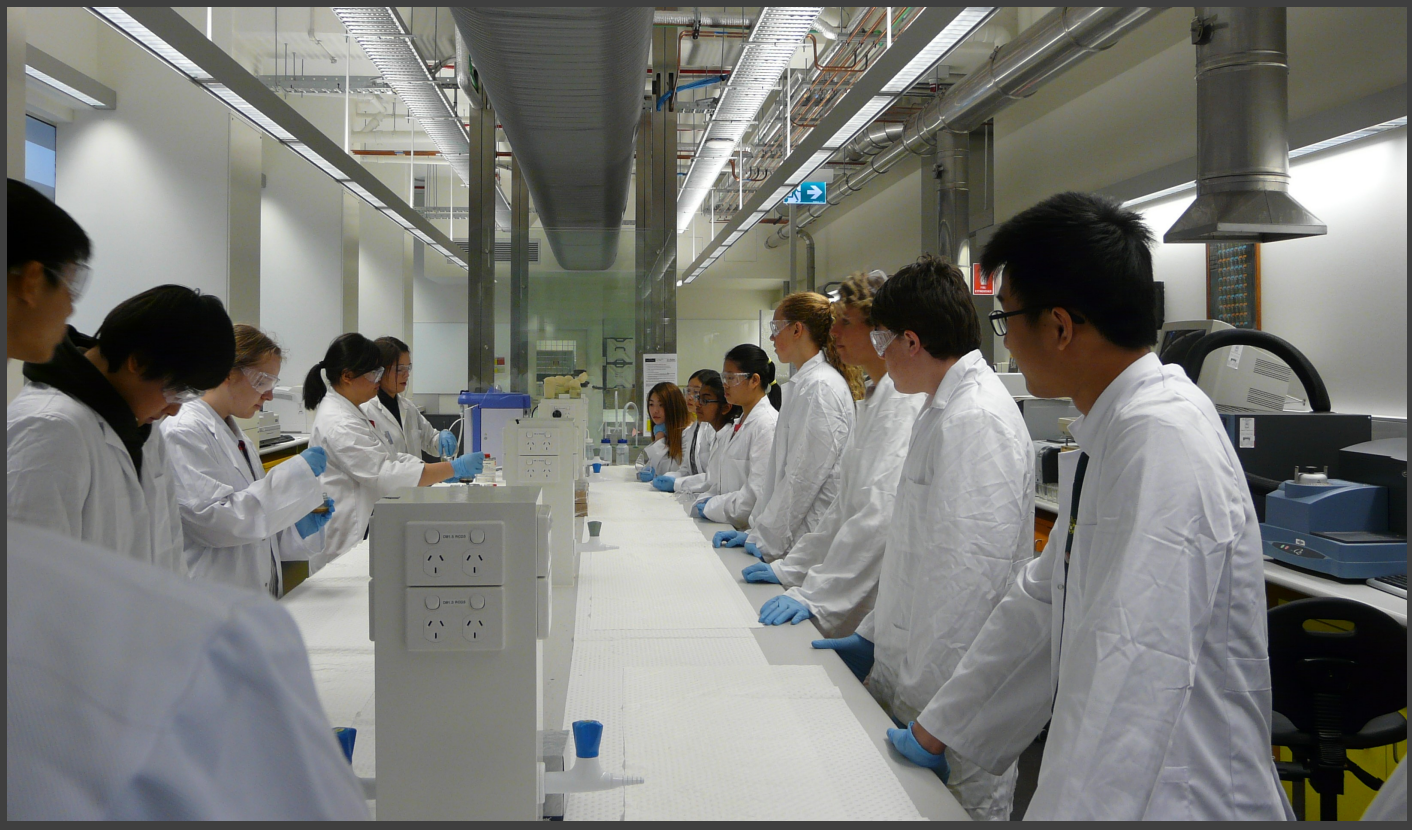
December 2020: issue #1

THE LEAD

UNSW, SCHOOL OF CHEMICAL ENGINEERING: NEWSLETTER



UNSW SYDNEY

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Reflections from the Head of School



Dear Alumni, Colleagues, and Friends,

Greetings from Sydney Australia. I am pleased to share with you our Spring 2020 newsletter, featuring the stories of our people and their accomplishments at UNSW School of Chemical Engineering. As we face unprecedented challenges posed by global pandemic as well as climate change, it is more important than ever to take a moment to celebrate our victories, big and small, with each other as we move closer to the end of this eventful year. On a personal note, I celebrate my relatively smooth and exhilarating transition to my new academic home here at UNSW and thank everyone for making it possible.

Please take care and stay safe.

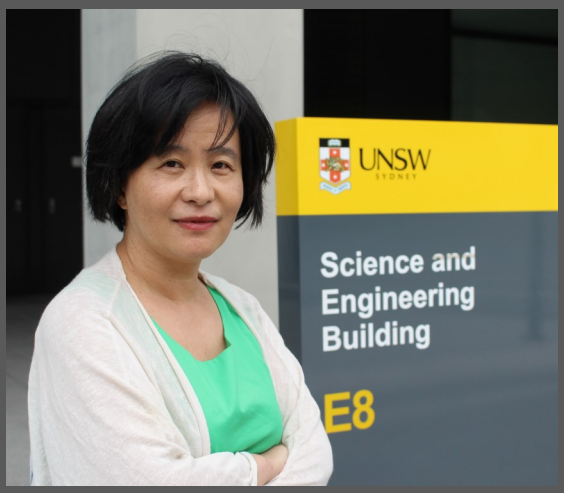
Best wishes
Professor Guangzhao Mao

UNSW Chemical Engineering rankings:

#40	**QS World by subject**
#57	**US News Best Universities for Chemical Engineering**
#51-75	**Shanghai Ranking's Global Ranking of Academic Subjects 2020—Chemical Engineering**

UNSW SYDNEY

Leading the way



"Prof Mao's research expertise is in applying nanotechnology for making functional materials and devices. Her work is split into two main streams. The first is nanomedicine for targeted drug delivery and the second is seed-mediated crystallisation applied to manufacturing of nanosensors "

We are thrilled to introduce our Head of School, Professor Guangzhao Mao.

There were two things that tipped the balance for Professor Guangzhao Mao when she was offered the position of Head of School for Chemical Engineering at UNSW, and both took her by surprise at first.

"I was comfortable in my position as Chair of the Department of Chemical Engineering and Materials Science at Wayne State University in Detroit, Michigan, where I had worked for the last 25 years; so, when UNSW approached me to discuss opportunities, I found the idea completely radical," she says. "However, I was amazed when I toured UNSW's campus. The Science and Engineering Building alone is one of the best-equipped chemical engineering buildings I have ever seen." In addition to the facilities, it was UNSW's strategic focus on being Australia's Global University that she found really exciting. "The second thing that attracted me, and where I really hope to contribute, is the University's focus on global impact," she continues.

Originally from China, Prof Mao did her undergraduate degree in chemistry at Nanjing University, China, before moving to the United States to do her PhD in Chemical Engineering at the University of Minnesota, Minneapolis. Prof Mao's research expertise is in applying nanotechnology for making functional materials and devices. Her work is split into two main streams. The first is nanomedicine for targeted drug delivery. The second is seed-mediated crystallisation applied to manufacturing of nanosensors.

"I have an ongoing project funded by the US Air Force to put nanowire sensors in pocket-sized micro-drones. The idea being that soldiers in the field have them to hand should they need to detect a chemical release in the environment. Civilian applications include personal safety devices for environmental monitoring in the chemical industry, for example."

With an impressive background in interdisciplinary, collaborative work, Prof Mao's priorities as Head of School include increasing synergies within the different research specialities of the school and increasing multidisciplinary opportunities within UNSW and internationally.

"I want to focus sharply on the School's global impact, in both research and education, and help the School better define itself so the outside world will easily understand what UNSW Chemical Engineering stands for," she says.

Our highly cited

Highly-cited UNSW chemical engineers influence peers all over the world

The top talents of four UNSW chemical engineers have been recognised by the latest Highly Cited Researchers Clarivate Analytics list which recognises the world's most influential researchers of the past decade.

"It is testament to the growing global influence of the School of Chemical Engineering that four of our researchers have been recognised on the prestigious Highly Cited Researchers list 2020," says Chemical Engineering Head of School, Professor Guangzhao Mao.

The Highly Cited Researchers (HCR) list is compiled annually by Clarivate Analytics and recognises the world's most influential researchers, whose citation records position them in the top 1% of their respective fields over a decade.

Around 6,200 HCRs were announced on the 2020 list, with 31 of those coming from UNSW. The four UNSW Chemical Engineers on the list include Professors Cyrille Boyer, Liming Dai, Da-Wei Wang, and Kourosh Kalantar-Zadeh, all of whom are conducting fascinating high-impact research.

"This result clearly demonstrates that UNSW's ambitious 2025 Strategy is delivering on one of its key objectives which is excellence in research."

Professor Guangzhao Mao

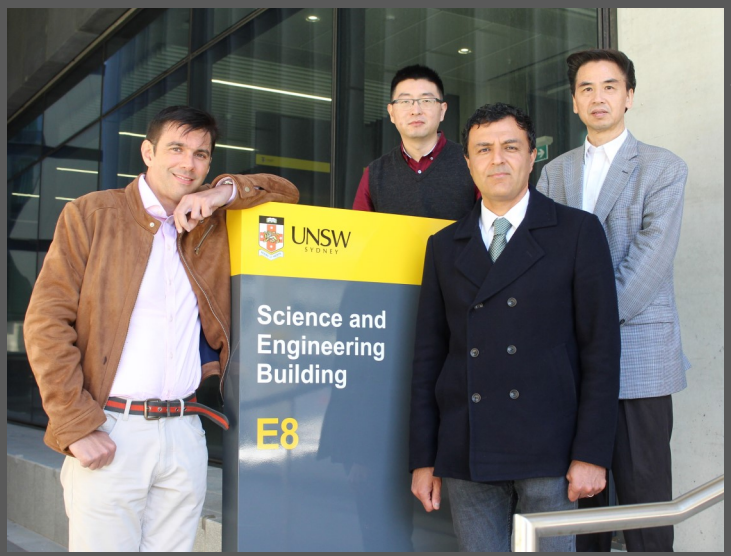
Head of School, UNSW Chemical Engineering

Prof Boyer is the Co-director of the Australian Centre for NanoMedicine. His research focuses on the development of sustainable techniques for the synthesis of functional polymeric materials for applications including drug delivery and 3D printing, as well as designing new-generation fire retardant products using nano-technology, resulting in commercialisation. The technique used has generated considerable global interest and Prof Boyer says it is very gratifying to see it used so widely.

Prof Dai is an international pioneer in the fields of carbon nanomaterials and metal-free carbon electrocatalysis for renewable energy applications. His research bridges the gap between nanoscale science and applied research on polymers and carbon nanomaterials and their related devices in the micro-macro-world. As evidence of the calibre and impact of Dai's work, his name has appeared on the HCR list, in both the *Chemistry* and *Materials* categories, each year for the past five years. There are only about 100 double-listed HCRs in the world, which puts his extraordinary achievement into perspective.

Prof Kalantar-Zadeh, is a multidisciplinary researcher with a background in electronics and telecommunications. His research on ingestible sensors, liquid metals and two-dimensional materials are internationally recognised and he has received several international awards for his work in the fields of materials, sensors and analytical sciences. "I have always endeavored to define and make sense of fundamental phenomena and have been fortunate enough to be involved in several novel discoveries and developments," he says.

With a focus on providing sustainable and affordable solutions to current and future energy and environmental problems, Prof Wang's research focuses on some of the biggest issues facing humanity today. "My work seeks to narrow the gap between academic knowledge and industry application through fundamental innovations in high-performing materials discovery, more efficient system engineering, and cross-field collaborations," he explains. "I truly appreciate the recognition of my contribution by my worldwide peers and the generous support from all my colleagues."



Prof Mao says she is proud of not just the four HCR researchers but all of the teams and colleagues their success represents. "I have no doubt they will continue to excel in their research areas and help our promising young researchers to grow through excellent mentorship," she says.

Cutting edge research

HYDROGEN ENERGY
RESEARCH CENTRE

We are proud to announce the newly formed centre: **UNSW & Providence Hydrogen Energy Research Centre (HERC):**

HERC is a multi-disciplinary R&D hub dedicated to hydrogen technologies. By enabling collaboration between UNSW, Providence Asset Group and key stakeholders, the Centre will develop innovative approaches toward cost-effective hydrogen energy technologies for generation, storage and use at scale, along with the novel social, political, regulatory and legal frameworks necessary for a successful energy transition. The Centre provides technical solutions, expertise, IP, training and answers to rapidly build capacity to accelerate the growth and prosperity of Australia's renewable energy industry.

HERC aims to be an internationally competitive research platform, enabling practical and technical training and solutions in:

Hydrogen generation - led by Prof Rose Amal
Hydrogen storage and use - led by Prof Francois Aguey-Zinsou
Advanced photovoltaic/hydrogen solutions - led by Prof Martin Green
Advanced computational technics for hydrogen materials development- led by Dr Claudio Cazorla
Advanced hardware for hydrogen power management - led by Prof John Fletcher
Advanced models for renewable hydrogen forecasting and productivity - led by Dr Merlinde Kay
HERC is geared toward rapid implementation at scale in real-world scenarios and will work with communities to tackle complex technical, social, and legal issues.

We look forward to seeing leading edge research from this centre well into the future.

https://www.herc.unsw.edu.au/



Professor Francois Aguey-Zinsou



Professor Rose Amal

Grants, wins and achievements

We are pleased to announce the grant news of Rose Amal, Kondo-Francois Aguey-Zinsou, Jason Scott, Emma Lovell, Xunyu Lu, Yansong Shen, Rahman Daiyan and their team winning ~$5M ARC Training Centre Grant.

“ARC Training Centre for The Global Hydrogen Economy. The centre aims to transform Australia into a hydrogen powerhouse by building enabling capacity in hydrogen innovation in a short timeframe. Australia is well-positioned to capitalise on the emerging global growth of hydrogen, however to be competitive and produce at scale, we need cost-effective hydrogen technologies and capabilities for transitioning hydrogen into industries. This innovative, five-year program will generate new technologies and equip a future workforce of industry-focused engineers with advanced skills for development and scaling-up of hydrogen generation and transport. Benefits include: export of hydrogen fuel and advanced technologies; job creation; a lower emissions domestic energy industry and benefit to the community.”

For more information, refer to the following link:

https://rms.arc.gov.au/RMS/Report/Download/Report/a3f6be6e-33f7-4fb5-98a6-7526aaa184cf/214



'Alchemy of energy':
Breakthrough offers mass hydrogen storage options

By Peter Hannam, Sydney Morning Herald: July 3, 2020



The promise of low-cost hydrogen storage to power our homes and businesses may be a lot closer to becoming a reality if new technology developed and owned in Australia can make a speedy transition from the lab. The country has more than 2 million homes with solar panels and new large-scale solar and wind farms are jostling for access to the power grid.

UNSW researchers led by Kondo-Francois Aguey-Zinsou say they have developed metal alloys capable of storing surplus electricity in the form of hydrogen much more cheaply than lithium batteries to take advantage of the renewables rush. "You can call me an alchemist, if you will," Professor Aguey-Zinsou said, laughing. "It is a game changer in how we use electricity - it's like the internet revolution."

The scientist said he had spent 20 years developing the metal hydrides that can bond with hydrogen. The system uses power to create hydrogen, which is then stored until needed for electricity production via a fuel cell. Professor Aguey-Zinsou said the alloy contained titanium and "other common materials", but declined to name them, pending the issuance of a formal patent expected within weeks. The solid-state mix can operate in a range of temperatures – such as from minus-10 to 50 degrees – depending on the climate the storage was intended for.

"It's safe ... it's not flammable," he said. "You cannot create the conditions when you have a certain burst of hydrogen." Hydrogen has lately emerged as a prospective alternative to fossil fuels. The Morrison government launched a National Hydrogen Strategy late last year, identifying break-even points needed to supplant gas and petrol.

UNSW"s Hydrogen Energy Research Centre, backed by $10 million from Providence Asset Group, reckons it is ready to produce the world's first hydrogen batteries for households as soon as early 2021.

"We aim to launch the LAVO [brand] commercial product by the end of this year, and start pilot production in the first quarter of next year," Alan Yu, a co-founder of Providence, said, adding the plan was to make the batteries in Australia. "It's cheaper and cleaner than buying from the grid," Mr Yu, an entrepreneur who also invests in artificial intelligence, said. "This will help households to accelerate the clean energy transition in Australia and save money."



Amy Kean, a board member of the hydrogen centre and director of Stride Renewables, said the household batteries would most likely hold up to 60 kilowatt-hours, or about five times the capacity of existing lithium storage on the market. About 130 centimetres high, the size of a small fridge, each would weigh 196 kilograms. The cost could go as low as 2¢ per kW-hour, or less than one-tenth the cost of lithium rivals and buying power from the grid, making the storage highly competitive, Ms Kean said.

Bjorn Sturmberg, a research leader at the Australian National University's Research School of Electrical, Energy and Materials Engineering, said people "shouldn't underestimate the road from the science that works in the lab to mass deployment" in the market.

The conversion of electricity to hydrogen and back again would "multiply the inefficiencies", and he cautioned against expecting a rapid take-up of the product. "The uses for hydrogen at the moment are extremely niche," Dr Sturmberg said. "This is a new opportunity within the niche." Mr Yu said his company hoped to add hydrogen storage for the company's planned five-megawatt community-owned solar farm planned for Manilla, near Tamworth in northern NSW.

The batteries, held within two shipping containers, would aim to store about eight hours' worth of electricity, increasing the prospect that the nearby users could move off the grid entirely.

The aim is to develop dozens of such solar farms, backed up with wind and storage, in coming years, he said.

https://www.smh.com.au/environment/climate-change/alchemy-of-energy-breakthrough-offers-mass-hydrogen-storage-options-20200702-p558dj.html

Food future in focus

Proud UNSW alumna Professor Cordelia Selomulya returns to UNSW to help launch the Future Food Systems CRC and vastly improve Australia's food fortunes



With extensive experience working with industry partners, Selomulya is well primed for her new role. A proud undergraduate and PhD Chemical Engineering alumna from UNSW, she says the opportunity to return to the university to work at the CRC was one too good to miss. "It is very impressive that UNSW has been able to attract so many world-class partners to the initiative," she says. "It demonstrates the size of the opportunity."

In her other role, as Professor of Chemical Engineering at UNSW, Selomulya says she will focus on building a new team and continuing her own research into food-drying technology. In her previous role at Melbourne's Monash University, she led the Biotechnology and Food Engineering group, and says much of their work involved the dairy industry. Selomulya is passionate about her research focus – and, more broadly, about seeking smart solutions to open-ended questions – and praises her PhD supervisor and mentor, Scientia Professor Rose Amal, as her primary inspiration. She says she is also becoming proud of her own legacy as she watches her PhD students carve out amazing careers.

"Australia has huge potential to become an export leader for trusted fresh food and advanced nutritional goods."

New Food Professor

It wasn't just a love of sailing that attracted nutrition expert Professor Johannes le Coutre to Sydney, the reputation of UNSW, and particularly the future food sciences focus at the School of Chemical Engineering, was just as great a lure. "There is a tremendous commitment at UNSW to play a key role in future food systems and production. The atmosphere here is very vibrant and energetic, almost more so than in the U.S. or Europe," he says. "Cellular agriculture is a rapidly growing area of research that aims to greatly modernise and invigorate our traditional agricultural methods"

Originally trained as a biologist, le Coutre obtained his Ph.D. in biophysics at the Max-Planck-Institute in Germany in 1995, then went to UCLA in Los Angeles where he focused on molecular biology and biochemistry, specifically investigating sugar transport proteins. His next career step coincided with a major discovery. "After five years at UCLA, in the year 2000, I accepted an offer from Nestlé Research Centre in Lausanne in Switzerland to build a team of experts just prior to the publication of the first draft of the human genome sequence," he explains.



Human health is central to le Coutre's research aims and some compelling numbers demonstrate the need for global improvements. "Over 820 million people worldwide are currently suffering from hunger and starvation, while two billion are suffering from malnutrition. Wrong nutrition is also linked to a further 420 million people who have Type 2 Diabetes, and poor nutrition has implications for other conditions, such as obesity and Alzheimer's disease, too!", he explains.

This is a really hot research field at the interface of medical, health, life science and engineering, and I'm actively looking for people who are interested in exploring this uncharted territory. If you are interested in helping build on Australia's reputation as a producer of fresh and tasty premium foods, don't hesitate to get in touch."

More information: johannes.lecoutre@unsw.edu.au

UNSW professor awarded prestigious science prize



"This prize is an extraordinary honour and it's humbling to see my name among the best in the history of analytical science."

Professor Kourosh Kalantar-Zadeh, Professor of Chemical Engineering at UNSW Sydney, has been awarded the prestigious 2020 Robert Boyle Prize for Analytical Science by the Royal Society of Chemistry (RSC).

The Robert Boyle Prize is awarded biennially for outstanding contributions to analytical science, with the winner receiving £5000, a medal and a certificate and an invitation to undertake a UK lecture tour.

Professor Kalantar-Zadeh has been recognised for significant research outcomes that have frequently been first-in-world and have set the international agenda in areas such as two-dimensional (2D) materials, liquid metals and microfluidics, gas sensors for pollutants, point-of-care diagnostic systems and ingestible sensors.

His research team has developed a gas capsule that offers an accurate and safe tool for monitoring the effects of an individual's diet and has the potential to be used as a diagnostic tool for the gut.

"I feel extremely happy to be recognised by the Royal Society of Chemistry," Prof. Kalantar-Zadeh said. "This prize is an extraordinary honour and it's humbling to see my name among the best in the history of analytical science."

Professor Kalantar-Zadeh joined UNSW in 2018 under its Strategic Hires and Retention Pathways (SHARP) initiative, which is designed to attract world-leading researchers in pursuit of the University's vision to be among the leading research-intensive universities worldwide.

Professor Kalantar-Zadeh is a 2018 Australian Research Centre (ARC) Laureate Fellow and Chief Investigator of the ARC Centre of Excellence FLEET. He is also an Honorary Professor of Electronic Engineering at RMIT.

A prolific researcher, Professor Kalantar-Zadeh has authored more than 425 research articles and reviews and was named among the top 1% Highly Cited Researchers internationally by Clarivate Analytics in 2018, 2019 and 2020. In 2019 he was awarded the Walter Burfitt Prize from the Royal Society of NSW.

Dr Helen Pain, acting chief executive of the Royal Society of Chemistry said, "We live in an era of tremendous global challenges, with the need for science recognised now more so than ever – so it is important to recognise those behind the scenes who are making significant contributions towards improving the world we live in. It is our honour and privilege to do that with these awards, which recognise exceptional scientific achievement.

"The global chemical sciences community is one that covers many different specialisms, from health and climate change to product development, sustainable transport, and everything in between. In recognising the work of Professor Kalantar-Zadeh we are also recognising the important contribution this incredible network of scientists makes to improving our lives every day."

The Prize is named after Robert Boyle, who is widely regarded as being the first modern chemist and a pioneer of the famous modern scientific method known as Boyle's Law, which relates pressure and temperature.

Recipients of the Prize are chosen by the RSC Analytical Division Awards Committee based on criteria including originality of research; impact of research; quality of publications and/or patents and/or software; innovation; professional standing; collaborations and teamwork; and other indicators of esteem indicated by nominee or nominator.

COVID-19 and the gut

Written by Merran White (Future Food Systems CRC)



Could the presence of a specific strain of bacteria in a person's gut make infection more likely on exposure to SARS-CoVid-2? A recent paper published by UNSW-based scientist Kourosh Kalantar-Zadeh and his co-authors calls for further research to test their hypothesis that high levels of specific bacteria in the human gut may be linked with poorer COVID-19 outcomes.

Kourosh Kalantar-Zadeh, a professor in the School of Chemical Engineering at University of New South Wales, and colleagues published the perspective in the May 2020 issue of ACS Nano.

The paper looked at the likely impact of dietary patterns and the commensal microbiome – an area that to date had been largely ignored. In their perspective/hypothesis paper, the authors presented a rationale for urgent investigation of the potential impact of the gut microbiome on SARS-CoV-2, including looking at potential therapeutic options for SARS-2 coronavirus disease (COVID-19) based on modifying patients' diets and thus, their microbiome.

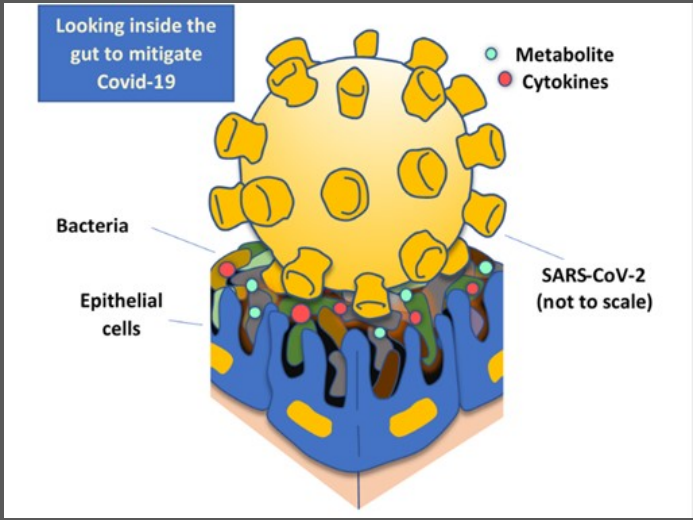
"The first clue was the link between those more vulnerable to COVID-19, who are the elderly [and] people with underlying health problems such as cardiovascular disorder, type II diabetes and hypertension," Professor Kalantar-Zadeh explains. Ageing, the paper notes, is associated with significant shifts in microbiome diversity and pro-inflammatory states – with strong interindividual variability 'that may explain, in part, the different impacts of viral infections in elderly individuals.

"The second link was several initial papers showing the possible high abundance of specific bacterial strains in clinical samples of COVID-19 patients," Prof. Kalantar-Zadeh notes. Such specific microbiome shifts are also seen in the elderly, and in asthmatic and diabetic patients. For instance, numbers of the H2-producing bacteria are 'highly enriched' in obese individuals prone to type 2 diabetes, while an abundance of Bifidobacteria – which can produce butyrate – in type 2 diabetes patients has been shown to improve glucose tolerance.

"The third set of clues are recent papers that show the possibility that viruses can modulate or be modulated by the gut microbiota," Prof. Kalantar-Zadeh says.
"The last clue was that gut disorders are seen in many COVID-19 patients; and the fact that COVID-19 is a two-stage process disease – five days' initial incubation versus less than a single stage two-day incubation period for normal influenza – gave me more confidence that the virus is first possibly hijacks the gut and its commensal bacteria (in the first five days) and then impacts different organs in the human body," the professor explains.
"Putting these clues together and exploring recent papers, we came up with the hypothesis that one or several of the gut bacteria can initially promote the virus one way or another. The core microbiome can modulate or be modulated by the virus."

Several medium-scale human trials have so far tested this hypothesis to show that the morbidity of COVID-19 patients is associated with their long-term dietary patterns and that the core microbiomes of COVID-19 patients are modulated. These trials so far support the UNSW scientists' hypothesis and support the idea of us improving our dietary habits and further investigating the link between the gut microbiome and SARS-CoV-2 virus impact.

"Still, large, adequately powered international studies that recruit COVID-19 patients and controls to collect clinical data, detailed dietary assessments, host genetics, immune phenotyping and multi-site, multiomic microbiome markers should be conducted to learn more," Prof. Kalantar-Zadeh adds.



Nutritional and dietary strategies: building a better microbiome

Until more is known about which microbiota strains are most useful or harmful in this respect, Professor Kalantar-Zadeh advocates adopting high-quality nutritional and dietary strategies as a potential means of suppressing viral infection and mitigating the harmful effects of SARS-2 CoV-2, particularly in the elderly and those with underlying health problems.



'One approach … could include strengthening the intestinal barrier against pathogens, increasing intestinal motility, and reducing an underlying pro-inflammatory state by adopting a more varied diet with a moderate increase in high-fibre and plant-based foods,' the authors state in their report.

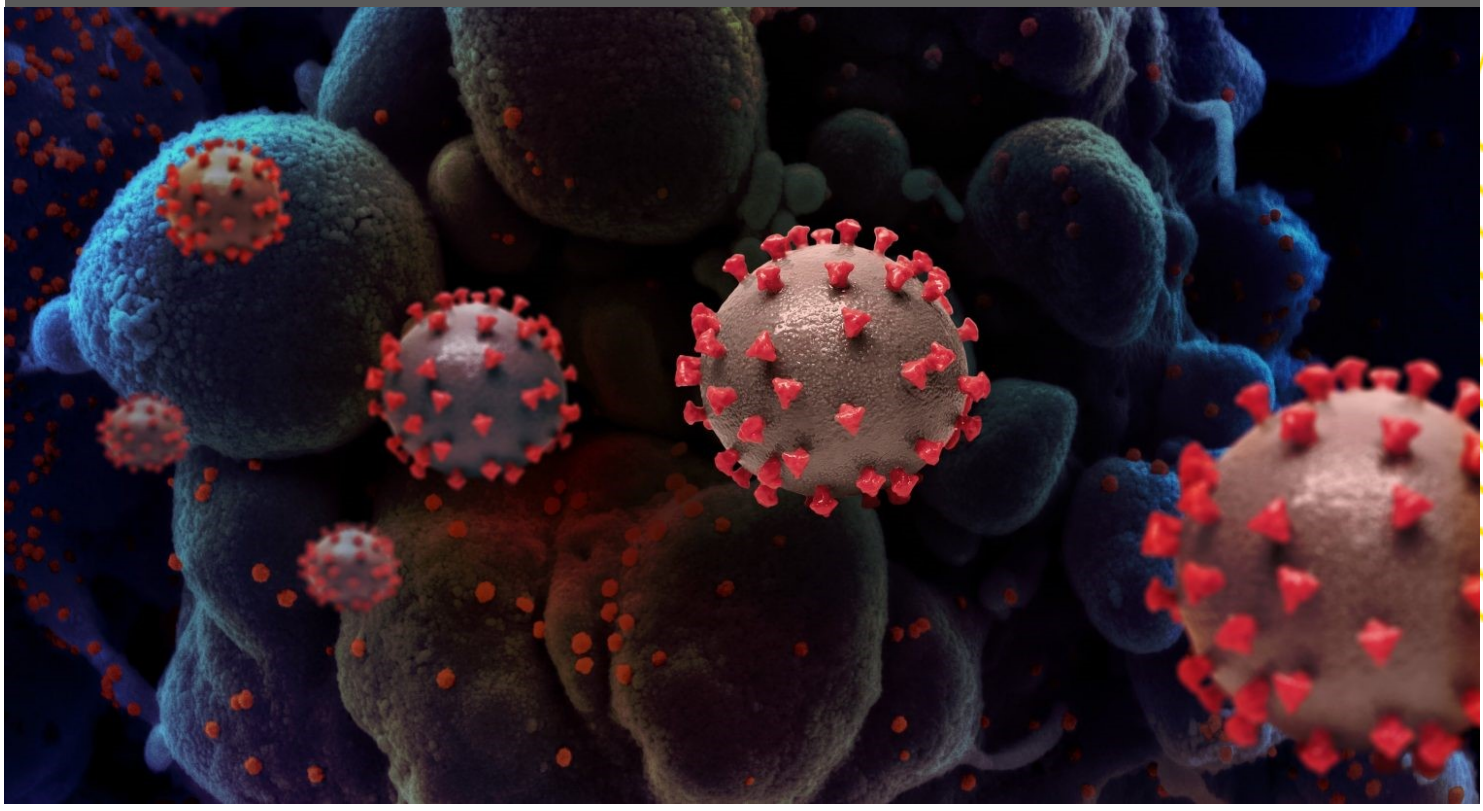
"High-fibre, diverse, moderate-calorie diets, high in fresh fruit and vegetables, low in fat and very low in sugar, and including some freshly fermented foods, could likely reduce the severity of the disorder," Prof. Kalantar-Zadeh explains.

Following a healthy balanced diet, states the report, is 'a logical approach to mitigate the severity of this viral infection as a plausible preventive action'. Such an advice is in agreement with the Australian Government Department of Health under the title of "Health eating during coronavirus (COVID-19) restrictions".

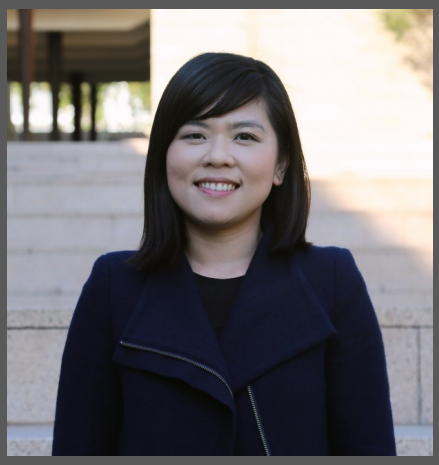
FURTHER INFORMATION:

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Australia's Most Innovative Engineers 2020 Young Engineers Award—Dr Rona Chandrawati



"The technology allows the enzymes to be deposited on virtually any surface, no matter how complex the topography, allowing them to release nitric oxide at a diseased site".

Nitric oxide (NO) is a molecule with a breadth of chemical and biological functions, such as promoting wound healing, dilating blood vessels, and lowering eye pressure in glaucomatous eyes.

But it also has a short half-life and diffuses only over short distances. This makes its delivery highly challenging, representing an unmet need in the field of nitric oxide therapeutics.

To overcome these limitations, Senior Lecturer Dr Rona Chandrawati developed enzyme-containing implant technology to locally produce nitric oxide at the right place, in the right dose, and at the right time.

The work successfully encapsulated enzymes that release nitric oxide into implantable polymer hydrogels and fibres and coated on the surface of cardiovascular stents.

"By manipulating the enzymes and the surface engineering, we can double or half the dose of NO, stop NO elution, or achieve NO elution on demand," she says.

"The enzyme encapsulation technology is a solution-based, self-assembly method: scalable and environmentally friendly."

The technology allows the enzymes to be deposited on virtually any surface, no matter how complex the topography, allowing them to release nitric oxide at a diseased site.

For instance, in a study in collaboration with ophthalmologists at Duke University and Imperial College London that used a mouse model, nitric oxide generated using this process induced vasodilation and reduced eye pressure, a process that could help prevent vision loss in people with glaucoma.

"Recently, my lab reported serendipitous findings that metal oxides mimic NO-releasing enzymes and produce NO from a broad range of pro-drugs," Chandrawati says.

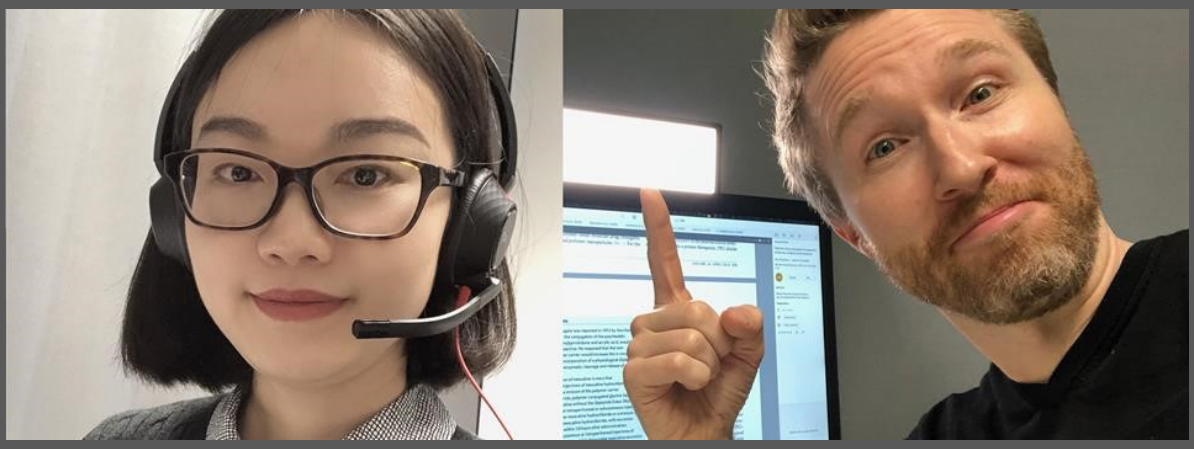
"These findings open new routes for engineering the next generation of implants. By tuning the concentration of metal oxide nanoparticles and prodrugs, we achieved physiologically relevant NO levels."

Judges' comments: "Dr Rona Chandrawati is progressing a successful research career in an area with significant potential benefit to the community.

"The application provides clear examples of the potential beneficial applications of the technology that has been developed, showing multiple applications for the use of nitric oxide, and the ways in which her research will allow for therapeutic applications. An innovative approach to solving the problem of nitric oxide diffusivity by generating it in situ."

Link: https://www.createdigital.org.au/innovativeengineers/#young-engineers

Teaching for the first time, teaching in a pandemic



Dr May Lim talked to Sophia Gu and Peter Wich about their teaching philosophies, their approach to student engagement and how they turned the COVID19 pandemic to their advantage.

Sophia Zi Gu and **Peter Wich** (CHEM ENG) are both relatively new teachers at UNSW. In 2019, Sophia proposed a new course, *CEIC6712 Pharmaceutical Design and Engineering*, to be taught for the first time in Term 2 2020. This would also be Sophia's very first time co-ordinating a new course, with Peter as co-lecturer. Unexpectedly, thanks to COVID19, Sophia was not only teaching this course for the first time, but teaching online and in a pandemic. Sophia and Peter took advantage of the opportunity that COVID19 presented, by creating an authentic and timely assessment task to enhance their students' learning.

May: How did you adapt the course for online teaching during the COVID19 crisis?

Sophia: We wanted to have an assessment task that is authentic. For a course on pharmaceutical design and engineering, the COVID19 pandemic presented a once in a lifetime (hopefully) opportunity. One thing that would turn our fortune around is a vaccine, so we asked the students to look into COVID19 vaccine development, while it is happening. Students spent six weeks of the term in small groups working collaboratively to research, critically assess and write a report on an emerging drug or vaccine of their choice. In the report, students were required to describe and analyse the current status of COVID19 drug/vaccine development – examples of drugs/vaccines under development, current development stages, limitations in terms of technology, manufacturing and regulation, and they were also encouraged to provide justified predictions on when we could expect an approved drug/vaccine against COVID19. This assessment task required students to use and apply the principles and knowledge they learned in lectures, promoting the practice and improvement of deep learning and critical thinking in an authentic, real-world context.

I always think about what students need in their future career and one skill they would need is to think critically. I want the students to not just focus on what is reported in the newspaper, journals and magazines, but really think about the limitations of the drugs and the vaccine development. This is an important skill to have if they are to become pharmaceutical engineers. The students really liked this kind of authentic assessment. Some of the reports are very good – so good I think we should publish them!

Peter: We also implemented a peer assessment element in an online workshop, where the students presented their findings on the vaccine development. During this workshop everyone could assess each other's performance and give feedback. I was very surprised and happy to see that the students were very thorough and accurate in their assessment, giving quite similar marks as the instructors.

May: How did you approach student engagement, and what was the students' response to the course?

Sophia: One good thing about this course was that we had a lot of interaction with the students on Microsoft Teams. We communicated with the students frequently. We constantly made announcements and sent reminders so we could keep in touch. And we always responded to their questions quickly. We also ran consultation sessions.

Peter: We had great feedback from the students. They liked the content and found the course quite interesting. The students said it is was a good overview of the traditional and modern drug development processes. Most suggestions for improvement were related to the online only delivery (which was unfortunately out of our hands due to COVID19). I think both the students and we as instructors feel the same, that we would prefer a more direct interaction and not having to talk into a screen.

Sophia: In the myExperience survey, a typical comment was "I love how she was very available for communication with the students". I think the students can feel how much you care about them, how much you want to help them, how much you encourage or motivate their learning. They know it.

Sophia: I want to acknowledge May Lim, who provided inspiring advice on course design and teaching, which was very important for this course development. Also Ilker Cokcetin, in the Faculty Teaching & Learning Team, who helped me so much with gradebook setup and Moodle troubleshooting. Without their help, we could not make this course happen.

Inspiring Alumni Series



Meet our first Inspiring Alumni Series Speaker: Michael (Mick) Farrell!

On Wednesday 17th June 2020, Mick presented to an audience of 156 students, academic staff, researchers and technical staff from both the School of Chemical Engineering and Biomedical Engineering, sharing his personal and professional experiences and how he reached his ambitious goals.

Currently the CEO of ResMed, Mick built his career following his graduation as a Chemical Engineer from UNSW, in 1994 with first class honors. From there, he held his first role at BHP, followed by DowDuPont and then on to his career in healthcare through Biotech and Medtech. Mick has been on a path of great success!

Mick has served as CEO of ResMed since March, 2013. Prior to that appointment, Mick was president, in the Americas where he ran ResMed's commercial operations for US, Canada and Latin America.

He also held the roles of Senior Vice President of the global sleep apnoea business for ResMed, involving diagnostic and therapeutic products and solutions, as well as Vice President of marketing, and business development.

Mick serves on two for-profit boards: ResMed (NYSE: RMD) as well as Zimmer Biomet (NYSE: ZBH).

ResMed are currently producing high quality ventilators to assist those affected by the Coronavirus to breathe more easily.

Link to presentation: https://www.youtube.com/watch?v=HqSpBa_X9RI&feature=youtu.be

Inspiring Alumni Series

Inspiring Alumni Series Speaker: September 2020



Louise Warner was appointed Interim Chief Operating Officer of Ampol (formerly Caltex Australia) in March 2020. She retains her responsibilities as Executive General Manager, Fuels & Infrastructure, responsible for managing the safe and reliable supply of high quality fuels, lubricants and related services for our valued customers across Australia and New Zealand.

Louise holds a Bachelor of Engineering (Chemical) from the University of New South Wales and was a Co-op scholar during her time at UNSW.

Having joined Caltex Australia in 1999 as a process engineer at the Kurnell refinery she has worked in a range of project, supply and technical leadership roles before gaining commercial and trading experience in London, Amsterdam and Nigeria through a secondment to Chevron in the UK. Louise founded Caltex Australia's first overseas operations, Ampol Singapore, which established the company's regional trading and shipping capability.

On her return to Australia, Louise has helped the company take the next steps to transform its business model, including the acquisition of Gull New Zealand, establishment of a strategic partnership with Seaoil in the Philippines and to further expand Caltex's trading and shipping capability, the establishment of a second trading office in Houston, Texas.

Link to presentation: https://www.youtube.com/watch?v=RmKiws7MXXA&t



Emerging Leaders 2020

In keeping with the Journal of Physics Series' 50th anniversary celebratory initiative in 2017, JPhys Energy brings together the best early-career researchers in the field and publish their exceptional work in an annual collection dedicated to 'Emerging leaders'.

An emerging leader is defined as a top researcher in their field who completed their PhD in 2009 or later (10 years excluding career breaks).

On behalf of the Editor in Chief Professor John Irvine, JPhys Energy announced that Ruopian Fang is the winner of the 2020 JPhys Energy Early Career Award, in recognition of her outstanding contribution to the collection.

“We would like to thank everyone who submitted a paper to this year's collection, which demonstrates the exceptional work being carried by this generation of talented researchers. We are proud to champion early-career researchers in the journal and encourage readers to browse the full collection.”

Ruopian Fang is currently a postdoctoral research associate at the University of New South Wales, Sydney (Australia). She received her PhD degree in Materials Science from the Institute of Metal Research, Chinese Academy of Sciences in 2018. Her research activities focus on rational materials design for electrochemical energy storage and conversion. She has over 20 publications with an average citation per article of over 100. She has received several prestigious awards including the 2018 Special President Scholarship of the Chinese Academy of Sciences.

Student Prizes and Awards!

A number of our recent PhD graduates have received The Dean's Award for outstanding PhD Theses in the most recent round. The Dean's Award for Outstanding PhD Theses was introduced in 2019. The award recognises high quality PhD theses produced at UNSW. To receive this award, candidates must produce a thesis that requires only minimal corrections, received outstanding and/or excellent levels of achievement for all examination criteria, and in the opinion of both examiners is in the top 10% of PhD theses they have examined.

Our school has the highest number of students receiving the award in the Faculty of Engineering in the most recent round, with 7 recipients out of a total of 25 in the faculty. This is a great achievement by our students. Below is the recently released list of student winners from our School:

- **Adel Rezaeimotlagh**
- **Chen Deng**
- **Song Gao**
- **Yitao Yan**
- **Yuting Zhuo**
- **Zahra Sadrearhami**
- **Chenyu Wu**

2020 Graduate Success!



Graduation 2020 was not quite the graduation Rosa Chan and her cohort were expecting, but she's celebrating none the less!

"I had a wonderful time studying at UNSW Chemical Engineering and I'm truly grateful to all the amazing lecturers and peers that I've encountered along the way," Rosa says.

"Thank you so much to Bluescope for giving me the opportunity to work and study, it's crazy to think where I would be without the cadetship".

"Finally thank you to all my family and friends who have been absolutely critical in supporting me throughout my learning".

"Although I've closed such a huge chapter of my life, I'm even more excited for what's to come!"

We all wish Rosa the very best in taking her next steps and look forward to watching her career take off!

Congratulations Rosa!!

Study with us at UNSW Chemical Engineering



Message from our Head of School

You will learn from dedicated educators in world class facilities. Your UNSW degree will enable you to pursue a variety of professional careers in academia, industry, government and community organisations. Our School has a long and proud history of teaching, research and service for the advancement of chemical engineering and food science to solve real-world problems both in Australia and around the globe.

Professor Guangzhao Mao



Our Programs

Bachelor of Engineering (Honours)	
Chemical Product Engineering	Chemical Engineering

Bachelor of Science (Honours)	
Food Science and Nutrition	Food Science and Technology

Join our network of world-changing alumni working to across a range of key industries. A degree in Chemical Engineering provides a gateway into a wide range of careers, with the graduates earning an average of over $68,000 (Association of Professional Engineers Australia, 2019).

- A wide range of scholarships are available from the University and Faculty.
- Trimester system offers increased flexibility in study. Offering opportunities to study abroad and gain industrial training.
- Our degrees offer experience in hands-on learning included thesis projects and lab courses.
- All of our undergraduate programs are professionally accredited by industry associations.

Our school in numbers

#1

Ranked Engineering Faculty in Australia

#1

Most employable students (AFR Future Leaders Awards 2020)

#1

University for research and impact in Australia

46%

Female undergraduate students in the School

Want to find out more? Find us at....

chemeng.FutureStudents@unsw.edu.au

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Postgraduate study at UNSW Chemical Engineering



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Professor Guangzhao Mao



Our Programs

Master of Food Science

Master of Engineering Science

- Chemical Process Engineering
- Food Process Engineering

Key Benefits

Whether you have just completed your undergraduate studies or are a few years into your career, a Masters degree at UNSW School of Chemical Engineering, will provide you with the opportunity to advance your professional skills and deepen your knowledge. According to the Association of Professional Engineers Australia, holding a Masters Degree delivered a wage premium 15.4 % (compared with a Bachelors degree, 2019). Join us in Sydney, Australia, to study, develop your expertise and help catapult your career.

- Join our network of world-changing alumni working to across a range of key industries.
- Trimester system offers increased flexibility in study. Offering opportunities to study aboard and accelerate learning.
- Our degrees offer experience in hands-on learning included thesis projects and lab courses.

Want to find out more? Find us at...

chemeng.FutureStudents@unsw.edu.au

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Our school in numbers

#1

Ranked Engineering Faculty in Australia

#1

Most employable students (AFR Future Leaders Awards 2020)

#1

University for research and impact in Australia

Academic Team 2020


Prof. Francois Aguey-Zinsou


Prof. Rose Amal


A/Prof. Jayashree Arcot


Dr Firoozeh Babayekhorasani


Prof. Jie Bao


Dr. Nicholas Bedford


Prof. Cyrille Boyer


E.Prof. Kenneth Buckle


E.Prof. Robert Burford


Dr. Graeme Bushell


A/Prof. Rona Chandrawati


A/Prof. Julian Cox


Prof. Liming Dai

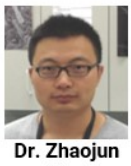

Dr Andrew Dansie


Dr. Sarah Grundy


Dr. Sophia Gu


A/Prof. Rita Henderson


Dr Alison Jones


Dr. Zhaojun Han


Prof. Kourosh Kalantar-Zadeh

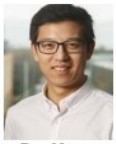

Dr. Dipan Kundu


A/Prof. Pierre Le Clech


Prof. Johannes Le Coutre


A/Prof. Alice Lee


Prof. Gregory Leslie


Dr. Kang Liang


Dr. May Lim


Dr. Emma Lovell


Prof. Guangzhao Mao


Prof. Michael Manefield


Dr. Peter Neal


Prof. Cordelia Selomulya


A/Prof. Yansong Shen


A/Prof. Patrick Spicer


A/Prof. Stuart Prescott


E.Prof. Maria Skyllas-Kazacos


Dr. Francisco Trujillo


A/Prof. Da-Wei Wang


Dr. Peter Wich


Prof. Per Zetterlund

Executive Team

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Head of School

Rahul Bajoria
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Deputy Head of Research

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