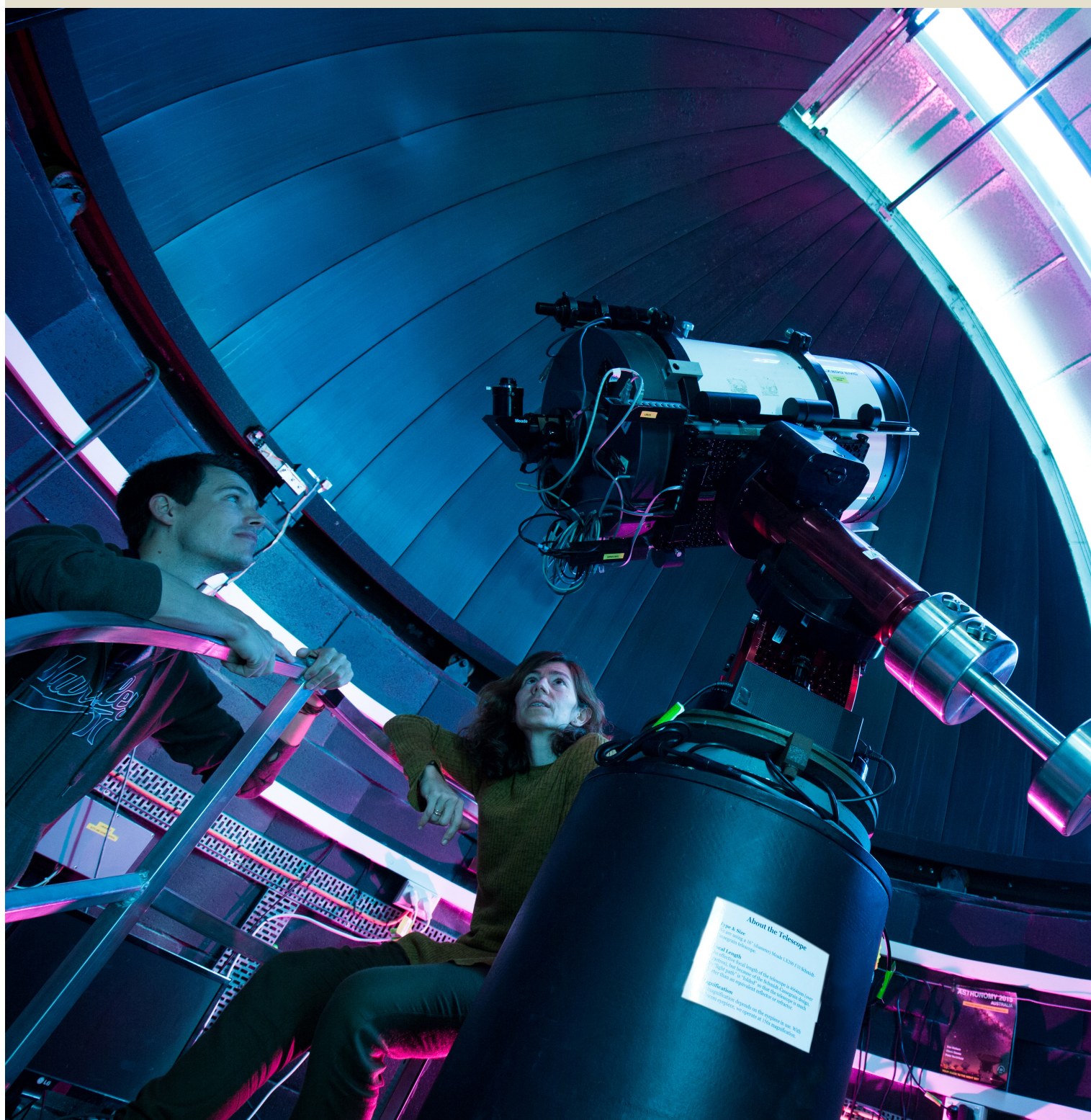


# Discover. Create. Innovate.

FACULTY OF SCIENCE AND ENGINEERING  
STRATEGIC PLAN 2016–2020

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*We're the university for the audacious and the brave, those not afraid to tackle the big issues. In a world more dependent on science and engineering than ever before, we stand at the forefront of change and innovation.*

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# Executive summary

Macquarie University was founded as an innovator; first in teaching and later in research. This tradition has carried on as the University has grown in size, scope, mission and impact. This energy for innovation and achievement is continued in the Faculty of Science and Engineering.

From a handful of students on the University's first day, today our Faculty serves nearly 6,000 science and engineering students across all our programs.

Currently the Faculty comprises 10 departments spanning the physical, biological, and mathematical sciences and engineering. Situated on a beautiful campus and adjacent to Macquarie Technology Park, the Faculty adjoins the Faculty of Medical and Health Sciences and Macquarie University Hospital, and the Faculty of Business and Economics. We could not hope for a finer location anywhere in Australia!

The Faculty of Science and Engineering has been the home of a number of areas of research excellence and led many significant initiatives over the years, including early climate change research, the commercialisation of WiFi, photonics, evolutionary biology, and internationally leading research in earth's crustal systems.

Over several decades the Faculty has also enjoyed a history of collaboration with external partners and has been recognised nationally and internationally for outstanding performance in both research and education.

The launch of our strategic plan 2016–2020 heralds the beginning of a new era for science and engineering at the University, one which looks back and honours the achievements of the past while focusing with excitement on the possibilities and opportunities the future will bring. The plan could not have been completed without the active contribution of colleagues from across the Faculty. I thank all those who participated in the planning process for their time, commitment and passion.

Our future vision is both powerful and inspiring. I look forward eagerly to the years to come.

**Professor Barbara Messerle**

Executive Dean, Faculty of Science and Engineering

**November 2015**

PHOTO: CHRIS STACEY



# Faculty at a glance, 2015

**5,200**  
UNDERGRADUATE AND  
POSTGRADUATE STUDENTS

**500**  
HIGHER DEGREE  
RESEARCH STUDENTS

**25**  
DEGREES

**37**  
MAJORS

**360**  
ACADEMIC STAFF

**170**  
PROFESSIONAL AND  
SUPPORT STAFF

**~\$70 MILLION**  
ANNUAL BUDGET

**~\$25 MILLION**  
ANNUAL RESEARCH INCOME  
(HERDC)

# Vision, purpose and values

The purpose of this plan is to provide strategic direction and priorities for the Faculty of Science and Engineering, as a basis for allocating effort and resources and measuring outcomes over the next five years.

**VISION**

We are committed to excellence in our research, teaching, innovation and engagement in science and engineering. Our vision is to make significant and valued contributions in these areas as we address the opportunities and challenges of our times.

**PURPOSE**

- Our purpose is to:
- Create and sustain an outstanding, supportive and ethical environment where our students, staff and partners can learn, grow and achieve their aspirations
  - Conduct research that has a significant impact on scientific knowledge and on the well-being and prosperity of individuals and societies
  - Act as a catalyst to drive scientific and technological creativity, innovation and effective partnerships
  - Promote and communicate the benefits of science and scientific methodologies
  - Provide an enriched student learning experience through scholarship, engagement to enhance employability.

**UNIVERSITY VALUES**

As custodians of Macquarie University we value:

Scholarship

We believe learning, enquiry and discovery improves lives

Integrity

We conduct ourselves ethically, equitably, and for mutual benefit

Empowerment

We make our community a source of strength and creativity

**FACULTY VALUES**

In addition to the University values, the Faculty developed its own more specific set of related values and behaviours as an expression of our unique culture.

VALUE	BEHAVIOUR
GENEROSITY	We are generous in supporting and encouraging each other and colleagues around the world.
ENTHUSIASM	We seek at all times to provoke and inspire a passion for science, engineering and knowledge.
INCLUSIVITY	We bring others into our circles and avoid all forms of discrimination.
EXCELLENCE	We pursue standards of excellence in all aspects of our research, teaching and innovation.
COURAGE	We stand by our convictions, make the hard decisions and take appropriate risks.
INTEGRITY	We act with integrity and honesty in our search for answers in science and life.
DIVERSITY	We support the right of individuals to hold diverse viewpoints and to respectfully advocate their views while also respecting the right of others to differ.
AWARENESS	We strive to be aware of the world outside as well as our institutional and personal impact on those around us, and aim to minimize our impact on our planet.



# Overarching faculty priorities

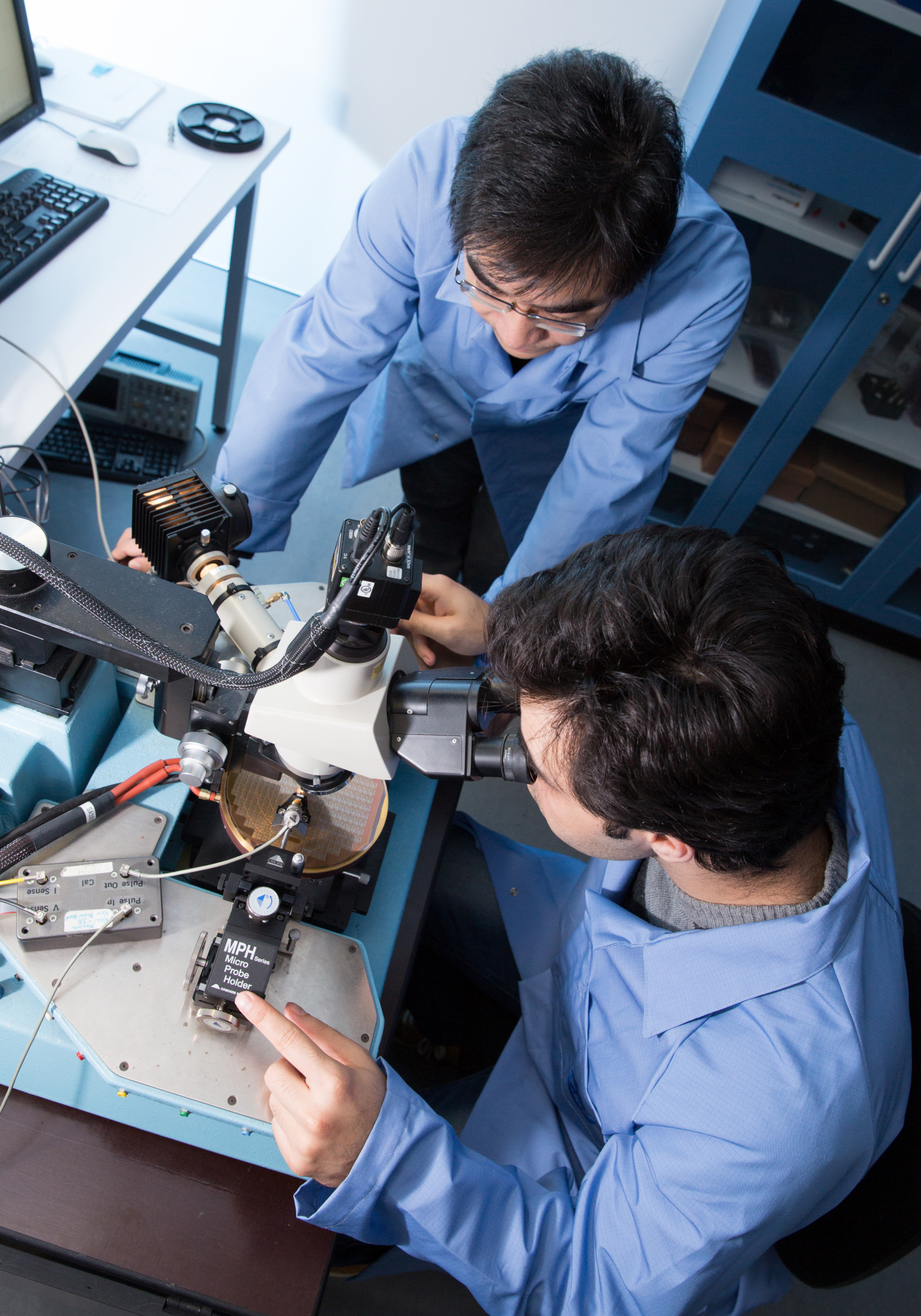
Based on extensive analysis and consultation, the Faculty will pursue 8 priority areas over the period of this plan.

## ACADEMIC PERFORMANCE, PEOPLE AND QUALITY

1. Improve research performance, quality and impact across all academic areas and research categories.
2. Increase the number, quality and employability of our HDR, postgraduate and undergraduate students and significantly lift the quality of incoming undergraduate students (established using ATARs and other relevant student measures).
3. Grow our capacity to conduct effective external collaborations and partnerships locally and globally including making best use of our proximity to Macquarie Park.
4. Provide a learning experience that produces graduates who are creative, innovative and adaptable, willing to take on challenges and learn from those experiences.
5. Offer opportunities for academic and professional staff to develop academic, leadership and other skills – with a particular focus on women, minorities and STEM education.
6. Develop successful collaborations and interactions within and between individual departments and Faculties.

## SUPPORT SYSTEMS AND INFRASTRUCTURE

7. Take advantage of new building programs, opportunities to create research infrastructure hubs and refurbishments to maximise innovation, research quality and connectivity.
8. Fix, renew and streamline key administration, data and support systems to release time for academics to focus on research and teaching.





# Priority research areas

Research performance is of special importance to any Faculty of Science and Engineering. Over the period of this plan the Faculty will build new directions in research by strengthening cross disciplinary research and supporting the growth of new collaborative research areas within and outside the Faculty.

## ADDRESSING THE “BIG QUESTIONS”

The Faculty will support research that addresses the big questions we face as a society including:

### SECURE PLANET

- Living in a changing Environment
- Exploring planet Earth and beyond

### INNOVATIVE TECHNOLOGIES

- Science and Engineering Technologies for the 21st Century
- Big Data: acquisition, analysis application and assurance

## STRENGTHENING CROSS DISCIPLINARY RESEARCH

The Faculty will encourage the growth of major research themes that involve research teams collaborating across the Faculty and with other Faculties, notably in:

- Climate Science
- Marine Science
- Planetary Sciences
- Biosecurity
- Cybersecurity

Underpinning these major themes we will continue to develop our existing research areas, each of which has articulated specific priorities as outlined below.

### MAINTAINING AREAS OF STRENGTH

- Biological Sciences (Ecology, Conservation Biology, Evolution, Animal Behaviour)
- Earth Sciences (Geodynamics, Geobiology and Marine Science, Planetary Science, Geochemistry and Petrology)
- Physics & Astronomy (Photonics, Optics and BioPhotonics, Astronomy & Astrophysics, Quantum physics & quantum information)

### BUILDING UNIQUE STRENGTHS

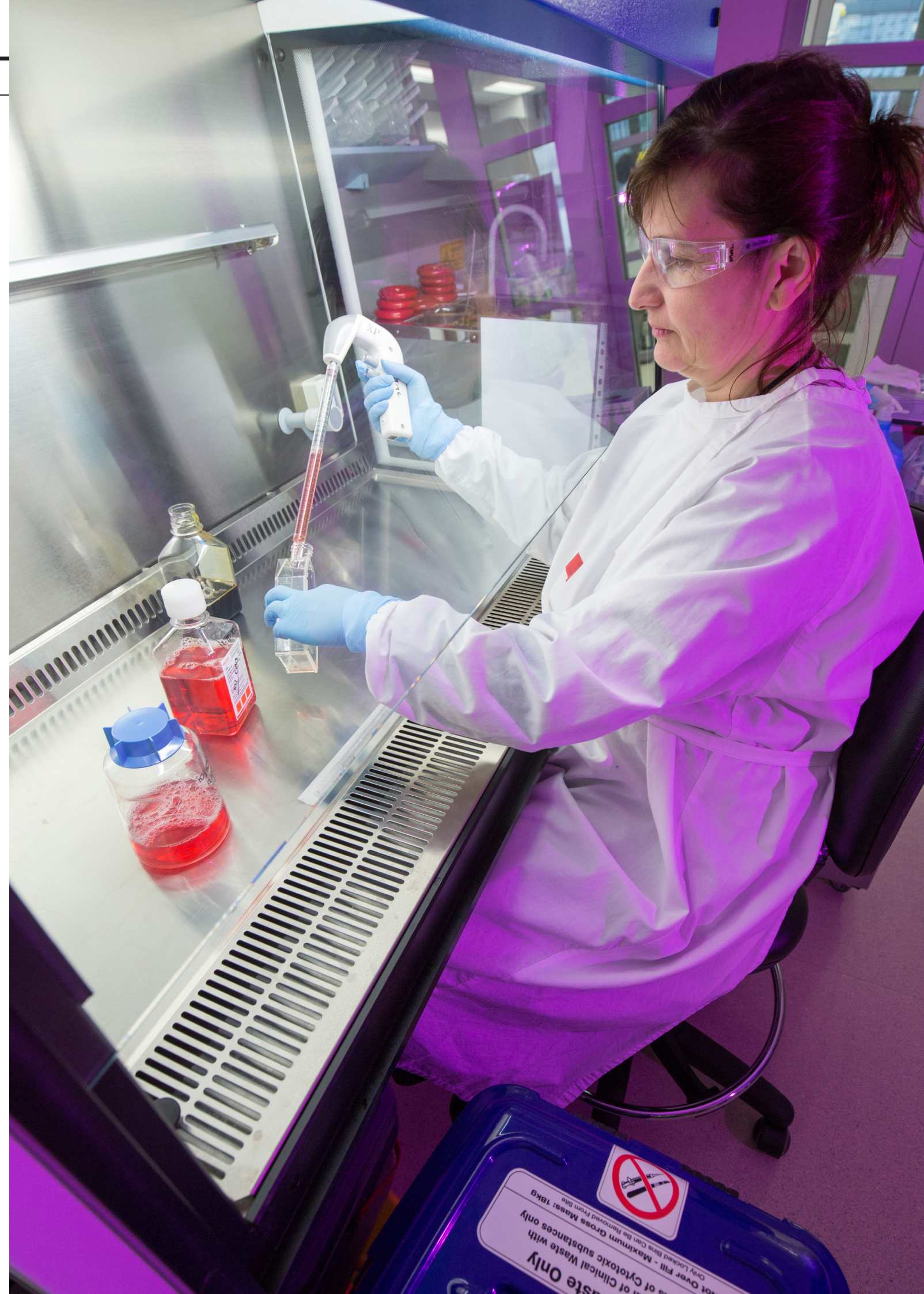
- Environmental Sciences (Earth Surface Processes, Energy & Contaminants, Coastal & Marine)
- Chemical & Biomolecular Sciences (Biomolecular Technologies & ‘omics’, Synthetic Biology, Chemical Biology)
- Chiropractic (Musculoskeletal conditions across the lifespan)

### GROWING AREAS OF OPPORTUNITY

- Engineering (Wireless Technologies & Networks, Biomedical Imaging & Sensing, Sustainable Energy Systems)
- Computer Science (Cyber Security, Data Science, Virtual Reality)

### STRENGTHENING THE UNDERPINNING SCIENCES

- Mathematics (Analysis, Applied Mathematics, Category Theory)
- Statistics (Mathematical & Computational; Biostatistics, Epidemiology & Medical; Bioinformatics)

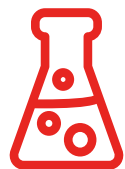








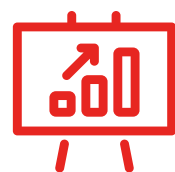
# Strategic goals



**1.**

**To be recognised as one of the leading science and engineering faculties in Australia and a respected peer regionally and globally.**

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**2.**

**To attract, grow and support world class researchers and talented professional staff.**

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**3.**

**To be the destination of choice for high ability students who share our values and are passionate about science and engineering.**

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**4.**

**To engage broadly, deeply and productively with industry, government and non-government bodies.**

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**5.**

**To engage and collaborate closely with our communities, schools and other key stakeholders and strengthen our profile and reputation.**

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**6.**

**To ensure we have the best possible infrastructure, administrative systems and processes.**

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# Strategic goals

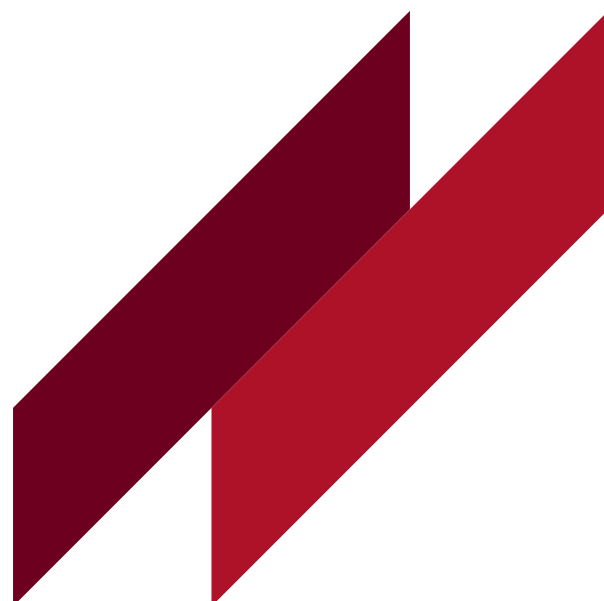
## 1. To be recognised as one of the leading Science and Engineering Faculties in Australia and a respected peer regionally and globally.

### WHAT WE WILL DO: PRIORITIES AND INITIATIVES

- 1.1 Develop and implement plans to meet our University research plan targets: increase significantly our performance in all research categories particularly non-Category 1 research funding
- 1.2 Seek productive collaborations with the Faculty of Medicine and Health Sciences
- 1.3 Build our priority research areas
- 1.4 Enhance public interest in science, maths and engineering
- 1.5 Review our workload and reward models to support high performing staff and encourage enhanced performance
- 1.6 Maximise our positioning in local and international rankings
- 1.7 Implement a program of ongoing, structured reviews of departments and programs
- 1.8 Support staff to be strategic in where and how they publish to increase journal impact
- 1.9 Publish an annual Faculty Report

### WE WILL MEASURE OUR PERFORMANCE BY:

- a) Assessing our progress against the research targets set by the University Research Framework
- b) Monitoring annually our rankings, where appropriate, nationally and globally
- c) Assessing our impact annually – through numbers of external collaborations, external awards, interactions with schools



## 2. To attract, grow and support world class researchers and talented professional staff.

### WHAT WE WILL DO: PRIORITIES AND INITIATIVES

- 2.1 Attract high performance research groups that will complement our strengths
- 2.2 Ensure research facilities are regularly upgraded to attract and retain outstanding researchers and teams
- 2.3 Review the Faculty research centre policy to maximise scale, performance and alignment with Faculty and University strategies
- 2.4 Minimise barriers to cross and multidisciplinary research within and outside the Faculty
- 2.5 Ensure our Master of Research and PhD offerings are innovative and high quality and maximises employability for graduates
- 2.6 Put in place a limited number of deep, two-way partnerships with overseas institutions
- 2.7 Partner with Human Resources to implement appropriate mentoring and development programs for Faculty leaders, academics, students and professional staff
- 2.8 Become a destination of choice for female scientists and engineers and professional staff by developing a transparent and evidence-based gender equity process
- 2.9 Continue to deepen and broaden our PhD cotutelle program
- 2.10 Track alumni destinations and employment outcomes more effectively

### WE WILL MEASURE OUR PERFORMANCE BY:

- a) Annually assessing the number of international partnerships (publications and grants with international collaborators, numbers of cotutelle HDR students)
- b) Growing the annual completions in HDR student numbers – currently 103, to 225 over 5 years
- c) Growing the percentage of female academic staff at Faculty and Department levels to reach a target of 40% in 5 years; we currently have 110 (29%) permanent and fixed-term female staff in the faculty
- d) Putting in place a mechanism to review centres and assess their output (grants and publications) every 3 years
- e) Monitoring the employment outcomes of our PhD and MRes Alumni



# Strategic goals

## 3. To be the destination of choice for high ability students who share our values and are passionate about science and engineering.

### WHAT WE WILL DO: PRIORITIES AND INITIATIVES

- 3.1 Develop a suite of exciting enrichment and accelerated options for high-ability students including the option of post-graduate summer schools
- 3.2 Grow the number of merit scholarships in science and engineering
- 3.3 Work with internal and external stakeholders to boost STEM skills of school leavers
- 3.4 Institute a number of innovative teaching programs including double degrees that address market needs or gaps and actively engage industry partners
- 3.5 Pilot and implement a program of evidence-based innovations in teaching and learning
- 3.6 Provide a personalised education with a strong sense of community
- 3.7 Develop a “learning space” strategy for the Faculty
- 3.8 Deliver a distinctive learning experience through the use of active learning and authentic assessment
- 3.9 Enhance research-integrated teaching in our coursework programs with an emphasis on students as active participants in their learning

### WE WILL MEASURE OUR PERFORMANCE BY:

- a) Annually assessing the number of incoming students and their ATARs. We will aim to substantially increase our entry ATARs in our generalist programs so that our minimum entry ATAR is close to 80 or above across all programs
- b) Annually determining the number of undergraduate students who hold merit scholarships or other scholarships
- c) Assessing our impact annually – through numbers of external collaborations, external awards, interactions with schools
- d) Review the number and nature of programs on offer annually
- e) Monitoring the employment of our coursework graduate alumni

## 4. To engage broadly, deeply and productively with industry, government and non-government bodies.

### WHAT WE WILL DO: PRIORITIES AND INITIATIVES

- 4.1 Develop a formal Faculty engagement plan
- 4.2 Actively align with the University Corporate Engagement strategies with a focus on Macquarie Park
- 4.3 Investigate creative options for academic staff and HDR students to work with, and in, industry settings
- 4.4 Seek out partnerships with Federal and State government agencies
- 4.5 Ensure all Departments and major Centres have an active advisory committee in place

### WE WILL MEASURE OUR PERFORMANCE BY:

- a) Annually assessing the number of partnerships in place, and the number of grant applications in collaboration with external partners
- b) Increasing our income from \$26M to \$46M (including non-Category 1 by 60%) by 2020
- c) Determining the progress with advisory committees in each department annually



# Strategic goals

## 5. To engage and collaborate closely with our communities, schools and other key stakeholders and strengthen our profile and reputation.

### WHAT WE WILL DO: PRIORITIES AND INITIATIVES

- 5.1 Develop a school engagement strategy with a particular focus on Northern and North-west Sydney
- 5.2 Leverage the PACE experience to deepen engagement in the community
- 5.3 Develop a new marketing and communications strategy for the Faculty
- 5.4 Identify and pursue new income streams and philanthropy in partnership with the Macquarie Foundation
- 5.5 Maximise the philanthropic outcomes of any new building program or refurbishment
- 5.6 Explore ways to deepen relationships with parents
- 5.7 Ensure we have in place an active program of visiting speakers and community events
- 5.8 Increase the number of women studying IT and engineering, and maintain high numbers studying across the Faculty
- 5.9 Investigate ways to attract indigenous and other minority students to study science and engineering

### WE WILL MEASURE OUR PERFORMANCE BY:

- a) An increased number of incoming students of high quality
- b) An increased number of students undertaking science and engineering based PACE units
- c) An increased income from philanthropy
- d) Successful community events
- e) An increased number of women, indigenous and other minority students studying science and engineering at all levels

## 6. To ensure we have the best possible infrastructure, administrative systems and processes.

### WHAT WE WILL DO: PRIORITIES AND INITIATIVES

- 6.1 Strengthen the Faculty's approaches and processes for WHS, to ensure we have the strongest possible WHS practices in place throughout the Faculty
- 6.2 Strengthen the Faculty's planning and performance culture while avoiding unproductive bureaucracy
- 6.3 Improve and streamline research management and reporting systems
- 6.4 Where productive, standardise Departmental administration and academic governance structures
- 6.5 Ensure Faculty leaders have the data, systems and support they need to manage operationally and strategically
- 6.6 Investigate the possibility of creating a suite of teaching and learning measures to parallel research metrics
- 6.7 Investigate the creation of a Science and Engineering precinct on campus including capacity to support start-up companies

### WE WILL MEASURE OUR PERFORMANCE BY:

- a) Improved administrative and technical support across the Faculty
- b) Enhanced administrative processes
- c) Annual reports from each department against a set of targets from this plan
- d) Requiring annual reports from each department against the University-based research targets



# Background and history of the faculty

Macquarie University was founded as an innovator; first in teaching and later in research. This tradition has carried on as the University has grown in size, scope, mission and impact. The University was formally established in 1964 with the passage of the Macquarie University Act of 1964 by the New South Wales Parliament. The New South Wales Parliament had determined a growing need for a third major university. Located on 126 hectares in Ryde Municipality, the University opened its doors on 6 March 1967 to roughly a quarter more students than anticipated.

Initially the University consisted of a set of schools based on naturally collaborative areas which provided the genesis of many of the University's departments that are in place today. Under Vice-Chancellor Di Yerbury, schools were amalgamated into Divisions and renamed as departments. In 2000, the University structure moved from having a number of schools to three Colleges (Commerce, Humanities and Social Sciences, and Science and Technology) each of which held Divisions, which in turn housed the new departments. In 2009 the University changed its structure to one based on Faculties. With the recent addition of Medicine and Health Sciences there are now five faculties at Macquarie University.

The Faculty of Science and Engineering traces its roots back to the founding of the University with the appointment of several key academics whose contributions continue to shape our approach to this day. Professor Frank Mercer was appointed in 1965 as the Chair in Biology and in the same year Professor Gordon “blue” Barclay was appointed as the Chair in Chemistry. Our continued emphasis on a holistic approach to education can be found originally in Professors Mercer and Barclay's wide interests and integrated approaches, with Professor Barclay proposing radical new teaching techniques for the time such as the “lectureless University”. In 1966, John Ward, a Fellow of the Royal Society who was an internationally highly respected Physicist for his work in quantum theory, was appointed to the University. In 1967 the first lecture at Macquarie University was delivered on “The structure and properties of matter” by Professor Peter Mason. Professor Ron Aitchison became the first Professor in Electronics in 1971, after the University's formal opening, laying the foundation for many future technical innovations and eventually a broader thrust in engineering. The first Head of the School of Earth Sciences was Prof Alan Voisey (DSc USyd.) who had also been the foundation professor of Geology at the University of New England before being the foundation professor at Macquarie. The School of Earth Sciences was the first in Australia to offer a broad coverage of geology, geophysics, physical geography and human geography. Continued growth in the sciences and engineering led to the

development of the eastern district of the campus at the same time that a division structure evolved from the schools. During this period, Professor Jim Piper joined Macquarie University and developed our world-renowned capability in photonics.

The current Faculty of Science and Engineering is based on the amalgamation of the Division of Environmental and Life Sciences (comprising Biological Sciences, Chemistry & Biomolecular Sciences, Earth & Planetary Sciences, Health & Chiropractic, Human Geography, Physical Geography and the Graduate School of the Environment) and the Division of Information and Communication Sciences (Computing, Electronics, Mathematics, Physics). In addition, the Department of Statistics which was part of the Division of Economic and Financial Studies, joined the Faculty. The departments that comprise the Faculty today reflect these original departments.

Situated on the edge of campus closest to Macquarie Technology Park, the Faculty adjoins the Faculty of Medical and Health Sciences and Macquarie University Hospital on the one side and the Faculty of Business and Education on the other. Offering 25 degrees across 37 majors, the Faculty prides itself on a personalised approach to teaching which is informed by world-class research. From a handful of students on the University's first day, today we serve 5200 students at the undergraduate and postgraduate levels, and nearly 500 HDR students.

Over the year the Faculty of Science and Engineering has been the home of a number of areas of research excellence and led many significant initiatives including climate change research, commercialisation of WiFi, photonics, evolutionary biology, and internationally leading research in earth's crustal systems. The commercialisation of WiFi, early work in climate change, and the development of gene sequencing are hallmarks of our world-changing achievements in wireless, the environment and proteomics, respectively. Macquarie has also promoted the growth of science through its various research centres which include the Climate Futures Centre, ARIES, CoACT, GEMOC, ARC CoE CCFS and Risk Frontiers.

Driven by the spirit of innovation the Faculty has enjoyed a long history of collaboration with external partners. We are recognised nationally and internationally for our outstanding performance in both research and education. At the forefront of research at the University, the Faculty is also known world-wide as a high-quality centre for teaching and research. This dual focus promotes an enquiring approach to learning which actively encourages students to question, investigate and contribute to the creation of new knowledge.





Faculty of Science and Engineering  
Macquarie University  
NSW 2109 Australia  
**T: +61 (2) 9850 6000**  
**[mq.edu.au](http://mq.edu.au)**

Photography: Rob Harcourt and Chris Stacey.