
FACULTY OF
SCIENCE AND
ENGINEERING
MACQUARIE
University
(YOU)us
YOU TO THE
POWER OF us
CAN FIND THE ANSWERS
TO LIFE'S QUESTIONS
Department of Biological Sciences

The Department of Biological Sciences is dedicated to achieving excellence not only in research and training but also in service to the scientific and broader community.

ABOUT US

We have a strong integrative approach to research. Our hallmark is a capacity to examine complex questions from multiple perspectives and to foster collaboration within the department and beyond. We are home to a diverse community of higher degree research candidates who are vital contributors to our research. We have state-of-the-art research facilities and provide support to and training for our students and researchers.

In the 2018 Excellence in Research for Australia, our research in biological sciences, environmental sciences, and agricultural and veterinary sciences was ranked as above or well above world standard.

We have strong industry research collaborations with leading bodies, including the Australian Museum, the Taronga Conservation Society, the Royal Botanic Garden Sydney, CSIRO, Hort Innovation and a wide range of industries. We are a founding partner in the Sydney Institute of Marine Science. Our engagement with industry ensures our research is world leading and industry relevant.

Our researchers and teachers have won multiple awards, including the Prime Minister's Prize for Science, the Eureka Prize, the Australian Academy of Science awards, the NSW Premier's Prize for Scientist of the Year, and the Young Tall Poppy Science Award.

PURPOSE

Our purpose is to:

- create and sustain a productive, diverse and collegial working environment that supports our staff, students and partners in achieving excellence in research, teaching and service
- conduct high-impact research that contributes to scientific knowledge and addresses significant challenges to the earth's biological systems
- inspire and support the next generation of researchers and educators in biology, and enhance understanding and appreciation of biology in the wider community
- provide an inspiring student experience that incorporates engagement, knowledge and skills to facilitate workplace readiness for the workplace
- create and sustain productive partnerships with researchers, industry, government, non-government organisations and the wider community to find creative approaches and solutions to biological issues.

RESEARCH CENTRES

Our researchers are associated with a number of external and internal research centres.

NATIONAL AND STATE RESEARCH CENTRES

- Biodiversity Node of the NSW Adaptation Research Hub
- ARC Training Centre for Fruit Fly Biosecurity Innovation
- ARC Centre of Excellence in Synthetic Biology
- ARC Centre of Excellence for Plant Success in Nature and Agriculture

MACQUARIE UNIVERSITY RESEARCH CENTRES

- Centre for Smart Green Cities
- Marine Research Centre

FACILITIES

Our students and researchers have access to world-class learning environments with cutting-edge facilities and equipment.

Our facilities include modern molecular labs, highly sophisticated plant growth facilities, seawater facilities, a microscopy unit, an arboretum, the Biology Discovery Centre and an 11-hectare fauna park –all situated on the Macquarie University campus.

RESEARCH GROUPS

Our research-intensive department engages in studies across a broad range of biological disciplines and taxa. Our research uses the unique Australian and Antarctic biota, and offers a dynamic and supportive environment for generating creative, relevant and high-impact research. Our researchers are world leaders in climate change research, conservation biology, ecology, animal behaviour and evolution.

ANIMAL BEHAVIOUR

The department hosts the largest group of animal behaviour researchers in Australia. Our research is integrative and transdisciplinary, addressing behavioural ecology, sociobiology, comparative neurobiology, performance physiology and behavioural genomics. On campus, our fauna park and ecology reserve allow an integration of lab, semi-lab and field studies. Our researchers also work at field sites in Australia and overseas.

CULUM BROWN

PROFESSOR
E: culum.brown@mq.edu.au

- Fish, shark and ray biology
- Behavioural ecology
- Comparative cognition: learning and memory, cerebral lateralisation, social intelligence and personality
- fisheries and conservation management

MARIE HERBERSTEIN

PROFESSOR
E: marie.herberstein@mq.edu.au

- Behavioural ecology of invertebrates, including spiders and insects
- Deceptive signals in spiders and orchids
- Mating behaviour and sexual selection in spiders and insects

KEN CHENG

PROFESSOR
E: ken.cheng@mq.edu.au

- Mechanistic, functional and evolutionary studies of animal behaviour
- How animals process information
- Learning and navigation in desert ants and bull ants
- Urban ethology of flying foxes along the east coast of New South Wales

MATTHEW BULBERT

SENIOR LECTURER
E: matthew.bulbert@mq.edu.au

- Behavioural and ecological solutions that animals use to deal with conflict
- What drives and maintains the diversity of predator–prey interactions
- Strategies animals and plants use to either capture food or avoid being food
- Conservation and management of native pests

ANDREW BARRON

ASSOCIATE PROFESSOR
E: andrew.barron@mq.edu.au

- Cognitive neuroethology
- Links between brain, physiology and behaviour
- How nervous systems support fundamental elements of behaviour like thought, memory, decision and navigation
- How behaviour emerges from neural circuits

AJAY NARENDRA

SENIOR LECTURER
E: ajay.narendra@mq.edu.au

- Neurobiology of insect navigation
- Neural basis of vision and visual navigation in dim light
- Design of sensory structures in miniature insects
- Collective behaviour in ants
- Role of colour in insect navigation

DARRELL KEMP

ASSOCIATE PROFESSOR
E: darrell.kemp@mq.edu.au

- The evolution, genetics and behavioural ecology of visual signals
- Sexual selection, gender dimorphism and sexual conflict
- Quantitative genetics and adaptation in both wild and captive populations

SIMON GRIFFITH

PROFESSOR
E: simon.griffith@mq.edu.au

- The evolution of behaviour, physiology and life-history variation across bird species
- The way that the harsh arid zone of Australia shapes the animals that live there
- Interactions between closely related species and how sperm, colour, and genomic structure influence speciation
- Utilisation of microscopy, optical spectrometry, acoustic analysis, molecular work, hormonal assays, individual tracking and comparative methods

PHIL TAYLOR

PROFESSOR
E: phil.taylor@mq.edu.au

- Insect biosecurity
- Sustainable and environmentally benign management of Queensland fruit flies (*Bactrocera tryoni* or Q-fly) and other tephritid fruit flies that threaten Australian horticulture
- Research and development support for the development of the sterile insect technique and lure-and-kill devices that reduce reliance on synthetic pesticides

ROBERT HARCOURT

PROFESSOR
E: robert.harcourt@mq.edu.au

- Behaviour, ecology and conservation of marine animals
- Animal personality, animal communication, mating preferences, individual differences, social behaviour
- Foraging ecology, animal movements, population dynamics, conservation physiology and anthropogenic interactions

NATHAN HART

ASSOCIATE PROFESSOR
E: nathan.hart@mq.edu.au

- Functional neural adaptations of different animals to their particular lifestyle and habitat
- Sensory perception, information processing, behaviour, ecological adaptation and evolution of sharks and rays, bony fishes, reptiles and birds
- Development and testing of non-lethal shark deterrent technologies

MARTIN WHITING

ASSOCIATE PROFESSOR
E: martin.whiting@mq.edu.au

- Communication: evolution and function of colour signals and dynamic display behaviour
- Social behaviour: evolution of kin-based sociality, plasticity of social behaviour and the mechanisms underlying sociality
- Cognition: evolution of brain size in lizards, social learning, culture, and the relationship between sociality and cognition

BRUNO BUZATTO

LECTURER
E: bruno.buzatto@mq.edu.au

- Behavioural ecology and sexual selection, mostly focused on insects and arachnids
- The evolution of alternative reproductive tactics, male dimorphism and the evolution of phenotypic plasticity

CONSERVATION BIOLOGY

Our researchers are recognised nationally and internationally as leaders in conservation biology. We are engaged with government and industry to achieve outstanding conservation outcomes in, for example, threatened species management and climate change adaptation. We also have excellent facilities for terrestrial and aquatic conservation research that include land and water field vehicles; controlled environment chambers and glasshouses; a large herbarium; and diverse isotope, sediment and geochemical analysis facilities.

LINDA BEAUMONT

ASSOCIATE PROFESSOR
E: linda.beaumont@mq.edu.au

- Ecology, biogeography and climate change
- Assessing biological responses to climate change and species' adaptive capacity
- Species distribution modelling as a tool for conservation and decision making, and management of invasive species
- Improving the resilience of urban green spaces to climate change

MELANIE BISHOP

ASSOCIATE PROFESSOR
E: melanie.bishop@mq.edu.au

- Estuarine and coastal ecology
- Greening of marine urban structures
- Marine habitat repair
- Ecosystem services of aquaculture

ANTHONY CHARITON

SENIOR LECTURER
E: anthony.chariton@mq.edu.au

- The development and application of omic technologies for monitoring and assessing aquatic systems
- The interplay between natural and anthropogenic stressors (eg contaminants) on sedimentary environments
- Utilisation of next-generation sequencing technologies to collectively examine the structure, function and connectivity of aquatic communities

ADAM STOW

ASSOCIATE PROFESSOR
E: adam.stow@mq.edu.au

- Conservation genetics
- Utilisation of genomic and field data to answer behavioural, ecological and evolutionary questions in a range of terrestrial and marine environments
- The impacts of human activities on dispersal, gene flow and adaptive variation at landscape scales
- The characterisation of mating systems, and the implications of these for the evolution of social behaviours

RACHAEL DUDANIEC

SENIOR LECTURER
E: rachael.dudaniec@mq.edu.au

- Landscape and evolutionary genetics
- Utilisation of field data and genomic sequencing approaches (eg RADseq, RNAseq) to address the effects of environmental change on gene flow and local adaptation in natural populations
- Land use and climate change effects on species' genetic diversity and their adaptive capacity

RACHAEL GALLAGHER

LECTURER
E: rachael.gallagher@mq.edu.au

- Quantifying the impact of climate change at different levels of biological organisation from molecules to biomes
- Utilisation of gene expression profiling, proteomics and transcriptomics to investigate species adaptive and plastic responses to changing climate
- Biogeography of plant form and function at the continental scale

MICHELLE LEISHMAN

DISTINGUISHED PROFESSOR
E: michelle.leishman@mq.edu.au

- Urban greening
- The response of plants to climate change
- How exotic plants can become invasive in novel environments
- Invasive plant pathogens
- The development of rehabilitation and restoration strategies for native vegetation

LESLEY HUGHES

DISTINGUISHED PROFESSOR
E: lesley.hughes@mq.edu.au

- Plant–insect interactions and climate change ecology
- The observed and potential impacts of climate change on species and ecosystems
- The implications of climate change on the applied issues of land management and conservation policy in Australia and elsewhere

RICK SHINE

PROFESSOR
E: rick.shine@mq.edu.au

- The intersection between ecology and evolutionary biology to understand the processes that shape the characteristics of organisms
- Primary focus on reptiles (especially snakes) and amphibians (especially cane toads)
- The application of evolutionary and ecological insights to build new and more effective approaches to wildlife conservation

JACO LE ROUX

ASSOCIATE PROFESSOR
E: jaco.leroux@mq.edu.au

- Phylogeographic and population genetic structures of invasive plant species
- Dynamics of plant–bacterial interaction networks
- Soil microbial community diversity and functional responses to plant community compositional changes
- Evolutionary biology and biogeography of plants

ECOLOGY

Macquarie has a proud tradition of excellence in ecological research. Our research in ecology spans the terrestrial, aquatic and marine environments, and there are many close synergies between our research in ecology and conservation biology.

ANDREW ALLEN

SENIOR LECTURER

E: drew.allen@mq.edu.au

- How environmental changes, including changes induced by human activities, influence the numbers of species present in ecosystems
- Utilisation of mathematical models to describe a range of biological phenomena, including broadscale biodiversity gradients, rates of DNA evolution and nutrient cycles in organisms and ecosystems

GRANT HOSE

PROFESSOR

E: grant.hose@mq.edu.au

- Freshwater ecology and ecotoxicology
- Ecology of groundwater and surface freshwater environments and the impacts pollution and environmental change have on them

JANE WILLIAMSON

ASSOCIATE PROFESSOR

E: jane.williamson@mq.edu.au

- Marine ecology
- The impact climate change, commercial fishing and microplastics have on marine ecological resistance and sustainability
- Species that are likely to be under threat and those that have the capacity to impart substantial community changes

IAN WRIGHT

PROFESSOR

E: ian.wright@mq.edu.au

- Functional ecology and ecological strategies of plants
- The how and why of differences among species in their structural, chemical and physiological traits
- The implications of this variation for larger-scale processes

HENDRIK POORTER

PROFESSOR

E: hendrik.poorter@mq.edu.au

- How plants respond to their abiotic environment
- Manipulation of light level, light quality, UVB, CO_2, O_3, nutrients, water, temperature, salinity or soil compaction to test how plants acclimate in the longer term and at different scales to these different factors

EVOLUTION

Our evolutionary studies consider evolution at multiple scales and levels of complexity. We address genomic and microbial evolution. We study adaptive changes in plant and animal traits in response to a changing world. We investigate evolution and adaptation across multiple taxa, and we have great strength in palaeobiology research.

OLIVER GRIFFITH

LECTURER

E: oliver.griffith@mq.edu.au

- How mutation and selection support the evolution of complex traits in animals such as the evolution of new organs
- Use of genetic, genomic, and cell biology techniques to identify how complex components of pregnancy have evolved

JOHN ALROY

ASSOCIATE PROFESSOR

E: john.alroy@mq.edu.au

- Macroecology, macroevolution and community ecology
- Global patterns of biodiversity
- Quantification of species richness and extinction rates

MATTHEW KOSNIK

SENIOR LECTURER

E: matthew.kosnik@mq.edu.au

- Conservation palaeobiology
- Quantifying the impact of western colonisation and development on Australian marine ecosystems
- Understanding the preservation of biological remains in sedimentary records and the idiosyncrasies of palaeontological assemblages
- Investigating the interplay between ecological and evolutionary processes at broad spatial and temporal scales

JEMMA GEOGHEGAN

LECTURER

E: jemma.geoghegan@mq.edu.au

- Utilisation of evolutionary analysis, statistical models and phylodynamic methods to infer the dynamics of key viral infections affecting human and animal health

MICHAEL GILLINGS

DISTINGUISHED PROFESSOR

E: michael.gillings@mq.edu.au

- The investigation of genetic diversity using DNA markers and sequence analysis
- The development of a range of molecular methods for rapidly assessing genetic and functional diversity in genomic DNA and DNA extracted directly from environmental samples (metagenomic DNA)

GLENN BROCK

ASSOCIATE PROFESSOR

E: glenn.brock@mq.edu.au

- Palaeobiology
- The evolution, phylogeny, biodiversity, ecology and biostratigraphy of the earliest members of the three major supergroups of bilaterian animals (Ecdysozoa, Spiralia and Deuterostomia)
- The study of exceptionally preserved macro- and microfossils from a variety of localities in Australasia

MICHELLE POWER

ASSOCIATE PROFESSOR

E: michelle.power@mq.edu.au

- The ecology and evolution of host–parasite interactions
- The dissemination of human-derived pathogens to wildlife within a One Health framework
- The pathogen cycling in threatened systems, such as in Antarctica and in endangered wildlife species

BRIAN ATWELL

PROFESSOR

E: brian.atwell@mq.edu.au

- Plant stress biology, specifically how plants survive in physically adverse conditions such as flooding, drought, heat and salt stress
- Targeting of stress-tolerance genes and how they confer this tolerance, and how they might be used to enhance resilience in the world's agricultural systems

FLEUR PONTON

SENIOR LECTURER

E: fleur.ponton@mq.edu.au

- Interactions between nutrition, immunity, gut microbiota and infections
- Trans-generational effects of nutrition and gut microbiota composition on resistance to infection

MACQUARIE University

At Macquarie, we know that research is the key to unlocking a secure future. It's central to everything we do. And everything we do is for the benefit of humanity and life. Our research is influenced by the big picture: finding solutions to critical global challenges – such as health, safety, climate crisis, and food and water security.

Ranked in the top one per cent of universities around the world*, we are home to leading researchers – a community of accomplished academics that unites collective thinking and expertise across all disciplines and areas of study.

As a researcher, research student or collaborator, you'll work alongside world-leading experts, and have access to world-class facilities and partnerships. We encourage you to find out more about our research priorities and projects.

*QS World University Rankings, 2019

FIND OUT MORE

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