MONASH University

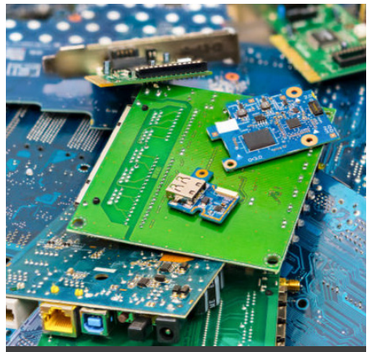
MONASH
CHEMICAL &
BIOLOGICAL
ENGINEERING

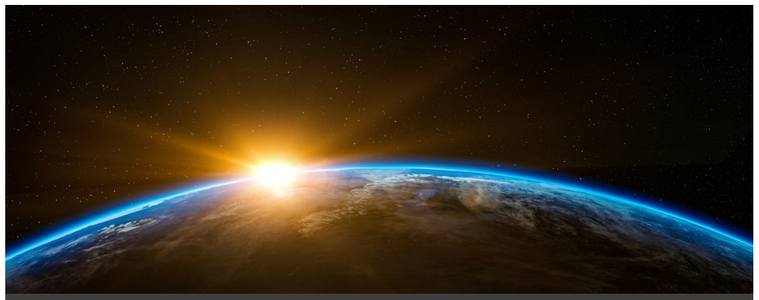
October 2021

FOCUS

TEACHING AND RESEARCH NEWS FROM THE
DEPARTMENT OF CHEMICAL & BIOLOGICAL ENGINEERING

CONTENT HIGHLIGHTS





FROM THE HEAD OF DEPARTMENT

Semester One of 2021 was on campus and a great relief after the lockdowns of 2020. Unfortunately, yet another lockdown hit Melbourne as we commenced Semester Two. Yet, as you can read in this FOCUS, our students and staff have persevered – completing degrees, starting new programs, initiating new research, and founding their own companies!

A first piece of big news is that we are now the Department of Chemical and Biological Engineering! The name change reflects curricular movements that began years ago and continue to evolve as chemical engineers engage with a wide variety of industries and increasingly focus on developing sustainable solutions. Our chemical engineering degrees will continue – but increasingly include biological approaches within the engineering solution set. In 2021, we also began offering a Masters of Biological Engineering – and students now have a pathway to a B Eng in Chemical Engineering and an M Eng in Biological Engineering in just five years. Over one-third of our students already opt for chemical engineering degrees coupled to another course with extensive biological content. The Department's research has also increasingly included biological engineering with 70% of academics engaged in biologically-relevant research - including our showcase bioprocessing efforts at BioPRIA and MIPO. In summary, the name change to Chemical and Biological Engineering reflects the Department's present teaching and research efforts – and is an important step for the Department as we create and define the processing field's future. We received endorsement and approval of this change from the Dean of Engineering and Monash's Provost and Vice-Chancellor. You can read about our new M Eng degree in this issue.

The second, bigger piece of news is the remarkable resilience required of our students this year. In 2021, our students have continued to progress in their courses, graduated and moved on to jobs and advance degrees, and have driven new opportunity as entrepreneurs. We are particular proud of this year's student award winners Garv, Thomas, Marisa, Samantha, Romalya, Nicholas, Dhiela Kuruvilla Vadakethu, Koh Yi Sze, Chiaw Kher Ai, and Wail Gourich and you can read their stories in this issue. Learn about our amazing entrepreneurs Rabeeh and Brian (e-waste), Daniel, Gina, and Shivam (The Zythologist), Jun and Xingya (Eureka Prize nomination), and Mostafa, Madhi, and Clare (James Dyson award competition). Read about Chiaw Ker Ai, Ooi Wen Shin, Yong Jing Ru, and Oon Su Ann and their commitment to energy sustainability and the COPE-BEST 2021 Video challenge. You can also read about the latest from the Monash Brewlab, MC3, Solar Water, SMUCE, the Chem-E car team, MEPSS, and the Student Pilot Plant.

Best wishes for the upcoming holidays and 2022!

Mark M. Banaszak Holl
Professor and Head, Department of Chemical & Biological Engineering

STUDENT NEWS

Waste to energy - recycling waste batteries

Two enterprising students from the Department are taking up the challenge of battery recycling with an ambitious plan.

Millions of electronic devices – including televisions, computers and mobile phones – are tossed into landfill each year in Australia, becoming the fastest-growing component of the municipal solid waste stream.

The Global E-Waste Monitor 2020 reported that e-waste increased by 21 per cent in the five years to 2019, and predicted that by 2030 it will be almost double the 2014 figure, fuelled by higher consumption rates, shorter lifecycles and limited repair options.

Among these mountains of e-waste are valuable materials, precious metals and limited resources.

In this context, Rabeeh Golmohammadzadeh and Brian Jong have launched the Monash Waste to Energy Student Team with some clear aims:

- To reduce hazardous waste from landfills
- Recover valuable materials from waste lithium-ion batteries (LIBs) as secondary resources
- Reduce the shortage of components form battery manufacturing and other industries

Noticing the increased number of spent LIBs in Australia, and lack of proper recycling process for treatment of this hazardous waste, the pair participated in and won the India Australia Circular Economy Hackathon (recycling critical energy metals and e-waste). This hackathon, organised by Atal Innovation Mission, NITI Aayog, the Government of India and CSIRO, provided a platform for students to present solutions to imminent issues faced by our society.

Rabeeh and Brian are hoping to grow their team and are seeking passionate students with an engineering or marketing background. Membership brings many benefits, including the satisfaction of working to solve a real-world problem through a multidisciplinary scientific approach, improving scientific as well as presentation skills, and the opportunity to participate in various competitions and seminars.

As final year PhD students, growing and managing a student team, especially during a pandemic, brings its own challenges, including how best to attract funding and interest from industry, as well as maintaining the balance between studies and team management.

The pair are looking for funding through different resources and hope to establish a pilot plant process based on the technology that they have developed.

Contact the team

Highest ranked in Climate Launchpad

In the climate launchpad competition, Brian and Rabeeh, together with a student from Deakin University, Henrique Bastos, presented their startup idea (based on Rabeeh's PhD thesis) to recycle lithium ion batteries using more economic and environmentally friendly approaches.

They ranked 1st in Victoria and placed in the top 8 start-up teams nationally.

The Climate Launchpad is the world's biggest cleantech and green business ideas competition.

IChemE Student Summit

Students from three of Melbourne's largest universities were invited to the 2021 Victorian IChemE Student Summit, held in July.

The 2021 summit focussed on pharmaceuticals and was organised as both an in-person and online event.

Participants from Monash University, RMIT and the University of Melbourne were joined by company representatives and members of the IChemE committee.

Advisors from CSL, Seqirus, Pfizer, Exopharm, Haemokinesis, and the CANN group gave their insights into the industry during panel discussions and made themselves available at the networking sessions.

The panel members were asked to discuss two key questions:

1. What is expected to evolve due to market and technological opportunities?

2. What key impacts do innovations from chemical engineers have outside of the traditional research and development activities (R&D)?

Other companies represented at the summit ranged from the pharmaceutical industry, to oil and water treatment companies and included GHD, Woodside, Dulux, Boral, Exopharm, PPG, CSL, gsk, Greater Western Water, Worley, Suez, and Ixom.

Student attendees had the opportunity to network with students from other universities, panel members, IChemE staff members, and industry insiders.

Final year students could meet people in industry and learn about future employment opportunities, while penultimate year students could explore internship options.

Learn more about the IChemE and its student initiatives

Anterior Cruciate Ligament: misfortune or just overuse - a 3-Minute thesis

Congratulations to Kevin Putera, the 2021 winner of the Departmental 3-minute thesis competition.

Kevin's 3 minutes provided an engaging overview of his research into Anterior Cruciate Ligament (ACL) injury. ACL injuries are so common they have become a household name in the Australian sports community, notably in the Australia Football League (AFL). When a person has torn their ACL, the ACL cannot heal on its own. Reconstruction surgery to replace the torn ACL is the preferred treatment to regain knee stability. However, the surgery involves rehabilitation of up to 12 months. In addition, 50% of all patients who have torn their ACL go on to develop osteoarthritis at later stages of life. Hence, preventing the injury from happening in the first place is crucial. Kevin's research aims to uncover the fundamental chemical and mechanical changes to the biomaterial in response to fatigue induced to the ACL. Understanding the motions that induce fatigue, and the biological responses associated with it, can be used to further understand the ACL fatigue failure mechanism, which can ultimately contribute to strengthen ACL injury prevention programs.

Watch here

AINSE PGRA award to support food technology PhD student Alice Tiong

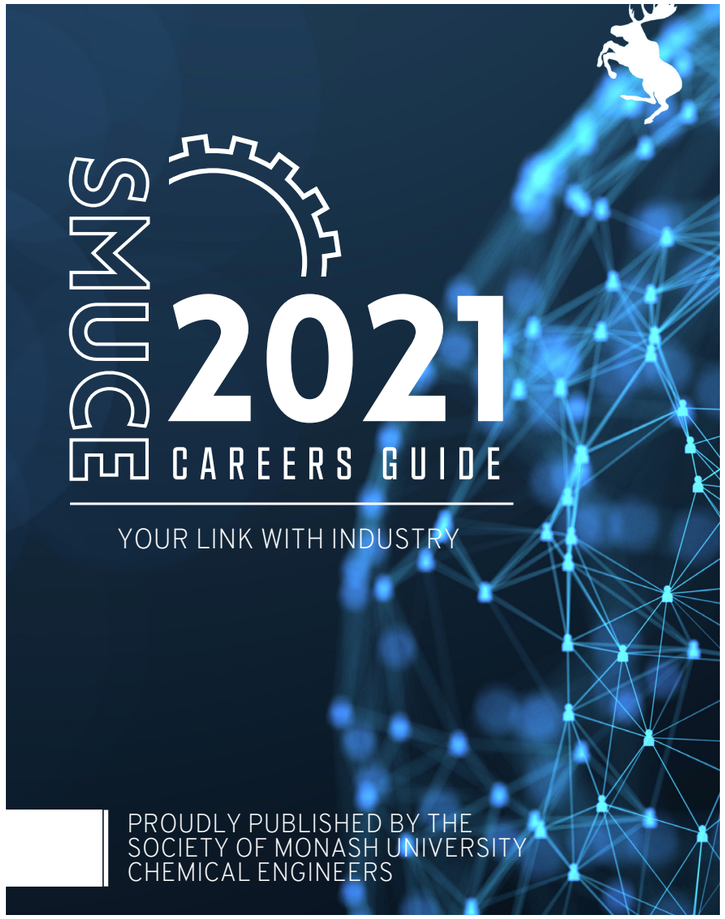
Congratulations to PhD student Alice Tiong who has been awarded an AINSE scholarship to support her travel and accommodation to present at conferences, undertake field work or travel to ANSTO facilities.

Alice commenced at Monash 2014, gaining a Bachelor of Chemical Engineering (Honours). Following a stint working in industry, she was keen to learn more about food technology.

When an opportunity arose to return to Monash for her PhD, Alice joined the research group of Dr Leonie van't Hag, and is co-supervised by A/Professor Warren Batchelor.

Her research focuses on commercial pea protein sources to understand the relationship between protein composition, protein structure and thermal behaviour, determination of how final gel structure is affected by gelation kinetics of pea protein, how pea proteins behave during extrusion and the optimisation of the extrusion process for texture of the final product, and formulation of a functional food product with pea protein.

"I have met many amazing people that have helped my progress. When I finish my PhD, I aspire to work for the food industry in the formulation and production of healthy food products to provide alternatives to the current options available on the market."



SMUCE career guide out now

Global pandemics not withstanding, we are delighted to share the 2021 Industry Careers Guide. The guide, created by SMUCE, is designed to help current chemical engineering students in Australia prepare for their post university career. Information and tips range from creating a résumé to completing CPD hours and the employment process of different companies.

The Career Guide can be downloaded from the SMUCE website underneath the careers tab (or via the orange button below). The 2021 Careers Guide was collated by SMUCE 2021 Industry vice president.

SOCIETY OF MONASH UNIVERSITY CHEMICAL ENGINEERS

Linking students with industry

Contact SMUCE to organise your opportunity to connect with the Chemical Engineering students at Monash University.

Relieving stress with pancakes

SMUCE invited students to indulge in pancake deliciousness to bust through end of semester stress. Free pancakes were offered to any students on Clayton campus

"We held the event as a sort of 'stress reliever' for students during week 12. By offering a free sweet treat just before exams it provided an outlet for students to treat themselves, socialise and take their mind off the stresses that may be bothering them."

The event was organised and run by the SMUCE committee

STUDENT NEWS

Monash's MC³ team vying for a slice of the XPrize

Monash Carbon Capture and Conversion (MC³) student team is determined to make an impact with long lasting change.

With a membership of passionate and determined individuals, the student team was founded with the goal of entering in the XPrize Foundation and Musk Foundation Carbon Removal XPrize Competition, a global challenge to generate creative methods of pulling CO_2 from the atmosphere and locking it away in a lasting and sustainable way.

The team are working towards developing innovative, sustainable, scalable and economically viable solutions to capture and store carbon from the environment to improve the outlook for the future of the planet.

This year the team are ready to enter the Student Awards component of the competition. In February 2022, the team will perform bench demonstrations for Phase One of the competition. Prize money of up to $350,000 is up for grabs and winning would support the team's participation in the next phase of the XPrize Carbon Removal competition.

MC³ is open to all current Monash University students (from first year undergraduate to PhD students). Supported by a diverse range of academic and industry advisors, the team continues to explore and develop a range of ideas and solutions that are considered and scalable.

Why join?

MC³ technical officer Garv Bhardwaj believes the team offers a unique opportunity for students to tangibly work against climate change. As part of the team, students gain experience collaborating with industry professionals, while working to safely store carbon emissions through capture and conversion means.

Students also have opportunities to improve soft skills such as communication, creativity and leadership under the guidance of a range of academic advisors.

Participation in the XPrize Competition through Monash Carbon Capture and Conversion also exposes students to a network of like-minded individuals who share the same drive to personally influence the future of sustainability. Moreover, through the XPrize Team Matchmaking, members are able to interact with other teams from across the world.

In a triumph of resilience, the team, created in April 2021, has had to grow and develop during a global pandemic. Although this came with a unique set of challenges, it has resulted in a persistent and committed group that is excited to develop an innovative solution to our planet's current climate crisis.

A positive team culture has developed through online games nights and incorporating fun activities into team meetings. Having all the interactions over zoom has also led to stronger connections with team members from Monash Malaysia, creating a united team across all campuses.

As awareness around the importance of climate action continues to grow, MC³ provides a space for students to generate innovative solutions to issues they are passionate about in a practical and implementable way

MONASH
CARBON
CAPTURE
CONVERSION

STUDENT NEWS

Students producing solar powered clean water

When Oxfam reached out to Professor Xiwang Zhang to create a water desalination device for rural areas, Professor Zhang led a charge of researchers to produce a prototype. A student team has been working on improving the prototype ever since.

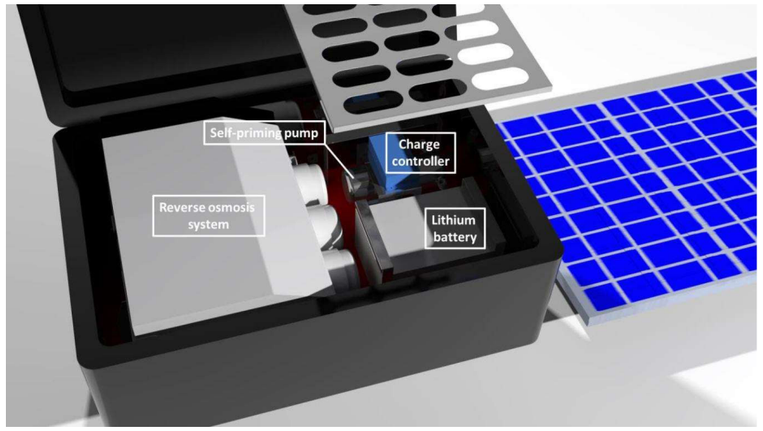
The Solar Water team aim to introduce the system into remote indigenous communities to improve the health and wellbeing of those affected by contaminated water.

The brief for the desalinator had four criteria: off-grid, portable, low-maintenance, and low cost.

This student-led team is on a mission to provide a low-cost, low-maintenance and sustainable desalination system for use in rural areas with little to no access to clean water.

They are equally committed to raising awareness of the social issues of clean water and sanitation in remote areas, and the potential of renewable water management solutions. With a focus on continual improvement, they design, manufacture, test and modify the water purification prototype, in consultation with the Department and the Monash Sustainable Development Institute.

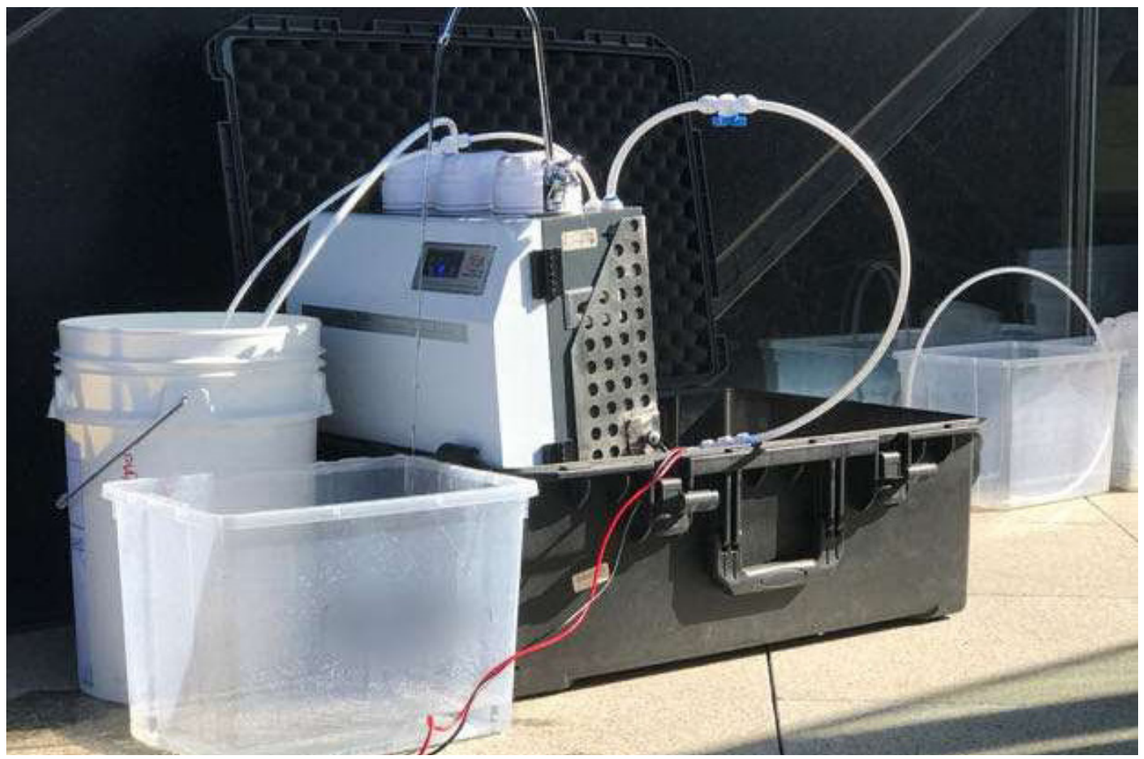
Currently, the team mostly consists of engineering students, but it is also open to students from other disciplines.



Students have the opportunity to develop the current prototype by adding their own innovation and partake in field testing to further the design and tailor it to specific environments, ensuring that the prototype is viable within communities. Engineering students will also have the added benefit of CPD hours and soft skills such as leadership, communication and teamwork

Despite the challenges of 2021, the students have done their best to connect, share ideas and remain motivated to move forward with the theoretical aspect of the design process.

“We would like to make rural visits to test the prototype in both the environment and community. We also aim to expand the team in the future in order to continue improving our prototype, and we also want to move into outreach and create awareness around the issues we are tackling, particularly for school students. Through our growth, we aim to build industry ties, both strengthening existing partnerships and connecting with new ones.”



Brewed by science - introducing *The Zythologist*

Combining a passion for brewing with a love for science, three Monash alumni have launched the ultimate crossover business.

Their enterprise, *The Zythologist* is a science-based brewery and analytical testing company. Not only do they brew unique combinations of flavour molecules in beer for commercial sale, but also offer their services to help other craft brewers improve their beers and processes.

The group of PhD science and engineering graduates, all of whom have a passion for beer and learning how things work, and have taken a different approach towards brewing. To make high-quality beer, they decided to start at the beginning to understand how brewing works chemically, analysing beer and what constitutes its quality.

There are over 40 dimensions and 300 compounds impacting flavour and quality that help shape beer in a specific way, so analyses can be quite complex. The insights derived from these analyses have the potential to improve efficiencies, save costs, and offer a path for product differentiation.

The Zythologist follows the team's first group effort, namely the Monash BrewLab, which they founded in 2018 as Australia's first student-led brewing team. After leading the BrewLab to its current success, they wanted to continue their legacy after graduation so jumped in and gained some experience in commercial brewing.

Now with formal affiliation with the Department of Chemical and Biological Engineering at Monash University, the Zythologist has extended its scope and incorporates education and research to its existing pillars of beer production and analysis.

The team behind the brew

Daniel Rojas Sanchez
CO-FOUNDER
With a PhD in Chemical Engineering, Daniel combines the scientific expertise of a researcher with the passion of a beer enthusiast. He has expertise in brewing processes and beer analysis, paired with a strong voice for sustainable practices. He uses his academic background in environmental modelling, his experience as the director of Monash BrewLab, and his professional path as a sustainability consultant to achieve his goal of redefining the future of craft beer.

Gina Pacheco Arredondo
CO-FOUNDER
Gina has a PhD in Chemical Engineering focused in biotechnology and a Masters of Science in Biochemistry. She is a skilled researcher specialised in protein engineering, microbiology and analytical techniques in the brewing, food, pharmaceutical and environmental areas. Her experience as Technical Operations Manager of Monash BrewLab and PC2 laboratory manager have made her an advocate for safety and safe work practices (and sanitation).

Shivam Tandon
CO-FOUNDER
Chemical Engineer and an innovative brewer, Shiv was introduced to brewing with a scientific lens during university and as Technical Operations Deputy Manager of Monash BrewLab. This mix of brewing and science ultimately shaped Shiv's degree, leading to specialising in yeast metabolites and kinetics. He is an experienced brewer with expertise in brewing processes, microbiology recipe development, and remote brewing laboratory operations.

Learn more

STUDENT NEWS

Monash Brewlab

The Monash BrewLab has not let the pandemic and successive lockdowns get in the way of good brews, with several exciting projects keeping the team busy throughout 2021.

Always on a path of improvement, the student run team has been working with BIRA, an interlaboratory proficiency testing service to compare its analytical procedures and results with professional breweries and analytical laboratories across Australia. Initial results have shown where improvements could be made, motivating the students to modify, improve and compare with some of the best breweries in Australia.

BrewLab also competed in the Good Beer Week Event "System Wars" at Grain And Grape, where they spent a day at the Grain and Grape warehouse, brewing alongside pro-brewers like Hop Nation, Stomping Ground and Co-Conspirators. Their submission, co-brewed with BrewLab Alumni Shivam Tandon and Daniel Rojas Sanchez (of *The Zythologist*), came equal second in the competition, which was a very exciting result for the team.

Further activities have seen the group working with industry partners including IMCD - a specialty chemical and ingredient supplier, where they experimented with new yeast strains for whiskey production.

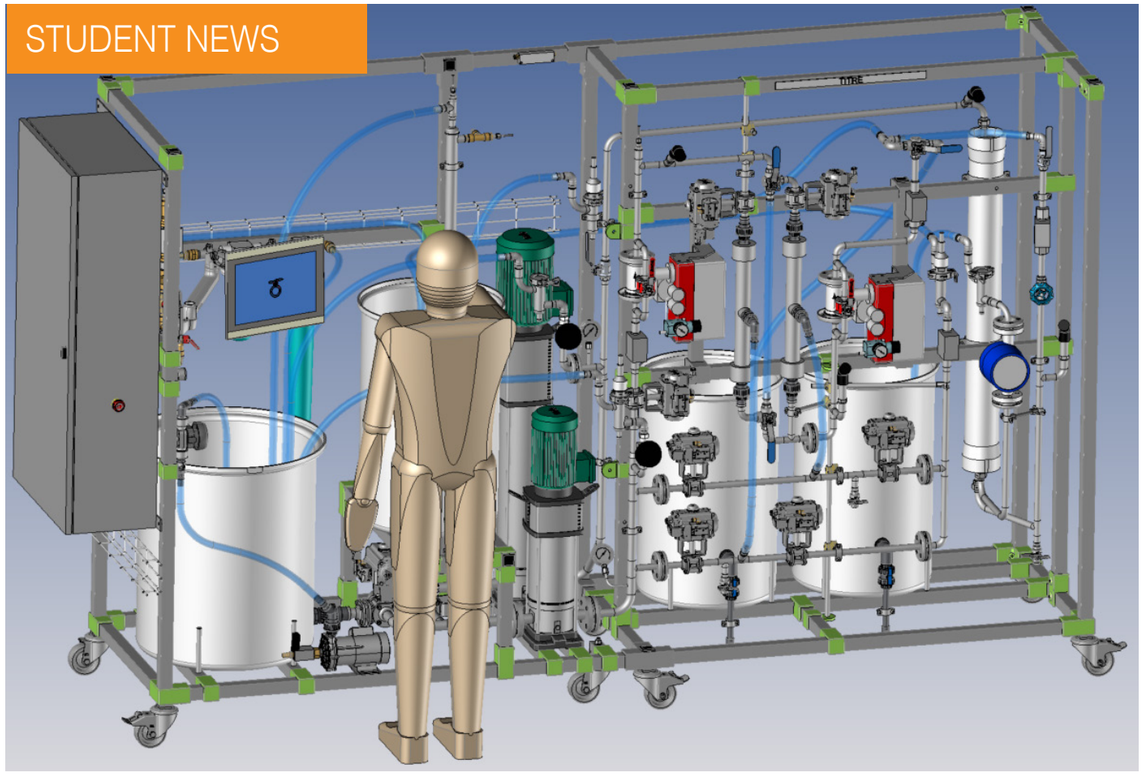
To celebrate International Women's Day, the women of the team brewed a special Lemon and Hibiscus Blonde Ale, which received a seal of approval by Dean of Engineering, Elizabeth Croft.

The year has not been without its challenges, with lockdowns impacting the brewing schedule and operations. Discontinuity of access to campus laboratories has limited what the team have been able to brew, reducing opportunities for some members to build skills and experience with the equipment.

However, at other times brewing has been full steam ahead, moving to an accelerated schedule and maximising the time available. Brewlab are particularly grateful to Dr Leonie van 't Hag and Ms Kim Phu, amongst many others in the faculty, who have greatly assisted the team in getting access to the laboratory and for general support at a difficult time.

Monash BrewLab will open the next round of recruitment in early 2022, just prior to the beginning of Semester 1. All students at Monash are eligible to apply, undergraduates to PhD students, however applicants must have at least one year left in their study. Anyone who is eager to learn more about the application process or express interest can email the team at brewlab@monash.edu.

Members of the BrewLab gain an invaluable and unique experience, dealing with project management, budgeting, specialist analytical equipment and engagement with a wide range of stakeholders. Those applying for graduate roles or internships often find their BrewLab experience to be of great value when reflecting on questions about leadership, teamwork and problem solving.



Student-led pilot plant integrated into curriculum

Chemical and biological engineering students at Monash will soon be able to gain industry-relevant hands-on experience with physical equipment and key state of the art digitalisation technologies including AI, machine learning and digital twins.

The new pilot water treatment plant is a semi-industrial scale apparatus demonstrating water and wastewater treatment via ultrafiltration and reverse osmosis membrane technologies. Water treatment was chosen due to its direct relevance to many of the Australian industries that employ chemical engineers.

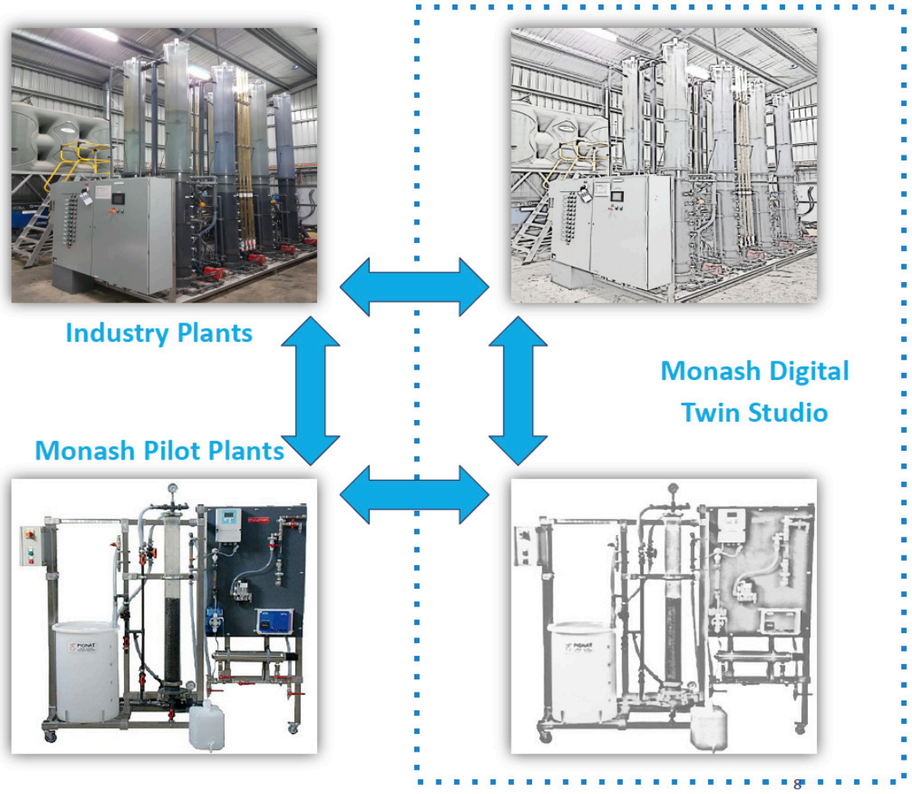
Directed by Dr Joanne Tanner and supported in the initial phase by Department technical and safety staff, the long term plan is for the plant to be run by a student-led team. An advisory group consisting of industry, academic and student members, plus a consortium of industry sponsors will ensure ongoing management and stakeholder engagement.

The pilot facility will be integrated into the curriculum across all year levels to give students practical, authentic industrial experience and offer them the opportunity to undertake interdisciplinary projects.

Opportunities for direct industry research projects, all involving students, are available via FYP (ENG4701), The MITI program, WIL (ENG5008), masters project (ENG5005/6), faculty summer research programs, and CoOp.

The double-height pilot facility is designed for optimum public accessibility and external visibility, with a cut-in staging area showing the equipment itself, a viewing platform on the mezzanine level, and large external windows wherever possible.

Multipurpose office and collaborative spaces (not shown) will also be included on the mezzanine level. The Pilot Control Centre (PCC) and Digital Twin Studio will be a multi-purpose collaborative teaching space, with AV capabilities similar to those in the Woodside Building.



Integrated with industry Students will interact with the Monash pilots and related industry plants physically and virtually. Digital Twins of the Monash and industry facilities will be housed in and linked via the Monash Digital Twin Studio.

The PCC features will closely mimic similar industry facilities, and will include an industrial SCADA system to enable pilot plant users to operate the equipment and gather process data in the manner of engineering professionals. The Digital Twin Studio, which can be physically separated from the PCC to enable simultaneous use, will house comprehensive digital twins of the Monash pilot plants, as well as securely hosted digital twins of key industry partner sites related to the Monash pilot plant processes. Key partnerships are underway or planned related to water and energy technologies.

The space can also be divided to play out real world scenarios such as remote site management and troubleshooting, multi-facility integration and scheduling, and integrated control and optimisation, and to enable industrial short courses and operator training sessions to be run at the facility.

The facility and pilot plant processes will be designed with a focus on sustainable production and renewable energy.

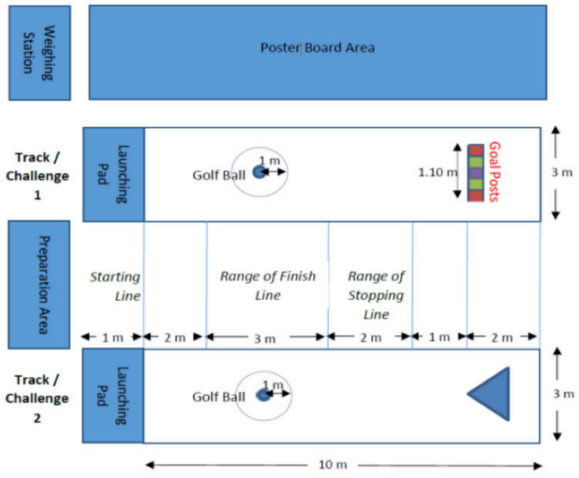
The future options for the second main pilot plant include CO_2 Utilisation, Biogas Processing and Waste (Plastic and Tyre) Processing. It is likely that only one of these will be implemented due to space considerations and the overlap in key equipment and concepts. As with the BEWT pilot, the future options are modular and flexible, and various inputs and outputs from the future options can be interconnected with the BEWT pilot. All of the options can be pursued with industry partners in the context of the Digital Twin Studio.

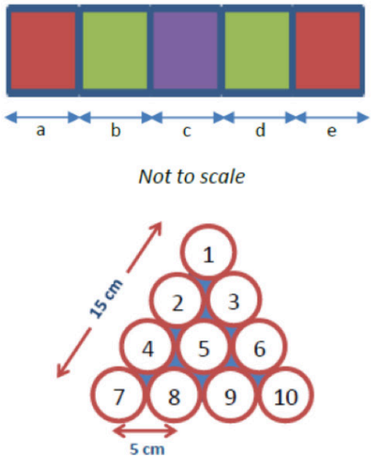
Learn more

Chem-E Car

The Chem-E Car Team in Monash Malaysia were in charge of organising the annual internal Monash Chem-E Car Competition in which teams of four students, consisting of at least two chemical engineering students, competed against another to qualify to participate in the annual Institute of Engineers Malaysia (IEM) Chem-E Car Competition. The objective of the competition is to design a shoebox sized car capable of operating via chemical reactions and carry a fixed load of water. The car is then tested on two obstacle courses:

1. To score a goal by hitting the golf ball into the goal posts. A centralised goal (ball enters purple region) achieves a higher score.
2. To knock down pins by hitting the golf ball using the car. (Just like bowling)





In 2021, the 7th Monash Chem-E Car competition was held on the 31st of July as a virtual competition due to the Covid-19 Pandemic. In the virtual competition, teams were tasked with designing the car along with innovative solutions on how their car can overcome the obstacle courses. A total of four teams competed by pitching their ideas in front of a panel of judges from the School of Engineering. The car design was judged based on a few aspects; starting and stopping mechanism, economic, environmental, safety and special features of the car. All teams were given a maximum time of three minutes to present the ideas, then followed by a Q&A session to clarify doubts by the judges. An additional competing category was the car poster. The teams had to submit an A1 sized poster with clear descriptions of the car prior to the pitching session for evaluation.

The first prize was awarded to Team Vigor for the Poster Competition category, while Team Organic claimed the first prize for the Presentation Competition category. The competition ended with a photo session and a big thank you to the judges and participants for the active involvement.

We hope that the next Monash Chem-E Competition will inspire engineering students at Monash University Malaysia to join in and enjoy the experience, hopefully with a return to hands-on activities.

Team Organic pitching the special features of the car

1st runner up in the COPE-BEST 2021 video challenge

Congratulations to our all-female CHE undergraduate student team comprising of Chiaw Kher Ai, Ooi Wen Shin, Yong Jing Ru and Oon Su Ann on emerging as the 1st Runner Up in the COPE-BEST 2021 Video Challenge! The COPE-BEST 2021 Video Challenge, with a central theme on 'Convention on Promotion of Energy Sustainability Best Practices', was organised by Optimal Systems Engineering, in collaboration with the Universiti Teknologi Malaysia's Process Systems Engineering Centre and Malaysian Green Technology and Climate Change Centre, with MAESCO as a strategic partner.

The objective of the Best Video Challenge is to expose Malaysian students to the challenges of energy sustainability and increase awareness of the topic among the younger generations. The competition was opened to students from Malaysia's higher institution of learning and all Malaysians studying abroad. Entries were received from IPG Campus Kota Bharu, Monash University Malaysia, University of Melbourne, Universiti Teknologi Malaysia and Universiti Teknologi Petronas.

Watch the winning video submission

Monash University Malaysia IChemE Student Chapter – 2021 events

MAMAK Friday

Throughout the year, the Monash Malaysia IChemE Student Chapter hosted MAMAK FRIDAY, a biweekly meetup session for students to interact and connect with one another over games. The purpose of these sessions was to allow students in the committee a space to relax and wind down throughout the semester. It also gave them the opportunity to socialise and foster deeper connections.

Monash University Symposium of Chemical Engineering (MUSCLE)

The event was hosted as a two-day online workshop with an internal competition. Five guest speakers were invited to share their experiences and advice regarding the working environment, soft skills, the future of chemical engineering and different career paths available to chemical engineers.

Participants were invited from educational institutions across Malaysia, with some international guests. The event provided an opportunity for chemical engineering students to learn more about what they could expect in a working environment, as well as gain insight into potential careers post-degree.

The internal competition involved participants grouped in teams to present solutions to a variety of topics related to the COVID-19 pandemic. Group activities included ice-breaking, solving a quiz and presentation to a panel of judges. Based on their performance in the presentation, groups were able to compete to win cash prizes.

Synergy Career Talk

The event was hosted online with a speaker from the Synergy company invited to give a career talk and share his working experience with students. The event provided an opportunity for Monash students to learn more about the working environment and skills needed in specific careers.

Insight into Working in an Offshore Platform

A speaker from ExxonMobil was invited to share his experience working on an offshore platform, as well as details regarding the job scope and lifestyle. The event provided an opportunity for Monash students to learn more about this unique work environment.

IChemE Student Summit

The 2021 Malaysian IChemE Student Summit was organised via a collaboration of the Monash IChemE Student Chapter with University Malaya IChemE Student Chapter. The event was hosted online through a forum. The topic for this year's forum was 'Looking to the Future of Chemical Engineering…challenges, demand and innovation.' The Malaysia summit had a focus on palm oil processing. Three panels were hosted through this forum, as listed below:

Panel 1: Roles of Chemical Engineers in the Palm Oil Processing Industry

Panel 2: Future of Palm Oil Industry

Panel 3: Challenges in the Palm Oil Industry

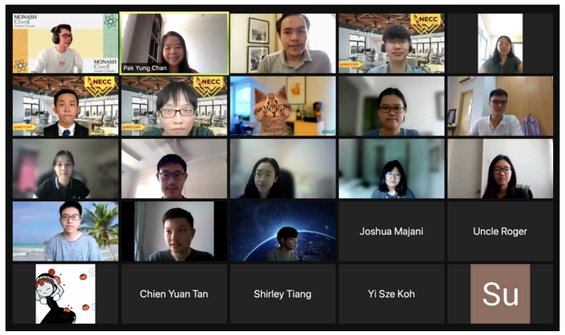
Four distinguished guest speakers in relevant industries were invited to speak on these panels.

Synergy Process Safety in Plants Talk

This talk was hosted as an online sharing session to introduce process safety in industrial plants to undergraduate students at Monash. A speaker from Synergy Engineering was invited to share their knowledge and experience in the industry. The session included a section for internship opportunities available at Synergy and application details.

Meet and Greet with Three Young Engineers

IChemE National Early Careers Committee (NECC) Malaysia collaborated with the Monash IChemE Student Chapter to host a meet and greet event for Monash students to connect with alumni currently working in the chemical engineering field.



Chemillion 2.0

Chemillion 2.0, continuing on from the previous Chemillion competition held in 2020, is a wordplay on *Chameleon* and follows the theme of 'adapting to the surroundings'. The competition is primarily aimed at challenging Monash students at persisting and adapting to competitive situations given a limited number of resources. Students will have to think critically and work together in groups of three to come up with solutions for a given problem before the given deadline. Winners will walk away with certificates and prize money from a total prize pool of RM 3400.

This event is aimed at providing participants an opportunity to display their skills and apply their theoretical knowledge in a practical situation.

The competition will also place an emphasis on the importance of sustainability development, which is crucial to raise awareness among participants regarding the roles of chemical engineering in mitigating global issues. Finally, the competition serves as a platform for participants to build connections and relationships among peers, which is crucial especially during this global pandemic.

RESEARCH

University learning in the time of COVID-19

In 2020, as the pandemic unfolded around the world, 'pivot' became the word *de jour*. For the university sector, this required a rapid transition from traditional face-to-face to online learning, leaving teaching staff to quickly rethink how to deliver quality education in an online environment.

In the Faculty of Engineering at Monash University, teaching staff implemented a range of innovative changes in order translate face-to-face, hands-on and collaborative learning into a fully-online mode of delivery.

The Teaching and Learning During COVID-19 Research project was established to better understand staff and students' experiences of the rapid transition to online learning. It sought to analyse the impact these changes had on both staff and students, capture teaching and learning changes and innovations, and provide recommendations about the most effective pedagogical approaches for online learning.

In a comprehensive study to quickly asses the effectiveness of online learning, Associate Professor Maynard and her colleagues at Monash University undertook extensive staff and student surveys to capture the experiences of both sides of the university community.

Over one thousand students completed the survey from Monash University's Melbourne, Malaysia and Suzhou campuses and 183 staff from Melbourne and Malaysia campuses. In a second phase of the project, researchers interviewed 19 staff members develop a richer understanding of the challenges, pressures and successes of the transition.

In a relatively short period of time, the team identified the range of learning pedagogies and technologies used for the delivery of fully online engineering courses, as well as the effectiveness of online learning compared with that of face-to-face instruction.

A further element of the project was to investigate

the barriers and enablers in adopting educational technology, the practices of staff and students associated with more effective online learning, and the conditions influencing the effectiveness of online learning.

Unsurprisingly, the rapid pivot to online teaching had measurable impact on both staff and students. Research into understanding this is important and necessary to the continuing progress for universities and their students. The lessons learnt and the feedback obtained provides all tertiary institutions a framework for meeting these challenges.

The results of this study revealed that (i) support and engagement (i.e. staff empathy, helpdesks and regular peer communication) was the overwhelmingly most important factor in supporting both staff and students during their transition to online learning; (ii) active synchronous workshops were very effective at promoting student engagement and collaboration, and (iii) students valued staff who provided honest and regular communication about the changes being made during the semester.

From a staff perspective, the rapid transition has built teaching confidence and reduced some barriers to pedagogical innovation, however without proper support it can negatively impacted staff wellbeing, many of whom found themselves with a massive increase in workload and intense time pressures, among many other challenges.

The project has a number of key findings and highlighted that the human connection is vital. Importantly, the study revealed that human connection can be best achieved through active online learning (case studies, problem-based activities and debates).

This article was written for the IChemE Australia and New Zealand Impact of Chemical Engineering Research publication, published in October 2021. Article written in collaboration with study author Associate Professor Nicoleta Maynard, Monash University

MASTER OF ENGINEERING BIOLOGICAL ENGINEERING

Biological engineering is at the interface of biomedical engineering, biomaterials science, pharmacy and pharmaceutical sciences, and biology. It is central to the growing biotechnology industry within pharmaceutical, food and beverage, wastewater and other materials, fermentation, bioenergy and bioplastics sectors.

This course offers students the opportunity to explore sustainable process engineering for pharmaceuticals, proteins, food, beverages, lignocellulosics, fermented products and a variety of other biologically-related areas of great importance to both local and international industry.

WHAT WILL IT GIVE STUDENTS?

The specialisation is designed to provide students with a thorough understanding of engineering which draws on biology to undertake transformations of materials including:

- bioprocessing in biopharmaceutical production
- microbial water treatment
- biocatalysis
- fermentation and advanced biotechnology
- transformation of primarily biological materials, e.g., food and wood processing

Course details

Location:	Clayton (on campus)
Course code:	E6014
Duration:	1 year full time 2 years part time
Start dates:	First Semester (February Second Semester (July)

Biological engineering benefits emerging industries to improve economic, social and environmental outcomes

RESEARCH

A breath of fresh air in tackling India's oxygen shortage

When Paul Webley heard that thousands of Indians were dying because hospitals were experiencing an oxygen shortage, he realised he had the skills to save lives.

For the past three months, Professor Webley has been designing an oxygen conversion unit that can be built from materials found at a local Indian hardware store.

Ideally, any technician with the unit's design specifications will be able to build it from scratch, load it onto the back of a truck and take it to village hospitals. It should be easy to repair, tough, cheap to make, and able to run on a diesel generator.

An oxygen conversion unit strips the nitrogen from the atmosphere, leaving the oxygen gas behind. India has the capacity to produce liquid oxygen, which is used in steelmaking.

Since the COVID patients have been filling India's hospital wards, this liquid oxygen has been commandeered for medical use – but it requires refrigerated trucks to transport it, and the trucks are in short supply.

Professor Webley's conversion unit, on the other hand, would have the capacity to produce oxygen on the spot, wherever it's required.

"I used to be an engineer at an industrial gas company in America, where I worked on designs for oxygen plants," he explains. "Then I left that world and became an academic, but my knowledge in oxygen generation didn't go away.

"When I saw this catastrophe in India, I thought, 'OK, how do I use some of that knowledge and see if we can help people there.'"

Calling in support on the ground

He quickly realised that unless he had buy-in from a willing partner in India, his idea wouldn't get off the drawing board. The technical aspects of designing such a unit are certainly important, he says, but equally important is convincing people in affected areas that such a device can work.

Professor Webley's first call was to Tejas Bhatalia, "a former postdoc of mine" who's now at Perth's Curtin University.

Dr Bhatalia set up meetings with his contacts in India to see if anyone was interested in collaborating on Professor Webley's DIY design. Abhishek Sharma, a chemical engineering professor from Manipal University Jaipur, stepped up.

For the past three months, the three men, working in three different cities, have been collaborating via video link to finesse the unit's design.

Dr Bhatalia has built a small unit in Perth, and Dr Sharma has assembled a slightly larger one in Jaipur. Professor Webley has had to adapt his design to suit the materials Dr Sharma can find in Jaipur.

"Urgent times call for urgent measures," he says. "So the design started in one form. It's looking like a very different design at the moment. But if an engineer can't do that, then they're no good."

Dr Sharma is "still struggling to make the oxygen purity correct; he's only getting about 70% purity", Professor Webley says.

"He needs to get it up to 90%. I'm helping him on a daily basis debug the piece of equipment as it runs, and he gets data … It's quite tough to do across the ocean, but we're getting there. He's very positive.

"He's been talking to hospitals in his area, and he's secured a place where they can take it out and test it, and see if it will meet the hospital's specifications and standards. If that works out, he's already got divisions to say, 'OK, we can make more of these.'"

Portable oxygen conversion units already exist for patients with chronic respiratory problems – they can be set up in the home, and are either purchased outright or leased from a hospital. Professor Webley's unit is different.

"My version is slightly bigger," he says. "And it's not necessarily for home use, because the villages in India don't have electricity."

Instead, his "steampunk" unit is designed to supply oxygen to 10, 20 or 30 patients at a time.

"My main goal was, can I help Indians do this themselves. Can I teach them how to do this so that they can cookie-cutter them and make thousands and become completely self-sufficient?"

"My main goal was, can I help Indians do this themselves?" he says. "Can I teach them how to do this so that they can cookie-cutter them and make thousands and become completely self-sufficient?"

The only specialist ingredient is the "molecular sieve", a form of silicon, which filters out the nitrogen. It's inexpensive, and relatively easy for a chemical engineer to purchase, Professor Webley says.

The oxygen the unit produces is "pretty much the same as the oxygen you get out of a bottle", he says.

The pressure is lower, but in hospitals "you're not taking high pressure gas anyway when you're breathing it".

"We make it at an intermediate pressure. The hospital has told us it's good enough for their use to hook up to their system."

Another option is for the unit to operate "as a standalone facility where we have a little compressor, and they compress it up to a high pressure, people come along with empty bottles, and we fill up the bottles and then they take them away", as people do with cooking gas (LPG).

Professor Webley has approached engineers in Brazil – where oxygen is also desperately needed – about building a DIY unit, but his Brazilian collaborator hasn't made as much progress as Dr Sharma in Jaipur.

The unit could also be adapted for African countries in need, or for Nepal or Bangladesh if necessary, he says.

Politics provides a hurdle

He says the problems he faces are not practical – he's confident that Dr Sharma's converter will be operational soon – but political.

"We're trying to provide oxygen to the medical industry, which is very heavily regulated for good reason. So unless your product meets all of these specific, very tight regulations, they don't want it," he explains.

"That's all well and good, but when you have people dying because they don't have enough oxygen, second-best is OK.

"Let's not throw out a good solution because we're looking for a perfect solution. We're not trying to compete with industrial gas companies. It's not a business we're setting up."

He's been donating his time for free.

"To me, the whole point of being an engineer is to be able to help humanity," he says.

This article was written for, and originally published in, Monash Lens, 6 July 2021

RESEARCH

Bark-based adhesives for water-proof wood products: Replacement of traditional PF adhesives

In 2000, an international collaboration between Wood One (formerly Juken, based in Hiroshima, Japan) and the Department was established to develop a new technology to replace synthetic PF adhesives derived from phenol-formaldehyde (fossil resources) with natural tannin adhesives derived from pine bark, a waste product from the wood processing plant in the company's operations in New Zealand.

Initial research at the laboratory and pilot plant scale showed that tannin could be efficiently extracted from the bark using methanol as a solvent. Further, the researchers could illustrate that tannin adhesives could replace synthetic PF adhesives as high-quality wood adhesives in the production of water resistant and exterior use wood products. However as with many technical developments the methanol extraction process was too expensive to be commercialised.

During the experimental work on the development of the tannin-based adhesives, and the extraction of tannin from bark, it was found that after grinding the bark, the small bark particles (less than about 63 microns in diameter) contained substantially more tannin than in the larger particles.

In the formulation of PF resin adhesives, wood powder, nut shell flour, wheat flour and calcium carbonate are added as fillers. Since fillers were normal constituents in the adhesive, the researchers questioned whether fine bark particles be used directly without tannin separation to produce a wood adhesive? The answer was yes, and although quality control could not be maintained, the results were sufficiently positive to warrant further research.

In 2016, experiments were conducted using bark ground in a disc mill to give a product containing fibres measuring 40 nanometres or less, instead of the previous micro-sized bark particles. Finally in 2017, consistently good results were achieved using the disc mill fibrillated products - a breakthrough in the field of tannin adhesives.

Bark-based adhesives formulated with PF resin, fibrillated bark and water only, gave excellent gluing properties. These bark-based adhesives have a number of additional advantages including no requirement to extract tannin, a full use of bark, and only a low-level PF resin required.

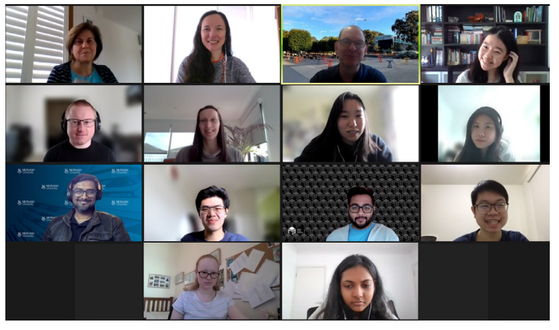
The Australian Plywood Bond Type Classification indicates that gluelines bonded with synthetic PF and natural tannin adhesives classified as type A must pass a 72-hour boil test. These gluelines can be expected to survive for more than 50 years under full exposure and long-term stress. As the plywood, bonded with the fibrillated bark adhesives, easily passed the 72-hour boil test, the fibrillated bark adhesives have been recognised as being most suitable for producing wood-to-wood bonding for external (water resistant) and structural applications.

There is a further advantage. The normal PF resin adhesives usually contain approximately 55% solids and 45% water, whilst the fibrillated bark adhesives, with the total solids as low as 21% (PF4.2%+bark16.8%) and 79% water, were found to produce good wood bonding. This suggests that the bark components such as hemicellulose, lignin, cellulose nanofibers and other minor components, as well as tannin, may be a factor in achieving the strong bond. The possibility of fibrillated bark-based adhesives may be used not only for plywood production but also for the other wood-based panels (fibreboard, particleboard, strand board etc.). Thus, the bark-based adhesives in the near future could replace the PF adhesives, which have reigned as the premier quality wood adhesives for more than 75 years.

The Monash team consists of Dr Yoshi Yazaki, an authority on wood and natural products chemistry, Dr Frank Lawson and Dr Peter Uhlherr both chemical engineers. (It is interesting to note that all three have officially 'retired' and have been welcomed into the Chemical Engineering Department to continue their research activities.) Their collaborators in Hiroshima Japan are Mr Yusho Nakamoto, the late Mr Toshihiko Tsunoda, Ms Keiko Sugata (formerly Ono), Ms Naoko Kurushima, Mr Masayoshi Horito and Mr Tomoyuki Matsumae.

DEPARTMENT UPDATES

Excellence, Inclusion and Diversity



Despite the limited opportunities to meet and hold events in 2021, the Excellence, Inclusion and Diversity (EID) Committee had a busy year as it continued to promote equal opportunities and expectations to staff and students, regardless of their career stage, gender, race, cultural background or sexual identity.

The high number of students in the 2021 committee (28 undergraduate students (1st - 4th year), four master students, two PhD students) is a reflection of our wonderful student cohort in the Department, and their commitment to improve the future workplace. The committee also included two professional staff and five academic staff.

With the core goals in mind – (i) developing the best team through recruitment, training and career development; (ii) delivering day-to-day tasks in the best possible way; and (iii) finding the best ways to innovate and create new knowledge – a number of carefully curated events took place in 2021.

A particular highlight was the 2021 book club, Erin Meyer's *The Culture Map*. Throughout the year, a chapter was discussed each month, with discussions led by a team of four who had prepared activities related to the themes.

The faculty wide (35 attendees from across the faculty and from varying career stages) *Shoulda, Woulda, Coulda* event focussed on moving beyond personal failure and actively cultivating a more equitable academy through interactive theatre. John Caroll (University wide Athena Swan chair) and Lucie Joschko (HR manager Staff Equity and Diversity) also met the committee and outlined what the university actions to promote and advance (gender) diversity and inclusion.

Sub-groups of the committee are invited to propose initiatives to implement desired change. Currently, a World Cafe with Early Career Researchers in the department is being organised once on-campus life is back. This will focus on supporting ECRs in the areas of career planning and mentors, skill development and inclusion as staff members.

2022 is looking bright, with the first initiatives from undergraduate students now being discussed.

Contact EID

Woodside Building for Technology & Design

As part of Monash's partnership with Woodside Energy, this new landmark building embraces innovation, design and cutting-edge technology to develop new solutions in sustainable energy technology. It is one of the most efficient and innovative teaching buildings of its type in the world and will help continue to drive Monash's commitment to Education Innovation.

The building houses more than 30 learning spaces, including an interactive tiered collaborative space accommodating 360 people, including many of the chemical engineering students and academics.

Learn more and watch a flythrough of the building

Mentoring program

Amidst the upheaval of 2021, the Monash Engineering and Pharmaceutical Science Society (MEPSS) introduced a mentoring program to help undergraduate students establish themselves at Monash University.

Driver of the initiative Labib Tajwar understands the challenges of study, finding a career pathway and creating a positive work/life balance as young adults, sometimes away from family and friend networks.

Through this program, regular catch up sessions (currently online only) are arranged, during which mentees a taught a different skill. Focus is usually on setting goals, creating job profiles, internships and vocational program guides, and industry skills.

The program provides a wonderful opportunity to create a lasting relationship with those who have aligning interests. Mentors guide mentees on how they can maximise their university life and find a direction, while also providing mentors a valuable opportunity to solidify the course of their own careers and improve their skills as a mentor and leader.

To match students to potential mentors, the committee accepts EOIs from both students and alumni, with details on workplace, field of work, advice for students (from mentors), and field of interest, company of interest, and general interest (from mentees). Mentoring occurs in small groups of one mentor and 3-5 students.

The program, which has helped rekindle relationships with alumni, will include more on-campus or face-to-face sessions between mentees and mentors as soon as possible. This may include shadowing the mentor in their workplace.

Currently, the program is open to BE (Chemical and Biological) and BPharm Sci students, with alumni of these two degrees (two years graduated and above). To learn more, or to become involved as a mentor or mentee, follow us on Facebook or send an email to mepss@monashclubs.org

Labib Tajwar

Chemical Engineering PhD student awarded one of Monash's top prizes

Dr Rodrigo Curvello has won the 2020 Mollie Holman Award for his thesis entitled 'Engineered nanocellulose hydrogels for biomedical applications', supervised by Professor Gil Garnier.

The Mollie Holman award is among the highest academic honours bestowed by the University, and marks the recipients as a doctoral researcher of the highest order. Each year, a maximum of ten medals are awarded to doctoral students, normally one from each faculty, who have fulfilled their degree requirements and presented their faculty's best thesis of the year.

The key findings of Dr Curvello's thesis included the introduction of plant-based nanocellulose hydrogels as a novel performant material for the growth of 'mini-organs' and blood tests. Nanocellulose can massively decrease the costs in biomedical research, allowing the 3D culture of human tissues for disease modelling and drug screening. Reliable and high-quality blood diagnostics can also now be performed with cellulose gels in a sustainable and eco-friendly fashion.

Rodrigo's thesis was ranked 5 out of 5 by two examiners, indicating an exceptional quality, significance and new contributions to the knowledge in his field. He has also published six papers including 5 in Q1 journals while completing his PhD.

Rodrigo's efforts are even more remarkable given that he paused his PhD research at the height of the Melbourne pandemic lockdown to join the Chemical Engineering COVID-19 Task Force. The team developed a low-cost, rapid diagnostic test to detect antibodies against the new coronavirus, resulting in a patent application as well as national and international media coverage. Rodrigo was interviewed by four TV channels in Brazil, including major network Globo, reaching over 250 million people in South America.

"I'm extremely delighted to have received the Mollie Holman Award for 2020!" "My PhD project was very ambitious and challenging, with the objective to connect chemical engineering, materials science, and biology. The pandemic made 2020 even more difficult, therefore I see this medal as a priceless reward.

"I am grateful for the support of my supervisor Professor Gil Garnier, who always motivated me to try my best and never give up. I also acknowledge my colleagues, who made my PhD journey so pleasant and fun."

This article was originally published in Monash Engineering News, 23 April 2021

Awards and Honours

Leverhulme Trust Research Fellowship

Former student of Professor Huanting Wang, Dr Baham Amini Horri (now lecturer of the University of Surrey) has been awarded a Leverhulme Trust Research Fellowship by the The Royal Academy of Engineering.

The fellowships, supported by the Leverhulme Trust, allow awardees to focus on full-time research for up to a year by covering the costs of a replacement academic to take over their teaching and administrative duties. This allows mid-career engineers to reinvigorate their research interests and it also gives other junior academics an opportunity to gain valuable teaching and administrative experience by stepping in to do those duties in the awardee's place.

We are always delighted to see our Alumni honoured for their achievements. Congratulations Dr Horri!

ARC Future Fellowship

Congratulations to Professor Zhang on his Australian Research Council Future Fellowship.

Professor Zhang is the Director of ARC Industry Transformation Research Hub for Energy-efficient Separation and the Deputy Director of Monash Centre for Membrane Innovation. His research focuses on membrane and advanced oxidation technologies for environmental protection and energy-efficient separation in various industries, e.g., water industry, energy sector, pharmaceutical manufacturing and dairy processing.

The award was granted for his project to develop high-precision selective membranes, which are urgently needed in Australian key industries for solute-solute separation. The project expects to generate advanced knowledge in the areas of nanosheet synthesis and functionalisation, membrane design and fabrication, selective transport of solutes and applications. The membranes developed in the project should make existing separation processes more effective and sustainable and advance emerging applications, in particular, pharmaceutical, dairy and mining industries, providing significant economic and environmental benefits to Australia.

Dean's Award for Excellence in Postgraduate Supervision

Congratulations to Professor Sankar Bhattacharya, who has been recognised with the 2021 Dean's Award for Excellence in Postgraduate Supervision. The selection panel assessed the nominees from the perspective of the impact they had on the graduate research students under their supervision, and what elements they believe best define academic excellence. On the basis of the written nominations, and against strong competition from the other nominees, Professor Sankar Bhattacharya was the clear winner. He made an unambiguously positive difference to his students' academic and career trajectories and showed sensitivity to cultural differences.

Professor Bhattacharya's approach to supervision is candidate-specific. He is an intuitive supervisor, taking the time to get to know his students and adapt his style depending on their needs.

A former student and current department staff member, Dr Joanna Tanner, remembers Professor Bhattacharya as always being available to provide advice and guidance when she needed it, while giving her the freedom to explore and define her own research. This has allowed Dr Tanner and others to develop into a confident, independent researcher under his tutelage.

Eureka Prize finalists

Collaborating and innovating! Congratulations to Huanting Wang, Xiwang Zhang, Huacheng Zhang, Matthew Hill, Anita Hill, Benny Freeman, Jun Lu, and Xingya Li for their Eureka Prize nomination for rapid extraction of lithium from brine. Great work across Monash University, RMIT University, CSIRO, and the McKetta Department of Chemical Engineering, and The University of Texas at Austin.

Watch the entry here

DEPARTMENT UPDATES

Awards and Honours

Top Research Scientists Malaysia (TRSM)

Congratulations to Associate Professor Meng Nan Chong from Monash Malaysia for being recognised as one of the recipients of the 2021 Top Research Scientists Malaysia (TRSM) award. The TRSM award is an initiative of the Academy of Sciences Malaysia to identify and recognise leading Malaysian Research Scientists who have made outstanding achievements and actively involved in research and development of Science, Technology, Innovation and Economy (STIE).

Associate Professor Chong joined Monash Malaysia in June 2012 from CSIRO and has established a highly successful independent research program funded by various national and international competitive grants from Malaysia, Australia, UK, Europe and the Asean region. His leading research work encompasses both fundamental and applied research in two major themes of: (1) sustainable water management and systems engineering and (2) environmental nanotechnology for resolving energy and environmental issues. Together with his research group members, he is leading the changes and making pragmatic implementation of carbon-neutral water and energy systems informed by his multidisciplinary research outcomes and rapidly contributing to the global decarbonisation efforts in realising the Paris Climate Accord.

Monash Malaysia CHE Students Swept Top Awards

Chemical engineering undergraduate students from the Malaysia campus emerged as winners in various competitions, including the Regional Chemical Engineering Undergraduate Conference 2021 (RCEUC 2021), the ASEAN Energy Youth Award (AEYA) 2021 and the COPE-BEST 2021 Video Challenge Competition.

Building on the previous success in 2020, our students achieved an even greater success this year at the RCEUC 2021 by winning both the Gold Award (recipient: Dhiela Kuruvilla Vadakethu) and Bronze Awards (recipients: Koh Yi Sze and Wail Gourich) in the Online Presentation category as well as the Gold Award (recipient: Koh Yi Sze) in the Paper Writing category. Congratulations to all the award winners as well as their supervisors for their excellent guidance and the School for providing full financial support for them to participate in this conference!

ASEAN Energy Youth Awards (AEYA) Winner

Congratulations to Chiaw Ker Ai for winning in the 2nd ASEAN Energy Youth Award (AEYA) 2021 - Video Category. The 2nd AEYA was organised by the ASEAN Centre for Energy (ACE) to recognise young students' valuable contribution to nation-building, sustainable development, and energy transition. The theme of this year's awards was 'Innovation and Creativity Towards Sustainable and Resilient Energy System in ASEAN'. This award was jointly organised by ACE and the Southeast Asian Ministers of Education Organisation (SEAMEO), supported by the Korean Ministry of Trade, Industry, and Energy and Korea Energy Agency.

The aim of the awards is to bring awareness towards the ASEAN Plan of Action and Energy Cooperation (APAEC) Phase II. Participants were expected to express their innovative and creative ideas for enhancing energy access and affordability of energy for everyone in a sustainable manner. This competition can bring about public awareness of the need of clean energy and a sustainable environment.

Watch Chiaw Ker Ai's winning entry

Awards and Honours

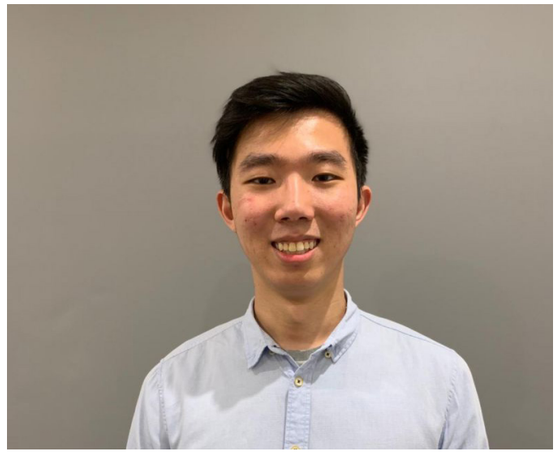
Owen Potter Award

We congratulate Thomas Coyle (below left) and Nicholas Tham (below right) on receiving the Owen Potter award for excellence in Chemical Engineering at Monash University.

In 1991, we instituted this award in recognition of the contribution made by our foundation professor, Owen E Potter, not only to the Department, but to the chemical engineering profession in Australia generally. The award is given for completing our first class honours degree with the highest marks in the minimum required time. A shared prize is given when students share an equivalent mark.

Thomas graduated with a Bachelor of Chemical Engineering and a Bachelor of Pharmaceutical Science. We asked Thomas to reflect on his time with us. "My time at Monash University is full of fantastic memories. I was able to learn so much thanks to my amazing lecturers who were always happy to answer any question and go above and beyond in preparing me to achieve both my academic and professional goals. I made great lifelong friends, who supported me and helped make university so enjoyable. I reflect on my final design project, which was certainly a challenge to complete during lockdown. However, it was absolutely worth the effort we put in, and it was so rewarding to see our work finally completed after such a tough year. I was also fortunate to be presented with many opportunities to take part in extracurricular activities. I was a part of the Engineering Leadership Program for three years, which helped to grow the soft skills that will assist me throughout my career. I was also part of the Monash Engineering and Pharmaceutical Science Society (MEPSS) and Employability Intensive committees, where I had the opportunity to give others the social and professional opportunities I benefited so much from. Overall, I am so happy I got the chance to study at Monash, and I will be forever grateful to the people who made it the experience that it was."

Nicolas graduated with a Bachelor of Chemical Engineering. We asked Nicolas to reflect on his time with us. “Out of the many opportunities and events throughout my four years in Monash, I would have to say the highlight was being a member of the Monash BrewLab student team. This program is designed to allow students to gain practical knowledge and provide invaluable experience by designing and operating a nano-scale brewery. My role as the Safety Officer was to develop protocols and prepare risk assessments to execute each operation efficiently through the implementation of safety controls. Getting hands-on experience in brewing beer with a group of brewing enthusiasts was a fun and adventurous journey! I was also fortunate to be a part of a research team under Lian Zhang over the summer of 2019-2020. The research aims to substitute conventional gasoline with bio-oil through refining processes using existing petrochemical infrastructures. Working closely with Dr. Shenyong Li, I assisted in analysing the properties of bio-oil refined in a fluid catalytic cracking (FCC) process. The experience from these opportunities has allowed me to craft my skills to be the engineer I am today!”



Follow Your Dreams

The 2021 Jenkins Family ‘Follow Your Dream’ Bursary was awarded to Romalya Ranasinghe, in recognition of her excellence in leadership, research, and coursework.

We asked Romalya to reflect on her time with us in Chemical Engineering at Monash University.

"A few of my favourite accomplishments within the course of this program include the project that I have been working on since the summer of 2020 with Akshat Tanksale, Munir Sadiq, Joanne Tanner and Matthew Hill. The project intends to use direct air capture methods to capture carbon dioxide from the atmosphere, and use it sustainably, such that net zero emissions can be achieved. Working on this project as the Technical Assistant, has definitely been one of the most rewarding outcomes of the knowledge acquired through the course of this degree. My role within the team is to analyse the viability of the upscaling of an existing carbon capture system. I have also been a committee member of the chemical engineering student Society of Monash University Chemical Engineers (SMUCE), since 2019 and currently hold the position of ‘Academic Vice President’. The work carried out by this society is aimed at improving the experience of a chemical engineering student at Monash, by bridging the gap between university and the chemical engineering industry. Being involved in SMUCE has given me a number of valuable experiences that have moulded me into the person that I am today!"

James Dyson Award

Congratulations to our Chemical Engineering team for winning National Runner-Up in the 2021 James Dyson Award for their Stand Alone Sunflow System water treatment technology!

The team is now in the running to be shortlisted for the international and sustainability prizes announcing on November 17.

Read more **Watch video**

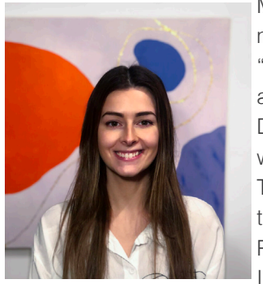
Awards and Honours

Bronwyn Adams and Karen Hapgood award 2021

We congratulate Samantha Landby and Marisa De Francesco on receiving the 2021 Bronwyn Adams and Karen Hapgood award for excellence in Chemical Engineering at Monash University. The $1000 award prize is based upon performance in the chemical engineering course, contributions to original research and/or industry R&D, and university and community leadership. The selection criteria reflect the interests of both Bronwyn Adams and Karen Hapgood – their interest in the professional development of young women and their passion for a diverse STEM community. Bronwyn Adams was the first female chemical engineering graduate in the State of Victoria - graduating from Monash in 1971. Dr. Adams was a second cousin to Professor Karen Hapgood who was the first female academic staff member in the Department of Chemical Engineering (2006) as well as the first Head of Department (2012-2016). Prof. Hapgood is currently Executive Dean of the Faculty of Science Engineering and Built Environment (SEBE) at Deakin University.

Sam worked closely with Greater Western Water (GWW) to investigate methods for PFAS treatment at one of their key wastewater treatment plants. The project team consisted of Sam, her fellow student Emma Selwood, Mostafa Dehghani, Joanne Tanner and Warren Batchelor from Monash BioPRIA (Bioresource Processing Research Institute of Australia), and Mathew Cunnington, Shelly Koh, and Joshua Mah from GWW. Sam's work assisted GWW to further knowledge on PFAS treatment and integrate this knowledge into their Master Planning. The quality of work was of an extremely high standard and demonstrated communication and technical capability at the level of professionals in the field. Sam also completed a project with Nufarm working on improving the performance of one of their herbicide formulations alongside 3 of her fellow students. Sam was one of the founding members of the Monash BrewLab student team. Sam also completed a highly successful Monash Industry Team Initiative (MITI) Program internship with HP, Inc where her team presented their final product concept focused on the Gen Z market to the HP Executive Leadership Team in Palo Alto.

On top of all of this, she played Youth League Basketball for the Waverley Falcons and served as team captain - encouraging young women to pursue higher education and STEM careers.



Marisa is a crucial team member on the project "Nanocellulose Foam as a Glucose Diagnostic Device" working closely with Laila Hossain, Patricia Tedja, and Gil Garnier at the BioPRIA (Bioresource Processing Research Institute of Australia). The research is to be presented at the International Conference of Undergraduate Research (ICUR) in September. The increasing incidence of Diabetes Mellitus (DM) represents an alarming global epidemic disproportionately affecting developing nations. Whilst sophisticated, electronic DM diagnostic devices are commonplace in the developed world; cost and electricity reliance make them unsuitable for remote, socioeconomically deprived communities. A robust, commercially viable, paper-based diagnostic device would facilitate early diagnosis; ameliorating DM outcomes and reducing the economic burden upon developing countries.The test developed is simple, low cost, environmentally conscious and ideal for low resource settings - with a direct result read out.

In addition to her research efforts, Marisa has been active as Female Engineering Academic Assistant at Mannix College and part of Monash Engineering Students' Society (MESS), Society of Monash University Chemical Engineers (SMUCE), the Monash Women's Varsity Soccer team, and served as a soccer coach to young girls. She interned with Ansac, Anergy, and TechnipFMC.

MONASH University

MONASH CHEMICAL & BIOLOGICAL ENGINEERING

CHEMECA 2022 coming to the Melbourne Convention Centre

Chemeca 2022 coincides with the 100th anniversary of The Institution of Chemical Engineers (IChemE). The overall conference theme will be ChemEng Evolution: Celebrating a Century of IChemE. We will be celebrating the accomplishments of the last 100 years and looking forward to a Greener, Safer, and Cleaner next century. Chemeca 2022 will be jointly organised with the Hazards Australia conference, which is an annual IChemE conference focussed on process safety.

The conference will take place 25-27 September 2022, followed by a one day workshop on 28 September at Monash University. The major topics to be covered in the Chemeca conference include - Energy Transition, Biological Engineering and Bioprocessing, Advancements in Materials and Catalysis and Education and Industry Engagement. We have confirmed five plenary speakers who cut across multiple topics above - Judith Swales (Fonterra), Karen Gomez (Paintback), Prof Liming Dai (University of NSW), A/Prof Kate O'Brien (University of Queensland) and Lauren Stafford (Woodside Energy).

Interested industry partners are encouraged to reach out, and we will shortly be providing a prospectus. There are opportunities to 'speed date' prospective graduate hires, as well as sponsoring the topical sessions.

Contact A/Professor Matthew Hill for more information

CONTACT MONASH CHEMICAL & BIOLOGICAL ENGINEERING

Department of Chemical & Biological Engineering

Monash University
Clayton Victoria 3800
Telephone: +61 3 9905 3555
Facsimile: +61 3 9905 5686
eng.monash.edu.au/chemical

LinkedIn
Twitter @MonashChemEng

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