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Bold ideas, real-world impact

With a commitment to real-world applications and a legacy of producing industry-ready graduates, we're not just preparing students for the future here at the QUT Faculty of Science, we're actively creating it. Discover how our global community, leading research centres, and strong industry ties are pioneering advancements in science, mathematics, data science and information technology.



Our commitment to multidisciplinary research bridges the gap between theoretical knowledge and practical application, ensuring our students are not just educated but real-world ready. We're at the forefront of translating academic inquiry into real-world impact, nurturing a new generation of thinkers and doers who are well-prepared to meet the complex challenges of our time.

I'm incredibly proud of the pioneering spirit of our faculty, which is a hub of creativity and problem-solving, where trailblazing scientists and ambitious students come together to push the boundaries of what's possible.

The projects and profiles featured here exemplify our dedication to creating solutions that matter. They illuminate how our community of scholars and learners contribute to solving real-world problems, embodying the essence of QUT's mission to develop industry-ready graduates who are poised to make a difference.

I'm honoured to represent a faculty that's not just part of the academic landscape but drives research that has real impact, locally and globally. Join us in celebrating the achievements and aspirations that drive us forward, steadfast in our pursuit of knowledge and innovation for a better world.

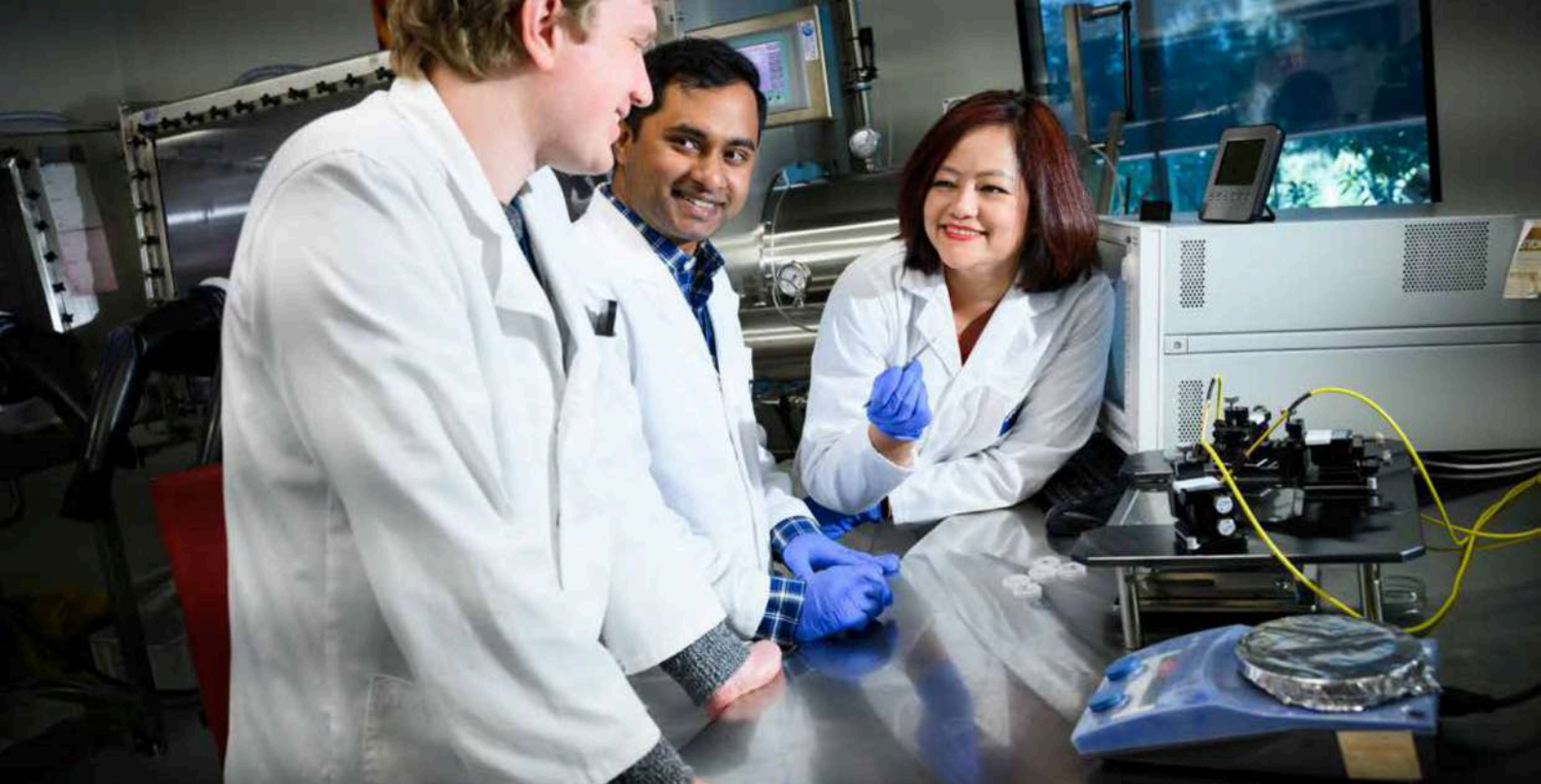


Professor Troy Farrell
Executive Dean, Faculty of Science, QUT

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QUT acknowledges the Turrbal and Yugara as the First Nations owners of the lands where QUT now stands. We pay respect to their Elders, lore, customs, and creation spirits. We recognise these lands have always been places of teaching, research, and learning. QUT acknowledges the important role Aboriginal and Torres Strait Islander people play within the QUT community.



Research beyond boundaries

Discover how interdisciplinary PhD programs are redefining research paradigms and creating a new era of scientific innovation.

In a world inundated by complex global challenges and new technology, innovative solutions are no longer born out of traditional research silos. Instead, they emerge from the fusion of diverse disciplines that ignites innovation and drives significant breakthroughs. Therefore, to hit the ground running, PhD scholars must now consider whether a narrow specialty or cross-disciplinary PhD research project is going to better equip them to achieve their goals.

The question is, what does a good multidisciplinary PhD program look like?

Breaking academic silos

Throughout academia, a significant transformation is underway. Traditionally, research projects, especially PhD projects, have largely been confined within the boundaries of a single discipline. However, as the complexities of the world's challenges grow, a more integrative and cross-collaborative

research approach has become increasingly necessary. So, as senior researchers increasingly participate in multidisciplinary projects, there's a lot of growth in opportunities for postgraduate students to build skills across several domains.

Interdisciplinary endeavours have proven vital across a variety of sectors, most notably when addressing climate change and advancing autonomous vehicle technology. These areas exemplify how combining ecological, meteorological, economic, sociological, and policy expertise yields comprehensive strategies for climate action, while the fusion of mechanical engineering, artificial intelligence, urban planning, and ethics propels innovations in self-driving car development.

Such collaborations enhance understanding and drive technological progress, underscoring the necessity of nurturing professionals and researchers who understand and integrate the breadth of knowledge from several domains. Bringing such multifaceted experts together creates a rich tapestry of perspectives that single-discipline pursuits might overlook, resulting in more comprehensive solutions and visionary advancements.

The power of data science

Data science is revolutionising entire industries and creating opportunities for innovation and progress in almost every field. From transforming business strategies to advancing healthcare, data analytics is at the forefront of the push to develop solutions to some of the most daunting challenges we've ever faced.

Learn how mastering data science skills could empower you to be a part of this dynamic field, shaping the future and solving real-world challenges so you can be part of the change you wish to see in the world.



https://link.cosmosmagazine.com/L_yE

Multidisciplinary research in action

Multidisciplinary research produces exceptional impacts. Here are some examples of how QUT's multidisciplinary research, at the postgraduate level and beyond, shapes a brighter future for us all.

Pioneering virtual geology

Imagine exploring the rugged terrain of Mars or delving into the geological wonders of Earth, all from the comfort of your



Cael Gallagher using a virtual geology teaching tool in a first-year QUT Earth science workshop.

classroom. This is no longer the stuff of science fiction, thanks to the groundbreaking work of PhD student Cael Gallagher and her colleagues in QUT's Virtual Geology research group. Supervised by Associate Professor Selen Trkay and Associate Professor Christoph Schrank, Cael's research is a key part of a larger ARC Discovery Project that blurs the lines between IT and geoscience. Creating virtual environments, this initiative revolutionises geoscience education and research, and it's an excellent example of interdisciplinary impact.

Geology is a notoriously challenging subject to teach at university. After all, astronomy students can view the universe through a telescope, and chemistry students can conduct experiments

in university labs, but geology teachers have to organise expensive field trips if they want to give their students hands-on experience in some of the most educationally valuable locations. At least that was the case until Cael and her team began developing virtual geology field trips for undergraduate science students.

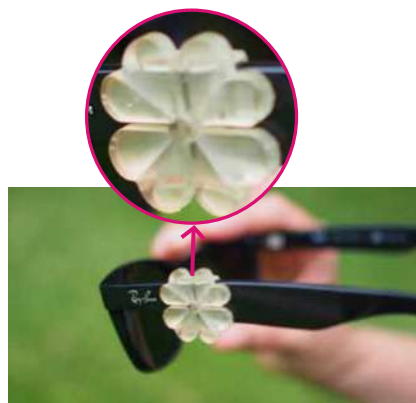
These digital excursions offer accessible, interactive learning experiences, allowing a wider range of students to explore geological wonders from their classrooms. And the applications of this research don't stop at Earthly geology.

Beyond Earth's landscapes, Cael's team has crafted a virtual Mars surface, granting students unprecedented access to extraterrestrial geology, a domain once reserved for astronauts and elite scientists. By harnessing the power of virtual reality (VR), this research opens up new frontiers in education and our understanding of the universe.

Cael's endeavours showcase the synergy of IT and geology, fostering innovative educational solutions and broadening the scope of scientific inquiry. Her work exemplifies the power of interdisciplinary research to break new ground in both educational methodology and the understanding of our planet and beyond, thereby inspiring future generations of scientists and revolutionising the educational landscape.

Fashion meets function with wearable tech

Current Australian guidelines advise us to 'slip, slop, slap, seek, and slide' to protect against harmful UV radiation, while also recommending sufficient sun



Meet Vanessa Zepeda, trailblazing astrobiologist



From marine biology to environmental science to astrobiology, Vanessa's path has been a little curvy. It's even taken her to NASA's Jet Propulsion Laboratory! For her PhD at QUT, she studied the possibilities of life beyond Earth. Vanessa's research explores how organisms survive in extreme marine environments, drawing parallels to potential conditions on other planets. Discover more about Vanessa's journey and her groundbreaking research.



https://link.cosmosmagazine.com/L_yG

exposure to obtain a vitamin D-effective dose. But how can we know when we've had enough UV exposure?

UV-sensing wearable technology could offer a handy way to monitor your exposure and is becoming more commonplace. But not everyone wants, or can afford, to wear expensive smartwatches and VR glasses, and single-use alternatives are neither cost-effective nor environmentally friendly.

Fortunately, QUT is well on its way to resolving those issues thanks to a project that spans several traditionally siloed fields.

Chemists have developed a groundbreaking switchable dye that changes from colourless to pink after UV exposure and can be reset using nothing more complicated than LED light. And fashion designers are designing super stylish 3D-printed earrings, bracelets, and bag clips that are impregnated with this dye, allowing anyone to seamlessly integrate this technology into their daily routine. In the future, people may even be able to create personalised designs.

Researchers are working on ways to enhance the speed of the reaction. So, eventually, this tech will be instrumental in monitoring UV exposure over time and alerting to the wearer when they need to seek shelter. The integration with digital technology may also allow long-term exposure monitoring.

This fusion of expertise from distinct fields is setting a new standard in wearable technology — one that protects, informs, and styles, all in a single, sustainable package.

Harnessing AI for wildlife

Imagine a world where the vast chorus of wildlife can be understood and preserved through the power of technology. This is

no longer a dream, but a reality being sculpted thanks to a collaboration between QUT and Google Australia, through their visionary A2O sound search engine.

Until recently, researchers had to manually sift through hundreds of years' worth of audio records to find sounds that match or are similar to the animal sounds they've recorded. Now, thanks to A2O, they can upload a recording and



Collaborative research at QUT developing wearables that change from colourless to pink when exposed to UV light.

Introducing Bailey Richardson, biomimicry innovator



Winner of the ATSE Ezio Rizzardo Polymer Scholarship, Bailey Richardson is using his PhD research to prepare for a future where biomimetic chemistry transforms healthcare and other industries. He builds peptides that fluoresce or change colour when exposed to light or a change in pH for use in diagnostic medicine. Other applications include targeted drug delivery and smart solar cells.

Dive deeper into Bailey Richardson's innovative work and the exciting possibilities of biomimicry in material science.



https://link.cosmosmagazine.com/L_yH

AI will automatically match it to any recordings in the extensive A2O database, allowing scientists to more quickly and easily make connections between species and locations.

This will save thousands of hours of manual labour and presents opportunities for using recordings made by citizen scientists to widen the scope of ecological studies.

Professor Paul Roe, Head of QUT's School of Computer Science and the Lead Researcher at the Australian Acoustics Observatory, says, "You have to understand the environment before you can protect it". A2O is now a powerful tool that will enable scientists to better understand Australia's ecosystems to protect them from threats like deforestation, bushfires, and invasive species.

Through the A2O search engine, QUT and Google Australia aren't merely bridging silos and innovating technologically. This collaboration marks a crucial step towards understanding and preserving our natural world. It also demonstrates the immense potential of AI in contributing to conservation efforts.

How to get started shaping tomorrow's world through interdisciplinary research

Some of history's most celebrated experts had a very narrow focus and remained focused on their specific fields. However, a traditional PhD in a narrow, well-defined field of study isn't your only option. As this research snapshot shows, scientists at all levels are also developing incredible solutions thanks to multidisciplinary research.

If you'd rather not be limited to a narrow field of expertise, QUT offers an array of PhD research projects that will enable you to develop multidisciplinary skills, equipping you to make a significant impact on the world — not just a substantial contribution to the body of knowledge. So, stop dreaming and start doing. Check out the QUT PhD projects actively looking for students now.



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QUT ecoacoustics research team, Professor Paul Roe and Dr Danielle Teixeira (2023).

Applied maths to the rescue: the Jack Powers story



QUT PhD student, Jack Powers, may hold the key to solving Australia's elective surgery waiting list problems. His superpower? Applied mathematics. Currently, category one patients are disproportionately prioritised, meaning category three patients often have to wait an inordinately long time before they can access the surgery they need. By developing a dynamic priority scoring system, Jack gives hospitals a more objective method of equitably prioritising patients.

Learn more about Jack's journey and the transformative power of applied mathematics:



https://link.cosmosmagazine.com/L_yI



Dr Katrina Wruck is excelling in academia and sharing her knowledge with remote Aboriginal and Torres Strait Islander communities

Inspiring Indigenous scientist empowers First Nations youths

Dr Katrina Wruck, industrial chemist and proud Mabuigilaig and Goemulgal woman, is revolutionising the field of environmental chemistry and standing out as a beacon of hope for young Aboriginal and Torres Strait Islander people who often mistakenly believe they'll never be able to go to university or become a scientist.

Like many Aboriginal and Torres Strait Islander people, from an early age, Katrina faced significant challenges that could easily have derailed her future career. From having her academic abilities underestimated to battling logistical challenges that had her waking at 4 am for lectures, the road to becoming a postdoctoral fellow has been anything but smooth. But she never let the challenges defeat her.

Thankfully, she caught a break when her dedication was rewarded with a CPME top-up PhD scholarship and later, the opportunity to become the inaugural participant in the QUT Indigenous Australians PhD/Professional Doctorate to Postdoctoral Fellowship (P2P) program, which gave her funding for a



“

They tell me I'm the first Indigenous scientist they've ever met. And that really tells me that what I'm doing with this outreach is so important.

postdoctoral fellowship and the chance to diversify her professional development with a year-long secondment to another university (Katrina chose the University of Melbourne).

This support has allowed her to conduct truly groundbreaking research. Her PhD work on zeolites, transforming mining waste into beneficial zeolite LTA, is set to be patented. And her postdoctoral research is crucial, focusing on breaking down harmful forever chemicals into safer elements. The latter offers hope in addressing global contamination and environmental preservation challenges, with especially significant implications for vulnerable polar regions where forever chemicals are bioaccumulating despite no significant human presence.

Katrina's impressive skills earned her the 2022 Queensland Women in STEM Prize as well as several prestigious appointments, including the 2024 Deadly Science Ambassador and a position on Science and Technology Australia's Reconciliation Action Plan Working Group. As a result, she's asked to speak at a wide variety of events. She then uses her speaker's fees to fund outreach trips to Aboriginal and Torres Strait Islander communities where she's inspiring the next generation of First Nations scientists and academics.

Katrina's story is not just one of scientific achievement but also of empowering Aboriginal and Torres Strait Islander youth, making her work both immensely impactful and transformative. You too can become an inspirational scientist when you choose a course from QUT's Faculty of Science.

KICKSTART your academic career with QUT'S P2P program.



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Computer games might be good for you

Professor Daniel Johnson is redefining the narrative around interactive media, merging his academic prowess and passion for gaming to challenge prevalent misconceptions about video games, presenting them not as mere sources of entertainment but as significant societal tools. He argues the medium, often criticised for promoting violence or antisocial behaviour, has far-reaching positive impacts that are overlooked. In fact, his work on human-computer interaction sheds light on how gaming can improve mental health, foster community, enhance learning, and even act as a catalyst for social change.

Like many of us, Daniel was, from a young age, captivated by the narratives and interactive worlds offered by video games. But while many video game enthusiasts fear it's not a sustainable job option, he's proving it's entirely possible to build a career around games. In fact, as a psychologist with only a fundamental knowledge of coding, he's living proof you can enter the field even if you're not enthused by coding.

So what exactly does Daniel do? He studies how people interact with computers with the aim of designing technologies that allow us to interact in novel ways. And what his research is uncovering is utterly fascinating, not least for parents worried about how much time their children spend gaming.

"There are some amazing quotes and pieces of research about the dangers of things like fiction novel reading," Daniel says. "Contrast that with today and how excited parents might be if their children pick up a fiction novel. Yet, it was not that long ago that there were real concerns about that. I believe we'll one day be in a similar situation with computer games."

He goes on to say that popular media has cast gaming as a bit of a villain and that parents often tell him they personally see their children having a great time but that they 'know they should be worried'. When asked what advice he'd

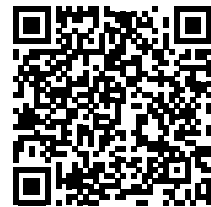
give to concerned parents, he said, "the best advice we have for parents is for you to play computer games with your kids. See what they're playing, play with them, find out who they're playing with, get engaged".

Daniel's work shows that interactive media is more than mere entertainment. His findings demonstrate that gaming can enhance problem-solving skills, foster creativity, promote emotional resilience, facilitate human connections, and a whole lot more. Perhaps most surprisingly, his work reveals games have therapeutic potential, offering hope for innovative approaches to preventing and treating mental health challenges, and even rehabilitation.

LOVE GAMES and keen to understand what makes us tick? Check out QUT's Bachelor of Games and Interactive Environments.



Video games can be an outlet that's absolutely what's keeping you above water and keeping you on track.



https://link.cosmosmagazine.com/L_yA



Human-computer interaction researcher, Professor Daniel Johnson, believes the benefits of video games are underrated