



LA TROBE
UNIVERSITY

ASIA RISING

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Message from the Vice-Chancellor

Welcome to the ninth issue of *Asia Rising*, La Trobe Asia's showcase for the excellent and diverse Asia-related research undertaken across La Trobe University.

It has been a challenging year at the University, however La Trobe Asia has been very productive during 2021 despite the hardships created by COVID-19.

While the global pandemic has presented difficulties for many facets of University life, I'm glad to say the La Trobe community has risen to the challenge, maintaining excellent performance during the year and continuing in our teaching and research activities.

We are excited about welcoming both domestic and international students back to campus next year. And we look forward to continuing in our international research collaborations with world-class institutions, developing new partnerships, and making the most of the opportunities we have in the region.

This publication highlights the important and diverse collaborations that La Trobe University and its academics are building across the region. As the COVID-19 pandemic has demonstrated, strong research partnerships within and beyond Asia have never been more vital, and La Trobe University has a valuable contribution to make toward some of the region's most pressing issues.

Thank you for your interest in the work of La Trobe Asia and La Trobe University.

Professor John Dewar
Vice-Chancellor

About the series

Asia Rising is a publication from La Trobe Asia, based at La Trobe University in Melbourne, Australia.

The stories in this series present research from La Trobe University academics in collaboration with Asian partner institutions or based on topics in the Asia region.

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Using luminescence to fight bacterial resistance

Bacteria and other types of pathogens evolve rapidly, making medicines less effective at treating infections over time, and increasing the risk of spreading diseases. Antimicrobial resistance (AMR) is a growing health issue recognised by the World Health Organisation (WHO), which has listed AMR as one of the top 10 global public health threats.

Many nations around the world, including Australia, have developed antimicrobial resistance strategies in order to curb the growth of AMR bacteria. This allows for more research to discover new and efficient methods of reducing AMR bacterial infections such as photodynamic therapy (PDT) using fluorescence.

"Using photodynamic therapy allows you to control the way light is used to activate the process of killing the bacteria, making it more difficult for bacteria to develop a resistance to the light," says Dr Yuning Hong, a Senior Lecturer in Chemistry from the La Trobe Institute for Molecular Science (LIMS) at La Trobe University. "This provides more options for researchers to develop anti-bacterial drugs, or use these kinds of methods to treat clinical equipment and avoid bacterial infections."

"My research focuses on fluorescence materials and how photodynamic therapy creates the possibility of using light to kill bacteria or cancer cells. By modifying the structures of chemical compounds, you can use light to selectively target cancer cells or certain types of bacteria."

Dr Hong's research has led her to work with several international institutions. One of her recent projects, in collaboration with a team of researchers from the Ming Wai Lau Centre for Reparative Medicine at the Karolinska Institutet in Hong Kong, focused on using fluorescence with PDT along with a metal complex to determine how to combat the bacteria's resistance process.

"I wanted to combine these iridium metal complexes, which have a similar kind of PDT properties with other antimicrobial drugs or peptides," says Dr Hong.

"Combining the molecules gives you a synergy effect to combat the anti-drug resistance. Using fluorescence, you will be able to see where the bacteria are and how much has accumulated on a surface. So, fluorescence is a multifunction method that allows you to see, check and kill bacteria."

This project contributes to Dr Hong's research using fluorescence materials in cells working with bacteria as she aims to further the application of the research to specialised medical research areas, such as helping develop stronger antimicrobial drugs.

"We design fluorescence dyes that can be used as a molecular tag which can label damaged proteins and trace where they are, study how they are accumulating, degrading and how they are causing a problem in the cells," Dr Hong says.

Dr Hong is currently working on another international collaborative research project with colleagues from the China University of Geosciences in Wuhan to develop fluorescence dyes that can target misfolded and unfolded proteins in cancer cells.

"We hope to understand the mechanism in cancer cell deaths and also find a solution to kill cancer cells more specifically with fewer side effects," says Dr Hong.



Promoting healthy biomes in China's rice supply

Rice is a major crop in China, being a staple part of the diet in most households and an important commercial export for the country. China is the world's largest producer and consumer of rice, where it covers up to 25% of the cultivated farmland, and accounts for 30% of total world production and consumption.

China has implemented a series of programs to promote rice productivity, and one area of active research is increasing rice yield. A healthy microbiome in soil is crucial in the cultivation of rice. Disruption of the microbiome can have significant repercussions to the viability of the environment, including increased emissions of greenhouse gas methane and the inability for soil to self-purify to remove pollutants.

"You can't overstate the importance of rice to the world, and there's a lot that can go wrong when growing it. Rice paddies are particularly at risk of pests, parasites and disease," says Ashley Franks, Pro-Vice Chancellor (Research Capability) and Professor of Microbiology at La Trobe University.

"Rice is mostly grown in the eastern provinces of China along the Yangtze and Yellow River, where the grassland biomes are marshy with plenty of water," says Professor Franks.

"These crops need a healthy microbiome that can conduct all the natural processes to ensure the cycling of nutrients, provision of energy, and plant growth is supported. Without this balance you lose production, which could have significant implications for the world's food supply."

Professor Franks is collaborating with colleagues at La Trobe University as well as Professor Yan He, Director of Institute of Soil and Water Resources and Environmental Science at Zhejiang University in Zhejiang, China.

"Rice is grown widely throughout Zhejiang province, and Professor Yan He and her team are experts in their field, making them the ideal collaborators in this project," says Professor Franks. "We wanted to examine the factors that affect diversity in the rice paddy and how this can help improve crop production, and examine the feedback loop between soil, nutrients, microorganisms and plants."

"Our partners in Zhejiang are doing the cultivation and growth in this study, while we at La Trobe are contributing to the analysis and bioinformatics."



Paddy soil samples were collected from paddy fields in Jiaxing city in Zhejiang, China. These fields are typically used to grow and harvest rice crops, with the partially flooded conditions perfect for growing semi-aquatic rice varieties.

The floodwater and groundwater used for the cultivation of rice aids water purification, oxygen generation and temperature regulation. However, the increasing use of insecticides to preserve rice growth has contributed to the loss in microbial diversity and endangered wetland species as a result.

“You can’t overstate the importance of rice to the world, and there’s a lot that can go wrong when growing it.”

“If the flooded rice paddy soils are not given a good balance of nutrients and carbon and maintained in a healthy state, this will lead to a loss of biodiversity and new bacteria needed to carry out function,” says Professor Franks.

“This means they can’t degrade pesticides, leaving them vulnerable to toxic buildup which can be detrimental to not just plants grown there, but also to the health of the people who eat them.”

Professor Franks’ collaboration with Zhejiang University is one of a number of activities with the institution, including joint PhD student scholarships and further agricultural research at La Trobe’s AgriBio, where researchers aim to increase the absorption rate of phosphate fertilisers in thale and rice.

Other research projects at La Trobe University explore the viability of small-scale and independent rice farming in China amidst the large scale commercial farming enterprises.

Professor Franks hopes his research will lead to cost effective ways to increase rice yields throughout China, while at the same time lessening the impact of invasive methods such as pesticides and fertilisers.

Although this research provides an in-depth analysis of the consequences imposed by biodiversity loss in soil within terrestrial ecosystems, Professor Franks says future studies should analyse how microbial diversity loss impacts other soil functions within different environments.

“A bacterial community is more than the sum of its parts, and the important thing is not just to know what bacteria is there, but how they are functioning together. By studying this we can promote positive interactions, leading to healthier biomes and increased rice productivity.”



Australia's AUKUS risk

Australia, the United States, and the United Kingdom signed the historic 'AUKUS' trilateral security partnership in September 2021, provoking much discussion about the implications of the deal for Asia.

Primarily cast as a technology and information-sharing arrangement by officials, most of the attention has been paid to Australia's plans to acquire at least eight nuclear-powered submarines known as SSNs as part of the agreement. Over the next 18 months, the states aim to identify 'the optimal pathway' for delivering the submarines, including ensuring Australia becomes 'a responsible and reliable steward of this sensitive technology'. The Australian Defence Force will be provided with additional long-range strike capabilities.

With the signing of this agreement, Australia has been rewarded for its 'dependable' ally status: The UK is the only other state with which the US shares this technology, and it has been reluctant to do so with other allies such as Korea.

As the waterways of East Asia become increasingly crowded with naval vessels from states within and beyond the region conducting joint patrols, the AUKUS deal reveals some broader trends in how Australia – as a middle-sized state – conceptualises its strategic geography and its roles and interests across the maritime region.

First, the agreement points to just how seriously Australia's leadership views the 'threat' of China's rise to its national and regional security interests. Nuclear-powered submarines will allow the Royal Australian Navy to patrol the strategic waterways of the Indo-Pacific for longer, which could be particularly handy at a time of competing territorial and maritime claims.

Australia sees itself as contributing to 'military deterrence' in the waters of North and Southeast Asia, and regional stability more generally. However, it is less clear how these capabilities might assist Australia in negotiating the 'grey zone' threats that the 2020 Defence Strategic Update (DSU) emphasised, or the raft of security challenges that may threaten Australia's vast Exclusive Economic Zone (EEZ).

Second, the move to SSNs reflects Australia's desire for an order-shaping role in the expansive Indo-Pacific region. The 2020 DSU also highlighted that Australia's decision makers are shifting Australia's national role conception from a middle power state situated in the world to a regional power situated in the largely maritime Indo-Pacific.

Third, AUKUS is another example of Australia's preparedness to cleave closer to the US in balancing rising China's influence in the region. Australia's government appears to have abandoned its pragmatic foreign policy of not having to choose between either great power.

Finally, Australia's political leadership emphasises defence capabilities at the expense of diplomacy and other arms of statecraft. This is deeply problematic, as many of the security challenges facing Australia and the region are non-traditional and require a whole-of-government approach.

In the maritime space, this includes grappling with 'blue crimes' such as illegal unreported and unregulated fishing, piracy, and human trafficking at sea, which requires co-operation with regional states.

The surprise announcement drew mixed responses among ASEAN states, with the Indonesian and Malaysian officials voicing concern over the deal. Australia also abandoned a \$90 billion contract with French defence contractor Naval Group to build 12 conventional-powered submarines, resulting in sunk costs of at least \$2.4bn with more expected in broken contract fees. The clumsy handling of the announcement saw Paris recalling its ambassadors in Washington and Canberra, and there is concern of a long-term rift in Australia-French relations which could affect ongoing partnerships.

A diplomatic rift matters for Australia and its order-shaping ambitions in the region, as France is one of the only countries besides Australia to have territorial and maritime jurisdictional interests in the Indian, Pacific and Southern Oceans.

This alignment of interests has seen the two states cooperate on maritime issues. For example, they both belong to the Pacific Quadrilateral Defense Coordination Group with the US and New Zealand, where they coordinate maritime surveillance and regional disaster relief. In the Southern Ocean, France conducts maritime patrolling, which advances Australia's interests in combatting illegal, unreported and unregulated fishing.

If Australia is to fulfill its ambitions of becoming a regional power, then the AUKUS debacle demonstrates the need for a more considered approach to regional diplomacy that invests in and uses all elements of statecraft.

Treating France only as a European power overlooks its status as an Indo-Pacific maritime power. It would be prudent for Australia to try and repair the damage using formal and public diplomacy channels, and for France to bracket out its submarine grievance from other important activities it conducts with Australia.

Australia also has its work cut out in reassuring neighbours in Southeast Asia, the Pacific and Europe that AUKUS will enhance rather than undermine regional stability.

Bec Strating is the Executive Director of La Trobe Asia. A version of this piece was first published on the Philippine Strategic Forum.



India and sport for development

Sport can be unifying, developing a sense of ownership amongst those who play and participate. It can also help community development, which has been the aim of an ongoing project in the Nilgiris Mountains of South India.

Dr Biju Philip, an academic at the La Trobe Business School, has spent a number of years in India working with the Sport4All Foundation in establishing Sport for Development projects in India.

His most successful project saw him living and working amongst the people of the Nilgiris mountains in southern India, implementing intensive soccer coaching programs amongst Tribal and non-Tribal groups.

"There are four Tribes in the Nilgiris mountains, although they worked together for survival, they are very different from each other," says Dr Philip. "Economically they are not very rich, and there are social and educational disparities with those in towns and cities."

Dr Philip's PhD project started in 2014 with establishing a partnership with La Trobe University, Nilgiris Wynaadu Tribal Welfare Society and the Sport4All Foundation and implemented a soccer peer-coaching camp in The Nilgiris which was attended by more than a hundred school children.

Later, the program was expanded into four schools, and involved children and young adults from Tribal and non-Tribal communities receiving an inclusive experience, no matter their gender, ability or caste.

"Implementing the program involved overcoming a lot of difficulties," says Dr Philip. "Developing local partnerships was crucial, and many had to be convinced that participating in the program was worthwhile."

"There were also hurdles in communication. Cultural and contextual understanding had to be developed, and our coaching manual and resources needed to be translated into Tamil for the participants."

Philip's findings from the study were published in a paper *Sport-for-development and social inclusion in caste-ridden India: opportunities and challenges* for the Soccer & Society journal (October 2021).

One unintended benefit was the establishment of two competitive teams amongst the Tribal children - one of boys and one of girls. Philip founds the results rewarding, as it encouraged participation amongst groups that rarely interact and gave them the opportunities to develop social, educational and leadership skills.

"Before the project was established schools were focused purely on academic development, and sport was only considered for competitive reasons," says Dr Philip. "The program helped the schools recognise the benefit of sport to the physical, mental and social health of these children. It improved community participation in school initiatives. For me that shows what an effective sport for development project can do."





Seeking health advice by using Voice Assistant apps

Speech recognition software has matured substantially since its emergence in the 1950s. What started as an efficient way to dial numbers quickly developed into digital voice assistants (VAs) that enabled technology to be of service in both our virtual and physical lives. According to Statista, globally, two in five individuals source their information online through VAs, and a growing number are using this technology to seek health-related advice.

"The internet provides convenience, anonymity and privacy. Some individuals tend to conceal their symptoms and are often unwilling to seek help due to barriers like stigma and shame," says Dr Kevin Yap, a Senior Lecturer in Public Health (Digital Health) at La Trobe University. "The internet can be used by these patients to seek information regarding their conditions, and voice assistant apps can provide the interface."

Focusing on patients with eating disorders and co-existing depression, Dr Yap, in collaboration with researchers Meryl Koh, Qihuang Xie and Lilian Wong from the Department of Pharmacy, Faculty of Science at the National University of Singapore, analysed how Cortana, Google Assistant, Samsung Bixby and Apple Siri were used to acquire health information online in their paper, *Quality assessment of digital voice assistants on information provided in eating disorders and coexisting depression*.

"Various studies have been conducted on the quality of information provided by VAs on other health-related topics such as vaccines, smoking cessation and sexual health advice," Dr Yap says.

"However, studies on their abilities to provide quality information regarding eating disorders and coexisting depression are limited."

Dr Yap's study indicates that patients use VAs to seek information for symptoms of eating disorders and depression, diagnosis and treatment plans. But while such information can be accessed conveniently at the touch of a button and a few words, Dr Yap is concerned about the reliability of search results as new literature suggests the accuracy of VA technology is deteriorating. Additionally, Dr Yap questions what serious health risks these patients may endure as a result.

"Relevant and comprehensive information is important to ensure patients' needs are met, while accurate and reliable information will ensure that patients are not misinformed," says Dr Yap. "Furthermore, healthcare professionals should educate patients on their medical conditions, so that they can use the information that they obtain from VAs to supplement their knowledge."

Dr Yap is commencing a new project where he will evaluate the quality of information regarding COVID-19 vaccines on various social media platforms. Prior to this, he also published a quality evaluation study on VAs in regard to supplying information relating to the pandemic.

"With the infodemic resulting from COVID-19, there is a need to determine the quality of online COVID-19 information provided by VAs and on social media platforms."

Navigating online misinformation and disinformation

False information online is a prominent issue around the world as digital technologies advance, allowing us more accessibility to read and share information. In the last two years, the COVID-19 pandemic brought a new wave of online misinformation and disinformation that posed new types of threats, including to public health.

Social media platforms such as Facebook, Instagram, SnapChat and TikTok are avenues where individuals or organisations can spread information intentionally to target a specific group of people. This was evident during the 2016 US presidential elections that saw a private Russian company manipulate social media posts to support a US presidential candidate.

The dangerous effects of ‘fake news’ have also been displayed across Asia, such as the 2019 post-election riots in Indonesia, after false theories and information regarding the presidential election sparked rage on the streets of Jakarta. In Singapore, the government has implemented laws to take action against online misinformation and disinformation, but also using it to target the reporting of government critics such as Singaporean-Australian blogger Alex Tan.

“Fake news has been around for centuries and we’ve always known that it is a problem. The difference is propaganda was used by leaders during the world wars and now individuals can spread fake news around the world just as much as organisations do. All you need is a keyboard and an internet connection,” says Dr Andrea Carson, Associate Professor in Journalism from the Department of Politics, Media and Philosophy at La Trobe University.

Dr Carson led an independent research study funded by Facebook, exploring the voluntary and legislative approaches of governments tackling online misinformation and disinformation around the world. Working with Liam Fallon, who is now a researcher at the Brotherhood of St Laurence, the study aimed to better understand how Australia could approach preventive measures in reducing the spread of false information online. It compared government actions in Indonesia and Singapore to the responses of the European Union.

“There’s not much agreement on how to best define misinformation. I use a fairly simple, broad definition which is verifiably false information that may or may not cause harm,” says Dr Carson.

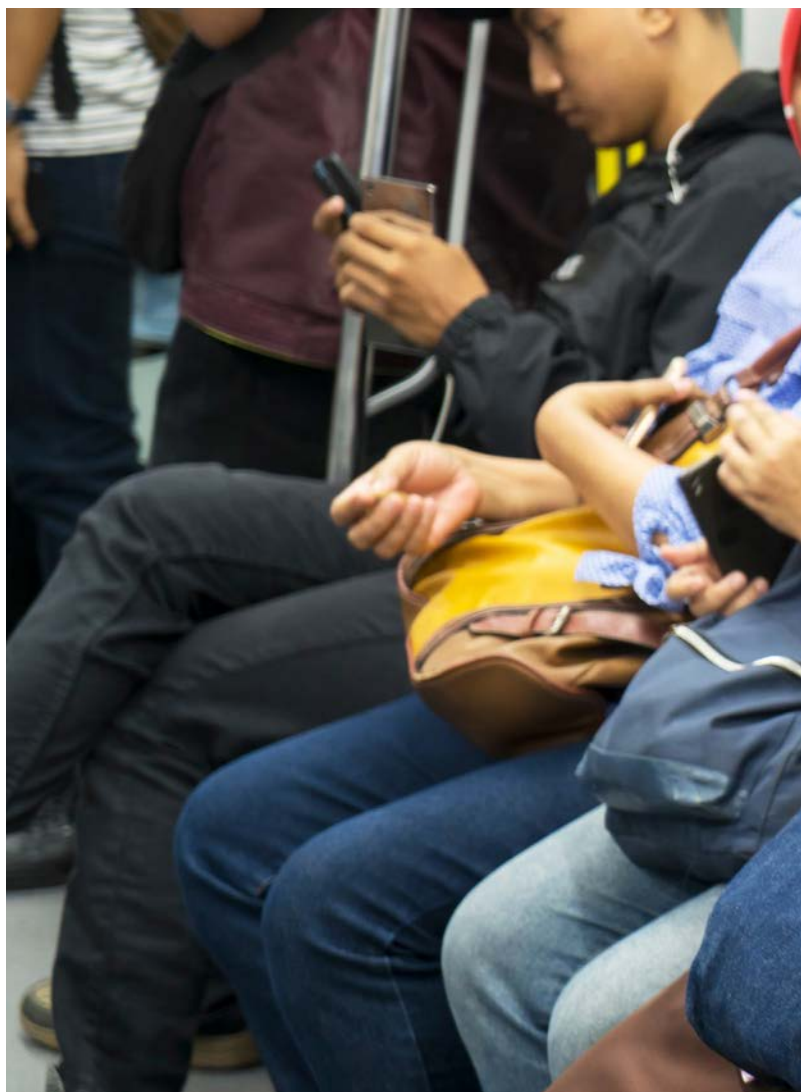
“Disinformation is more specific—it is the intentional spread of misinformation. And that is to operationalise intention by looking at an individual’s actions or an organisation’s actions.”

The spread of false information online, or “hoaxes”, has been an issue for Indonesia, with disinformation targeting the political opposition and the diverse ethnic, religious and cultural groups of people. In September 2019, the government discussed the possibility of implementing new changes to include laws regarding online misinformation and disinformation in Indonesia’s Kitab Undang-Undang Hukum Pidana (KUHP) criminal code.

Indonesia also has the 2016 Information and Electronic Transactions Law (ITE) with the focus on removing or taking down false information in the country.

“Anyone accused of spreading misinformation or hoaxes, which is more akin to disinformation, risks being jailed or heavily fined,” says Dr Carson.

The nation’s Ministry of Communication and Information Technology (KOMINFO) persuaded social media platforms to also do their part in preventing the spread of false information online. But human rights organisations are criticising KOMINFO and the National Cyber and Encryption Agency (BSSN), the KUHP and ITE laws as being used against journalists and any oppositional groups.



"The laws have been criticised because political opponents of the government, journalists and minority groups have been caught up in that legislation and are being penalised. So the law in that way has been weaponised, which can stifle free speech and diverse political expressions of journalists and critics of the government," says Dr Carson.

There is a similar issue in Singapore with the government's approach in tackling false information online with the introduction of the Protection from Online Falsehoods and Manipulations Act (POFMA) in April 2019.

The government proposed to use POFMA to prevent the spread of false information but also to retain people's freedom of speech. However, that is not the case with the law being used to silence political opposition, journalists and academics who criticise the Singaporean government as evident during the 2020 elections.

"Singapore has a number of strategies to deal with misinformation, from simply labelling it as fake news but not taking it down, right through to ordering the platforms to remove it. This gives the government a lot of power and they get to determine what is and what isn't fake news," says Dr Carson.

"This particularly affects freelance journalists in Singapore, who find themselves needing to self-censor when approaching sensitive topics such as capital punishment. At times, their only safe option to reach their Singaporean readers is through international newspapers like The Guardian."

Overall, the study shows that a legislative approach to online misinformation and disinformation can present a danger to free speech if used inappropriately by the government and is not applicable to Australia. The advisable route is to continue with the voluntary approach in Australia with a multi-sectoral action involving the government, tech companies and the public's response.

In February, DIGI, a not-for-profit industry association representing the major tech companies launched the Disinformation Code. The new Code is voluntary and is designed to help digital platforms cut the spread of misinformation and disinformation in Australia.

"Combating online misinformation needs to involve sincere collaboration between tech platforms and civil society actors, especially human rights activists, who are often at the forefront and can recognise when there's misinformation and disinformation campaigns happening," says Dr Carson.

Dr Carson is currently working on another research study also funded by Facebook in determining the most effective fact-checking method to mitigate COVID-19 misinformation. She and her team from three universities will be conducting surveys and is expected to have results by late 2022.





Social justice in Japan's education system

Over the past two decades Japan has experienced economic growth, changed employment practices, population decline with an ageing society, and an increasingly multi-ethnic population due to migration. All of these have led to dramatic changes in the schooling system, as it adapted to meet the needs of a diverse population.

"When I was growing up and went through the schooling system in Hiroshima it was very hierarchical," says Kaori Okano, a Professor in Japanese Studies at La Trobe University.

"There was a certain kind of optimism that if you work hard, you will get the better life. You can enjoy a better standard of living, materially, emotionally and psychologically. This has now significantly changed."

Professor Okano explores the evolution of Japan's education system over the last two decades in her latest book, *Education and Social Justice in Japan*, published by Routledge.

It presents an evaluation on how changes introduced to Japan's school routine have shaped their education system into what it is today.

One of the major changes to Japan's education system is how the curriculum and processes are organised. The system was highly centralised, with all decisions, from school lunches to textbooks and curriculum, directed by the Ministry of Education in Tokyo.

"For a long time conformity in education was effective, especially in post-war Japan where it helped raise the standards of areas that were poverty stricken," says Professor Okano.

"This is no longer effective in a diverse population. In the last twenty years decision making has become much more decentralised, and while the Ministry provides guidance there are many decisions made at the local government level by an education board. This has led to a greater amount of diversity in the system."

The curriculum flexibility has allowed schools to adapt to their students as well - areas where there are larger migrant populations are able to diversify class content and teach appropriate languages.

"I think decentralisation is a good thing, although some critics argue that the government is trusting too much to the educational practitioners," says Professor Okano.



"Personally, I believe teachers have the professionalism to do what's best for their students, but it's true that there's no monitoring system or accountability in place."

Another instance of flexibility is represented in compulsory school lunches, designed by qualified school nutrition teachers. While they must follow national nutritional guidelines, they are cooked on campus and are instructed to use as much of the local produce as possible.

"Local produce is interwoven into the learning experience, and students learn about where their food is from and who provides it," says Professor Okano. "Many have had a class excursion to farm or fishery, and the local agriculture and fishing industries are very much in favour of it as it represents a sizable contract and increases their market."

School lunches are often given an 'international' theme, incorporating meals of other nations into planned lessons on different countries.

Another aspect of Professor Okano's research involves the examination of academic scores and retention rates of different social groups, to determine to what extent educational opportunities are taken up by students of different social backgrounds.

"Children of minority backgrounds may not perform as well as the dominant group, and we can determine that by looking at retention rates," says Professor Okano.

"The other aspect of social inclusion concerns the curriculum and school experience, as to whether students are gaining a diverse world view and learning experience."

Professor Okano believes the education system is emblematic of the wider problems Japan is experiencing in its hesitancy to embrace migration and address the changes that can come with it. Traditionally a closed society, immigration reform laws introduced in late 2018 have increased the access of foreign workers, bringing their families and education needs with them.

"The government doesn't have a national policy of multicultural education like Australia does," says Professor Okano. "For them it's easier and more practical to leave these decisions and programs to the local level of government. I think this is partly because the ruling conservative party is so broad that it's difficult to get support for the idea of a 'multiethnic' Japan from most conservative within the party. For them it's homogeneous, but I'm not sure to what extent that can continue forever."

Professor Okano's current research concerns a longitudinal study using her interviews with the same girls over thirty years in Kobe, Japan.

"I initially examined them during my one-year PhD ethnographic fieldwork, when they were in year 12 and making decisions about employment after school," says Professor Okano. "I have followed up on their progress at regular intervals and have been speaking to twenty of these girls about their lives and decisions for thirty years. They are reaching fifty soon!"



Using equations to understand rainfall soil behaviour

Flooding under heavy rainfall is becoming more frequent following the impact of climate change around the world. Understanding how water flows through soil plays a key role in analysing the damaging effects of flooding on our environment. Hydrologists, along with engineers, commonly use mathematical models to predict and better understand water infiltration and movement in the soil.

“Our study aims to deepen our understanding of soil water transport under heavy rainfall. Rather than adopting typical computational approaches, we are producing exact solutions to the difficult nonlinear governing equations,” says Dr Dimetre Triadis, Assistant Professor at Kyushu University’s Institute of Mathematics for Industry (IMI) and Research Fellow from the Department of Mathematics and Statistics at La Trobe University.

Dr Triadis, in collaboration with Emeritus Professor Philip Broadbridge from the Department of Mathematics and Statistics at La Trobe University, conducted a study analysing a solution for the movement of water through the soil under ponded surface conditions using the nonlinear Richard’s equation.

“In the initial stages of a rainfall event, it is typical for all the water that falls on the surface to be taken into the soil – this is a flow constrained boundary condition. In heavy rainfall events the soil’s ability to absorb water can be overwhelmed: the surface becomes saturated, and ponding can occur on top of the soil,” says Dr Triadis.

“Significant surface ponding increases infiltration due to water essentially being pushed into the soil under pressure. One can consider a simple situation where the pond depth is held constant or consider dynamic changes to the pond depth due to rainfall, surface flow, and the water that gets taken into the soil.”

The solution from the study clarifies the nature of the evolving subsurface moisture wave. These results can be applied to different soil properties and complement the computational methods used by soil scientists.

“You can see how hydrologists would want to gain a deeper understanding of these fundamental and useful physical systems,” says Dr Triadis.

Following this research study, Dr Triadis is working on another research project with Professor Kenji Kajiware from the IMI at Kyushu University, along with a masters student, on how moisture flow within the soil is affected by plant root uptake and seasonally varying water supply.

This is just one of a number of collaborations between La Trobe University and Kyushu University, with further projects in agriculture, education and political sciences. The two universities have developed a strong relationship since the IMI was established in 2013.

“We’re exploring new exact solution techniques,” says Dr Triadis. “The solutions we’re producing are useful for testing the accuracy of numerical methods and are giving us more fundamental insights into the behaviour of these important physical systems.”

Featured La Trobe University academics



Kevin Yap

Adjunct Senior Research Fellow, Digital Health

Dr Yap is a digital health strategist and cyberpharmacist researcher. His research targets the digital healthcare innovation cycle and his current projects focus on telehealth, virtual reality, serious games and quality evaluations of digital health innovations.



Andrea Carson

Associate Professor, Journalism

Dr Carson is a political scientist and a trained journalist. Her research examines the intersection between politics and the media - with special interests in investigative journalism, the media's role in democracies and political communication.



Kaori H. Okano

Professor, Japanese Studies / Asian Studies

Professor Okano conducts social anthropological research on education, diversity and social justice, and school lunch in Japan. She continues a longitudinal panel study of Kobe women's life courses that she began in 1989.



Ashley Franks

Professor, Microbiology and Pro Vice-Chancellor (Research Capability)

Professor Franks is Co-Lead of the Applied and Environmental Microbiology Laboratory and he has active research projects looking at the interactions of mixed microbial communities with plants, soils, microbiome, electrodes, sewer systems and submarines.



Yuning Hong

Senior Lecturer, La Trobe Institute for Molecular Sciences (LIMS)

Dr Hong leads a lab in Chemistry and will commence an ARC Future Fellowship in 2022. Her research is mainly focused on the development of novel luminescent materials with aggregation-induced emission feature and exploration of their applications.



Biju Philip

Adjunct Lecturer, La Trobe Business School

Dr Philip teaches masters and bachelors business and sport subjects offered at the La Trobe Business School. His research interest is in sport based individual and community development.



Rebecca Strating

Associate Professor, Politics and Director, La Trobe Asia

Dr Strating is an expert in maritime disputes in Asia and Australian foreign and defence policy. She is a frequent contributor to the media and she has active research collaborations in regional maritime security, law of the sea, and seafood slavery.



Dimetre Triadis

Research Fellow, Mathematics and Statistics

Dr Triadis is jointly appointed as a member of Kyushu University's Institute of Mathematics for Industry (La Trobe). His research focuses on using exact solution methods for partial differential equations to model important physical systems.



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