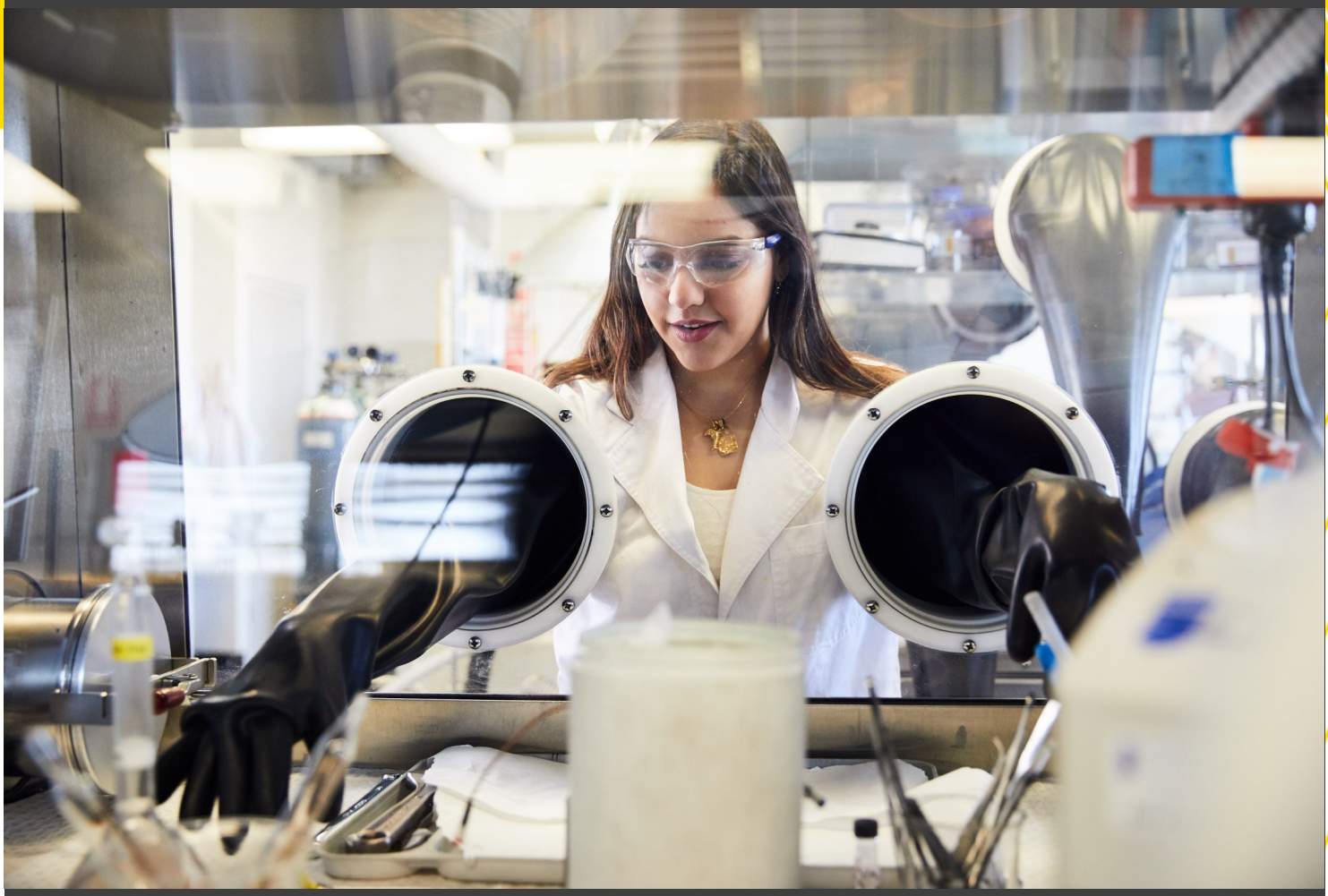
December 2022: Issue #5

THE LEAD

UNSW SCHOOL OF CHEMICAL ENGINEERING NEWSLETTER



UNSW SYDNEY

In this issue:

Message from the Head of School

Dear members and supporters of the UNSW Chemical Engineering community,

For a historic global research powerhouse, UNSW Chemical Engineering has had, by all accounts, a record breaking year in 2022.

The year began with a $50M Trailblazer award for UNSW from the federal government to accelerate Australia's clean energy transition. Professor Rose Amal's *Power-to-X* will play a major role in this project and we are excited to be part of such a worthwhile and unprecedented initiative.

Our school also received five prestigious Australian Research Council (ARC) fellowships, awarded to Prof Cyrille Boyer, Dr Kang Liang, Dr Zhaojun Han, Dr Emma Lovell and Rahman Daiyan. Prof Cyrille Boyer's ARC Laureate Fellowship will enable him to pursue his world-leading research in *Light-Driven Manufacturing for (Re)Programmable Materials.*

Our School was also delighted to learn that the federal government awarded $35M to establish an ARC Centre of Excellence for Carbon Science and Innovation at UNSW. The Centre of Excellence will be led by Prof Liming Dai with other UNSW Chemical Engineering academics as Chief Investigators, including Prof Rose Amal, Prof Guangzhao Mao and Dr Nick Bedford.

Last but certainly not least, our school received a record number of ARC Discovery Project grants - the premier government support for individual research projects. Of the eight ARC Discovery Projects, four are led by our academics including *Tandem Photocatalytic Conversion of CO2 to High Value Hydrocarbon Products,* led by A/Prof Jason Scott and Prof Rose Amal; Advanced *Materials from Automated Synthesis of Sequence-Defined Polymers*, led by Prof Per Zetterlund; *Synthesis and Characterisation of Tracer-Functionalised Nanoparticles*, led by Prof Guangzhao Mao; and *Accessing Liquid Noble Metals for Low Temperature Chemical Reactions,* led by Prof Kourosh Kalantar-Zadeh.

2022 has been a truly an exciting time for UNSW Chemical Engineering and we are all looking forward to discovering what 2023 has in store. Thank you to all our academic and professional staff, our students, our partners and our supporters for making 2022 such a successful and rewarding year.

Best wishes,
Professor Guangzhao Mao

UNSW Chemical Engineering rankings:

#53 QS World by Subject

#55 US News Global Ranking (Chemical Engineering)

UNSW SYDNEY

Clean Energy Group

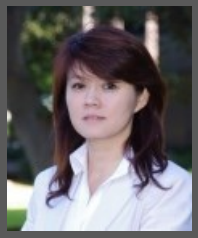
The world is experiencing an energy revolution. As we move away from traditional fossil fuels that have powered us since the industrial revolution, our research enables the transition to a more sustainable, clean energy future.

As a global leader in energy innovation, our Clean Energy Group is exploring ways energy is harnessed, stored, and used to feed our ever-growing energy needs.

To date, they have developed many innovative technologies for affordable, clean and sustainable energy systems through novel and improved materials, systems development and optimisation as well as computational and data-driven modelling. These technologies include producing synthetic chemicals and clean fuels such as hydrogen, directly from sunlight, high-performance storage systems and generating biofuels from waste.

Our researchers

ROSE AMAL



Rose is a respected and recognised pioneer and leading authority in the fields of fine particle technology, photocatalysis and functional nanomaterials and have made significant contributions to these research areas over the past 15 years. Her research contributions span from fundamental chemistry to applied chemical engineering fields; from material science and nano- research to a specialised photochemistry field. Professor Amal's current research focuses on designing nanomaterials for solar and chemical energy conversion applications (including photocatalysis for water and air purification, water splitting, development of indoor self-cleaning materials, low temperature catalytic reactions and utilisation of CO2) and engineering systems for solar induced processes, using the sun's energy as a clean fuel source. She has successfully supervised over 73 PhD students (36 of them are female), seven Master students and more than 200 honours students in fields relating to environmental and energy technologies, including eight University Medallists and over 20 Australian and International Postgraduate Award Holders.

NICHOLAS BEDFORD

"The Bedford research group is interested in rational materials development through establishing synthesis-structure-property relationships. The foundation of this work focuses on the "structure" component, where the group leverages its expertise in synchrotron scattering and spectroscopy methods to construct atomic-scale structure models of any material of interest. Once atomic-scale structure is better resolved, a fundamental understanding of materials properties can be established, along with means of how to arrive at that structure via specific synthesis and processing techniques. The group uses imaginative synthetic capabilities coupled with the knowledge from synchrotron experimentation to make functional materials in a range of application spaces, most predominately in catalysis and electrocatalysis. Nanostructured catalysts are largely geared toward 2D materials with engineered defect sites and/or high entropy-stabilized materials, with focused emphasis on both biomass conversion reactions and sustainable hydrogen generation. The groups efforts on clean energy are collaborative in nature and involve research entities at UNSW and abroad, most notably with the National Renewable Energy Laboratory in the US."

LIMING DAI

"Our research activities on clean energy focus on carbon-based metal-free catalysts (C-MFCs) for renewable energy conversion and storage. Renewable energy technologies, such as fuel cells, water splitting, metal-gas (O2/CO2) batteries, hold great promise to solve the world's energy and environmental challenges. However, to achieve this, high-cost noble-metal-based catalysts are required, leading to current renewable energy technologies unsustainable. Various carbon nanomaterials have shown potential as alternatives to noble metal-based catalysts for energy conversion and storage due to their Earth-abundance, good catalytic activities and high tunability of structures at the atomic/morphological levels. Additionally, they are free from metal dissolution and poisoning. Specifically, our clean energy research involves the development of the design principles, novel precision synthesis strategies, and in-situ operando characterization methods to understand, control and direct the catalytic activities of C-MFCs for key reactions involved in energy conversion and storage."

ZHAOJUN HAN

"Rapidly depleting fossil fuels and the associated atmospheric pollution have been a driving force in the search for alternative environmentally-benign energy sources. Amongst many proposed solutions, hydrogen appears to be the ultimate clean energy carrier to replace fossil fuels, as it generates zero emission with water as the only product. Our research focuses on developing low-dimensional functional materials to tackle the challenges in materials, energy and environmental science, in particular, (i) developing highly active and stable non-precious metal catalysts for both cathodic hydrogen evolution reaction (HER) and anodic oxygen evolution reaction (OER). Vertical graphene, a two-dimensional (2D) nanomaterial with high surface area, interconnected porosity and good electrical conductivity, will be used to facilitate the catalyst engineering; (ii) optimising the electrolyser structure in both polymer electrolyte membrane (PEM) and anion electrolyte membrane (AEM). Proper designs of the flow cell, membrane electrode assembly and surface wettability control on catalysts will be the foci of such studies; (iii) Power-to-X (P2X) is emerging as a potential approach for electrochemical green synthesis and global carbon management. Our topics in P2X are mainly electrochemical CO_2 reduction reaction into fuels and valuable chemicals, which will play a positive impact in carbon neutralisation and net-zero emissions."

DIPAN KUNDU

"Facilitating and controlling ion/electron transport in materials and across interfaces hold the key to developing batteries with greater reliability and safety than those available in today's market, which is the overarching ambition of our research team. Our current research focus is high-energy and safe lithium solid-state batteries for portable (e.g., electric transport) applications, and aqueous zinc batteries for stationary – renewable, grid, residential, and industrial – storage. We are doing so through understanding and improving the performance of materials and electrochemical systems, unveiling and validating performance under scaled-up conditions, and engineering tools and methods to probe operation in real time. As we have demonstrated already, translation of innovation through commercialisation lies at the heart of our research and development endeavours."

PRIYANK KUMAR

“My research group is interested in understanding and designing nanomaterials using theory, computation and data-driven methods. We do so by collaborating with experimentalists in relevant areas. Currently, we focus on applications including catalytic systems, batteries, functional polymers and water/gas separation membranes.”

EMMA LOVELL

“Our research works toward creating a more sustainable future. The way we do this is through Power-to-X (P2X). P2X is the conversion of green, renewable energy to chemical energy in various forms (known here as ‘X’). This chemical energy, which can be hydrogen, or ammonia, or carbon-based fuels, can then be stored, disturbed and used within our conventional energy infrastructure. The way that we do this, is through catalyst and systems design. For example, this allows us to take air and water, and using power in the form of plasma and electrocatalysis, to produce ammonia. In our P2X approaches, we use heat, light, plasma and electricity to produce green ammonia, reduce carbon dioxide to vital chemicals and fuels, and make green hydrogen.”

XUNYU LU

“Electrochemical manufacturing provides a green way for the decentralised production of some important chemicals, such as hydrogen, hydrogen peroxide and methanol, through a series of electrocatalytic processes. The barriers exist for the large-scale deployment of this promising technology are its high cost and low energy efficiency. My research emphasizes on the design and development of next-generation catalyst materials to overcome these barriers. The rationally designed and prepared catalysts can enable the electrochemical processes to proceed with high activity, high product selectivity and prominent stability, leading to significantly increased energy efficiency as well as apparently lowered cost. My research will pave the pathway towards the commercialisation of electrochemical manufacturing.”

JASON SCOTT

“Our research focusses on designing and producing materials and systems which use complementary and renewable energy sources to produce hydrogen as well as convert carbon dioxide (CO_2) into useful products. Many countries, including Australia, are striving to reach net zero emissions by 2050. ‘Net zero’ emissions means there is a balance between the amount of greenhouse gas emitted into and the amount of greenhouse gas removed from the atmosphere. CO_2 is a significant greenhouse gas where its presence in the atmosphere can be managed by a combination of strategies. A major source of CO_2 emission is from the combustion of fossil fuels where one management strategy involves establishing alternatives energy sources such as renewable hydrogen which, when combusted, doesn’t release CO_2. A second strategy involves capturing the CO_2 before it is released into the atmosphere and converting it synthetic fuels and other carbon-based chemicals. Both strategies require the use of a catalyst and, for the process to be renewable, sunlight must provide any energy requirements of the system. We are currently engineering stand-alone prototype units, which employ the catalysts we design, to produce renewable hydrogen and/or convert CO_2 into synthetic fuels (e.g., methane, methanol) using only sunlight (i.e., solar-thermal, photovoltaics). Our research is supported by funding entities including ARC, ARENA, CRC, NSW Trailblazer and AusIndustry and we work with academic, Government and industry partners to deliver technologies which will contribute to the target of net zero emissions by 2050.”

DA-WEI WANG

“We focus on the innovations and translation of nature-inspired supramolecular materials and devices for energy storage through the development of sustainable batteries and other ionic devices. Our strength lies in the cross-disciplinary studies on sustainable battery technologies and supramolecular materials chemistry. In brief, we are using diverse monomers to create new materials and devices that are safe, affordable, degradable with good performance for batteries. Under the umbrella of Net Zero, sustainable batteries and their core materials are critical to the greener deployment of renewables for electricity generation, road transport and many other areas where electrification will be dominant.”

Meet John Starling, Technical Manager

Many staff and students who have passed through the UNSW School of Chemical Engineering have had the privilege of working with John Starling. Having been at the University since 1983 when he first began his Chemical Engineering degree, John has seen the School grow and evolve through at least eight heads of School and a few different Vice-Chancellors too.

With almost 40 years of experience under his belt—33 of those as a member of staff—John has become one of the longest-serving professional staff within the school. “I know where the skeletons are,” he says with a grin.

John’s journey to Technical Manager of the School begun after taking a role as Laboratory Manager for the Particles and Catalysis Group in 1989. At that time, he undertook some interesting consulting work which extended from testing vacuum cleaners to evaluating the safety and effectiveness of tampons. At that time, health and safety was far more laissez-faire—something which has transformed immensely since the 1980s and 90s.

“It was in about the year 2000 that safety changed, I believe due to a shift in legislation,” says John.

“We quickly went from having a lonesome ‘be safe’ signs on the wall of our lab and a single, disorganised chemical cupboard to having rigorous health and safety processes and a meticulous chemical management system.”

And health and safety processes have evolved even further since 2000, partially aligning with the construction of a new, $222m building, the Science and Engineering building, that the School moved into in 2019. One of the biggest projects of his career, John oversaw the move of nine levels from the aging home of Chemical Engineering into world- class facilities with over 55 laboratories—now recognised as one of the best chemical engineering facilities in Australia.

“I was involved in the design of all the labs, making sure that they were all safe and fit-for-purpose for the different types of research that would be occurring within and complied with current standards,” says John.

“Simultaneously, there was a lot of resource and people management involved. I had to have a global view of the School and all the difference nuances with training, teaching, research, systems, risk management, health and safety and more.”

John also helped to guide the school through the unprecedented impacts of the COVID-19 pandemic. Not only did it significantly affect the School as a whole—with labs closing down, teaching becoming virtual and a substantial decrease in professional staff—but John himself found that he struggled working from home full-time.

“My job is very hands on, so staying home for three months was certainly not easy,” said John.

“I missed the social side as well. The research at the School is interesting and exciting—but the people here are the real winners.”

John Sta

John Starling (pictured right) with the research group led by Cordelia Selomulya (pictured front, third from right).

For John, the most rewarding parts of his job are seeing the students succeed and being able to contribute to so many different aspects of the running of the school. Despite being called the 'Technical Manager', he says that he finds his role incredibly creative—with plenty of room to dream up new ideas and solutions.

John was recently invited to an event for those at the University with over 20 years of experience. There were over 200 attendees, seven of whom who had at least 40 years under their belts. Astoundingly, there were over 6000 years of collective experience just within that room.

Happy with what he has achieved and with great career satisfaction, John is beginning to focus his attention on encouraging other people within the School to take on more responsibility.

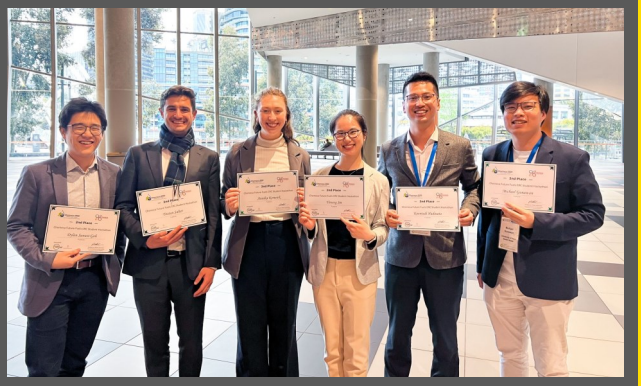
"My next stage will be preparing to pass on the baton to others by highlighting all the wonderful things about my role," says John.

"The people management can be challenging—especially for those with a technical background—but it's also the most rewarding part of the job."

"The research at the School is interesting and exciting—but the people here are the real winners."

Congratulations to the UNSW finalists in the 2022 Chemeca Hackathon

Two teams from the UNSW School of Chemical Engineering made it into the final stages of the inaugural Chemeca Future Fuel CRC Student Hackathon. The goal was for students to deliver a conceptual design of a net zero carbon future fuels infrastructure solution and showcase the concepts at Chemeca 2022 on 22nd June.



One of the UNSW finalists, FUELTURE, was represented at Chemeca by Annika Kerwick, Dylan Sanusi-Goh, Koentadi Hadinoto, Michael Gunawan, Tristan Salter, Yimeng Jin. FUELTURE proposed a new green hydrogen facility in the Hunter Valley, powered by wastewater containing glucose from local wineries.

Watch the presentation

The other UNSW finalist, P2Future, was represented by Alicia Shih, Ben Malik, Effie Hong, Elke L and Nicole Harrington. They proposed to turn freight rail carbon neutral in the Pilbara region of Western Australia by building a new and completely green ammonia plant, powered by solar energy, with the capacity to fuel 100 locomotives.

Watch the presentation

Hosting Indigenous Youth Leaders

The School of Chemical Engineering was privileged to host the Indigenous Youth Leaders Program in July, with a group of 23 Aboriginal and Torres Strait Islander high school students gaining valuable leadership skills and experiences.

The program by the UNSW Indigenous Strategy and Nura Gili , the UNSW Centre for Indigenous Programs, is designed to give the high school students a unique opportunity to see what UNSW has to offer through a cross-faculty experience that instils a sense of cultural leadership and comradery.

Students addressed real-life scenarios that impact Aboriginal and Torres Strait Islander communities, participating in a series of workshops and problem-solving activities.

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....

chemeng.FutureStudents@unsw.edu.au

UNSW School of Chemical Engineering

@UNSWChemEng

@UNSWChemEng

www.unsw.edu.au/engineering/our-schools/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

Chemical Product Designs—From Slow Melting Ice Cream to Microplastics Alternatives

Thirty Bachelor of Engineering (Honours) students from the School of Chemical Engineering recently presented new and innovative product designs to a panel of industry experts as the final step in their Chemical Product Design Project Thesis course.

The students spent the best part of a year researching, designing, patenting and testing new commercially viable products that utilised bacterial nanocellulose—a non-toxic, biodegradable and recyclable biopolymer with excellent mechanical properties, high water holding capability and outstanding suspension stability.

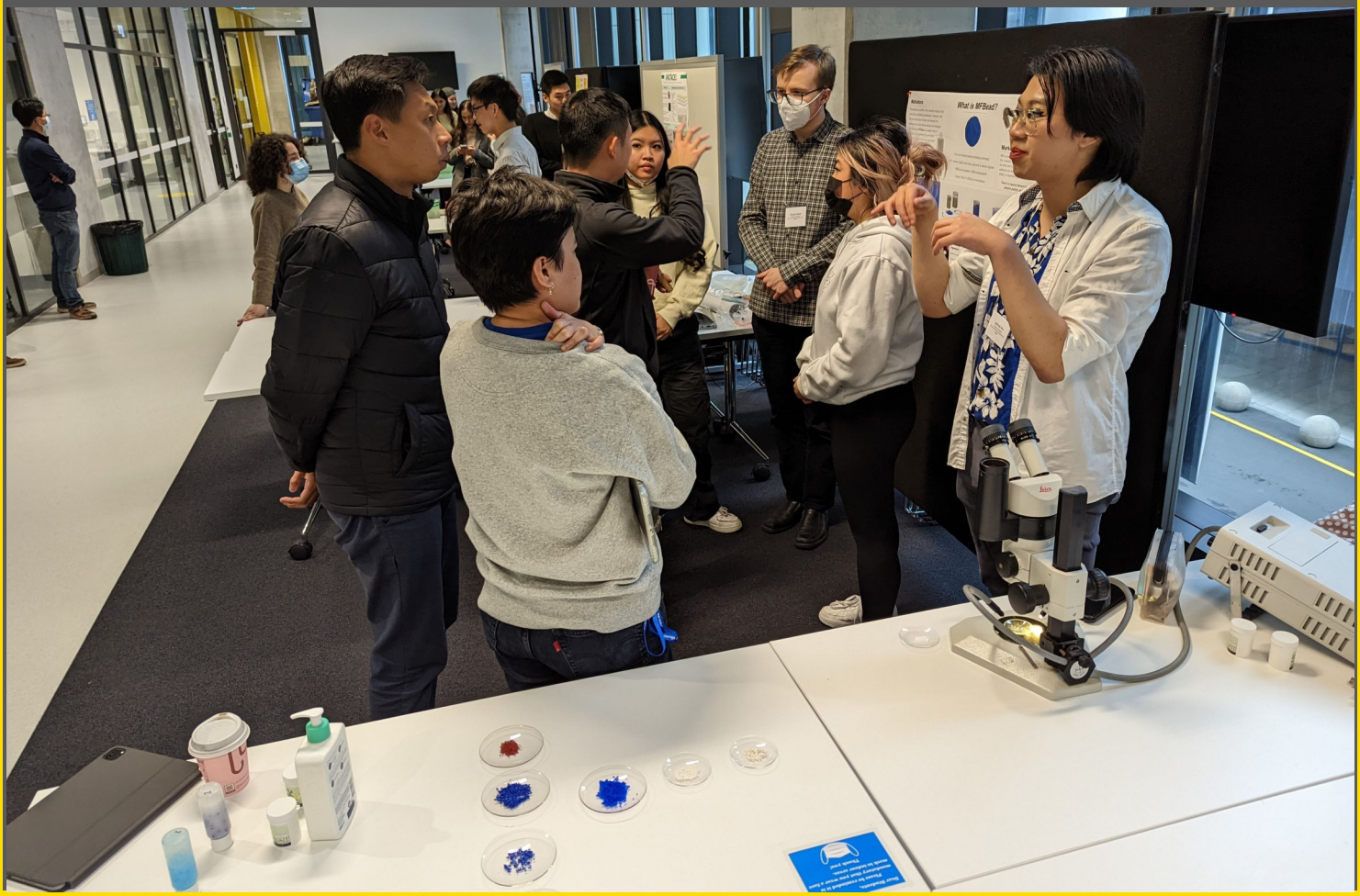
Among the creations were an extremely lightweight, strong and biodegradable phone case; harmless cosmetic abrasive beads to replace microplastics; slow-melting ice cream; probiotic infant teething rusks; and a biodegradable label for plastic bottles to enhance recycling efforts.

Chemical Product Engineering Stream Coordinator and Teaching Lead Patrick Spicer says that as a newer material, the criteria to utilise bacterial nanocellulose left plenty of room to generate new intellectual property.

“Bacterial cellulose can provide benefits to products, such as thickening foods or cosmetics, at much lower levels than typical additives can—and even improve existing products by replacing key ingredients,” says Spicer.

“This allows companies to increase sustainability while lowering their costs.”

The Chemical Product Design course is unique in that the students work in groups of two or three to design an entirely novel product concept from start to finish. They develop an Intellectual Property strategy, a draft patent, a full working prototype and poster presentation to pitch their product to an expert panel—which included representatives from v2food, JoyHarvest, Macquarie Bank and San Francisco Venture Capital firm IndieBio.



"I wanted to create a course that would give students something to discuss during their interviews that would be new to the employer; something that would be immediately relevant and beneficial to their future work at the company"

Spicer says that the Chemical Product Design Project Thesis equips the students with skills that may supplement employers' existing skill bases.

"I wanted to create a course that would give students something to discuss during their interviews that would be new to the employer; something that would be immediately relevant and beneficial to their future work at the company," says Spicer.

"We term this 'job-enriching', where students bring NEW skills to the employer—rather than 'job-ready', where they come ready to be taught company-specific skills and existing culture." says Spicer.

Student Melody Ranger agreed, and said that she believed the structure of the course was also more relevant to real-world jobs.

"Unlike other university courses where you are taught the content to then apply to assessment, in Chemical Product Design Thesis, I was responsible for my own learning over six months," said Melody.

"This required consistent work throughout the two terms, rather than doing it all at once, which is more applicable to jobs in the real world. It gave me experience in how to navigate through the entire life cycle of a project, from the creation of a novel idea to prototyping."

Spicer says that some of the students have seen great success as a result of the course, which has been running for four years. Some students have attracted the attention of venture capitalists, received job opportunities or obtained lucrative offers for I.P. purchases.

Each year the theme is meant to be relevant and impactful while giving students plenty of room for creativity. 2022 the second concurrent year in which students focused on utilising bacterial nanocellulose, while previous years focused on alternative forms of existing products for equity and access (2019) and re-application or brand diversification (2020).

Melody said that she enjoyed the level of autonomy that came with the course.

"I was able to have the freedom to tailor my own learning to what I enjoyed and was passionate about. I could choose a product to make in a field that I had the desire to learn about, which really made the experience rewarding," she said.

More information on the course can be found on the School's website.

ChemEng Alumni Night

The School of Chemical Engineering Alumni Night was held on 20th October. More than 90 school alumni gathered at the new buildings—some who graduated more than 40 years ago and some who are still working in the School.

Pictured above at the alumni night (L-R): Christina Halim, Liwan Lioe, Usha Kotur, Sarah Grundy, Mandalena Hermawan, Mary Sunarho

The event was co-organised by the School's alumni working group, consisting of Nader Daniel; Jane Harding; Alex Soeriyadi; Richard Kydd; Suriya Shanmuga, Rosa Tran; with support provided by the student societies. It was an opportunity for the alumni to visit the new building, learn about the new teaching and research facilities and interact with current staff and student societies

It was also an opportunity to finally present some of the awards given to our undergrads online during the COVID-19 pandemic. These were:

- Eliza Otton: The Professor Graham Fleet Memorial Prize
- Miranda Yang: The UNSW Chemical Engineering Prize for Product Design
- Yamunaputri Setiorini: The UNSW Chemical Engineering Prize for Product Design
- Edward Fu: The UNSW Chemical Engineering Prize for Process Design
- Gary Yang: The UNSW Chemical Engineering Prize in Undergraduate Chemical Product Engineering
- Maggie Lim: The Norman Prize in Chemical Engineering for the best final year thesis project in the School
- Harvey McGeorge: The iChemE Prize—Best DP 2021

Inspiring Alumni featuring Daniel Mullette

Our Term 2 Inspiring Alumni Series speaker was Daniel Mullette, Head of Research & Development from The Arnott's Group.

In his one-hour presentation on 12 July, Daniel discussed his career journey from graduating from UNSW as an Industrial Chemist (BSc, UNSW, 2000) to becoming a respected technical leader in industry. With 20 years of R&D experience, Daniel has held a variety of technical roles including water treatment with Memcor, consumer personal care with Unilever and food & beverages with Arnott's.

Known as an inspirational leader with a passion for growing people, Daniel has some wise words of advice for those in the early stages of their careers.

"I think it's important for anyone in engineering or a science-based role to be curious, to look for your passion, to recognise what you're good at but also recognise the areas where other people might nake you better".

building innovative products and creating connections for new ideas and opportunities to create organisational value.

"I think it's important for anyone in engineering or a science-based role to be curious, to look for your passion, to recognise what you're good at but also recognise the areas where other people might make you better," said Daniel.

"Also, in every role that I've had where I've thrived, I had a great technical mentor who had my back."

He also spoke about the importance of

"Gone are the days where the only way to progress is to go up (…) You can go horizontally and choose different disciplines or jump around between different industries. Going horizontally can be just as fulfilling and fruitful as going vertically."

https://youtu.be/b9enc21GWIk

Daniel Mullette, Head of Research and Development, The Arnott's Group.

Updates from our student societies

Chemical Engineering Undergraduate Society (CEUS)

The end of 2022 has been a fantastic year for the Chemical Engineering Undergraduate Society. As we come out of the pandemic, CEUS has enabled chemical engineering students to get involved with life at UNSW.

CEUS has held several key Industry events over the last six months to aid students in their professional development. The Industry Night held mid-Term 2 provided both students and industry representatives a valuable networking experience as well as an insightful night out. Our Speed Networking event held in Term 3 also enabled students to practice their networking skills and further engage with industry representatives. CEUS also facilitated site tours to Toohey's and Veolia for students to further their understanding of the operations in an industrial setting. The Vertically Integrated Projects / Taste of Research information seminar also informed students of the many research and additional learning opportunities that are available to them during their studies.

In addition to Industry events, CEUS kicked off social events in Term 2 with the harbour cruise, "A night under the Auroras". We ended the term with a thrilling Masquerades-themed ball in collaboration with FSA, MATSOC and RESOC. In addition to these big events, CEUS has also held regular smaller social events throughout the term, getting students involved with campus life as we come out of online learning. These included a Beers and Bowls event at Coogee pavilion at the end of Term 2, a Trivia Night in collaboration with EWB and an intersociety Pub Crawl to wrap up the year. CEUS looks forward to running events in the new year, with planning for the First- and Second-Year camp and Industry Night already underway for 2023!

Facebook | Linkedin

Chemical Engineering Research Society (CERS)

On 18 November, the Chemical Engineering Research Society (CERS) was announced the winner of the Public Engagement category at the iChemE Global Awards in Manchester, United Kingdom. Celebrated for its many achievements in its inaugural year, one of the biggest successes highlighted through the iChemE awards process was the Inaugural networking night, where relationships were established with over 40 companies and organisations.

Over the past term, CERS brought together over 200 members and raised over $18,000 internally and from industry sponsorships to host 20+ events across the year. Across the term, events hosted by CERS included workshops, well-being events, professional development activities and research seminars. These events provided mentorship, collaboration and job opportunities for members.

The CERS newsletter, which celebrates student awards, engages alumni, and lists career pathways after a research degree reached over 1000 people at UNSW and externally. Recently CERS was also recognised at the ARC Club awards 2022, taking home the ‘new club of the year award’, ‘people’s choice video award’, and ‘online activity award’ and securing the runner-up position for ‘outstanding hybrid activity award’.

Video: The inaugural year of CERS | Instagram: @cersunsw | Twitter: @CersUnsw

Food Science Association (FSA)

The last six months have been massive for us Foodies from the Food Science Association!

We had two of our biggest social events for the year in our Harbour Cruise and Ball in collaboration with our mates at CEUS and MATSOC. It was great to see so many people coming together in person for some of the largest turnouts post-Covid lockdowns.

It wasn't all fun and games as we also offered opportunities to help build professional networks at the annual CEUS x FSA Industry Networking Night. With over 100 students attending and over 20 different companies represented, it was a great chance to get our networking on.

Our inaugural Career Pathways Convention in June was also a hit. We brought together a range of professional bodies, including AIFST, Nutrition Society Australia, Professionals Australia, and even international guest speakers from IFT to present the different career options available alongside some of the key skills and tools that students can use to kickstart their careers. The event was capped off with a panel of current UNSW postgraduate students as well as some of our favourite former FSA Presidents who gave great insight and plenty of priceless advice.

By far the highlight of the year was travelling to Melbourne for the AIFST Convention '22 and 5 site visits. Our group of 15 students were warmly welcomed by companies such as KraftHeinz, Aryzta, CSIRO, Yakult and Kinrise – we were able to see, hear, smell (and taste!) food fresh off the line and meet some amazing people who were more than happy to answer just about any question we had.

As another year comes to an end, I'd like to acknowledge the incredible work of the outgoing executive team. Without your help and support we would not be able to offer such a range of different and engaging events for our students. I'd also like to especially thank Alina Xie, Annelise Sarikas and Eliza Otton for all their efforts and contributions to the FSA over the past years.

With an almost brand-new and fresh-faced executive team coming in next year, ready to keep up the good work from the last few years, this is an exciting time for the FSA and I look forward to seeing what the future brings for them!

Finally, a special thanks to all students and staff who got involved with society events this past year and to the School of Chemical Engineering for its continual support.

Instagram: @fsa.unsw | Facebook: | Linkedin

Invitation to Industry Partners

The UNSW School of Chemical Engineering has a long tradition of engagement and collaboration with industry. Over the years, our students have not only greatly benefited from industry guest lecturers, and their participation in curriculum review, but also from a range of site visits, industrial training placements and industry-based projects spread across the teaching programs. The industry also gains from these interactions, having prime access to the best graduates on the market and to academic experts in the topics of energy, polymers, environmental technologies, food science and nutrition and more to address their research needs. We invite industry to engage with our school through one of our many pathways.

Teaching

Contact: Stuart Prescott
Deputy Head of School Education
s.prescott@unsw.edu.au

Educating the next generation of Chemical Engineers is the main objective of the School and we continuously strive to offer modern and industry-relevant programs. Both students and Industry partners can greatly benefit from industry participation to our curriculum and seminars, during which a range of topics and case studies can be presented. We also invite industry representatives to interview 4th year students on their capstone design project (see video)

Examples:
- Guest lecture
- Curriculum design/ review
- Inspiring alumni presentations
- Case studies
- Interview/ Assessment

Site visit (real or virtual)

Contact: Sarah Grundy (Lecturer)
s.grundy@unsw.edu.au

Visits of real operating plants are a great opportunity for the students to see chemical engineering in action. We are now bringing some visits to the next level by developing virtual reality tours which can be used directly in our teaching materials. See here the insight virtual visit of the Tooheys brewery at Lidcombe guided by one of our new undergrad student.

Examples:
- Virtual Reality tour of Tooheys
- Site visit Tooheys

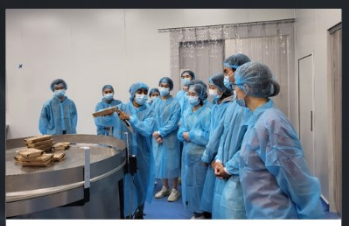
Scholarships/ prizes/ awards

Contact: Emma Lovell (Lecturer)
e.lovell@unsw.edu.au
or Co-op office (cooprog@unsw.edu.au)

UNSW, the Faculty of Engineering and the School offer a range of options to celebrate the great work done by our students through prizes and awards. One of the most prestigious accolade remains the Coop scheme during which industry can sponsors a high achiever high schooler to join the Chemical Engineering program and work with them through a number of internships distributed across the program.

Examples:
- Honours poster prize
- Co-op program

UNSW Co-op Program Scholarship



Industrial training & graduate job opportunities

Contact: Sarah Grundy (Lecturer)
s.grundy@unsw.edu.au
or industrial training office, ENG.it-training@unsw.edu.au

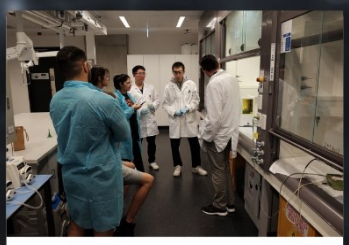
Industrial training allows industry partners to work with current students and to identify potential future recruits. Students have the opportunity to gain exposure to a Chemical Engineering or Food workplace, culture and expectations. It plays an important part in any engineer's professional development. Scan the QR code to read our Industrial partner guide.

Industry Honours Project

Contact: Pierre Le-Clech (Deputy Head of School Engagement)
p.le-clech@unsw.edu.au

We have been running several 4th year honours projects with industry partners such as Arnotts, Sydney Water, Tooheys, where the students work on topics related to industry challenge and with an industry mentor.

There is no stipend required, although depending on the nature of the project, the industry partner may provide in kind in the form of materials, access to their facilities, etc. If you have a project topic / scope, feel free to contact us.



Consulting/ Commercial Activities

Contact: ChemEng@unsw.edu.au
or specific academic of interest for consultation specific to your field

Industry can greatly benefit from the range of resources, infrastructure and expertise that UNSW and the School of Chemical Engineering staff can offer. Whatever the size of your business or business problem, we can help.

Examples:
- Access to advanced analytical services
- Assitance with results interpretation and advices

To view full list of equipment in UNSW Mark Wainright Research Center (MWAC), head to

Research Projects (including industry Master and PhD)

Contact: Cyrille Boyer (Deputy Head of School Research) cboyer@unsw.edu.au
or Cordelia Selomulya,
cordelia.selomulya@unsw.edu.au

We are in constant conversation with industry partners to assess and address their current challenges. By holding the quality of our research to the highest academic standards, we aim to deliver positive, real-world impact to the industry. While the Australian Research Council (ARC)'s Linkage scheme remains a conventional appraoch to work with the School, research partners can benefit from new industry-Master and -PhD programs.

Examples:
- Linkage with Australia Research Centre (ARC)
- Future Food Systems CRC
- Master of Industrial Research
- Industry-based PhD project
- AGSE PhD (to be launched in 2022)

Philanthropy

Contact: UNSW Alumni and Giving

By giving to UNSW and the School of Chemical Engineering, you are enabling cutting-edge research and creating opportunities to break cycles of disadvantage. In particular, we work with non-for-profit organisations and foundations to develop and conduct humanitarian engineering projects in various countries.

Congratulations to our recent PhD and Masters graduates!

Jing Shi, PhD
Advanced Alumina Feeding Control of Aluminium Smelting Cell

Ariestya Arlene Arbita, PhD
Biochemical, milk-clotting and cheese making properties of proteases from the marine macroalga Gracilaria edulis

Alexander Charlton, PhD
Characterisation and Optimisation of hydrodynamics in Emerging Membrane Technologies for Water Treatment

Gervase Ng, PhD
of Well-defined Macromolecules through Photomediated Reversible Deactivation Radical Polymerization: An Application of Oxygen Tolerant High Throughput Approach

Stephanie Chua, PhD
Towards effective design of electrolytes for lithium-metal batteries using metal organic frameworks

Liwen Zhang, PhD
Metalloporphyrin Based Photocatalysts for PET-RAFT Polymerization and Applications

Jialuo Han, PhD
Exploring the surface and core properties of liquid metals

Zhipeng Ma, PhD
Development of Hybrid Copper-based Electrocatalysts for Carbon Dioxide Reduction to Valuable Chemicals

Erna Wulandari, PhD
Antimicrobial Platforms for Combating Multidrug-resistant Bacteria in Wounds

Lei Zhang, PhD
Exploiting SUMI Technique for Kinetic and Mechanistic Investigation in Initialization Stage of Photo-RAFT Polymerization

Xin Jin, PhD
DEM Study on the Mixing Behaviour of U-shaped Ribbon Mixers

Michael Christoe, PhD
Telecommunications and other electronic subsystems of ingestible capsule devices

Ruizhe Liu, PhD
RAFT Single Unit Monomer Insertion Technique for Tuning Sequence Structures and Thermal Properties of Discrete Oligomers

He Zhang, PhD
Coordination Nanoparticle Based Drug Delivery Systems for Cancer Treatment

Muhammad Saad Salman, PhD
Developing Core-Shell Borohydride Nanoarchitectures and Understanding their Structure-Hydrogen Release/Uptake Relationships

Quynh Anh Le, MPhil
Encapsulation of Protein Allergens with Bimetallic Metal-Phenolic Networks (MPNs) for Therapeutic Applications

Zainab Zehra Mustafa, PhD
Characterisation of feed and membrane properties for industrial ultrafiltration management

Zeyu Shao, MPhil
Antimicrobial Polymers as Adjuvants/Synergists of Antibiotics to Combat Multidrug-Resistant Bacteria

Jenani Sutharsan, MPhil
Development of Edible Chitosan based active film with improved Physicochemical and Biological properties

Peter Judzewitsch, PhD
Using Photopolymerisation for Streamlining the Discovery and Production of Antibacterial Polymers

Shuang Song, PhD
Modelling of fluid flow through packed beds and application in water treatment processes

Nigel Rambhujun, PhD
Alternative bottom-up approach to design and prepare hybrid magnesium nanostructures for solid state hydrogen storage

Zijie Luo, PhD
Nanomaterials and Polymers for Nitric Oxide Therapeutic Delivery and Sensing

Ali Asghar Esmailpour Valmazouyi, PhD
Understanding the Role of Oxygen Vacancies in Catalytic Ozonation Process to Degrade Organic Pollutants

Boran Xia, MPhil
Crossing blood-brain barrier via nanobiotechnology

William Hadinata Lie, PhD
Prussian blue analogue thin-films for electroreforming of biomass-derived alcohols

Rabiatul Mat Noor, PhD
Synthesis of Polymer/Graphene Oxide Nanocomposite Foams: A New Dispersion-Based Approach

Choon Jie Wong, PhD
Dynamic Mass and Heat Balance Model of Hall-Héroult Cells: A Discretised Approach

Thi Thu Phuong Pham, PhD
Design of Ternary Antimicrobial Polymers

Chulaluck Pratthana, PhD
Alanates at the nanoscale: synthesis, stabilisation, and hydrogen storage

Danladi Yunana, PhD
Managing the risk of legionella in drinking water aeration processes

Lai Wei, PhD
Discrete-time Contraction Analysis and Controller Design for Nonlinear Processes

Junma Tang, PhD
Mechanochemical application of liquid metals

Timothy Zurrer, PhD
Catalyst Decorated Magnesium Metal-Organic Frameworks for the Capture and Conversion of Carbon Dioxide to Chemical Fuels

Zhouzun Xie, PhD
Multi-resolution modelling of polydisperse particulate flow in solid-liquid systems

Prabal Sapkota, PhD
Self - Breathing Fuel Cells - From Catalyst Synthesis to Cell/Stack Design and Performance Analysis

Zhiheng Zhang, PhD
The Application of Photomediated RAFT Polymerisation in 3D Printing

Xueting Wang, PhD
Ultrasonication-assisted Preparation of Zn-BTC nanoplates and Electrochemical Applications of Its Derivatives

Farhan Ahmad, PhD
Understanding the role of catalyst in hybrid nonthermal plasma-catalytic methanation of CO2

Muhammad Yazid Bin Zulkifli, PhD
Phase Control and Transformation of Azole-Based Metal Organic Framework Composites

Chengchen Zhang, PhD
Liquid metals droplets in polymeric and biological systems

Qianyi Zhang, PhD
Synthesis and Surface Modification of Nanoparticles for Biomedical Imaging Applications

Awards, grants and fellowships

Cyrille Boyer - Laureate Fellowship Recipient & Australian Leader in Polymers and Plastics

In November, Research Magazine 2023 (published by The Australian) named Prof Cyrille Boyer as the Australian leader in the field of polymers and plastics. Prof Boyer was also awarded a Laureate Fellowship in September, through which he aims to develop a suite of chemical reactions independently activated by specific colours of light to produce advanced 3D printed objects. These innovative tools will revolutionise 3D printing methods, creating a new era of advanced manufacturing.

Rahman Daiyan

Prog Rahman Daiyan was awarded a DECRA Fellowship for his research in designing |single-atom catalysts for renewable waste conversion to urea, in which the utilisation of flue gas and wastewater will be materialised, extending the scope of renewable Power-to-X to realise a circular economy.

Emma Lovell

Emma was recognised with an ARC DECRA Fellowship or her research in photo-thermal ammonia decomposition, with the aim to develop catalysts tailored towards capturing light for ammonia decomposition to enable a new potential pathway for the hydrogen economy, with ammonia as hydrogen carrier.

Angie Tjandra

Angie won first place in the annual interuniversity NSW JCEC iChemE Postgraduate competition, was part of the winning team for the UNSW New Wave competition, and was a finalist for the NSW International Student of the Year Award.

Patrick Spicer

Patrick received $594,000 in funding from Fonterra Co-operative Group to support a 5-year project on advanced imaging of food structures. The work supports a postdoctoral researcher and PhD student and is part of a global four-university collaboration supporting Fonterra's research.

Kang Liang

Dr Kang Liang was awarded an ARC Future Fellowship of $985,876 to develop nanobionic plants as a network of semi-permanent sensors capable of rapid, sensitive, selective and unmanned detection and detoxification of chemical warfare agents in aquatic environments and in open air on-site, to allow timely and effective countermeasures. The goal is to advance the field of advanced manufacturing, environmental change, and nanotechnology with potential to support new national defence capabilities.

Han Zhaojun

Dr Han Zhaojun was awarded an ARC Future Fellowship of $947,616 to develop multifunctional 2D vertical heterostructures for sustainable energy applications. Expected outcomes will include improved electrochemical performance of materials and an integrated

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

What's hot?

Graduate Certificates

Study something bite-sized to whet your appetite for our postgraduate programs.

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.

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

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

chemeng.FutureStudents@unsw.edu.au

UNSW School of Chemical Engineering

@UNSWChemEng

@UNSWChemEng

www.unsw.edu.au/engineering/our-schools/chemical-engineering

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

Academic Team

Ali Jalili

Alice Lee

Alison Jones

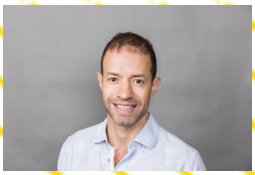
Cordelia Selomulya

Da-Wei Wang

Dipan Kundu

Edgar Wong

Emma Lovell



Francisco Trujillo

Graeme Bushell

Greg Leslie

Jason Scott

Jayashree Arcott

Jian Zhao

Jiangtao Xu

Jie Bao

Johannes Le Coutre

Kang Liang

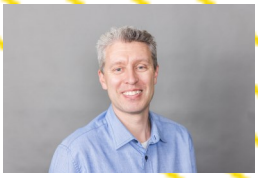
Kourosh Kalantar-Zadeh

Liming Dai

May Lim

Nicholas Bedford

Patrick Spicer



Per Zetterlund

Peter Neal

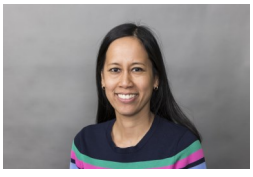
Peter Wich

Priyank Kumar

Rita Henderson

Rona Chandrawati

Rose Amal



Sarah Grundy

Xunyu Lu

Yansong Sheng

Zhaojun Han

Zi Gu

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

UNSW School of Chemical Engineering
@UNSWChemEng
@UNSWChemEng
UNSW Chemical Engineering

UNSW Chemical Engineering
https://www.unsw.edu.au/engineering/our-schools/chemical-engineering