

December 2021: Issue #3

THE LEAD

UNSW SCHOOL OF CHEMICAL ENGINEERING NEWSLETTER



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UNSW
SYDNEY

Message from the Head of School

Dear Colleagues, Alumni, and Friends,

During this season of celebration and thanksgiving, I would like to extend my gratitude to all the members of our UNSW Chemical Engineering community. Everyone comes to UNSW with dreams of a successful and fulfilling career, making impactful discoveries and innovations, and being valued by our colleagues and community. My mentor, Professor H. Ted Davis, a long-time department head of Department of Chemical Engineering and Materials Science at University of Minnesota, liked to say that there is no better job than a tenured full professor. I completely agree! It is indeed a privilege to come to work every day indulging in one's own passion and curiosity while passing them along to the next generation. None of us were prepared for the challenges caused by the pandemic. All of us have suffered losses of productivity, access, contacts, opportunities, and in the worst cases family members and friends. It will take years to know the true costs of this pandemic. Yet, at the end of 2021, we get together to celebrate survivals and achievements and prepare to welcome our students back on campus for in-person learning in 2022. We look forward to international travels to conferences, visiting our colleagues, friends, and families, and making up for lost time. I am so proud of our students for their resilience and of our staff for going the extra mile to do their job under some extraordinarily difficult circumstances. After almost two years of anxiety of fitting in, I feel more settled in the fast-paced work environment of UNSW. I am more comfortable to openly acknowledge the many differences between the academic systems of Australia and the United States and hope to apply that knowledge to add value to my UNSW community. I want to thank everyone for accepting me into your community. To some I must seem very "foreign" at times.



In this issue, we feature the Macromolecular and Interfacial Engineering research cluster. You will read about the researchers and their groundbreaking research. The Australian has recently published an article identifying UNSW Polymers & Plastics research as global leading. Clarivate Analytics Web of Science has named 5 of our school's researchers as 2021 Highly Cited Researchers: Rose Amal, Cyrille Boyer, Liming Dai, Kourosh Kalantar-Zadeh, and Da-Wei Wang. We congratulate Rose Amal for winning the 2021 Chemeca Medal by the Australian and New Zealand Federation of Chemical Engineers (ANZFChE), the most prestigious award in the chemical engineering profession in Australia and New Zealand.

I am touched by your heartwarming messages of encouragement and support after each issue of the school's newsletter. You can reach us at ChemEng@unsw.edu.au. I look forward to visiting you, welcoming you to our campus, meeting you in conferences and events in Sydney and elsewhere, and wishing you a very merry Christmas and happy new year!

Best wishes,
Professor Guangzhao Mao

UNSW Chemical Engineering rankings:

- #50 QS World by Subject
- #55 US News Global Ranking (Chemical Engineering)



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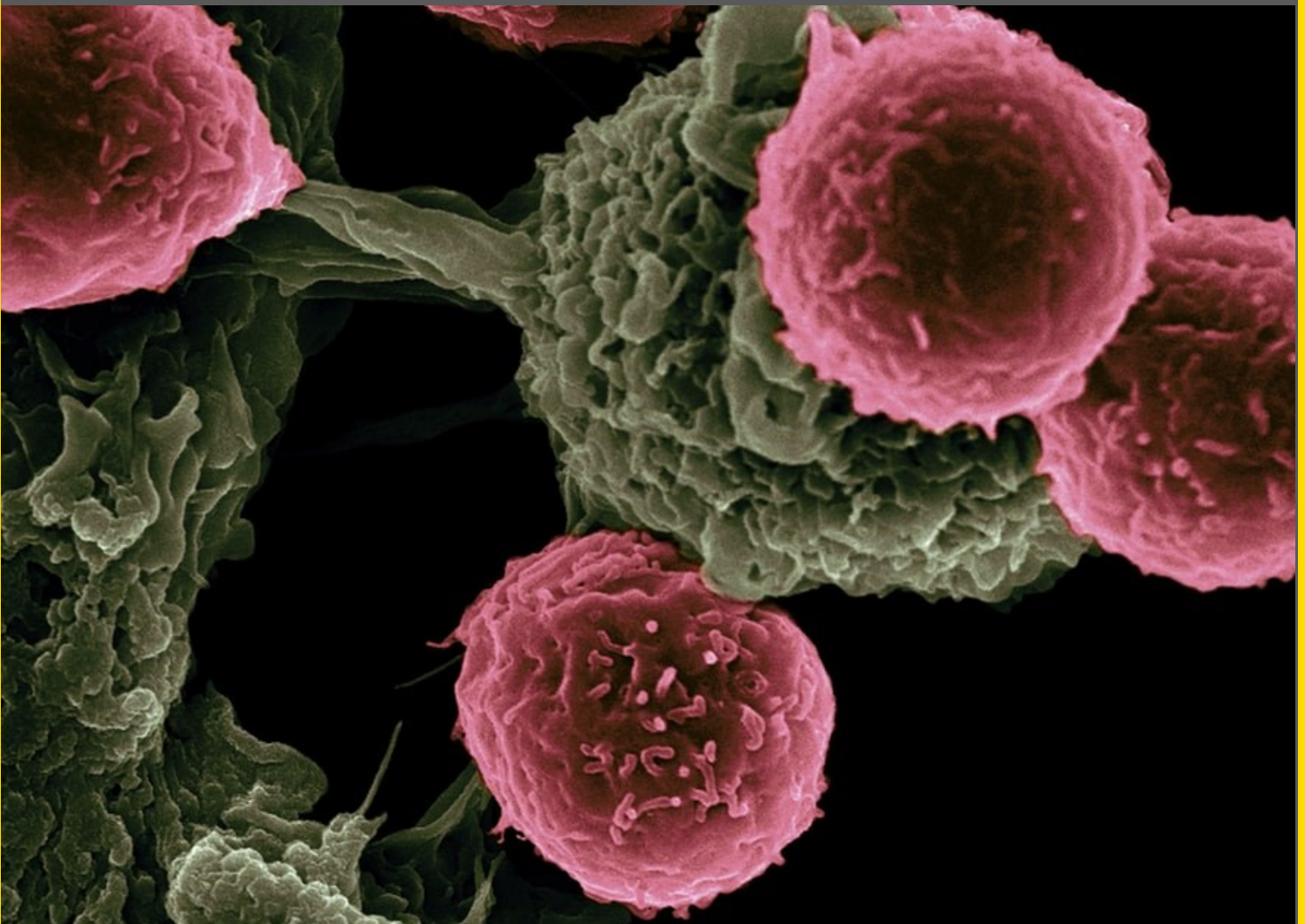
Research Feature

Macromolecular and Interfacial Engineering

The Macromolecular and Interfacial Engineering research cluster takes novel materials and transforms them into solutions that can be applied in electronics, energy, medicine, commercial products and food.

Experts within this cluster work specifically with polymers, complex fluids, soft matter and nano-composite materials. Researchers are studying polymers and colloids in truly unique ways – aiming to develop novel methods to achieve high levels of control over desired properties to manipulate them for a range of beneficial uses. They utilise controlled and living radical polymerisation, organic chemistry and self-assembly methods to innovate new materials—and combine experimental work with computational modelling to bringing a distinctive quantitative aspect to their research. The group also works on measuring the interface of molecules to improve the stability of face creams, pharmaceuticals and paints, minimising the effects of external factors such as pressure and temperature.

While they work on the smallest molecules, their research has a big impact on many facets of society including economies, human health and the environment.



Macromolecular and Interfacial Engineering

Our researchers

The Macromolecular and Interfacial Engineering research cluster is comprised of nine researchers. Each are leading teams working to find solutions and improve processes across food, medicine energy, electronics and commercial products. Here, they talk about their research in their own words...

CYRILLE BOYER

“The Boyer research group is focused on the development of new polymer synthesis strategies for the fabrication of nanostructured materials, which can find applications as advanced smart materials in the fields of energy and nanomedicine. By developing precise synthetic methods, we endeavour to establish structure-property relationships and to discover technologically important applications for polymers. We combine modern polymer synthesis, including various controlled polymerisation techniques and selective polymer modifications, with emerging chemical engineering processes such as flow chemistry and high throughput methods to prepare nanostructured materials featuring advanced properties and functions. Ultimately, our aim is to combine contemporary polymer synthesis with detailed molecular, morphological and property characterisation to expand our knowledge of fundamental polymer science and advance new technologies. Our research is highly interdisciplinary and collaborative with numerous groups in chemistry, engineering, materials science, and medicine. Our group pursues three specific directions. First, by developing new polymerisation tools, we aim to precisely control the macromolecular structure, enabling the establishment of fundamental knowledge on material structure-property-performance relationships. Second, by combining polymerisation techniques, we have developed, such as photoinduced electron/energy transfer - reversible addition-fragmentation chain transfer polymerization, with other modern polymer synthesis methods and advanced manufacturing techniques, we aim to fabricate nanostructured 3D printed materials with enhanced mechanical properties that find applications in the energy and the biomedical fields. This research is carried out in collaboration with industry partners. And finally, by exploiting the knowledge gained, we aim to design synthetic polymers capable of fulfilling specific biological functions. For example, we investigate the design of synthetic polymers capable to be used as next generation of antiviral, anticancer, and antimicrobial agents. By turning the structure of the polymers, we design new delivery systems for the treatment of hard-to-treat diseases. To achieve this aim, we collaborate with biologists and clinicians.”



RONA CHANDRAWATI

“The Chandrawati group focuses on the design, synthesis, and development of nanomaterials for sensors and drug delivery applications. We aim to solve problems of global significance in food and health, including monitoring food quality to reduce food waste, and enabling a more effective means to release therapeutics from biomedical devices to reduce the need for revision surgery. We conduct synthesis and characterisation of a range of nanomaterials assembled from polymers, lipids, peptides and proteins. Our team has successfully developed colorimetric polymer-based nanoparticle sensors (indicators) that can be attached to food packaging to enable consumers to monitor food quality or food spoilage at home through colorimetric changes that can be seen by the naked eye. This technology is valuable in preventing \$10 billion worth of edible food from being thrown out in Australia every year. The unique capabilities of colorimetric sensors are also being applied. We have also developed enzyme-like nanoparticles (nanozymes) for the delivery of drugs and signaling molecules to combat infection and to promote tissue repair. This innovation opens new routes to the next generation of biomaterials and devices in diverse biomedical applications.



ZI (SOPHIA) GU

“I lead a Nanotechnology Research Group working on development of advanced nanomaterials to address critical issues in health and medicine. We utilise interdisciplinary approaches that bring together material chemistry, biomedical engineering, and nanotechnology to synthesise functional nanoparticles, optimise their biomedical properties, and develop smart nanobiotechnologies and advanced delivery strategies for cancers, cardiovascular diseases, and inflammation. One of my main research interests is advanced drug and gene delivery systems, specifically, developing systems where nanoparticles are able to target specific biological sites and function as both drug/gene carriers and prodrugs. These systems not only transport therapeutic payloads to the targeted biological site, but also ensure that therapeutic agents do not damage normal tissues before they reach the disease site, thereby lowering systemic toxicity and increasing therapeutic efficacy. I’m also interested in bioimaging contrast agent design and development—synthesizing smart nanoparticles to detect and monitor anatomical structure and pathological processes in the disease microenvironment for early and accurate diagnosis. My third specific research interest is theranostic nanoparticles and nanomedicine. My work in this field focused on developing multifunctional bioactive nanoparticles that combine both therapeutic and diagnostic functionalities in one nanopatform for precision medicine. And my final research interest is bioactive catalytic nanomaterials. This involves synthesising bioactive nanoparticles for next-generation catalytic nanomedicine, including photothermal, photodynamic, chemodynamic, and sonodynamic therapies. With our clinical collaborators, our research group has demonstrated great potential to provide better solutions to diagnose and treat diseases.”



GUANGZHAO MAO

“The Mao group works in the general area of interfacial engineering. In one research stream, we explored seed-mediated nucleation and crystallisation in nanoscale confinement for advanced manufacturing of nanosensors, discovering that nanoparticle seeds of 50 nm or less in diameter are effective at nucleating molecular crystals of confined geometries. Our research group conducts nanomaterials synthesis and characterisation research to understand the effect of seed size and surface chemistry in molecular crystallisation at the nanoscale. We apply the new knowledge in seed-mediated crystallisation for electrochemical synthesis of molecular nanowire sensors on ultramicroelectrode and nanoelectrode arrays. We aim to overcome the manufacturing challenge of nanosensors by controlled electrochemical deposition of molecular sensing units directly on microfabricated substrates and devices. In another research stream, our group collaborates with international medical researchers to find a therapeutic cure for spinal cord injury. Current respiratory drugs to prevent infections and deaths of spinal cord injury patients are too toxic and have many side effects because of the drug’s nonspecific biodistribution. We pursue a unique approach by chemically conjugating the drug molecules with a targeting protein through a nanoparticle linker. We utilise neural tracing proteins that are transported across active synapses along specific respiratory neural pathways as the targeting moiety. We have shown the targeted approach to be capable of inducing functional recovery with less than one thousandth of the free drug dosage. We are also working on a promising targeted nanomedicine to reduce or even eliminate the toxic side effects of spinal cord injury drugs.”



STUART PRESCOTT

“My research interests are in the relationships between the molecular structures that are found at interfaces and the control of properties at interfaces. These are the structures that provide the functions to products in our everyday lives: an oil droplet in a hair conditioner, the particle in a paint, the pigment in a cosmetic; all need carefully engineered molecules on their surfaces to give them the best function. As well as working on improved function, my research improves the environmental sustainability of these common products by helping manufacturers use less material, use more sustainable feedstocks, and reduce transport emissions. To tailor formulations and design functional surfaces, I use facilities at Ansto such as neutron reflectometry and neutron scattering that let me look deep into the mixture with molecular precision. My research also looks at the application of surface science and the study of important surface structures in fields ranging from epidemic thunderstorm asthma, novel technology for food decontamination, algal processing, drug delivery and consumer products.”



PATRICK SPICER

“I work with a diverse group of researchers focused on the understanding, design, and creation of soft materials and complex liquid microstructures. Complex fluid materials form the basis for commercial food and cosmetic products, advanced soft robotic materials, and even biological structures like blood and skin. Our group’s work is enabled by strong capability in microscopy and other imaging methods, for quantitative study of soft material structures, and rheology, for measurement of flow and mechanical properties. A fundamental understanding of the structures and flow properties we study enables us to build theoretical models of material behaviour and predict or explain performance in new and existing applications. Our research led to the development of novel active ingredient delivery methods for consumer products, respiratory delivery technologies for pharmaceuticals and even new insights into environmental phenomena like thunderstorm asthma. A key focus area for us is emulsion structure and texture as they are both key elements of performance in diverse materials like crude oil, dairy products, and cultured meat. A new area of study for us is harnessing bacteria to synthesise soft biomaterials and biodegradable robots with movement and responses that do not require any power source other than stored elastic energy.”



PETER WICH

“The Wich Research Lab for Functional Biopolymers (Wichlab) focuses in the area of macromolecular chemistry at the interface between nanotechnology and bioorganic chemistry. Our main interest is in the chemical modification of natural biopolymers with the aim to engineer multifunctional and biocompatible materials for applications in drug delivery, nanomedicine, bio-catalysis and 3D printing. To achieve this, the Wichlab utilises nature’s toolbox that provides a variety of biopolymers, such as carbohydrates, lipids, polypeptides and proteins. We apply a variety of chemistry methods to produce functionalised nanomaterials in order to mimic biological properties, while maintaining biocompatibility and degradability. The resulting dynamic biohybrid materials can be formulated into nano- and microparticles for the transport and delivery of a wide range of therapeutic drugs, including small molecule drugs, therapeutic proteins, as well as DNA and mRNA. We also develop functional (bio)polymers that produces a new generation of catalytically active nanomaterials for nanomedicine-related applications and industrial processes in food and agrochemical settings. Combining chemistry with material design, biology and medicine, the Wichlab is working on novel fundamental approaches to produce functional biomaterials. We aim to produce advanced nanomaterials with the potential to revolutionize personalized medicine and biocatalytic industrial processes.”



JIANGTAO XU

“The Xu group is dedicated to the development of synthetic technologies for precision macromolecular synthesis and sustainable polymer manufacturing. We aim to mimic the structural precision of natural peptides and proteins in monomer sequence and stereochemistry using widely used petrochemical monomers and materials and explore their potential applications in catalysis, pharmaceuticals and nanomedicine. Our research draws inspiration from both traditional polymer chemistry and organic synthesis, enabling the design of materials with tailored properties and understanding fundamental structure–property relationships. We also explore innovative green technologies for transforming renewable biomass and abundant feedstocks from natural resources into high valued polymer materials. These projects expect the new polymer materials will increase manufacturing sustainability, chemical diversity and industrial viability; produce many benefits for Australia by improving environment and economy.”



PER ZETTERLUND

“Our research group focuses on the design and synthesis of polymers, polymeric nano-objects and hybrid polymeric materials for applications in a range of advanced and emerging technologies such as materials chemistry, nanotechnology and nanomedicine, and also in more traditional fields such as paints and coating applications. One of the key concepts is structure control at the molecular and/or nano level – we strive to develop and understand methods for synthesis of polymers of well-defined molecular structure and to develop methods for synthesis of polymeric nano-objects of specific size and shape/morphology. Significant research efforts are also directed towards synthesis of polymeric materials and polymeric nanoparticles that are hybrid materials comprising various types of 2D nanomaterials such as graphene, whereby additional functionality can be imparted on polymeric materials such as for example electrical conductivity. An important aspect of our research is the use of a wide range of aqueous emulsion-based environmentally friendly polymerization techniques. We interact strongly with industry, especially in the area of material science, including coatings and pressure sensitive adhesives. “





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 across a range of key industries. A degree in Chemical Engineering provides a gateway into a wide range of careers, with 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, including thesis projects and lab courses.



All of our undergraduate programs are professionally accredited by industry associations.

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



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UNSW School of Chemical Engineering



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unsw.edu.au/engineering/chemical-engineering

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

Talking Equity, Diversity and Inclusion in Chemical Engineering

As the UNSW Faculty of Engineering's new Associate Dean for Equity, Diversity and Inclusion (EDI)—an appointment that was announced in August 2021—Associate Professor Rita Henderson has an extraordinary opportunity to make a significant impact on EDI issues within the Faculty and the School of Chemical Engineering.

A key part of her role is to champion the EDI agenda within the Faculty, working closely with the Executive team, Heads of School, the EDI Committee and the University's EDI Division. She will lead and deliver initiatives designed to achieve the Faculty's EDI goals, including those that advance gender equity, improve student access and inclusion and contribute to the Sustainable Development Goals.

Rita says that EDI principles are particularly important for the Faculty because having a diverse workforce is proven to drive innovation—a critical aspect of research.

"Diversity among our teaching team is vital to engage and inspire our students, who come from a range of backgrounds," says Rita.

"An inclusive culture is also essential to create a sense of belonging in all our communities."

A Faculty-wide strategic plan is currently under development following a series of successful EDI strategy sessions attended by members of the Faculty EDI Committee, the Gender Equity Working Group, student representatives and others involved in EDI initiatives.

The sessions brought passionate and engaged people together to articulate a shared vision, and goals, to identify key initiatives and to determine how success would be measured.

Chemical engineering in focus

Rita notes that the School of Chemical Engineering, where she is also an Associate Professor, is already doing particularly well on gender balance – but there are other EDI considerations that may come into focus.

"We have a relatively high proportion of female academics within our School who are excellent role models for our female students, both at undergraduate and postgraduate levels," says Rita.

"I think more thought can be given now to removing barriers to student participation from minority groups, enabling all students to achieve their full potential."

"We have a relatively high proportion of female academics within our School who are excellent role models for our female students—both at undergraduate and post-graduate levels"





From a strong background in gender

Rita has been involved in EDI activities since 2015. It was then that she was asked to lead a gender equity study for the UNSW Faculty of Engineering that would reveal to her the significance and intricacies of EDI in the academic environment.

The aim of the 2015 study was to identify any gender issues that may be impacting academic staff, with Rita's final report recommending 10 strategies across attraction and recruitment, retention and development to achieve a better gender imbalance.

"This opportunity really impressed upon me the importance of gender balance and raised to my attention some of the challenges we have in our Faculty," says Rita.

"Up until then, I had been somewhat unaware due to my engagement in the water industry—which performs better than average in workplace gender equity. I was therefore lucky to have a number of female role models."

During her time leading the Faculty project, she joined UNSW's Self Assessment Team for the Science in Australia Gender Equity (SAGE) Athena SWAN pilot helping to deliver UNSW's successful submission for the Bronze award. The award recognises institutions with a solid foundation for eliminating gender bias and developing an inclusive culture that values all staff. In 2019, she also convened and Chaired the Faculty of Engineering Gender Equity Working Group, working closely with former Associate Dean Equity and Diversity, Professor Lucy Marshall.

Building equity across engineering

Beyond gender, Rita has always been interested in equity issues more broadly. Of particular interest to her is contributing to disadvantaged communities through teaching and research.

Rita is looking forward to making a valuable contribution to not only the School and the Faculty - but to the Engineering discipline more broadly. According to Engineers Australia, only 13% of Australia's engineering workforce are female.

"We clearly have a long way to go in addressing inequities, but I am excited by the push for improved diversity and inclusion that I keep encountering in all my professional roles," says Rita.

"There is a lot of good will and motivation out there at the moment to create meaningful change in this space."



"I am excited by the push for improved diversity and inclusion that I keep encountering in all my professional roles."

In focus: Engagement and communication

Like many organisations, the success and growth of the School of Chemical Engineering relies heavily on appropriate and effective engagement and communication between its various stakeholders including staff, students (prospective, current and alumni), industrial employers and research partners. Under the leadership of the Head of School Guangzhao Mao, a new role of Deputy Head of School – Engagement has recently been established. This is the first time in the Faculty of Engineering that this position has been considered, highlighting the critical need to streamline, improve and further develop the School's current efforts in a more cohesive and efficient manner.

A/Prof Pierre Le-Clech commenced the role of Deputy Head of School – Engagement in August this year. Over his 17 years working within the School, Pierre has always aimed to establish stronger interactions and collaborations between the teaching and research stakeholders both within and outside the School.

“My goal is to strengthen the voice of the UNSW School of Chemical Engineering through targeted, appropriate, and efficient communication, engagement and advocacy between its key stakeholders,” says Pierre.

One of Pierre's first tasks was to form an Engagement Committee within the School. He began by recruiting some of those who were dedicating large amounts of time to various communication and engagement activities already: Dr Emma Lovell, Dr Peter Wich, Dr Zhaojun Han, Prof Cordelia Selomulya, A/Prof Rona Chandrawati, D Sarah Grundy and Dr Alison Jones.

“The main challenge is to build on and synergise the existing activities conducted by the School engagement team, the vary active students societies and the relevant committees both within the School and the Faculty in line with the Faculty and UNSW strategic priorities,” says Pierre.

Other objectives for the new engagement team are:

- To identify and deliver SMART actions to target prospective students, to improve current student experiences, to grow the alumni network, and to facilitate opportunities for industry to interact with the School .
- To highlight existing paths and relative benefits of better engagement to increase staff enthusiasm, cohesiveness, and participation in activities.
- To focus on communication through the School website and newsletters—and establish a yearly action plans for activities and events
- A new Alumni working group has recently been established to develop a mentoring pilot program for undergraduates, and a new industry engagement strategy is being prepared.

From ‘Surviving Second Year’ to ‘Striving in Chemical Engineering’

Second year students often question the rationale for the courses taught in Chemical Engineering. As the teaching materials mostly relate to fundamental principles, it is challenging to appreciate the importance and significance of the knowledge developed during this critical time of the program and how it does relate to a potential job in the field.

In collaboration with CEUS, the Engagement Team of the School organised an forum to hear directly from 3rd and 4th year students and their perspectives on the 2nd year of the program. Second year students received first-hand advice and tips on how to succeed and make the most of their challenging year. Ample time was dedicated to ask questions to the panel.

The meeting chaired by Annie Tu, supported by Junias Tjanaria and Willson Blesstian from CEUS with panellist including George O'Connell, Denise Chan, Isabella Notarpietro, Pierre Le-Clech, Emma Lovell and Sarah Grundy.

CEUS also presented their recent initiatives designed to support students such as weekly study sessions, a [discussion group on Facebook](#) and an [industry/careers handbook](#).

A [recording of the meeting](#) is available online.



In focus: Health and Safety

Giulia Oss completed a Master's in Pharmacy and Industrial Pharmacy in her home country of Italy before moving to Sydney in 2016 to begin her PhD in Chemistry at UNSW. During her PhD, she collaborated with the safety committee at the UNSW School of Chemistry which ignited a strong passion and interest in safety. She was appointed the Health, Safety and Environment Advisor for the School of Chemistry in January 2020, subsequently completed a Diploma in Workplace Health and Safety and became the School of Chemical Engineering's Health and Safety Advisor in November 2020.

Giulia has made a significant impact on the School's safety strategy, policies and procedures. After commencing her role, one of her first tasks was to conduct a gap analysis to determine initial priorities and to allow staff and students to voice their individual concerns. Based on her findings, her first port of call was to establish a new approach to laboratory safety inspections.

"I began doing unannounced inspections, but I also invited anyone to join me if they happened to be around. This collaborative approach helped to spark the all-important safety conversation with lab users, which I believe is crucial in facilitating a strong safety culture," says Giulia.

Another priority was to improve chemical order procedures to incorporate safety considerations. After consulting with staff and students, Giulia designed an automated system that requires researchers to plan ahead and thoroughly assess the risks of their required chemicals. For orders deemed high risk, there is now a three-step approval process.

Giulia also improved the safety aspects of induction procedures. Inductions that were once face-to-face are now done primarily online, offering a COVID-19 friendly solution for new laboratory users, managers and staff. The induction process itself now involves online learning and a quiz to ensure that important health and safety knowledge is retained.



This year, one of the School's focuses has been on minimising the impact of the pandemic on research—especially lab-based research—but within COVID-safe guidelines.

"Unfortunately, research has been heavily impacted by COVID-19. We faced new challenges due to limitations on the number of people allowed in the laboratories and we had to adjust our everyday operations to respond to this. Moving forward, we will need to ensure research can thrive again as we return the School to campus," says Giulia.

Giulia believes that it is important to have a consistent and centralised approach to safety—which is easier when there is a dedicated person in the role. She has recently departed from the School but she congratulates the team on their dedication to health and safety issues.

"The UNSW School of Chemical Engineering is fully committed to safety as a living value and having a dedicated person in this role is one of the many ways this commitment is translated into practice," said Giulia.

"I look forward to seeing what they will achieve next."

"I would like to thank Guangzhao Mao, Rahul Bajoria, John Starling and all the professional staff for their tireless support and incredible collaboration throughout my time in the role."



"The UNSW School of Chemical Engineering is fully committed to safety as a living value and having a dedicated person in this role is one of the many ways this commitment is translated into practice"

The Journey to Online Learning

When the COVID-19 pandemic hit and lockdowns commenced, workplaces all over the world began scrambling. In education, online teaching was going to be essential. But the logistics of implementing such a drastic change were daunting for many.

By the time the lockdowns hit the city of Sydney in March 2020, the UNSW School of Chemical Engineering was relatively well prepared.

“A number of us had been thinking about online teaching approaches and technologies for many years,” said Peter Neal, Senior Lecturer in Process Engineering.

“There had been noticeable trends towards online quizzes and those sorts of developments—so when the pandemic hit, it simply offered a decision point.”

When travel to and from China halted in early 2020, members of the School began to think more deeply about how they would stay connected with students overseas. They started exploring different technologies and approaches that might help them to teach in an accessible, reliable and engaging way.

This was no easy task. Some of the platforms that the School was using, such as YouTube, are not available in China—and others aren't designed for teaching on a large scale. Peter Neal, the School's Deputy Head of Education Stuart Prescott and Senior Lecturer May Lim worked with a group of students in China to trial a series of technologies in order to determine what worked best.

The result ended up being a suite of tools, each with a different purpose: for video sharing, it was 'The Box' (UNSW's in-house system) or 'Microsoft Stream'; for live teaching sessions, 'Blackboard Collaborate'; and for live collaboration, 'Microsoft Teams'. The School also uses a sophisticated engineering software hosted on a virtual platform – but a series of test were required to determine whether students had the connectivity to access the platform and whether it was functional from a speed perspective.

Rising to the challenge

Within a few weeks of beginning Term 1 in 2020, UNSW had no choice but to pivot to online learning.

“When the crunch came, we had some confidence,” said Peter.

“The great thing was that because we'd invested that time earlier, it meant that we had some internal assurance about what would work and what we could advise implementing within the school.”

But of course, not everyone had been thinking about online learning in the same detail as Peter and his colleagues. The next challenge was working out how to move an entire whole school online – no easy task for a School of over 800.

As Sydney's strict lockdown approached, final face-to-face tutorials were spent showing students how the software worked and answering any questions so that they were comfortable with the changes to come. For teachers too, the most significant shift was to the heavy reliance on technology.

“In the classroom, you can use as much technology as you're comfortable with,” says Peter.

Recognising that teachers needed additional support and guidance for the transition, UNSW Office of Pro Vice-Chancellor Education organised a number of Education Focussed academics to facilitate university-wide workshops on online teaching. Peter and others within the School were part of this group.

“Because we'd invested that time earlier, it meant that we had some internal assurance about what would work and what we could advise implementing within the school”

Meanwhile, one of the new initiatives established within the School was called Teaching ChEFS - a community of practice for people who teach Chemical Engineering or Food Science. Set up as an online community through Microsoft Teams, anyone who is teaching in the school in any capacity can join, ask questions and share resources with colleagues. Monthly 'Lunch and Learn' series were established through Teaching ChEFS— bringing members together to discuss different topics that are relevant to teaching – from online exams through to fostering collaboration.

“Teaching ChEFS Became a great place to share knowledge and advice—and to ask others questions as we all navigated the new online teaching journey,” said Peter.

“It’s not just focused on the technical aspects either—it’s more about the teaching.”

What’s next for online teaching?

When reflecting on the past 12 months, Peter says that there was a lot of goodwill within the School which assisted greatly in the transition.

“Staff worked long hours in those initial stages to get things switched over for students; we were running on a lot of adrenaline!” says Peter.

With restrictions in Sydney beginning to ease, a cautious return to Campus has now commenced. And although there some specific aspects of online teaching that still require more thought; building community, online assessment and laboratory-based learning, for example; Peter believes there are some key aspects that may remain in place or return in future.

“I think that online teaching will continue to some extent, possibly with live lectures or pre-recorded videos delivered online,” says Peter.

“More students are working longer hours and commuting longer distances—and online lectures mean that they don’t have to come to campus as many days a week.”

“But I think what we’ll notice is more strategic use of our precious face-to-face time. My experience with students in 2021 has shown a real hunger to be in the physical presence of others. We’ll look at how we can best this to build a sense of community and complete collaborative learning activities together.”



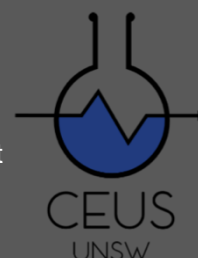
Updates from our student societies

Chemical Engineering Undergraduate Society (CEUS)

The last couple of months were a bit tumultuous for CEUS as they were for everyone, and they had to pivot away from the face-to-face events they had planned. They took the opportunity to run online games nights, virtual arts and crafts, and most significantly the 2021 online speed networking night which was attended by industry representatives and over 80 students. This event was a great opportunity for students of all points in their study program to connect with the chemical engineering industry.

The new 2022 CEUS executive team is excited to plan and run some big events, including the annual ball and an industry night, after a somewhat disappointingly quiet last two years.

[Facebook](#) | [Linkedin](#)



Food Science Association (FSA)

The FSA recently launched its new logo and released some merchandise (sweaters and beakers) which are now available for purchase.

They also collaborated with CEUS and MATSOC for their annual Speed Networking Night. There were over 40 industry representatives in attendance.

With CEUS and CERS, FSA also hosted a Cocktail Masterclass and Games Night where many students from each of the societies came along—and some academics too.

[Instagram: @fsa.unsw](#) | [Facebook:](#) | [Linkedin](#)



Chemical Engineering Research Society (CERS)

At CERS' first inaugural event in June, new executive team was elected. The current team runs under the leadership of Angie Tjandra (President), Koentadi Hadinoto (Vice President – Internal) and Xichu Wang (Vice President – External).

Since the election, CERS has become affiliated with UNSW Arc clubs and societies as a constituent club which runs under the School of Chemical Engineering. They have also raised over AU\$11,000 from sponsors to support members and established partnerships with CEUS, FSA, UNSW Postgraduate Council, University of Sydney Postgraduate society, Australian Institute of Food Science & Technology, Meat & Livestock Australia and Australia Water Association Young Water Professionals. The team also published the inaugural CERS monthly newsletter and released the first batch of CERS 2021 merchandise including face masks and coffee cups.

During lockdown, CERS hosted two online events to keep momentum building. Since NSW 'freedom-day' on October 11th, five events have been held including the first collaboration with the undergraduate societies (Cocktail Mixing Masterclass), a brewery visit to Atomic Beer, a Live Q&A seminar with A/Prof Patrick Spicer, a de-stress from annual progress review with Dogtor Jasper & Luka, and CERS Deck The Halls (a Christmas party & end-of-year gathering).

[Latest newsletter](#) | [Instagram: @cersunsw](#) | [Twitter: @CersUnsw](#)





Inspiring alumni

Professor Attila Brungs FTSE FRSN UTS Vice Chancellor and incoming UNSW Vice Chancellor

On 25 August, Professor Attila Brungs gave an inspirational talk to students, past and present staff and other guests as part of the 'inspiring Alumni' Speaker Series. He talked about his career journey and what he sees as the key strategies for success.

Attila began his career by studying Industrial Chemistry at UNSW. During that time, he completed four internships which he credits for teaching him many of the valuable lessons that stayed with him for the rest of his life.

After UNSW Attila went to Oxford, where he built personal and professional relationships with people all around the world, he then moved on to McKinsey company which he likens to 'completing a third degree' - giving him insight into how business operated around the globe. He then took on a senior position at CSIRO, where he established important, productive partnerships with Australian universities undertaking world-leading research.

His pull back to the university sector was driven by the power of education to change peoples lives, and he firmly believes that it's often alumni that are making the biggest changes in the world.

[View the presentation highlights](#)



Dr Theresa Sukkar General Manager of Innovation and New Product Development—Vinidex

UNSW Industrial Chemist graduate Theresa Sukkar presented virtually to the School on 5 October. The industrial chemistry graduate shared her career journey, explaining that site visits and work experience opportunities helped her to decide where to begin her career.

Her first job was at Wattle and she gained some valuable experience there while undertaking her PhD at the same time. Theresa's career has been diverse in that it has spanned technical roles as well as business leadership roles. It was after joining James Hardie and then 3M that she gained a comprehensive understand of the breadth and techniques of innovation before moving into Research and Development (R&D).

Theresa's presentation highlighted the ways that an engineering degree can help you in the R&D industry by teaching you new ways to think and solve problems. She said that the key to a fruitful career is to do what you love and to have the courage to pursue your goals.

[View the presentation highlights](#)

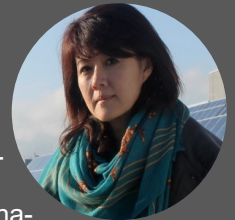


Awards, grants and accolades

Congratulations to the following people from the School of Chemical Engineering

Rose Amal

Scientia Professor Amal was awarded the 2021 Chemeca Medal by the Australian and New Zealand Federation of Chemical Engineers (ANZFCHE), the most prestigious award in the chemical engineering profession in Australia and New Zealand. The award is in recognition of her world-leading research in the fields of fine particle technology, photocatalysis and functional nano-materials, which has profound implications for solar and chemical energy conversion applications such as treating water, purifying air, and generating renewable hydrogen economically and sustainably.



Cyrille Boyer

Prof Cyrille Boyer was named by The Australian as Global Leader and Top Australian Researcher in Polymers and Plastics. The Australian also lists "Polymers & Plastics" as one of the four areas UNSW is leading globally and as the top Australian research institution in Ceramic Engineering, Chemical and Materials Sciences (general), Power Engineering, Sustainable Energy, among others.



Peter Neal

Dr Peter Neal was named Arc / Postgraduate Council (PGC) Course Coordinator of the year, recognising his focus on developing his students' capacity in design, enquiry, and professional skills. The PGC Course Co-ordinator Awards recognise Course Coordinators who have displayed exemplary administrative efforts beyond their minimum requirement and to acknowledge their efforts in taking care of their students.



Nicholas Bedford

Dr Nicholas Bedford received a grant from the United States Department of Defense for a project entitled "Functionalized metal-organic frameworks (MOFS) as heterogenous platforms and nanoreactors"



Rona Chandrawati

Rona Chandrawati was selected as a finalist for the 2021 Eureka Prize for Outstanding Early Career Researcher for her achievements as a rising leader in the field of nanozymes development for drug delivery.



Edgar Wong

Dr Edgar Wong received an ARC Future Fellowship for "Nanoengineering Smart and Precise Antimicrobial Polymers." The project aims to combat the critical global issue of antibiotic resistance via fundamental and innovative chemistry design solutions.



Highly cited

Five academics from Chemical Engineering featured on the annual Highly Cited Researchers 2021 list from Clarivate. They are: Rose Amal, Cyrille Boyer, Liming Dai, Kourosh Kalantar-Zadeh and Da-Wei Wang. These results see UNSW tie for second place in the Group of Eight (Go8) and place 23rd among universities globally.



Postgraduate study 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

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 from UNSW School of Chemical Engineering, will provide you with the opportunity to advance your professional skills and deepen your knowledge and expertise. Study with us in Sydney, Australia! According to the Association of Professional Engineers Australia (2019), holding a Masters Degree delivered a wage premium of 15.4%, compared with a Bachelors degree.



Join our network of world-changing alumni working across a range of key industries.



Trimester system offers increased flexibility in study, offering opportunities to study abroad 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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#1

Ranked Engineering Faculty in Australia

#1

Most employable students (AFR Future Leaders Awards 2020)

#1

University for research and impact in Australia

Executive Team



Guangzhao Mao
Head of School



Cyrille Boyer
Deputy Head of
Research



Stuart Prescott
Deputy Head of
Education



Pierre Le Clech
Deputy Head of
Engagement



John Starling
Technical
Manager



Rahul Bajoria
School Manager



Ali Jalili



Alice Lee



Alison Jones



Cordelia Selomulya



Da-Wei Wang



Dipan Kundu



Emma Lovell



Francisco Trujillo



Graeme Bushell



Greg Leslie



Jason Scott



Jayashree Arcott



Jian Zhao



Jiangtao Xu



Jie Bao



Johannes Le Coutre



Kang Liang



**Kourosh Kalantar-
Zadeh**



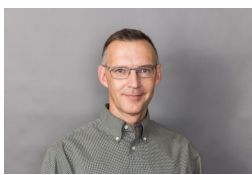
Liming Dai



May Lim



Nicholas Bedford



Patrick Spicer



Per Zetterlund



Peter Neal



Peter Wich



Priyank Kumar



Rita Henderson



Rona Chandrawati



Rose Amal



Sarah Grundy



Xunyu Lu



Yansong Sheng



Zhaojun Han



Zi Gu

Academic Team



www.unsw.edu.au

UNSW School of Chemical Engineering in numbers

Total number of academic staff: 40
Total number of technical and professional staff: 18
Total number of PhD students: ~220
Total number of postdocs: 65

Research funding: USD 236k/academic staff/year
Publications: ~10 papers/academic staff/year
Clarivate 2021 HCR: 5 academic staff



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<https://www.unsw.edu.au/engineering/chemical-engineering>