its good engagement with schools and key publications and also received high praise from the teachers involved.

Dr Patcy Yeung Pui-sze, Associate Professor in the Faculty of Education, said: "Relatively, more work is done on solving reading problems than on writing problems. While a good deal of research has been done on the subject, in Hong Kong explicit efforts to turn the resulting theory into practice have been rare. Teachers told us there were few resources available for helping struggling writers. I hope our work is a start."

There were three critical elements to the intervention study – a core writing curriculum based on scientific research findings; continuous progress monitoring to evaluate effectiveness; and professional development for teachers.

The Tiered Intervention Model (TIM) element of the project is in line with the 3-Tier Support Model currently advocated by the Education Bureau for supporting education needs. The 'tiered' part of the name refers to different levels of support. Tier 1 is quality teaching received by all students. Tier 2, which is based on the Tier 1 curriculum, gives more support for those not responding well to Tier 1 alone, while Tier 3 is for those who need more concentrated help.

"The tiered system also includes three other key elements," said Dr Yeung, "professional development for teachers, progress monitoring and early identification. To develop our model we used literature for both English and Chinese curricula, and worked on phases – planning, translation and review. It is not common to have the kind of structured writing we introduced.

"For Tier 2 we made use of findings among English and Chinese writers and included writing

Materials are designed to arm students with better tools for writing instruction. A graphic organiser is used to facilitate students' organisation of ideas in writing, such as the above train with compartments for organising the ideas of each paragraph.

Dr Patcy Yeung (first from left), Dr Elaine Chan (first from right), Co-Investigator of the 'A Cognitive-linguistic Approach to Tiered Writing Intervention for Students with Diverse Learning Needs in Senior Primary Schools' project, and school representatives at a seminar.

strategies that involve explicitly teaching students to plan, revise, brainstorm and edit, to summarise through writing and to collaborate with students in small groups to provide feedback."

The project's scope supported eight local schools from different districts, backgrounds and demographics so as to get more diverse feedback. The team made 110 service visits to the schools and provided on-site support including teacher training, monthly collaboration planning, class observation and monitoring of students' progress.

"Working together with teachers was a great learning experience," said Dr Yeung. "It gave us insight into what is actually going on at classroom level and the practical problems teachers face in dealing with students of similar age but different writing ability. It was a two-way, professional exchange – they gave us feedback on what worked and what didn't and we revised the model according to that feedback."

From the school administrators' point of view, the project was also a success. They liked the model because it employs a whole school approach to integrated education. Dr Yeung and her team now hope the project will be a catalyst and anchor point for future teacher development programmes.

An element of fun

The programme includes exercises designed to be enjoyable for students. To help with sentence construction, they employed a variety of graphic organisers, such as a train with compartments for organising the ideas of each paragraph. "It's great to use images that children find fun and that they're familiar with," said Dr Yeung. "We also have an exercise on review and editing with a hot spring illustration for which the students have to go through three steps starting with adjectives, then conjunctions and finally rhetoric."

Narrative writing was made more engaging by inviting the students to role play. "For example, in one exercise they are assigned the role of a detective who has to describe a character or event to others." Dr Yeung said: "This requires the students to be observant and to think carefully about the description, but also enables them to have fun as there is a sense of excitement."

Materials for teachers include differentiated worksheets that look the same to the students (for example, they are the same length), but in fact are divided into low, medium and high ability. Only the teacher knows which category each worksheet is from, thereby guarding against students feeling discouraged if they are struggling at lower levels of ability.

Feedback from teachers has been very encouraging. "They said the model enhanced learning and teaching effectiveness of writing instruction and had armed them with better tools for writing instruction, leaving them feeling more capable of dealing with student diversity in ability levels," said Dr Yeung.

Since the publication of the report, Dr Yeung and fellow team members Miss Tsang Po-yin, Miss Chan Yan-lee and Miss Peggie Chan have held several dissemination seminars and distributed a DVD of their work to local primary schools. ∎

Teaching resource packages, designed by Dr Yeung's team, were distributed to local primary schools.

The aircraft for the round-the-world journey is a Van's RV8 aircraft and this is the first Hong Kong registered homebuilt aircraft. It travelled across 20 countries and landed at 40 airports, with a total flying distance of approximately 50,000 kilometres.

REACHING FOR THE SKY

A dream to touch the sky brought together several generations of engineering alumni, along with a group of secondary school students, to build an aircraft and fly it around the world.

In a project appropriately called 'Team Inspiration', a group of HKU engineering graduates joined forces with students from St Paul's Convent School to build the first Hong Kong-registered homebuilt aircraft then fly it on a three-month round-the-world (RTW) journey across 20 countries, landing at 40 airports.

The project was launched by pilot Hank Cheng, and when HKU engineering alumni Gary Tat read about it in local newspaper *Ming Pao*, he knew he wanted to get involved. He had dreamed about becoming an aviator since secondary school and that ambition grew stronger when he was at HKU and became the first Mechanical Engineering student chosen to go to one of the best aviation colleges in the US, Embry-Riddle Aeronautical University (ERAU).

"I did a full-year exchange programme in 2004 to 2005, organised by HKU," said Mr Tat. "At ERAU, I took two aircraft design courses and we got the chance to design our own aircraft as part of a competition. The winner would be sponsored to make their design into a model and take it for wind-tunnel testing. This sparked the thought that I wanted to have my own aircraft one day and to do a round-the-world trip in it – perhaps after my retirement."

The dream would become reality much sooner, when he read about Hank's plan and tracked him down. "The project started with only Hank and myself. He did the building part and, given my work background, I dealt with the certification part. Building the aircraft was similar to buying furniture from IKEA – the manufacturer gives you the parts and a manual

and you follow the instructions step by step. But, to allow the aircraft to fly legally, it must be airworthy and comply with international and local aviation rules and regulations. Since there was no precedent in Hong Kong, we had to negotiate with the Hong Kong Civil Aviation Department (CAD) on every single requirement in order to establish our compliance."

Later, when the Government gave them the green light, Mr Tat became one of the 'certifying' engineers for the aircraft so that during the RTW, he would follow the aircraft to perform maintenance.

Cross-generational team

And he soon got the next generation involved too. "I graduated from HKU in 2006, after which

❝ The return to Hong Kong was particularly exciting as obviously we were finishing the round-the-world trip as the first aircraft homebuilt in Hong Kong. It was inspiring and I felt honoured to be part of a great team. **❞**

Mr Gary Tat

I joined Cathay Pacific (CX) as an engineering trainee. It is usual practice to help the next batch of trainees, and so I thought about getting more graduates involved. I simply asked them if they would be interested in building an aircraft."

He recruited Sam Chen, Mechanical Engineering Class of 2011, Cyril Li and Wing Go Ng who are both Mechanical Engineering Class of 2016 alumni. They planned to finish the entire project within three years, but in the end building and testing took seven years, then the eighth year was devoted to the RTW trip.

Their proudest moment was when the plane took off for first time, but for Mr Tat the highlights of the RTW trip were leaving and returning to Hong Kong. "We left on August 28, 2016. The weather was not that good but we were finally being able to depart. As the first trip it was really remarkable to me that what we had dreamed became true and I was there."

He flew from Hong Kong and all the way cross Australia, then was part of the support team for Hawaii and the US, and followed the rest of the journey. "The return to Hong Kong was particularly exciting as obviously we were finishing the round-the-world trip as the first aircraft homebuilt in Hong Kong. It was inspiring and I felt honoured to be part of a great team."

Since the team's RTW trip the Hong Kong Science Museum has held an exhibition about the expedition and the Inspiration team has published a book about their journey.

For Mr Tat, the project was a dream come true and he hopes that it also inspires others to pursue their goals. "This was a group of passionate and professional aviation lovers doing what they love to do by sacrificing their own time to achieve a common goal. Our team went through many difficulties and problems, but we overcame each one. This symbolises the can-do spirit of Hong Kong and we want to tell people that if you have a dream, then you have to work hard at it and keep going."

He also has some advice for upcoming engineers. "As engineers, we are often labelled tech freaks who are not good at communicating with people but only at talking to a machine or doing coding. Without too many debates, I admit this is often the case, but think it is changing. The modern engineer will have to be able to communicate and to put what is in their minds into words, to materialise their visions so that other people can understand. I saw every teammate in this project develop and improve their ability to do this.

"The scope for engineers has widened tremendously but the core value remains

unchanged, which to me is to make our society or the world a better place to live in using our expertise. To do this, you have to be able to plan, to do and to communicate with the people. You may have an innovative idea but if you can't explain that idea to others, it will just become another sketch paper in the trash bin – for future engineers communication is the magic word." ∎

Gary (centre, seated) and a group of HKU engineering graduates devoted many hours of their personal time to certify B-KOO.
(Courtesy of Cathay Pacific Corporate Communications)

'Team Inspiration' is led by Mr Gary Tat (left) and Mr Hank Cheng (right).

The first-ever homebuilt aircraft certified to fly under Hong Kong registration – B-KOO Inspiration – took off from the Hong Kong International Airport for the first time on November 15, 2015.
(Courtesy of Cathay Pacific Corporate Communications)

66 My recommendation on neighbourhood planning is to use our existing estate network to increase the density of elderly-related service provision such as medical clinics and daycare centres so that ageing in place is possible. 99

Professor Rebecca Lai Har Chiu

LIVING LONGER AND BETTER

Recommendations based on two research projects by the Faculty of Architecture are contributing to the development and provision of housing for the elderly.

The research projects, collectively entitled 'Improving Livability in Ageing Hong Kong', were carried out by Professor Rebecca Lai Har Chiu and her team in the Department of Urban Planning and Design and the Department of Social Work and Social Administration. The first, 'A Comprehensive Study on Housing in an Ageing Community', was commissioned by the Hong Kong Housing Society (HKHS), Hong Kong's housing laboratory and foremost non-government organisation in subsidised housing provision. It comprised a questionnaire survey of 5,000 individuals, aged between 34 and 75, 20 focus group meetings, and

interviews with senior professionals and former senior government officials.

"With the proportion of elderly people in the population increasing due to longer life spans, the aim was to investigate housing trends in overseas ageing communities and the possibility of similar trends happening in Hong Kong; to define future housing demands from households of different life stages; to study the current living arrangements of the elderly, especially those in co-residence with the younger generations; and to assess policies such as ageing in place, elderly housing schemes and

holistic solutions to enable active and healthy ageing," Professor Chiu said.

The second study, 'Social Sustainability of Gated Communities in a High Density City: The Case of Hong Kong', involved a questionnaire of 900 samples and looked into the evolution of housing estates in Hong Kong as semi-gated communities; social sustainability considerations in planning and design and social sustainability performance from the perceptions of internal and external residents; and socio-spatial performance among different types of existing housing estates.

In Asian society, respect for elderly relatives is strong and the principle of ageing in place – that is remaining in your own home environment while you age – is upheld. However, this traditional Chinese normative order is facing challenges from rapid social and economic changes.

"85 per cent of the people surveyed, aged 50 and above, said they would prefer ageing in place when they got older," said Professor Chiu. "The question is how can we make the living environment surrounding them more supportive? Approximately 70 per cent of Hongkongers live in housing estates, and my recommendation on neighbourhood planning is to use our existing estate network to increase the density of elderly-related service provision, such as medical clinics and daycare centres, so that ageing in place is possible.

Pyschological and social well-being

"Estates must have adequate services and facilities to enhance the elderly's psychological and social well-being. Public space must be accessible and usable and there should be adequate circulation routes such as covered walkways and a social community environment where they can interact within the neighbourhood. Most public housing estates in Hong Kong have this as a planning principle – but we want to ensure that it is not just a principle but is actually happening." Jolly Place, a purpose-designed housing estate of HKHS, is located on flat ground with a variety of facilities and shopping centres in the neighbourhood within easy access. "Residents interviewed were very happy there," she said. "Based on the recommendations of the report, HKHS and the Government are looking into developing a more

basic version of Jolly Place for the lower-income home owners."

Studies into how to reduce degeneration of cognitive processes in the elderly show that living within a mixed community, well served with facilities helps significantly. "While elderly homes can be good at first because the residents feel safe surrounded by people of the same age, there is no stimulation for the brain, so in the long term they are not beneficial. For the elderly, the most stimulating environment comes from living in what we term 'Mixed Developments'," said Professor Chiu. "Mixed in terms of age range and activities, so they are living within a normal and vibrant neighbourhood, and preferably within reasonable proximity to their children – while not actually living together. This is why ageing in well-equipped neighbourhoods such as our public and private housing estates makes so much sense."

To ensure the focus remains on this subject, Professor Chiu also recommended the formation of an integrated Elderly Policy and Elderly Affairs Office at bureau level in order to develop policy for the future developments. This would include land use zoning, and coordinating services which need to be coordinated across all government units.

The report, which won an HKU Faculty Knowledge Exchange Award in 2017, is already making an impact. HKHS used the recommendations when devising its Medium-Term Development Strategy. The Government's Planning Department also referred to the findings in formulating its long-term development strategy beyond 2030, specifically to develop inclusive and supportive housing for all ages in the context of a

livable high-density city. In addition, the recommendations have been taken up by the Elderly Services Programme Plan commissioned by the Labour and Welfare Bureau with the aim of enhancing the provision of elderly services and facilities.

For the next stage of the livability research, Professor Chiu is looking into housing standards for the elderly in other Asian countries, to see if Hong Kong's experience can be applied there. Professor Chiu said: "We are studying South and South-Eastern Asian cities in the Belt and Road Region, such as Dhaka (Bangladesh) and this research is also expected to generate local impacts to help in tackling livability issues in ageing cities." ∎

Jolly Place, located in Tseung Kwan O, is a purpose-designed housing estate of the Hong Kong Housing Society for benefiting the elderly by way of healthy ageing and ageing in place. The estate is equipped with supporting facilities including rehabilitation room, gymnasium and Jolly Place Care Home, and the Society's first residential care home for the elderly.

> ❝ One of our most important competitive advantages is that we prepare our students to be leaders in the business world for Hong Kong and beyond. ❞
>
> **Professor Hongbin Cai**

TAKING CARE OF BUSINESS

Professor Hongbin Cai has the hybrid background and energetic vision befitting a Dean of Business and Economics in one of the world's top financial centres.

From growing up in the shadow of a state-owned enterprise (SOE) to graduating from Stanford and teaching at UCLA and Peking University, Professor Hongbin Cai is at home in the East and the West. Fittingly, he is now at their symbolic meeting point, Hong Kong, leading the Faculty of Business and Economics (FBE) of the city's oldest tertiary institution.

"The University of Hong Kong has a great reputation and attracts the best students from Hong Kong and beyond, and the FBE has a very

good foundation in terms of faculty research capacity and business education programmes. But obviously I hope to work with my colleagues to make it better and stronger," he said.

Professor Cai brings to the job rich life and academic experience. Both of his parents were engineers and worked for an SOE in Jiangxi province that was supposed to produce helicopters but switched to making minivans when China started economic reforms. "I grew up in that company town observing all the

changes that went down starting in the 1980s. It motivated me to try to understand economic problems and social changes," he said.

He initially studied mathematics at Wuhan University, then switched to economics for his Master's degree at Peking University. In the 1990s he went to the US where he did his PhD in economics at Stanford, then taught at UCLA until 2005 when, attracted by the fantastic dynamism of China's growth and a desire to understand the forces that were driving it,

he took up a position at his alma mater Peking University.

"I was trained as a game theorist, but when I moved back I changed my research focus from theoretical work to more real-world issues and empirical work on the Chinese economy," he said, investigating such topics as inequality and economic development, the impact of corruption on firm performance and economic development, and comparisons of SOEs, private firms and multinationals.

In 2010 he became Dean of Peking University's Guanghua School of Management, then last summer came to HKU, leading a faculty that is still young within HKU terms (16 years old), but growing in strength and international standing. For example, its EMBA was ranked number two in the world in 2017 by the *Financial Times* and its MBA is ranked best in Asia by *The Economist*, while its scholars have a strong record of publication.

A grander vision

Professor Cai's mission is to take the Faculty to the next level. He plans to recruit more top

scholars from around the world, develop young promising staff, and continue to improve and enrich education programmes. A new Faculty-based career development office is being set up to provide advice and services to all undergraduate and taught Master's students.

Facilities are a particular concern because they have not kept up with the FBE's rising stature. "All business schools around the world have very good space and facilities, but not at HKU," he said. He will be working with the University to try to address this.

Apart from these bread-and-butter issues, Professor Cai also wants the FBE to fulfil a grander vision that involves strengthening its international focus and its impact in the community.

More ties will be forged with business communities, not only in Hong Kong but in Mainland China and abroad, to provide opportunities for students. "Future leaders in the business world will have to have a global perspective. One of our most important competitive advantages is that we prepare our

students to be leaders in the business world for Hong Kong and beyond," he said.

He also wants to see the Faculty achieve stronger social impacts through its research and other activities. He cites the example of Professor Richard Wong Yue-chim, Philip Wong Kennedy Wong Professor in Political Economy, whose work on housing, demographics and immigration has helped inform policy-making in Hong Kong. Professor Cai also sees potential for the FBE's scholars to advise on the future economic relationship of Hong Kong and the Mainland. "I would like the Faculty to develop a stronger institutional capacity so that collectively we become a sort of think tank on Hong Kong economic policy," he said.

A final priority is to strengthen ties with alumni. "The alumni I have met in Hong Kong and in recent trips to Shanghai and Beijing are so proud to be members of HKU. This is a good asset for us and we should take advantage of that," he said. ◼

Professor Cai is delighted that HKU Business School's EMBA-Global Asia programme has achieved second place in its first ever entry in the annual Financial Times *Executive MBA ranking.*

Professor Ian Holliday (centre), Vice-President and Pro-Vice-Chancellor (Teaching and Learning), and Professor Cai (second from right) at the launching ceremony of the Bachelor of Finance in Asset Management and Private Banking programme.

社科

> **"** Now people recognise that there are social elements to so many aspects of life, including our current challenges – climate change, immigration issues, racial and economic inequality. **"**
>
> **Professor William Hayward**

BRINGING SOCIAL AWARENESS TO TROUBLED TIMES

"May you live in interesting times" is an English expression said to be translated from a Chinese curse that implies 'uninteresting' times are a lot more conducive to harmonious living. The phrase may be apocryphal, but in today's turbulent world it seems apropos and, as the new Dean of Social Sciences points out, ironically, troubled times make the study of Social Sciences, a subject born in the Age of Enlightenment in the 17th century, more relevant now than ever.

In the nearly 20 years since he first came to Hong Kong to work, Professor William Hayward, who took over as Dean at the start of the academic year, feels that Social Sciences have become better understood in the city as making a real and necessary contribution to society. "While two decades ago there was demand for a Social Sciences degree, you had the feeling some students had to persuade their parents that this was a good subject to do," he said.

"Now people recognise that there are social elements to so many aspects of life, including our current challenges – climate change, immigration issues, racial and economic inequality. Yes, there are technological solutions to climate change, but the fundamental problem is one of persuasion and political influence. Fundamental issues affecting societal harmony and/or discord – including Trump and Brexit, and relations between Hong Kong and Mainland China – these are all social issues. Our Faculty has an important part to play in addressing these issues."

A New Zealander, Professor Hayward completed his initial degree at the University of Canterbury, did his Masters and PhD at Yale in the United States, then spent five years at Wollongong University in Australia as a lecturer in Psychology.

His professional association with Hong Kong began in 1999 when he became Assistant Professor of Psychology at the Chinese University of Hong Kong, where he stayed for seven years, also cultivating his specialist research area of visual perception. He joined HKU in 2006, encouraged by a former colleague from Australia Dr Tony Hayes, along with Professor Terry Au Kit-fong, who were senior leaders in the Psychology Department at the time. Starting as Associate Professor, Professor Hayward became Head of Department after two years.

At the end of his second term in the role, he was invited to take on a similar position at the University of Auckland at a much bigger

department which he felt would bring its own challenges and rewards. "I'd been away from New Zealand for 20 years, and by then had children of my own. So it seemed right to go back there for a while. But when the opportunity came up this year to be Dean of Social Sciences at HKU, one of the world's leading universities, it was simply too great an opportunity to miss."

Global outlook, top in Asia

"HKU has both a global outlook and a leading position in Asia," said Professor Hayward. "Within that, the Faculty of Social Sciences has a strong history and is respected in terms of its teaching and research expertise. It benefits from substantial community backing – particularly from supporters like the Hong Kong Jockey Club and HSBC – and it gives back by training practitioners in various fields and through its dedication to knowledge exchange."

While acknowledging the strengths of the Faculty, he feels there is room for further development. "In research for example, there is a lot of individual achievement within the Faculty, but it is also quite uneven. I would like to build upon existing strengths to create a small number of truly world-class research clusters.

"In areas such as mental health, urbanisation, sustainable development, China studies, and migration, we have opportunities to be among the best in the world, but it requires us to build scale in a few areas, rather than trying to do everything. We are starting the process now by looking at which areas can bring us together in interesting ways, and then seeing who is doing similar work in other departments and institutions that can complement our own. One of the main goals here is to grow the pie, to find new sources of funding for our work.

"Ultimately, we want to achieve critical mass and aspire to international excellence. When experts overseas are looking for knowledge and excellence in the Social Sciences in Asia and around the world, I want HKU to be one of the first places on their search list."

Professor Hayward said his transition into deanship has been made easier by the already strong leadership in the Faculty: "There are people in senior roles who lead in different ways – which makes it easier for me to come in as Dean."

Having lived in Australia, the US and Hong Kong, he is a keen advocate of the benefits of going beyond your own borders. "Going abroad gives

you new perspective, not only on your own country but on the world too. You see more angles and have a better understanding of how it fits together.

"We have a commitment to internationalisation, to broadening our students' horizons in terms of research and of teaching. In particular, our off-campus learning programmes enhance the daily teaching our students receive and offer them global experiences outside of the University, and outside their own city."

Here in Hong Kong too, the Dean noted that the Faculty is well respected and the Bachelor of Social Sciences is a sought-after degree – "both among aspiring students and among employers. It's a good stepping stone to careers in many areas.

"We train Hong Kong's social workers and psychologists, we fill government positions. We also provide benefit to the community through our involvement in a variety of programmes and projects – from NGOs, through end-of-life care, to Sustainable Lai Chi Wo Programme and dyslexia support, to name but a few. I'd like us to be even more visible – stronger, bigger and more coordinated, to create a more coherent vision all round." ■

Professor Hayward (sixth from left in the back row), Professor Ian Holliday (sixth from right in the back row), Vice-President and Pro-Vice-Chancellor (Teaching and Learning) and colleagues and student helpers from the Faculty of Social Sciences on the Information Day for Undergraduate Admissions 2017.

Professor Hayward (seventh from right in the first row) and Professor Terry Au Kit-fong (eighth from right in the first row), Vice-President and Pro-Vice-Chancellor (Academic Staffing and Resources) at the Faculty of Social Sciences' Student Prize Presentation Ceremony.

Celebrity Culture and the Entertainment Industry in Asia *by Vivienne Leung, Kimmy Cheng and Tommy Tse is published by Intellect Ltd in the UK and distributed by University of Chicago Press*.

CELEBRITY CULTURE IN THE MODERN AGE

Branding and technology are affecting the nature of celebrity today and have knock-on effects in other parts of society, argues the author of a new book on celebrity in Asia.

Hong Kong pop star Denise Ho has experienced the highs and lows of fame. As a successful singer who is a lesbian and political activist, she has been hailed for her talent and for sharing her personal life and inspiring others. But she has also been vilified online for her sexuality and been banned in China and dropped as a Lancôme spokesperson for her political views. It has all taken a toll.

"[Celebrities] are, like, lying on the chopping board. People who dislike us can randomly 'shoot an arrow' at us any time or slap our face," she said. "I feel like today's celebrities…

have become punching bags, which is another identity for us."

The quote is contained in a new book, *Celebrity Culture and the Entertainment Industry in Asia*, co-authored by Dr Tommy Tse Ho-lun in the Department of Sociology and two colleagues from Hong Kong Baptist University, that has two unique features. First, through Dr Tse's previous work in the media and his PhD on the fashion world, they obtained unprecedented access to a dozen Asian celebrities and artist managers, including Ms Ho; globally, scholars rarely have the opportunity to interview celebrities directly.

And second, they bring an Asian perspective to the field.

"The field of celebrity studies has usually centred on the West, but with the rise of East Asia and the craze for the Korean wave and the new Chinese cultural wave, we were interested to see how they managed to create their cultural influences within such a short period of time," Dr Tse said.

The rise of the celebrity in Mainland China and Korea has mirrored their economic development and, to a certain extent, Hollywood-style brand

> 66 The power of digital technology makes the celebrity system more complicated. You think you can control everything but there are many more variables and unexpected interactions, and you can't manage the celebrity 24/7. 99
>
> **Dr Tommy Tse Ho-lun**

management. The images of Korean pop stars, for instance, are very tightly controlled, similar to the old Hollywood studio system, but with a twist: in order to keep unflattering items out of social media, they are under almost constant supervision by agents and other handlers. Dr Tse experienced this first-hand when he was denied access to a small press conference by a Korean pop star because the star's manager did not recognise him.

"The whole system is rigorous and well-monitored because they want to maintain the image for the economic value they get from that. In this way, a celebrity is not an individual at all, just one element in a system generating not only economic values, but social and cultural values," he said.

Magnified on social media

The wrench in that system is social media. On the one hand, it connects people immediately to celebrities, empowering fans with the ability to communicate directly with someone they admire and burnishing the image of the celebrity, especially when they let down their guard to show their 'true' selves and when they promote

issues they value, such as gender equality or even the importance of staying fit.

On the other hand, as countless celebrities have found out – such as Ms Ho and former actress Hilary Tsui, wife of pop singer Eason Chan, who has faced cruel and pointless attacks over her mothering skills and intelligence, among other things – the public can also use that access to turn against them.

"The power of digital technology makes the celebrity system more complicated. You think you can control everything but there are many more variables and unexpected interactions, and you can't manage the celebrity 24/7.

"We assume digital technology has empowered powerless people to voice out their opinions and that this makes a better world, but it actually just brings offline ideological values and problematic cultural values to the online world where they are magnified. That is the bad side of it," Dr Tse said.

That has not stopped ordinary, non-famous people from adopting the values of self-branding to promote themselves.

People put their daily lives on Facebook, Twitter or Instagram and often Photoshop themselves to look better.

"You could say these things have nothing to do with celebrity culture, but the influence is there. We are treating ourselves as celebrities and becoming more conscious about how we present ourselves in virtual spaces," he said.

"The negative aspect of celebrity culture is that it encourages consumerism, materialism and this virtual superficial culture."

Other sectors beyond the entertainment and fashion industries are also embracing celebrity branding, exemplified by US President Donald Trump, who initially built a fan base through self-promotion, reality television and Twitter, and by private tuition centres that prominently feature attractive star teachers in their bus signs. "'Attention capital' is becoming as important as economic capital and the connections you have. As long as people pay attention to you, you have the power," Dr Tse said. ∎

Hilary Tsui, a former television and film actress, a fashion blogger, the wife of famed Cantopop singer Eason Chan, actively uses social media platforms to promote running and radiate 'positive energy' to the public.

Denise Ho, a renowned Cantopop singer and film actress, suggested a celebrity's ideal role in society – as a charismatic opinion leader of various moral and social causes, and an advocate of justice, human rights, and democracy.

Ancient Wisdom, Modern Thinking

Professor Sun Kwok's book and Common Core course, *Our Place in the Universe*, take on the big questions and find answers in the discoveries of ancient astronomers.

Albert Einstein reportedly said that the true sign of intelligence is not knowledge but imagination, and his words could be a cornerstone of Professor Sun Kwok's book, *Our Place in the Universe*. Based on his Common Core course of the same name, the book focusses on science and knowledge, but above all it teaches people to think for themselves.

"Most science courses teach facts based on current theories," said Professor Kwok, HKU's former Dean of Science and now Director of its Laboratory for Space Research. "I wanted to use the history of the science of astronomy to demonstrate the evolution of rational thinking. The first scientific ancestors knew a lot more than we tend to credit them with – they had a

sophisticated grasp of the structure of the Universe, even 2,000 years ago.

"My point in looking back at their thinking is to demonstrate to students today that when it comes to facts, it is not what we know, but how we know it and that the model changes continuously as we learn new things."

What is interesting is how he approaches the subject by looking at historical changes in the perception of our place in the Universe as a result of astronomical development, while at the same time illustrating the development of the scientific method and how science has influenced the evolution of our philosophical thinking and cultural development.

"When Copernicus [the Polish astronomer who in the 16th century developed the concept of a heliocentric solar system in which the sun rather than the Earth was the centre] came along, his thinking was revolutionary. What he did had

Astronomy in society

"Scientific development also had effects beyond science," he said, adding that in the Middle Ages, astronomy was firmly integrated into the hierarchy of European society. Aristotle, Ptolemy and the Bible were the basis of government, church, everything. It developed in parallel in the West and in China, where the emperor also used an astronomy model to justify his position and rule.

major implications, shaking the church to its foundations and threatening upheaval in the structure of society. The absolute authority of the Pope, kings and emperors were questioned.

"The book uses the historical development of astronomy to illustrate the process of rational reasoning and its effect on philosophy, religion and society. Because celestial objects followed regular patterns, astronomical observations gave humans some of the first hints that Nature was understandable. The complicated nature of these patterns also challenged our intellectual powers."

Professor Kwok is a strong advocate of HKU's Common Core and was one of the first to develop a course for it, which is carefully framed to fit exactly the objectives – namely be interdisciplinary, as well as inter- and cross-cultural, and to promote students to think and analyse for themselves. The massive open online course (MOOC) titled 'Our Place in the Universe' will be available on edX in the spring term of 2018.

He wants to reach non-scientists via both the book and the course. "The course attracts students from many disciplines, and the book can be read by anybody. But sometimes Arts students come to me worrying that they will be

at a disadvantage on this course because they don't have a maths background. I tell them it is the Science students who will be at a disadvantage, as they will embark on it with preconceptions – which can be misleading! There is no maths in the course, but there is deductive thinking. These are not complicated problems – if our ancestors could work them out 2,000 years ago, then so can you.

"Over 5,000 years our understanding of the Universe has changed continuously, but never forget that at any given time within those 5,000 years people were as convinced then that they were correct as we are today."

He also goes on to say that modern man thinks he is smart, but in fact our ancestors knew more about the world around them than we do. They didn't have so many distractions and they had time to figure things out. Now we are too busy to spend time thinking.

Students' reactions to the course are interesting. His favourite quote is: "In my 12 years of study, I've always been told to memorise. You're asking me to think and I can't do it." But then that is the point – learning to think. By the end of the course most are totally enthusiastic.

"Students say the course has helped them in work situations where they are presented with a

problem and can now look at it from new angles. The delivery of the course and the book is very different to other science textbooks which usually give you the correct theory, then deduce from that. I start with the observations, then ask what can you theorise from these? When new observations are made, how do you adjust your theory?" ■

The first half of the content of the Common Core course 'Our Place in the Universe' was written up by Professor Sun Kwok and Our Place in the Universe *was published by Springer in 2017.*

'Our Place in the Universe', designed and taught by Professor Kwok, was among the first batch of Common Core courses offered in the academic year 2010–2011 and has since been offered every year for a total of seven times.

Professor Kwok (centre) meeting his readers at the book launch party.