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University**FACULTY OF SCIENCE
AND ENGINEERING**

September 2018

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From the Dean

NEWSLETTER | SEPTEMBER ISSUE

Dear FSE Research Communication

This week Macquarie is holding its [Third Gender Equity Summit](#), as part of our drive to create a more diverse and inclusive culture. I'm very proud of the significant progress our School of Engineering is making towards achieving gender balance in their school. In 18 months they've gone from having only five per cent of their academic positions being held by women to 20 per cent of Engineering's academics being women. We're also seeing more women choosing to study Engineering at Macquarie. In 2018 15 per cent of our commencing domestic Engineering students were women, up from only 11 per cent a few years ago.

Molecular Sciences researchers are engineering bacteria that turn sugar into hydrogen, in a bid to produce hydrogen at yields that are commercially viable. Their research has received a \$1.1 million grant from ARENA, the Australian government's renewable energy agency.

A new study of house sparrows' genes, led by researchers from Biological Sciences and Environmental Sciences, has found the first evidence of animals adapting to lead contamination in heavily polluted areas of Australia. We're also looking at new ways to manage the impact of coastal urban development on natural habitats, and we're celebrating women in conservation science.

Earth and Planetary Sciences' Michael Eze is looking at how we can harness the synergy between plants and microbes to clean up oil spills more effectively, and Engineering's Vidushi Bhagwanani has been named a finalist for the 2018 NSW International Student Awards in the Higher Education category.

Congratulations to the Australian National University's Mohsen Rahmani, who won the 2018 Macquarie University Eureka Prize for Outstanding Early Career Researcher last month. We're also very proud of Environmental Sciences' Neil Saintilan, who was a finalist for the University of Technology Sydney Eureka Prize for Outstanding Mentor of

Young Researchers.

And finally, it is with sadness that I write to tell you Environmental Sciences' Grant Edwards passed away earlier this month from a heart attack. Grant was a passionate and enthusiastic member of our academic faculty and will be greatly missed. Our thoughts and sympathies are with Grant's wife and family.

If you want to know more about what's happening across the Faculty, follow our Faculty Twitter account [@MQSciEng](#) and my personal account [@BarbaraMesserle](#). If you've got news to share, please tweet about it and include our Faculty handle so we can see it and retweet. If you're not on Twitter, then email us at fse.execdean@mq.edu.au and we'll share the news.

Regards,

Barbara

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Bugs' burps for efficient hydrogen production



Bacteria that turn sugar into hydrogen are being engineered by Macquarie University researchers who received a \$1.1 million grant from ARENA, the Australian government's renewable energy agency.

"There's global interest in using hydrogen gas to produce electricity in hydrogen fuel cells, for example to power vehicles, heat buildings or provide electricity for industry," says Robert Willows, who is one of the project leaders. "It's a clean and efficient energy source."

While 95 per cent of the hydrogen used worldwide currently is produced from fossil fuels, increasingly people are looking at how to produce hydrogen from renewables.

"A lot of recent research efforts are focused on using electrolysis to produce hydrogen by splitting water molecules into oxygen and hydrogen," says Louise Brown, co-leader of the project. "They're doing this by using electricity generated from solar and wind."

"Other people are taking a biological route, and tweaking photosynthesis in algae to produce hydrogen."

"We think we can use genetically engineered bacteria—in our case *E. coli*—which will be able to eat glucose produced from renewable sources like sugar cane and cereals," says Louise. "We'll also be looking at other low-cost carbohydrate feedstocks as well."

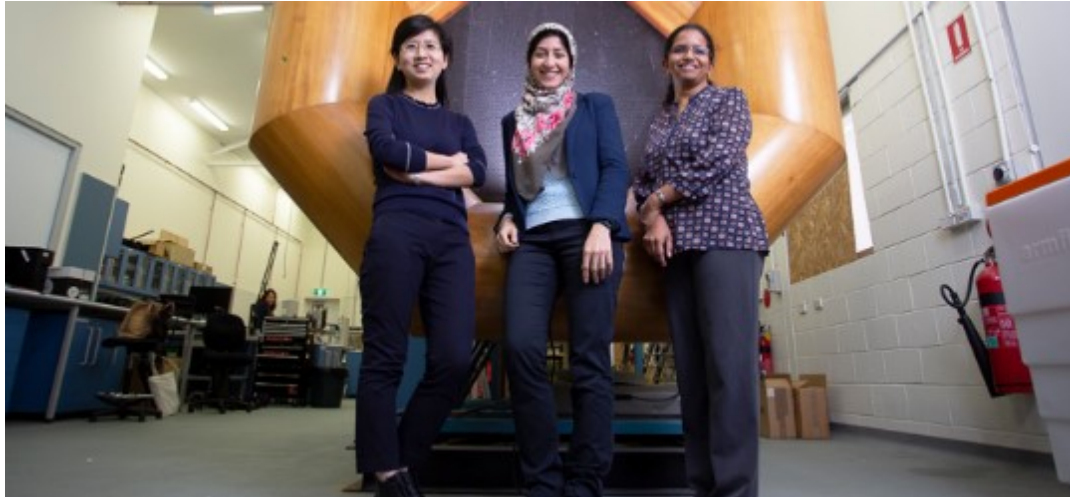
"The aim of our project is to design a system that produces hydrogen relatively rapidly and at yields that are commercially viable," says Robert. "The bacterial approach has many advantages over hydrogen from algae, including that it doesn't need large open ponds."

"Even in the lab we can produce enough hydrogen in a day from a few spoonfuls of sugar, to produce enough energy to charge your mobile phone for up to two weeks," says Louise.

The researchers, from Macquarie's Department of Molecular Sciences, have teamed up with BOC Australia and Bioplatforms Australia on the project.

[Find out more](#)

Engineering emerges from the 'man cave'



It's no secret that – like engineering more broadly – engineering at Macquarie is a heavily male-dominated discipline. A few years ago, one media commentator went so far as to call Macquarie's engineering department a 'man cave'.

But the last 18 months have seen a significant shift. Propelled by the University's [Gender Equity Strategy](#), which commits Macquarie to recruiting more academic women in under-represented disciplines, the School of Engineering has undertaken an ambitious drive to seek out and recruit talented females.

Dean of the School of Engineering, Darren Bagnall says there were a number of obvious reasons for doing so.

"With a national shortage of engineers, Australian companies need to be able to tap into the full 'talent pool' available, and that pool should include more women engineers," he says. "We know that to attract more young women onto our courses we need more women in our academic team."

"We also know that diverse engineering teams make stronger teams and with improved gender balance, teams find better solutions to problems. This understanding applies not only across engineering but also to our faculty teams."

While several other Australian universities have advertised 'women only' engineering positions, Darren says Macquarie instead took other proactive steps to give the University the best possible chance of securing talented female candidates, while building a more inclusive and flexible culture.

"We've used our networks to identify promising candidates and then encouraged them to apply," he says. "We took extra special care when forming long-lists and then

committed to interviewing all the women on those long-lists.”

The results have been quite remarkable.

“The percentage of women in academic positions in the School of Engineering is set to rise to 20 per cent (eight out of 40 positions) in the next month, and will potentially reach 25 per cent (11 out of 43 positions) by January,” says Darren.

“These are small beginnings but it marks a considerable change from the roughly five per cent (two out of 28 positions) we were at 18 months ago.”

[Read the full story on *This Week*](#)

Nanoscale surfaces developer wins Eureka



Congratulations to the Australian National University’s Mohsen Rahmani, who won the 2018 Macquarie University Eureka Prize for Outstanding Early Career Researcher last month.

Mohsen has developed a new class of nanoscale surfaces for miniaturised consumer devices. His research could be used in night-vision technology, adjustable lenses, and ultra-sensitive biochemical detectors.

We were pleased to host Mohsen and the other award finalists for a celebratory lunch at Macquarie University before the awards ceremony.

Caitlin Byrt from the University of Adelaide is developing salt-tolerant food crops that are better adapted to rising salinity, drought and changing environments.

And Justin Chalker from Flinders University is working to convert mercury-containing industrial by-products into polymers—a novel and cost-effective solution for the human and environmental health problem of mercury-tainted waste.

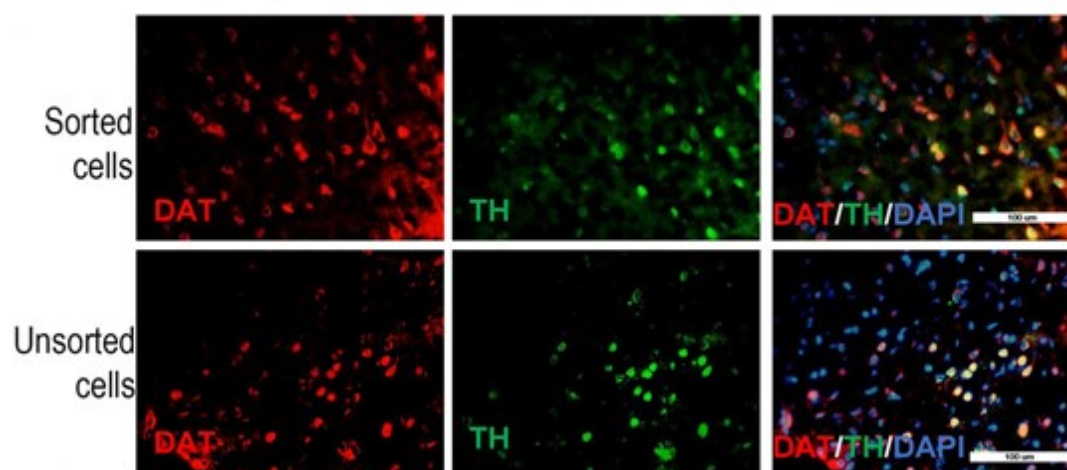
We're also very proud of Environmental Sciences' Neil Saintilan, who was a finalist for the University of Technology Sydney Eureka Prize for Outstanding Mentor of Young Researchers.

Neil is tackling the big issue of 'blue carbon'—the carbon stored in wetlands, rivers, estuaries and oceans. Understanding and managing blue carbon is a challenge for today and for future generations.

Neil has mentored and continues to mentor the next generation of researchers and policymakers who will have to understand and respond to the changing climate.

[Read more about Neil's work](#)

Improving cell replacement therapy for Parkinson's disease



An international team of researchers has developed a new technique for selecting dopamine-signalling neural progenitor cells to use in cell replacement therapy for Parkinson's disease.

A neural progenitor cell, like a stem cell, has a tendency to differentiate into a specific type of neuron, but is already more specific than a stem cell and is pushed to differentiate into its 'target' neural cell.

The technique has only been trialled in rats modelling Parkinson's disease at this stage, but results indicate the transplanted cells selected using this technique were a better match for the dying neurons they were meant to replace, and reduced the motor symptoms of Parkinson's in the rats.

The research is a collaborative effort between Mehdi Mirzaei from Macquarie's Australian Proteome Analysis Facility and Ghasem Hosseini Salekdeh from the Royan Institute for Stem Cell Biology and Technology in Iran. Hosseini is also a Honorary Professor in the Department of Molecular Sciences.

Parkinson's disease is a neurodegenerative disease that affects dopamine-signalling neurons in patients' brains.

Cell-replacement therapy involves turning stem cells into dopamine-signalling neurons and transplanting them into a patient's brain to replace dying neurons, and has shown some promise as a treatment for Parkinson's.

However, the variability of the cells being transplanted, including when the transplanted cells include other neuronal cells types or residual stem cells, can affect transplantation outcomes.

In clinical trials in the 1990s, for example, such contamination gave some patients severe dyskinesia, uncontrollable jerky movements that were worse than the movement problems caused by Parkinson's disease.

This technique uses the discovery of novel protein markers on the surface of the neural progenitor cells to yield a more uniform population of dopamine-signalling neurons for transplantation. This may be an important step towards more successful cell replacement therapy.

The research was published in the journal *Molecular & Cellular Proteomics* in May.

[Find out more](#)

Eco-engineering our infrastructure to better protect coastal habitats



How can we eco-engineer our infrastructure to better protect natural habitats when we're planning and building on our coastlines?

Environmental Sciences' Katherine Dafforn and James Cook University's Nathan Waltham have co-edited a special edition of the journal *Ecological Engineering* which calls for scientists, engineers and planners to work together to manage the burgeoning

growth of new construction on Australia's coastline.

Ten per cent of the coastline adjacent to the Great Barrier Reef is now affected in some way by development and 'business as usual' is no longer an option, with the altered coastline fracturing natural habitats, says Nathan.

"While we know a lot about the impact of coastal urban development, less is known about potential strategies to manage these impacts," he says.

"There is an urgent need for scientists, engineers, and planners to consider together the challenge of managing our coastal footprint, and balancing that with outcomes that are positive for the environment."

Katherine says there is a need to integrate eco-engineering insights into the design of new coastal development projects early on in the process, but opportunities to retrofit existing marine structures are also possible.

"The problem with a lot of current developments is they provide a blank, concrete canvas for marine life which doesn't work," she says.

"But we can now use 3D technology to closely mimic natural marine habitats and provide a better home for our coastal biodiversity."

[Find out more](#)

Sparrow in a lead mine: birds adapt to life in contaminated areas



A new study of house sparrows' genes has found the first evidence of animals adapting to lead contamination in heavily polluted areas of Australia.

House sparrows have lived in the mining towns of Broken Hill, NSW and Mount Isa, Queensland for around 100 and 50 years respectively, providing a unique opportunity to examine how the introduced species has adapted to these environments.

Led by researchers from Biological Sciences and Environmental Sciences, the study compared the genomic data of sparrows from these areas of high lead concentrations with sparrows from other regional and urban centres.

The study, published in *Science of The Total Environment*, found 12 genetic variants in the birds from the mining areas that have been previously associated with lead exposure in laboratory studies.

The presence of these outlier genes suggests the sparrows in Broken Hill and Mount Isa have adapted to avoid the uptake of lead into the body and to counter its negative impacts on neural and bone development.

“Adaptation to pollutants is vital to the future health of ecosystems in areas affected by human activity like mining, but we currently have very limited understanding of how animals can evolve to mitigate the negative impacts,” says lead author Samuel Andrew.

“House sparrows generally live in areas with humans, and have been in some mining towns for up to 50 generations, so they’re a perfect example to start analysing how wildlife more generally might be changing to cope with a contaminated environment”.

[Find out more](#)

Celebrating women in conservation science



Two Macquarie ecologists have contributed to a special issue of *Pacific Conservation Biology* highlighting the work of women in conservation science.

Michelle Leishman was one of the co-editors of the issue, and Lesley Hughes contributed a paper.

Michelle says it's important we focus on the great work being done by women in

conservation science to improve our knowledge and understanding of Australian plants, animals and ecosystems, particularly in light of the recent commitments by Australian institutions to achieve gender parity in science.

“Conservation science has a long history of providing the evidence base that underpins management of diverse and unique biota and landscapes,” Michelle and her co-editors write in their opening editorial.

Gender parity initiatives “should help identify and redress some of the barriers that to date have prevented some talented women entering conservation science” they write.

“By bringing together a smorgasbord of inspiring stories from a cross-section of women in conservation in Australia today, we hope that we will excite and motivate young women starting their careers in science, as well as encourage senior school students looking for options and career opportunities in science.

“As not-so-early career conservation scientists, we are frequently impressed at the passion, drive and sheer competency and skills of the next generation coming through who will lead conservation research into the future. We feel that the field is in good hands!”

Photo of co-editor Margaret Byrne, Executive Director, Biodiversity and Conservation Science of the WA Department of Biodiversity, Conservation and Attractions launching the special issue in Perth.

[Read the issue](#)

How plants and microbes can work together to clean up oil spills



Harnessing the synergy between plants and microbes will enable us to clean up oil spills more effectively, according to Earth and Planetary Sciences’ Michael Eze who spoke at Falling Walls Lab Australia earlier this month.

Falling Walls Lab Australia is a forum for 20 early-career Australian researchers and innovators to present their research, business model or idea in just three minutes in front of peers and a distinguished audience from academia and business.

“The purpose of the event is to answer the question: ‘Which wall will fall next as a result of scientific and technological innovations?’” says Michael.

Michael’s presentation, based on his ongoing PhD research, was entitled ‘Breaking the Wall of Hydrocarbon Remediation’ and looked at how we need to develop more cost-effective and eco-friendly alternatives to current methods of remediation.

“For example, the dig and haul method was estimated to cost \$4,000 per ton in Antarctica,” says Michael. “In addition, current methods are environmentally unfriendly as they alter the soil matrix and its associated microbiome.”

“In my presentation, I explained how I am trying to harness the synergy between plants and microbes to clean up oil spills in a more effective way,” he says.

“Plants produce nutrients such as sugars and amino acids through photosynthesis. They secrete these nutrients via their roots. These nutrients help the oil-degrading microbes growing on and colonising their root systems to survive.

“In response, the microbes speed up their digestion of the oil as they use it as their main carbon source, as well as promote the growth of their host plants.

“This masterpiece of biological teamwork is called ‘microbial-enhanced phytoremediation’ and is the sledgehammer we hope will shatter the wall of hydrocarbon remediation, and revolutionize the way oil spills and other environmental contaminants are cleaned up!”

Photo of Michael with Australia’s Chief Scientist Alan Finkel.

Engineering student a finalist for International Student of the Year Awards



Congratulations to Engineering's Vidushi Bhagwanani who has been named a finalist for the 2018 NSW International Student Awards in the Higher Education category.

Vidushi is from Delhi, India and is completing a Bachelor of Engineering with honours in mechanical engineering. This year she was elected president of Macquarie's Engineering Society (MQES). She is the first woman and the first international student to hold the role.

Her interest in engineering, and robotics in particular, was piqued when she read about quadruped military robot BigDog in 2005, and it was this interest in robotics which later drew her to Macquarie.

Vidushi says engineering students going into industry today need academic, professional and networking skills: "While the impeccable faculty members of the university take charge of the academic and professional development, my aim [as president of MQES] has been to help students make tangible connections with top-tier companies."

"My executive team and I were able to achieve that by organising a large-scale industry event in May 2018 with companies such as Microsoft, IBM and Aurecon. This was my greatest achievement as many soon-to-graduate students got a chance to network and gain recruitment tips from multinational companies."

Vidushi says she's honoured to be an awards finalist.

"I am extremely honoured that my work has been appreciated at such a high level at just the age of 21," she says.

"I believe the key to success is to do work worthy of recognition, not for recognition. I hope this brings confidence among other international students at Macquarie because if I can do it, they all can."

The winners of the awards are being announced on 25 September. Vidushi, we wish you the best of luck!

Knowing who to trust on Twitter



Research assessing the trustworthiness of Twitter users has seen Computing's Peiyao Li take out third place and win the People's Choice Award at Macquarie University's Three Minute Thesis finals.

"We're seeing more and more cases when fake news or deceptive information is causing financial loss and reputation damage," explains Peiyao.

"Being able to evaluate the trustworthiness of information and people is crucial for maintaining an open and health Twitter platform for society.

"Through my PhD research, I'm developing methods to evaluate the trustworthiness of users and tweets by analysing the connections and activity of users, as well as the contents of their tweets."

Engineering students explore China



Seventeen of our undergraduate engineering students recently had a wonderful study experience at Jilin University in north-eastern China.

Supported by the Australian Government's New Colombo Plan, students joined the Formula One racing car building team at Jilin and sat in the same engineering class, working alongside top Chinese students.

They enjoyed studying Chinese language and being schooled in modern and traditional Chinese culture, with the history of the region and its links with Russia, Korea and Japan also explored passionately.

"All our Macquarie engineers enjoyed their engineering study experience within the local culture like nowhere else," says Yinan Kong, academic convenor of the program from the School of Engineering.

"These added most splendid moments on their career picture at an early stage."

Vale Grant Edwards



Staff across the Faculty were saddened when Environmental Sciences' Grant Edwards passed away earlier this month from a heart attack. Our thoughts and sympathies are with Grant's wife and family.

Grant and his family moved from Canada to take up an academic role with Macquarie in 2009.

Grant's funeral is being held in Canada, but Grant's wife will be back to organise a memorial celebration in Sydney for friends, colleagues and students in October. Details will be circulated once known.

Grant was an atmospheric scientist and engineer, specialising in micrometeorology and air pollution.

Grant's research spanned many areas over his life including trace gas exchange in agricultural ecosystems, CO₂ and methane fluxes from wetlands and coal seam gas emissions.

His primary research focused on atmospheric mercury in the southern hemisphere, where he helped establish and maintain long-term background monitoring sites at Cape Grim and Gunn Point, NT.

Grant also managed the university meteorological site, and was an inspiration to his higher degree research students (pictured with him above), who, along with his colleagues, will greatly miss him.

Research in tweets

We've been sharing snippets of our recently published research and Faculty members being mentioned in the media on Twitter.

Here are some recent highlights from [@MQSciEng](#).

RT @AusSMC: Western and Indigenous knowledge unite to solve ecological mystery - @Macquarie_Uni @CSIROPublishing [Read the story](#)

"They've walked away from Paris without saying it, hoping no one would notice," says @MQBiology's Lesley Hughes QT @NatureNews: Australia now becomes the second advanced economy after the United States to drop emissions-reduction policies since the 2015 Paris climate conference. [Read the article](#)

RT @pipilika_aj: [See our latest article](#) on the principles of insect path integration @CurrentBiology @MQBiology @MQSciEng

RT @alexcarthey: Ever wondered whether microbes might actually be running the show? [We published a new review in TREE](#), thinking about the role of microbes in olfactory communication: The Extended Genotype: Microbially Mediated Olfactory Communication

RT @CulumBrown: Why is there opposition to the fact that fish feel pain? @FishLab_MQ @MQBiology @MQSciEng [Read the article](#) #welfare

RT @Macquarie_Uni: From abandoned industrial relic to Sydney Harbour's biggest green roof! [Here's how Macquarie researchers have helped transform a 1920s coal depot into a community garden, science lab and outdoor classroom](#)
#LighthouseNewsflash

Could your smart car be hacked? "Automobiles have a lot of security weaknesses in them that currently aren't really being addressed properly by car manufacturers," [says security expert John Baird](#), who consults to @OptusMQCSH @computing_mq

RT @MQMathsStats: If you missed last night's episode of @ABCcatalyst, starring our own @sophluidynamics, you can watch the full episode now! @ImpatientMaths @MQSciEng @STEMwomenMQ #mathsofchance #maths [Catalyst Series 19 How To Be Lucky: The Maths Of Chance](#)

RT @MQMoISci: Discover the world of #MolecularSciences @Macquarie_Uni in our new video "Molecular Solutions for Global Challenges: An Introduction to Molecular Sciences". Watch our staff and students in action! #excitingresearch @MQSciEng [Watch the video](#)

RT @Macquarie_Uni: "I always thought you had to be sort of Einstein's relative if you were going to be a physicist." [Macquarie University alumni Dr Cathy Foley has recently been appointed @CSIROnews' chief #scientist](#), blazing a trail for other #WomeninSTEM. #mqalumni

RT @STEMwomenMQ: [Great article in @ConversationEDU](#) with @Macquarie_Uni co-author @DrShariGallop. Gender inequalities in science won't self-correct: it's time for action @MQSciEng @WOMEESA

Faculty bulletin

New staff | Current vacancies | Third Gender Equity Summit | Lighting impacts on human and environmental health public lecture | Faculty Safety and Wellbeing Day

Welcome to new Faculty staff

A warm welcome to all the new staff who have joined the Faculty in the past month.

Please join me in welcoming **Erin Cheng** who joins Biology as an Administrator Assistant from South Way Study Tours.

Bianca Sawyer is a Senior Scientific Officer with Physics and Astronomy from the University of Otago.

Jenny-Marie Haidle has joined Computing as a Research Programmer from the University of Newcastle.

Noushin Nasiri is a Lecturer in Material Engineering and joins Macquarie from the

University of Technology Sydney.

And **Elton Button** joins the Faculty as a Technical Officer – Machinist from HRC Alliance.

Current vacancies

We're looking for an eminent and experienced academic leader to make their mark as [Professor, Functional Proteomics](#). This is a tenured appointment.

We're looking for [two postdoctoral fellows](#) to join our multimillion-dollar synthetic biology initiative in the Department of Molecular Sciences.

We have an opportunity for a [senior scientific officer](#) to provide high quality technical and administrative support to the Departments of Earth and Planetary Sciences and Environmental Sciences.

We're looking for an [electrical engineer with an R&D focus](#), and [a lecturer in engineering – electronics](#) to join an exciting industry-based project in the School of Engineering.

We have an opportunity for a [research centre administrator](#) to provide high quality support to a Macquarie University-based research centre.

We're looking for a [senior lecturer or associate professor in computer games](#).

And we have an opportunity for a [part-time administrator and outreach coordinator](#) with the Department of Physics and Astronomy.

Third Gender Equity Summit

Macquarie's progress towards gender equity involves the collective efforts of individuals and teams working at the University level and in faculties, departments and offices.

Our Gender Equity Summits, held every six months, bring together the many champions who are driving change for a more diverse and inclusive culture at Macquarie – to share ideas, successes and opportunities for collaboration.

The next Summit will be held on **Tuesday 25 September**.

[Find out more about this event](#)

Lighting impacts on human and environmental health public lecture

High-intensity LED lighting such as those used in street lighting, emits a large amount of blue light that appears white to the human eye, and is known to create glare and have a negative effect on drivers.

These LEDs operate at a wavelength that suppresses melatonin, impacts circadian sleep rhythms and impairs daytime functioning.

It does not just impact humans. Birds, insects, turtle and fish species are all disoriented by artificial light at night.

Dr Maya Babu will address artificial light at night and the impacts on human and environmental health at a public lecture at Macquarie on **Tuesday, 25 September**.

[Find out more about this event](#)

Faculty of Science and Engineering Safety and Wellbeing Day

To celebrate National Safe Work Month, the Faculty of Science and Engineering Health and Safety Committee invites all Faculty of Science and Engineering staff and HDR students to join them for the Faculty of Science and Engineering Safety and Wellbeing Day on **Wednesday, 10 October**.

Visit the stands and complete activities for your chance to win prizes.

[Find out more about the event](#)

Connect with us

If you have comments, questions or research news you think might be of interest to the rest of Faculty, I'd love to hear from you. Drop me a line at fse.execdean@mq.edu.au.

Connect with your Faculty online:

- Website: science.mq.edu.au
- Faculty on Twitter: [@MQSciEng](https://twitter.com/MQSciEng)
- Barbara on Twitter: [@BarbaraMesserle](https://twitter.com/BarbaraMesserle)

Got a story?

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