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

2021 1ST RUNNER UP OF #BEST VIDEO CHALLENGE

E-WASTE TO ENERGY
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!
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 from 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.
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 DPGFSFDTVF0EFUBLFwME 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, 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. BIFO*moJTINZ1%*BTQJSFUP 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 notwithstanding, 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.

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.

Contact SMUCE to organise your opportunity to connect with the Chemical Engineering students at Monash University.
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 CO₂ 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’s 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 sustainability. Moreover, through the XPrize Team Matching, 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.
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 off-grid, portable, low-maintenance and low-cost environments, ensuring that the prototype is viable within communities. Engineering students will also have 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. Students have the opportunity to develop the current prototype by adding their own innovation and partake in renewable resource management solutions. They are 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.

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“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.

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.

The Zythologist has extended its scope and incorporates education and research to its existing pillars of beer production and analysis.

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
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.
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.

**Student-led pilot plant integrated into curriculum**

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.

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.

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 CO₂ 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.

**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.**
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.

SiFmSTUQ5|FXBTBX8SEFEUUPSFBN7|HPSGSPSUFI1PTUF5 Competition category, while Team Organic claimed the mSTUQ5|FGPSUFI1STFDUBU|POSPNFUJ|JPODBUFHP5Z

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.

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.

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 the industry.

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.

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 win 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.

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 industry.
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 to translate face-to-face, hands-on and collaborative learning into a fully-online mode of delivery. A 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 assess 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, project work 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.

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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).

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 a thorough understanding of the challenges, pressures and successes of the transition.

This course offers students the opportunity to explore the barriers and enablers in adopting educational technology, the practices of staff and students associated with more effective online learning, and

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 Teaching and Learning During COVID-19 Research project was established to better understand staff and students’ experiences of the rapid transition to online learning. In a second phase of the project, 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.

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
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 using materials found at a local Indian hardware store.

Ideally, any technician with the unit’s design and the right equipment could build 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.

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

In 2000, an international collaboration between Wood One (formerly J ukken, 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 industry in the company’s operations in New Zealand.

Initial research at the laboratory and pilot plant scale showed that fibrillated bark particles could be expected 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 bark-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, OVTIFLM[FVBFUPVSBODEMBMJDVNBDSPOBFBFSTVMBEFEFTMMSFSTXFSPOSRMBPDPTUJJUUIBEFT]WIUFJIFSBFDISFTVTUEFTVOJFJOUIMZOPOTUIJWFUFK85BBOUTH20206 research

In 2016, experiments were conducted using bark ground in a disc mill to give a product containing mCSTFNFTVSIOHOHBPONFSPTMPSSFTJTOTUFEBGUIGUIV previous micro-sized bark particles. Finally in 2017, consistently good results were achieved using the disc mCSTMCL[MJMMBUEQSEPVDUTCBSFBLUISPHVJ]OUIMF of the bark-based adhesives

Bark-based adhesives formulated with PF resin, mcSJM[MUFBECBSLBOEXBFSPOZMBFBFDFMBMFUHVM]OH 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.

SIFVTVUSJMBO1MXPEM#OESQZFSMBTJMDBOUPO indicates that glueslines bonded with synthetic PF and OBVSBMUBO0JDBEFTJWIETFDBTIEFMFSTUZQ9NVTUQBT T 0 3 0 1 for our boil test. These glueslines can be expected to survive for more than 50 years under full exposure and long-term stress. As the plywood, bonded with the mcSJM[MUFBECBSLBEIF]WIJFTFMBZMQBTEFUEIFISVSCPJM UFTUIUMCJMMBUECBEBSLBEIF]WFTBIWBCFCSPOFDDHOJTFE 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 BOEXBFUNSMJMTUUMCJMMBUECBEBSLBEIF JTWT with the total solids as low as 21% (PF4.2%+bark16.8%) BOEXBFUNSFPSPOEUPOEPFDHPEPKPE bonding. This suggests that the bark components such BTFNIFDMVMPFTMHJODDFMVMTPOBOFMCSFTBOEPUIF bark-based adhesives may be used not only for plywood production but also for the other wood-based panels mCFCPSBQEBSDJDMFPCBSETUESDOBCEPSUDVSTUFI bark-based adhesives in the near future could replace wood-based adhesives, which have reigned as the premier quality wood adhesives for more than 75 years.

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 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.
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 are 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 make the most of their university experience.

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

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.

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 COVID-19 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!”

“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
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 functionalisation, membrane design and fabrication, and knowledge in the areas of nanosheet synthesis and separation. The project expects to generate advanced environmentally friendly, selectively permeable membranes for large-scale separations.

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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.

"I was fortunate to be part of the Monash Engineering and Pharmaceutical Science Society (MEPSS) and Employability Intensive committees, where I had the opportunity to be the engineer I am today!"

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

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

Follow Your Dreams

James Dyson Award

Congratulations to our Chemical Engineering team for winning National Runner-Up in the 2021 James Dyson Award for excellence in leadership, research, and coursework.

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!"
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.

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. If you are interested in sponsoring the conference or providing support for the graduate student showcase, please contact A/Professor Matthew Hill (matthew.hill@monash.edu) for more information.

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 is based upon performance in the chemical engineering course, contributions to original research and/or industry R&D, and university and community involvement. Both Samantha Landby and Karen Hapgood – their interest in the professional development of young women and their passion for a diverse STEM community – have been crucial in inspiring and supporting young women in STEM careers

Some highlights from each of their achievements:

• Samantha Landby
  - Undertook a project with Laila Hossain, Patricia Tedja, and Gil Garnier at the BioPRIA (Bioresource Processing Research Institute of Australia), and Mathew Cunnington, and Francisco Tedja, from Monash BioPRIA (Bioresource Processing Research Institute of Australia), and Mathew Cunnington, and Francesco Tedja, from Monash BioPRIA.
  - Assisted GWW to further knowledge on PFAS treatment and demonstrated communication and technical capability at the level of professionals in the field.
  - The quality of work was of an extremely high standard and demonstrated coordination and technical DBQCVMJUZBUIUIUFMFWMPQGSGFTJDPBMJUOIFMFWFMC.
  - 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 improving the performance of one of their herbicide formulations.
  - 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 De Francesco
  - 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 Student Emma Selwood, Mostafa Dehghani, Joanne Varsity Soccer team, and served as a soccer coach for the Waverley Falcons and served as team captain - encouraging young women to pursue higher education and STEM careers.

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, low cost, environmentally conscious and ideal for low electricity reliance make them unsuitable for remote, socioeconomically deprived communities. A robust, 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 in the Chemeca conference include - Energy Transition, Biological Engineering and Bioprocessing, Advancements in Materials and Catalysis and Education.

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.

Would you like to receive future issues of ChemEng Focus? If so, please join up here to be added to our newsletter mailing list.

monash.edu/engineering/departments/chemical