UQ’S CAPABILITY AND DISTINGUISHED RECORD IN MARINE RESEARCH

World-class expertise and facilities

Marine research underpins the management of coastal and marine resources and provides fundamentally important knowledge and understanding of marine assets, both here and internationally.

The University of Queensland’s Centre for Marine Science has arguably the largest and most diverse assemblage of marine researchers in Australia, with more than 60 research groups, and 250 graduate students and research fellows, spanning science, engineering, business, management and law.

UQ’s two world-class marine research stations — at Heron Island and Moreton Bay — along with advanced research capabilities on UQ’s main campus support research efforts and excellence in marine science.

Currently, UQ is ranked third in the world in marine and freshwater biology (CWUR World University Rankings 2018–19). Some of the other primary focuses in CMS include biodiversity conservation, which UQ is ranked first in the world, ecology (sixth), environmental sciences (sixth), environmental engineering (sixth), environmental studies (eighth) and water resources (fourth).

An unprecedented seven Laureate Fellows (highest level of academic and research achievement in Australia) are in CMS: David Craik, Bernie Degnan, Ove Hoegh-Guldberg, Phil Hugenholtz, Justin Marshall, Peter Mumby and Hugh Possingham.

CMS’s diverse marine research strengths uniquely span from policy, management, conservation and ecology to genomic, molecular and physical sciences and engineering and advanced technologies, with numerous demonstrated basic-to-strategic-to-applied research axes, yielding solutions for and from our oceans.

(continued over ...)
In addition, CMS has an enviable record in community service at local, national and international levels, including CoralWatch, a citizen science program used worldwide, substantial contributions to the Intergovernmental Panel on Climate Change (and a major role in the Nature Conservancy.

Great Barrier Reef

With 10 per cent of the world’s coral reef ecosystems in Queensland, UQ has always had a strong research focus on the Great Barrier Reef.

In economic terms, the Great Barrier Reef is estimated to contribute more than $5.6 billion a year to the Australian economy and about 70,000 jobs.

In association with our more traditional disciplines, our new green-algae technologies are exploring the sun’s energy generating capacity. Green-algae technologies are also known for their ability to absorb CO₂ — providing economic, solar-driven solutions to help supply the world’s growing energy, food and water needs and a path for increased CO₂ utilisation.

In total, Australia’s marine-based industries are estimated to be worth more than $16 billion annually.

UQ has remarkable world-class expertise in marine conservation, remote sensing, marine genomics, biodiscovery, sensory physiology, biotechnology, climate change coastal engineering and more.

XL Catlin Seaview Survey

One international marine research project, managed by the UQ Global Change Institute, began in September 2012 on the iconic Great Barrier Reef. The team surveyed 150 km of reef with a custom-built, motorised underwater cameras, known as SVIs. Already some 105,000 GPS-located, panoramic images are ready for analysis by marine scientists around the globe. The images can be accessed by anyone through the online database — the XL Catlin Global Reef Record.

Following the successful Great Barrier Reef and Coral Sea surveys, the project was rolled out globally thanks to the ongoing support of the XL Catlin Group Limited.
UQ Marine Science Capability, Expertise and Experience

**MEASURING & MONITORING**
- Remote sensing & ecosystem mapping
- Public policy & decision science
- Management of coral reefs
- Understanding & responding to climate change
- Artificial intelligence and image recognition

**RESOURCES**
- Moreton Bay Research Station
- Centre for Solar Biotechnology
- Climate Change Mesocosm
- Heron Island Research Station
- More than 60 research groups
- 250 graduate students

**RESILIENT COMMUNITIES & LIVELIHOODS**
- Public policy & decision science
- Management of coral reefs
- Engagement with Indigenous communities
- Building alternative livelihoods for people & communities
- Responding to global change
- Maritime law

**BIO-TECH**
- Microalgae and cyanobacterial isolation
- Cryopreservation
- Nutrient optimisation for production
- Light optimisation for production
- Lab and pilot scale systems optimisation
- Supporting commercial scale systems development
- Techno-economic analysis
- Life cycle analysis
- Molecular/structural biology

**MARINE ECOSYSTEMS**
- Marine engineering
- Marine biodiversity
- Animal development
- Coastal systems
- Marine ecology
- Populations – genetics
- Palaeoecology & photobiology of coral reefs
- Physiology & global change

**RESEARCH OUTCOMES**

**Medium-term impacts**
- Expanding our fundamental understanding of marine organisms and ecosystems, improving the resilience of Australia’s coastal ecosystems

**Long-term impacts**
- Delivering long-term sustainability in the face of rapid climate change
- Using microbes to understand and protect coral reefs and corals

- Using genome-informed molecular approaches to produce scalable biocontrol systems for the crown-of-thorns starfish.
- Developing and using microalgal species that are highly efficient producers of oil, protein or nutraceuticals
- Developing renewable fuels by understanding and harnessing the photosynthetic capability of microalgae (phytoplankton).
WORLD-CLASS UQ RESOURCES

THE University of Queensland owns and operates research stations at both Moreton Bay and Heron Island. The research stations are designed to support **fundamental advances** in scientific research and provide advanced and interactive teaching programs for scientific minds.

Heron Island Research Station

Heron Island Research Station (HIRS) is internationally renowned for coral reef research and student training in marine sciences.

With facilities and equipment rarely found in an offshore facility, combined with its enviable position on the world’s largest reef, the HIRS is ideally located for marine and climate change research.

Situated on the southern Great Barrier Reef, HIRS is the oldest and largest marine research station on the reef.

With crystal clear water and near pristine conditions, the station provides easy and direct access to the marine environment.

The station caters to Australian and international researchers and educational groups, offering modern wet and dry laboratories, indoor and outdoor aquaria, a large animal holding tank, separate research and teaching laboratories, seminar facilities, a library, computer room and extensive boating and diving facilities.

- **Dedicated research block** – the HIRS research block is purpose-built for research and separate from our education facilities, yet with easy access to the shared seminar, library and computer rooms. All labs and decks are connected to a flow-through sea water system.
- **Dry laboratories** – HIRS has five modern dry labs, each with bench space for about 15 researchers, a 520L fridge/freezer, freshwater/saltwater sinks and network access. The space is flexible can be opened up to accommodate larger research groups.
- **Wet laboratories** – the two wet labs each have wet/dry bench space for as many as 10 researchers, a large aquarium table, a fridge/freezer and a freshwater-saltwater sink. These labs are great for those requiring indoor aquaria set-ups or those doing dissections. Wet Lab 1 can be completely darkened for light-controlled experiments.
- **Instrument rooms** – the two instrument rooms run the length of the building and are located immediately behind the labs on each floor providing direct lab access. These communal spaces contain a range of lab equipment and chemicals.
- **Darkened microscope room** – the darkened microscope room contains a fluorescence compound and stereo microscopes allowing for light controlled work.
Moreton Bay Research Station

MORETON Bay and its nearby ocean waters contain significant populations of dugong; six of the world’s seven species of marine turtles; numerous species of sharks and rays; Indo-Pacific humpback and bottlenose dolphins, as well as other cetaceans, including a large population of humpback whales which annually migrates past the island between May and November.

Located on North Stradbroke Island (38 km long and 12 km wide), the research station has a microwave internet link and features four dedicated research laboratories, plus a library, computer and reading room, large adaptable teaching laboratories, seminar rooms, boating and diving facilities.

The research station is designed to accommodate about 100 researchers or students.

Only 13 km east of Brisbane, North Stradbroke is the world’s second largest sand island. The region supports a rich variety of fauna and flora, and numerous diverse habitats for research and educational programs.

Local habitats include rocky shores, mangrove forests, mud and sand flats, wallum scrub, fresh water lakes, sclerophyll forests, sand dunes, wetlands, coral reefs and seagrass beds.

With Moreton Bay to the west, Moreton Island to the north, and the Pacific Ocean to the east (the edge of the continental shelf lies about 35 km offshore), the Moreton Island Research Station is uniquely located for research purposes.

Several Moreton Bay regions are listed as nationally important wetlands, significant sections of which are designated Ramsar wetlands. An estimated 50,000 migratory shorebirds of some 43 different species winter at North Stradbroke each year during the non-breeding season.

The local wetlands are rich in fisheries, contain more than 355 species of marin invertebrates, seven mangrove species with 55 species of associated algae, and seven seagrass species.

- **Wet laboratory/aquarium system** – The wet lab at the Moreton Bay Research Station is a chemical-free laboratory space containing a large, closed indoor saltwater aquarium (~20,000 litre re-circulating system) as well as bench space, laboratory sinks and two large dissection tables immediately outside the laboratory.

Bench space can be used for either salt- or freshwater tanks requiring isolation from the main aquarium system. The main system has three large tanks (1000, 4000 and 12,000 litre). In addition, three racks can house up to 12 standard tanks per rack. Racks can be dismantled and replaced by two 400 litre round or 2 x 1000 litre oval tanks or other tanks as required.

A 1000 litre self-contained aquarium is also available and can be either isolated or connected to the main system. Water quality is maintained through regular water changes (salt water pumped from Moreton Bay) and daily water-quality monitoring.
Centre for Solar Biotechnology

By 2050 the human population is forecast to expand from 7.5 to 9.6 billion people. We will require 70% more food (United Nations), 50% more fuel (International Energy Agency), and 50% more water (Organization for Economic Co-operation and Development). We also need to reduce CO₂ emissions by more than 80% (Intergovernmental Panel on Climate Change). All of these will have to be achieved to ensure economic, social, political, climate, food, water and fuel security.

The UQ Centre for Solar Biotechnology connects some 30 international research teams and its industry partners to accelerate the innovation and commercialisation of new solar powered technologies and industries, based on photosynthetic green algae. Our green-algae technologies tap into the huge energy resource of the sun and absorb CO₂, to provide economic solar-driven solutions that will help supply the world’s growing energy, food and water needs, and a path for CO₂ utilisation.

- Microalgae and cyanobacterial isolation
- Cryopreservation
- Nutrient optimisation for production
- Light optimisation for production
- Lab and pilot scale systems optimisation
- Supporting commercial scale systems development
- Techno-economic analysis
- Life cycle analysis
- Molecular biology
- Structural Biology

Coral Watch with Global Impact

BASED at The University of Queensland, CoralWatch is a well-established citizen science program founded in 2002 by Professor Justin Marshall and a team of collaborators and supporters.

CoralWatch aims to create public understanding of the value of reefs and provides opportunities to actively help save the reef through participation in scientific research and education.

The CoralWatch coral health chart (right) provides citizen-scientists with the hands-on means to interpret coral bleaching.

The easy-to-use tool helps quantify changes in coral colour associated with bleaching. Used in the field and classroom, the chart is available in 12 languages and the data from more than 230,000 corals and 1910 reefs (in 79 countries) has been made publicly accessible.
Climate Change Mesocosm

THE Climate Change Mesocosm (CCM) project is one of the largest and most accurately controlled ocean acidification and warming experimental systems in the world. Marine scientists such as UQ’s Associate Professor Sophie Dove built this world class mesocosm system to simulate the ocean temperatures and acidification levels which are predicted to occur on coral reefs during the next 50 to 100 years.

The CCM is able to regulate both temperature and CO₂ levels prescribed by the 2100 Intergovernmental Panel on Climate Change scenarios in a highly controlled environment, facilitating studies of climate change from the molecular to the ecosystem level.

The CCM differs in that it regulates the temperature and the acidification levels, above and below the current ambient conditions of water on the reef.

It is unique in so far as the experimental controls allow variation with respect to real-time conditions of CO₂ and temperature measured in the adjacent deep water of Wistari channel.

Conditions in the 72 experimental aquaria and 12 mini-reefs can then fluctuate a fixed amount above or below the ambient control conditions, but importantly incorporate a day/night and seasonal variability.

The main components of the system are 4 x 7500 litre custom built air-tight and insulated fibre-glass tanks or sumps, which provide the necessary residence time of the water for the fine control of CO₂ and temperature.
The remote sensing teams’ skills are in high demand across state and federal agencies, helping them to measure the effectiveness of environmental management policy decisions.

REMOTE sensing has evolved to become the tool-of-choice for environmental organisations around the world. UQ researchers Professor Stuart Phinn, Dr Chris Roelfsema and Dr Peter Scarth lead a cross-disciplinary team of scientists who specialise in measuring and monitoring environmental changes using earth observation data.

Their teams’ skills are in high demand across local, state and federal agencies, private industry and NGOs helping them to measure the effectiveness of environmental management decisions.

By being at the forefront of the scientific methods used to measure and monitor environmental changes, the Joint Remote Sensing Research Program assists Australian government agencies in keeping pace with rapid changes in remote sensing technology.

Their methods and research to operational program underpins the use of satellite data in legislated mapping and monitoring programs in multiple states and territories, as well as leading national development and coordination of earth observation through Earth Observation Australia.

As professor of Geography at UQ, Stuart Phinn teaches remote sensing and directs the Remote Sensing Research Centre, which includes programs to support government agencies across Australia (Joint Remote Sensing Research Program) and enabling coordination across all government, industry and research groups collecting and using EO data (Earth Observation Australia).

The majority of Dr Scarth’s work uses images collected from satellite and aircraft, in combination with field measurements, to map and monitor the Earth’s environments and how they are changing over time. This work is done in collaboration with other environmental scientists, government environmental management agencies, NGO’s and private companies.

Above: Great Barrier Reef geomorphic — one of the many observational data tools used to measure and monitor environmental changes.
FISHING is big business in Queensland. For a start, there are about 1500 licensed commercial fishing boats, harvesting an estimated $190 million in seafood every year. The recreational fishing industry is twice as large, with an estimated 640,000 Queensland fishers spending about $400 million a year on this popular pastime.

So it should come as no surprise to learn that over-exploitation of fisheries is as bad for the economy as it is for Queensland’s coastal ecosystems. And that’s where UQ’s research expertise comes to the rescue.

One of the best ways to minimise over-fishing and protect the viability of our valuable fisheries is to use advanced modelling and assessment techniques to estimate fish abundance and determine sustainable quotas.

UQ’s Centre for Applications in Natural Resource Mathematics (CARM) was established in 2010 to do just that – develop and apply mathematical and statistical theory to improve the management not only of Queensland’s fisheries but also forestry, water security, conservation, pest and disease management, and adaptation to rapid global change.

Since CARM started working with its Queensland Government colleagues, the UQ researchers have had a big influence on the state’s fishery management practices.

In 2016, responding to concerns about declining catches of legal-sized saucer scallop, Dr Wen-Hsi Yang and Professor Kaye Basford worked closely with DAF’s fisheries stock assessment team. The team’s analysis alerted decision-makers to the fact that the scallop spawning ratio of 2015 had fallen to just six per cent of 1977 levels. Based on the researchers’ findings, Fisheries Queensland officers met with commercial operators to outline the protection measures needed to re-build yields and sustain the market.

These measures included the closure of six high-density areas (referred to as the scallop replenishment areas), and of a winter-spawning zone from May to October.

Given the many sensitivities associated with closing down a source of seafood production, and to provide even more weight to the research findings, DAF asked the US National Oceanic and Atmospheric Administration (NOAA) to review UQ’s modelling methodologies.

NOAA reported back to the Queensland Government that: “The model is state-of-the-art. It reflects a great deal of ingenuity to capture not only the temporal dynamics but also the spatial aspects of the fishery.”

At any given time, CARM researchers are working with DAF on multiple fisheries management research programs.

In 2013–14, CARM collaborated with DAF and Fisheries Queensland scientists to develop a regional-, sex- and age-structured population model for grey mackerel on Queensland’s east coast.

The study helped determine allowable commercial catch levels for the fishery and addressed several other issues such as setting minimum legal sizes.

In other work, CARM’s Dr Matt Holden is examining harvest strategies for coral trout in the Torres Strait Finfish Fishery, while Dr Sabrina Streipert and DAF collaborators are redesigning a stock assessment model for barramundi.

CARM’s achievements have been driven by a strong partnership between UQ and DAF, which includes sharing access to infrastructure and other resources. And its research output is not just limited to fishery projects, but also includes model solutions for forestry, water security, pest and disease management, and adaptation to climate change.
The Clean Water initiative is designed to advance solar powered green technologies based on microalgae to purify water.

Microalgae water purification systems are designed to capture environmental pollutants and recycle valuable resources. This will improve the sustainability and viability of agricultural, livestock, mining and municipal wastewater treatment sectors and ensure freshwater security for our future.

SINGLE cell green microalgae capture sunlight, nutrients and CO₂ and produce clean water, O₂ and biomass.

The Clean Water initiative is focused on the integration of microalgae technologies to enable innovative and sustainable land management and water treatment practices to improve water quality and oxygenation, soil biology, crop health and fertiliser efficiency.

Land use change over the past 100 years has had a dramatic impact on water quality. This has affected the health of many ecosystems, water security for human consumption, as well as the sustainability and efficiency of important industries such as agriculture, livestock, mining and municipal wastewater treatment. Algal water treatment systems offer a low-cost option for water purification and oxygenation.

These clean water projects focus on the characterisation of natural and industrial wastewater streams, systems optimisation, scale-up and deployment. Systems can: reduce polluting agricultural and livestock runoff to the Great Barrier Reef; extract certain heavy metals from mine tailing dams (phytomining); and treat municipal and industrial waste water.

The microalgae produced as a by-product of water treatment can be used as a feedstock to produce bio-products such as next generation biofertilisers, bio-plastics and renewable fuels.

Above: In economic terms, the Great Barrier Reef is estimated to contribute more than $5.6 billion a year to the Australian economy and about 70,000 jobs.
AQUACULTURE & Livestock Feeds

As the global population expands from 7.4 to 9.6 billion people, we will require 70% more food by 2050.

Our vision is focused on delivering innovative algae-based functional feeds to meet increasing demand from Australia’s $21 billion aquaculture, livestock, egg and dairy industries.

The expansion of large-scale aquaculture is important as it reduces pressures on rapidly depleting natural fish stocks, while meeting increased demand for human consumption.

THE Aquaculture & Livestock Feed initiative is designed to deliver enhanced macronutrient, micronutrient and phyttonutrient properties to functional feedstocks for Australia’s $21 billion aquaculture, livestock, egg and dairy sectors.

Microalgae are well established aquaculture feeds that offer substantial benefits as livestock feeds. This initiative is designed to produce cost-effective microalgae feedstocks that can integrate enhanced mineral nutrition and microbiome technology for maximum effect. This advanced approach offers advantages in terms of improved feed conversion and higher quality food products, as well as improved animal health.

- Select microalgae strains and blends can provide high quality, high protein content feeds, enriched in omega-3 oils and potent phyttonutrients to maximise health and productivity.
- Advanced mineral nutrition can cost-effectively increase health and product quality.
- Microbiome technology can have dramatic benefits in aquaculture, poultry farming, and intensive cattle and pig feedlots.

Microalgae feeds can be produced on non-arable land, often using saline water. This offers the ability to enhance feed security, drought proof the live stock sector, support the expansion of the aquaculture industry and enable sustainable regional development and job creation.

Professor Ben Hankamer
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Mapping the GBR and global reefs

Despite being Australia’s top tourist attraction and one of our greatest national treasures, there is no complete detailed map of the Great Barrier Reef showing the different types of coral present on each of the 2900 reefs.

UQ Remote Sensing Research Centre directors Professor Stuart Phinn and Dr Chris Roelfsema have set out to change this, leading a habitat mapping program that’s aiming to map the Great Barrier Reef to a new level of detail by 2021.

The project is a collaboration with the Australian Institute of Marine Science and EOMAP, and is funded through Great Barrier Reef Marine Park Authority.

Their work on the Great Barrier Reef has resulted in a world-wide coral reef mapping program as part of the Allen Coral Atlas. This project will map and monitor coral reefs globally and is a collaboration between UQ, Paul G. Allen Philanthropies (Vulcan), Planet, Arizona State University, and National Geographic.

In addition to traditional field data collection, the researchers are using satellites, drones, physical attributes such as depth and waves and the documented observations of volunteer community members along with big data processing to complete this massive undertaking.

“Without these techniques and new mapping and modelling technology, it would take 400 years to map the entire Great Barrier Reef for instance and its 2900 individual coral reefs,” Dr Roelfsema says.

The global project initially mapped individual reefs such Heron Reef on the GBR, Moorea in French Polynesia, the Lighthouse Reef in Belize, the western side of Big Island of Hawaii, and Karimunjawa in Indonesia, Blue Reef in Sri Lanka.

Now the focus is on applying the Great Barrier Reef based approaches to other coral reef regions such as Fiji, Micronesia and Cuba.

Slowly the project will expand its mapping and encompass the globe by 2021.

“Without these techniques and new mapping and modelling technology, it would take 400 years to map the entire Great Barrier Reef for instance and its 2900 individual coral reefs.”

— Dr Chris Roelfsema
POWERFUL ATTRACTANT FOUND TO DRIVE CROWN-OF-THORNS STARFISH

The crown-of-thorns starfish gather en masse due to a release of special pheromones

HUSBAND-and-wife Professor Bernard Degnan and Associate Professor Sandie Degnan believe they — along with their research colleagues — can use the powers of attraction to decimate one of the reef’s fiercest enemies.

In the journal *Nature*, the international research team has revealed crown-of-thorns starfish gather en masse due to a release of pheromones — a scent they’ve decoded so the prickly pests can be lured to their capture.

“For an already struggling Great Barrier Reef, and indeed any reefs across the Indo-Pacific region, these starfish pose an enormous threat due to the ability of a single female to produce up to 120 million offspring in one spawning season,” Professor Bernard Degnan said.

“They feast on the coral and leave it bleached white and vulnerable to destruction in heavy storms.

“Millions of dollars have been spent over many years on a variety of ways to capture crown-of-thorns starfish, whether it be via diver collection, injections or robotics.

“Now we’ve found the genes the starfish use to communicate, we can begin fabricating environmentally safe baits that trick them into gathering in one place, making it easier to remove reproductively-primed animals.”

The Degnans worked alongside a team of UQ researchers, and long-standing colleagues at the Australian Institute of Marine Science (AIMS), the Okinawa Institute of Science and Technology (OIST) and University of the Sunshine Coast (USC).

The painstaking process of sequencing the crown-of-thorns genome and its pheromones was completed 30 years after Professor Degnan moved from New York to Brisbane, to study as one of UQ’s first international exchange students.

A graduate in Marine Biology and Molecular Biology, Professor Degnan developed an early fascination with the biodiversity of Queensland’s Great Barrier Reef during his formative years, and while at UQ’s Heron Island Research Station he met his future wife.

“I guess there is a nice story there about the reef bringing us together and now we’re working hard to develop novel ways to understand and preserve it,” Professor Bernard Degnan said.

“But beyond us, there’s personal history with some of the other researchers, like Mike Hall at AIMS who is one of our oldest colleagues and who came up with the original genome concept.

“Nori Satoh at OIST could be considered the grandfather of marine genomics and has been a very supportive friend, as has Scott Cummins of USC, who was a former research fellow in my lab.

“What I like most is that we’re finding a solution to a problem, not merely documenting it.”

Beyond the role their genomics breakthrough brings to controlling the crown-of-thorns, the Degnans believe it could have other environmental and economical benefits.

They say a similar approach could be used to combat invasions of sea snails and other marine pests throughout the world.

For fishermen and coastal communities, that’s a win on several fronts.

“I expect for local economies there could be some positive cash flow from the fishermen that collect and remove the crown-of-thorns,” Professor Bernard Degnan said.

“Furthermore, as the reef becomes healthier, the benefits to a raft of industries from tourism to fisheries quickly follow.”

Photo: Chris Brunner
Reducing run-off for a healthier Reef

UQ researchers are working with government and business partners to develop fertilisers that decrease environmental degradation and impact on areas such as the Great Barrier Reef. Agriculture accounts for approximately 80 per cent of land use in Reef catchment areas and is the main source of excess nutrients, fine sediments and pesticides that flow to the Reef. These nutrients are linked to outbreaks of the destructive crown-of-thorns starfish and cause growth of algae and algal blooms – another key threat for the Reef.

A collaborative project between researchers at UQ’s Dow Centre for Sustainable Engineering Innovation and School of Agriculture and Food Sciences, together with the Queensland Government and industry partners, is using materials science and microbiology to develop cost-effective and environmentally sustainable alternatives to commercial fertilisers, which are a major contributor to the man-made nutrients found in the Reef.

These new formulas will reduce the amount of run-off that makes its ways to our streams and oceans, helping protect the Reef from further harm.

Agriculture and Food Sciences researcher Professor Susanne Schmidt says while farmers are aware of the need to reduce nutrients in soil, progress has been slow as there haven’t been many options when it comes to fertilisers.

“Commercial fertilisers are mostly highly soluble and therefore easily lost from soil in wet tropical environments,” Professor Schmidt says.

“Alternative commercial fertilisers currently available – which are either plastic-coated or have additional toxins to slow bacterial conversion – don’t always deliver on the promise of reducing pollution and may actually create their own problems. “There is no doubt that innovation in fertiliser design is needed, and this interdisciplinary collaboration between materials science engineers and agriculture and ecology experts is breaking new ground.”

The Dow Centre was established in 2014 thanks to a $10 million donation from The Dow Chemical Company, and recently received a further $4.4 million investment from Dow to continue its development of solutions that tackle threats to global sustainability.

The UQ Centre for Solar Biotechnology is working on ways to improve agricultural runoff water treatment with microalgae.

Professor Susanne Schmidt
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Rebirth from resilient reefs

JUST three per cent of the Great Barrier Reef’s corals may hold the key to regenerating reefs damaged after major disturbances.

Researchers from The University of Queensland, CSIRO, Australian Institute of Marine Science and the University of Sheffield have pinpointed 100 reefs that have the potential to supply larvae (fertilised eggs) to almost half of the Great Barrier Reef’s ecosystem in one year.

Professor Peter Mumby from UQ’s School of Biological Sciences and ARC Centre of Excellence in Coral Reef Studies, and Chief Scientist of the Great Barrier Reef Foundation, says that finding these 100 reefs is a little like revealing the cardiovascular system of the Great Barrier Reef.

“They are well connected to downstream reefs by ocean currents and can provide coral larvae, which are carried by the currents, to support the recovery of other reefs,” he says.

Professor Mumby says these reefs also appear to be less at risk of the damaging effects of bleaching and predation by coral-eating crown-of-thorns starfish.

UQ School of Biological Sciences Dr Karlo Hock says the presence of these well-connected reefs on the Great Barrier Reef means the whole system of coral reefs possess a level of resilience to help it bounce back from disturbances.

“Identifying only 100 reefs with this potential across the length of the entire 2300 km Great Barrier Reef emphasises the need for effective local protection of critical locations, as well as the need for carbon emission reductions to support natural recovery processes in the ecosystem,” Dr Hock says.

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UQ RESEARCHERS

The depth of capability in marine research at The University of Queensland is truly world class. The following selection of some 100 leading research staff provides a brief overview of the experience and expertise UQ brings to research partnerships.

Simon Albert
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Dr Albert has a background in natural resource management, water quality, marine ecology and climate change. For the past 15 years he has worked at the intersection of these fields in both Australia and Melanesia providing a gradient of social-political-ecological factors.

Jonathan Aitchison
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Professor Jonathan Aitchison is Head of the School of Earth and Environmental Sciences (SEES) at The University of Queensland. Originally from New Zealand, he grew up on a plate boundary where the rocks and types of landscapes he studies are generated. After graduating with a BSc Hons and MSc at the University of Otago, Professor Aitchison took up an appointment in Japan as a Monbusho Scholar. On completion of his PhD, which focussed on convergent plate margin rocks in the New England Region of northern NSW he returned to Japan to undertake a JSPS (Japan Society for the Promotion of Science) postdoctoral fellowship. After spending five years at the University of Sydney in the Department of Geology and Geophysics, he moved to the University of Hong Kong in 2003. As Head of the Department of Earth Sciences he also led the HKU Tibet Research Group. In 2011 he returned to Australia and the University of Sydney after accepting the Edgeworth David Chair of Geology. Professor Aitchison commenced with UQ as Head of the School of Geography, Planning and Environmental Management in February 2015 until the end of 2016 when this school was merged with Earth Sciences to become the School of Earth and Environmental Sciences.

Paul Alewood
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Professor Alewood is a Group Leader within the Institute for Molecular Bioscience (IMB) at the University of Queensland and former Head of the Division of Chemical and Structural Biology. He was formerly Associate Professor in the Centre for Drug Design and Development (UQ), Assistant Professor of Peptide Chemistry at Bond University and Lecturer at the Victorian College of Pharmacy. He is internationally and nationally recognised for his research in the field of bioactive peptides and synthetic proteins and is the author of over 300 publications in high quality journals – he is widely recognized for his research on peptide synthesis, structure-activity relationships and peptide toxins.

Tom Baldock
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Professor Baldock’s research is primarily in coastal and ocean engineering, including coral reef hydrodynamics, coral reef ecosystem services, beach erosion and sediment transport, wave runup and overwash tsunami impacts, and renewable energy. He
has strong national and international collaboration on research on topical issues in coastal engineering and close links with government and national agencies, which includes consultancy and expert witness services in marine engineering.

**Andy Barnes**  
[a.barnes@uq.edu.au](mailto:a.barnes@uq.edu.au)

Associate Professor Andy Barnes obtained his BSc (Hons) in Microbiology from Heriot-Watt University, Edinburgh and his PhD from the Medical School, University of Edinburgh. Andy worked for the Scottish Office Agriculture and Fisheries Department and at the Moredun Research Institute, Edinburgh before joining a small Canadian biotech company, Aqua Health Ltd, specialising in vaccines for aquaculture in 1993. In 1999, Aqua Health was bought by Swiss pharmaceutical giant Novartis and Andy worked in their animal health division for four years before beginning an academic career at The University of Queensland. Currently in the School of Biological Sciences, Andy’s Aquatic Animal Health Lab researches vaccines for the aquaculture industry and investigates health and immunity in aquatic animals ranging from reef-building corals, through prawns and oysters, to barramundi, stingrays and grouper.

**Justine Bell-James**  
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Dr Bell-James is a senior lecturer at the TC Beirne School of Law, teaching undergraduate and postgraduate courses in the areas of environmental law and property law. Dr Bell-James’s research focuses on legal mechanisms for protection of the coast, drawing upon environmental, planning, property and tort law. In addition to her work on sea-level rise, Dr Bell-James is also particularly interested in novel legal mechanisms for protection of coastal ecosystems such as mangroves and seagrass, protection of the Great Barrier Reef, and biodiversity offsets in the coastal context.

**Mike Bennett**  
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Professor Mike Bennett’s current research is in fish biology and ecology, and vertebrate biomechanics. Research involving fishes has a focus on elasmobranchs (sharks, rays and skates). We currently have two major Australian Research Council-funded projects: Project Manta and GenoJaws. Project Manta is an inter-disciplinary project has been running for 10-years and is focused on the biology and ecology of the reef manta ray around the Australian coast, but has involved research in Mozambique, Japan, Ecuador, Indonesia, the Maldives and the Philippines. GenoJaws is an international collaboration between UQ and the Danish Technical University, and aims to uncover important aspects about the biology of four globally distributed large shark species through analysis of their genomes. We have collected many thousands of DNA samples from both ancient and contemporary shark populations from around the world, with the aim of investigating, through time, species’ population interconnectivity, genomic diversity, and population size. Other research includes: The energetics of swimming in filter-feeders; the biology and ecology of grey nurse sharks; bamboo shark biology and taxonomy in Indonesian and Australian waters; devil ray biology and ecology; electroceptive sensory system morphology in sharks and rays; the stress response in the epaulette shark, with particular emphasis on effects on reproduction; and the biology of electric rays.
Dr Beyer is an ecologist working on conservation and environmental management problems. His research spans both marine and terrestrial ecosystems and focuses on the development of evidence-based tools that can inform decision making and policy development. He is particularly interested in the development of strategic planning and decision support in the context of the major uncertainties about future conditions that arise from climate change impacts.

David Booth
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Dr Booth’s research interests include the energetics and biology of reproduction and incubation in reptiles and birds, the effect of temperature on physiological processes and respiratory gas exchange between animals and their environment. Current studies include respiratory gas exchange and embryonic development in lungfish, reproductive ecology and physiology of sea and fresh water turtles and lizards, water economy during aestivation of burrowing desert frogs and the effects of hypoxia on embryonic development in crocodiles and turtles.

Yves-Marie Bozec
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Dr Bozec is a post-doctoral research fellow in the UQ School of Biological Sciences. Trained in France, Dr Bozec specialises in coral reef resilience, modelling and management. His research focuses on the recovery dynamics of coral metapopulations and the persistence of functional reef habitats under climate change.

David Burt
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As Director of UQ Genomics, Professor Burt facilitates interactions between UQ researchers and other organisations in the application of genomics. In the area of marine ecosystems, this includes analysis of the genomes of these communities, how they react to environmental stimuli, and the evolution of such systems.

Dave Callaghan
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Before joining The University of Queensland, Dr Callaghan held positions within industry including Parsons Brinckerhoff and Lawson and Treloar and research sector including Nederlands Instituut voor Ecologie and The University of Queensland. He has worked recently with private and government organisations to improve understanding of extreme coastal weather responses. He is recognised for leading-edge research in coastal engineering including statistics of extremes, beach erosion from extreme events, physical and biological interactions of salt marshes and coral reefs, lagoon dynamics and wave propagation.
Rob Capon
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Professor Capon’s research group specialises in the detection, isolation, identification and evaluation of biologically active small molecules from nature (natural products). We acquire valuable knowledge on how and why natural products are made, and apply this knowledge to better understand living systems, and solve important scientific and societal challenges. To achieve these goals we have established specialist capabilities that extend across:

Microbiology — the isolation, characterisation and cultivation of bacterial and fungal strains.

Chemistry — the extraction and fractionation of natural extracts, the purification, chemical and spectroscopic characterization, and structure elucidation of natural products, and the use of synthetic and medicinal chemistry to explore bioactive scaffolds.

Biology — to evaluate extracts and natural products against an array of bioassays, leading to new human pharmaceuticals that target such indications as infectious and neurodegenerative diseases, cancer, pain and epilepsy, as well as new animal health products and new crop protection agents.

Cheong Xin (CX) Chan
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Dr Chan has a PhD in genomics and computational biology from UQ. During postdoctoral training with Professor Debashish Bhattacharya at Rutgers University (New Brunswick, New Jersey), Dr Chan focussed on algal genomics and evolution (phylogenomics), and the origin of plastids. His research routinely involves de novo assembly and analysis of high-throughput sequencing data. Since his return to UQ in November 2011, Chan has been using advanced computational and database approaches to explore and develop highly scalable phylogenomic approaches, and to study genome evolution of microbes, including bacteria, algae and protists.

Karen Cheney
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Dr Cheney has a strong interest in the evolution of animal colour patterns, particularly on what they are used for and how they are perceived. She uses a variety of lab and field techniques, including behavioural experiments, spectrophotometry, theoretical visual modelling, and colour pattern measurements. Her focus is mainly on marine fish and invertebrates, including triggerfish, clownfish and brightly coloured nudibranch molluscs. She also collaborates with chemists to understand how compounds are stored by nudibranchs and used for defensive purposes.

Richard Clark
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Dr Clark is a Senior Research Fellow at the School of Biomedical Sciences where he is Head of the Peptide Chemical Biology Lab. He completed his PhD in 2000 at the UQ Chemistry Department studying marine natural products chemistry and chemical ecology with Prof. Mary Garson. He then shifted his research focus towards peptide chemistry, structural biology and drug design when he was recruited to the lab of Prof. David Craik at the UQ Institute for Molecular Bioscience. His current research focus is the development of technologies to stabilise peptide therapeutics and the elucidation of the structure/function activity of bioactive peptides.

Remo Cossu
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Dr Cossu has 12 years of research experience in water engineering and recently joined the School of Civil Engineering in February 2016. Remo’s research projects span over a range of topics such as hydrodynamics in coastal areas and lakes, renewable energy, sediment transport processes, water quality management, seafloor mapping, pipeline surveys etc. Remo started his professional career as a Research Associate at the Fraunzius-Institute for Hydraulic, Waterways and Coastal Engineering at Hannover University, Germany, where he investigated flood risk and management in tidally influenced estuaries with numerical models. Remo did his PhD on the hydrodynamics of oceanic gravity and turbidity currents under the influence of Coriolis forces in the Earth Sciences Department, University of Toronto, Canada. Remo continued hos work in Canada as a Postdoctoral Fellow in the Department of Physical and Environmental Sciences at the University of Toronto where he focused on turbulence in coastal boundary layers and sediment transport processes in density currents. Before joining UQ, Remo worked as a lecturer and postdoctoral fellow at the Australian Maritime College (AMC) at the University of Tasmania where
the worked on projects in Tasmanian coastal waters (renewable energy, analysis of tidal currents, pipeline surveys) and limnological processes (Lake Ohau, New Zealand). A career highlight was a research trip with a team of sea-ice experts funded by NZARI to Antarctica (Cape Evans, McMurdo Sound) to analyse characteristics of the sea-ice ocean boundary layer using an autonomous underwater vehicle (UBC Gavia AUV). In addition, Remo also worked as a Coastal Engineer at the Federal Administration for Waterways and Shipping in Hamburg, Germany, to improve seaway conditions and sediment relocation strategies for Europe’s second largest port.

**David Craik**
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Professor David Craik is part of UQ’s Institute for Molecular Bioscience. He discovered the cyclotide family of circular proteins and has characterised the structures of many animal toxins including conotoxins from cone snail venoms. He heads a research team of 35 researchers whose current work focuses on applications of circular proteins, toxins and NMR in drug design. David obtained his PhD in organic chemistry from La Trobe University in Melbourne, Australia and undertook postdoctoral studies at Florida State and Syracuse Universities before taking up a lectureship at the Victorian College of Pharmacy in 1983. He was appointed Professor of Medicinal Chemistry and Head of School in 1988. He moved to University of Queensland in 1995 to set up a new biomolecular NMR laboratory and is currently an Australian Research Council Laureate Fellow.

**Tom Cribb**
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Associate Professor Thomas Cribb’s research focuses on helminths parasitic in Australian animals. Within this large field he focuses on one major group of parasites, the trematodes, and one major group of hosts, the teleost fishes. The work has two major themes: diversity and evolution. The first part of his work relates to the task of describing the fauna of Australian trematodes, especially in marine fishes where this group is at its most diverse. This work involves the systematic sampling of Australian fishes for their trematodes. The work ramifications into many areas — taxonomy, systematics, life-cycles, ecology and biogeography. His work is assuming an increasingly international flavour as, with British and French colleagues, he is exploring patterns of parasite diversity across the tropical Indo-Pacific.

**Andrew Crowden**
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Dr Crowden is Associate Professor in Philosophy at UQ’s School of Historical and Philosophical Inquiry. He is an active researcher and currently a chief investigator for several funded research projects including UQ’s interdisciplinary Genomics in Society: Policy and Ethics project, a co-principle investigator on a Genetic determinism project in collaboration with QIMR Berghofer, and an investigator on The ELSI policy challenges associated with the delivery of genomics in association with the Queensland Genomic Health Alliance (QGHA).

**Vinh Dao**
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Dr Dao is a senior lecturer in civil engineering at UQ. His research interests are in the broad areas of structural engineering and fundamental behaviour of concrete/structures. The focus of Vinh’s research has been on connecting materials behaviour to structural response of concrete in order to address major issues facing construction industry; with current emphasis on performance of concrete at early ages and at elevated temperatures.

**Angela Dean**
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Dr Dean is a research fellow in the UQ School of Biological Sciences. Her research interests include social science, community engagement, communication for behaviour change, and citizen science.

**Bernard, Degnan**
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Professor Degnan is Director of the Centre for Marine Science and a UQ Development Fellow. His research interests include marine genomics, marine biotechnology, marine biology, and the evolution of bio-mineralisation. His research interest in marine biology includes developing and applying genomic and proteomic tools to problems in the marine environment such as biocontrol of pest species (e.g. crown-of-thorns starfish).
Animals evolve because their genomes need to respond to the constantly changing environment presented by both their external habitat and their internal microbial symbionts. Over evolutionary time, these different factors interact during development, when the animal body plan is being established, to generate the extraordinary animal diversity that graces our planet. In ecological time, early life history stages must detect and respond to the precise nature of their environment to generate a locally adapted functional phenotype. Using coral reef invertebrates from phyla that span the animal kingdom, Associate Professor Degnan and colleagues study these gene-environment interactions using genomic, molecular and cellular approaches combined with behavioural ecology in natural populations. They work mostly with embryonic and larval life history stages of indirect developers, as these are crucial to the survival, connectivity, and evolution of marine populations.

Dr Dennis leads an exciting research group that applies cutting-edge technologies to understand the roles of microorganisms and their responses to environmental change. He is also a passionate educator and public speaker who advocates for the importance of biological diversity and evidence-based environmental awareness. He has talked about his research on ABC Radio and a range of other media outlets. His teaching covers aspects of ecology, microbiology, plant and soil science, and climatology. He considers these topics to be of fundamental importance for the development of more sustainable societies and takes pride in helping others to obtain the knowledge and skills they need to build a better future. Paul’s research has taken him to Antarctica, the Amazon Rainforest, high mountains and oceans. The approaches used in his lab draw on a wide range of expertise in molecular biology, ecology, statistics, computer science, advanced imaging and soil science. He applies these skills to a wide range of topics and systems including tropical agriculture, plant-microbe interactions, Antarctic marine and terrestrial ecology, biogeography, pollution and human health.
Pedro Fidelman
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Dr Fidelman has a multidisciplinary background, which includes oceanography, geography and environmental social science. His research focuses on policy, institutions and management in the context of environmental governance. Particular areas of experience include coastal and marine social-ecological systems, climate change adaptation and natural resource management in Australia, Brazil and Southeast Asia.

Jerzy Filar
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Professor Filar is the Director of the Centre for Applications in Natural Resource Mathematics within the UQ School of Mathematics and Physics. Jerzy is a broadly trained applied mathematician with research interests spanning a spectrum of both theoretical and applied topics in operations research, stochastic modelling, optimisation, game theory and environmental modelling. CARM aims to develop and apply mathematical and statistical theory to produce tools that directly impact the management of fisheries, forestry, water security, conservation, pest and disease management, and adaptation to global changes.

Craig Forrest
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Professor Craig Forrest is the Director of the Marine and Shipping Law Unit, and Fellow of the Centre for Public, International and Comparative Law. Professor Forrest teaches and undertakes research in the areas of maritime law, private international law and cultural heritage law. He has published widely in these areas, and contributed directly to national and international public policy development through advice and workshops provided to the United States, United Kingdom, South African and Australian governments, and directly to the drafting of national legislation and international law. In maritime law, Professor Forrest has provided advice to both government and the industry in relation to the law of the sea and wet maritime law. He supervises United Nations Division of Ocean Affairs and Law of the Sea Nippon Fellows. Craig has a long association with the United Nations Educational, Scientific and Cultural Organisation (UNESCO). Between 1998 and 2000, he was a member of the South African delegation to UNESCO to negotiate the 2001 Underwater Cultural Heritage Convention. He acted as an advisor to UNESCO regional cultural meetings in 2009 (Solomon Islands) and 2012 (Cambodia), and in 2013 drafted a Model Law for the implementation of UNESCOs cultural heritage conventions for the Caribbean States and co-chaired the intergovernmental meeting in St.Kitts and Nevis. He is currently engaged in a UNESCO project, with Dr Bill Jeffery (University of Guam) on the protection on underwater cultural heritage in Micronesia. He is a member of the International Law Association’s Committee on Governanace in Global Cultural Heritage Governance.

Craig Franklin
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Professor Franklin’s lab investigates the physiological and behavioural responses of fish, frogs and reptiles to changing environmental conditions including assessing and predicting the impact of human-induced environmental change. A major thrust of this research is within the emerging field of conservation physiology. We are particularly interested in the capacity and plasticity of physiological systems (e.g. respiratory, cardiovascular, osmoregulatory, digestive and musculo-skeletal) to compensate and maintain performance under changing environmental conditions. We combine lab-based experimental studies with fieldwork, and take an integrative approach that utilises ecological, behavioural, physiological and genomic methodologies. In the field we utilise remote sensing technology (acoustic and satellite telemetry, archival tags) to investigate the movement patterns and behaviours of animals in relation to environmental conditions.

Current projects include:

- Assessing the effects of increasing temperatures on sharks, frogs, turtles and crocodiles
- Determining the physiological basis for the impact of increasing UV-B radiation on frogs
- Diving behaviour and physiology of freshwater turtles and crocodiles
- Acoustic and satellite tracking of sharks, turtles and crocodiles in Queensland
- Regulation of physiological function in aestivating frogs.
Venoms play a range of adaptive roles in the animal kingdom from predation to defence to competitor deterrence. Remarkably, despite their biological importance and uniqueness, the evolution of venom systems is poorly understood. New insights into the evolution of venom systems and the importance of the associated toxins cannot be advanced without recognition of the true biochemical, ecological, morphological and pharmacological diversity of venoms and associated venom systems. A major limitation has been the very narrow taxonomical range studied. Entire groups of venomous animals remain virtually unstudied. Associate Professor Bryan Fry’s research is inherently interdisciplinary, integrating ecological, evolutionary, and functional genomics approaches to understand the evolution of venom systems. Studies range from discovering the shock-inducing hypotensive and anticoagulant venom of the iconic Komodo Dragon through to exploring the unique temperature specific adaptations of Antarctic octopus venoms.

The actions of everyday people have caused a massive biodiversity crisis, pushing many species to the brink of extinction and beyond. Doing something about this is one of the most important and urgent problems globally. Professor Fuller is interested in understanding how people have affected the natural world around them, and how some of their destructive effects can best be reversed. On the flip side, he is also keen to understand whether people can benefit positively from experiences of biodiversity. To answer these questions Professor Fuller works on pure and applied topics in biodiversity and conservation, spanning the fields of biogeography, conservation planning, conservation psychology and urban ecology. Much of his work is interdisciplinary, focusing on the interactions between people and nature, how these can be enhanced, and how these relationships can be shaped to converge on coherent solutions to the biodiversity crisis. Recent research topics include predicting the consequences of urbanisation on biodiversity and human quality of life in south-east Queensland, investigating patterns of contagion in global habitat destruction, working out how best to expand Australia’s protected area system, and achieving the conservation of migratory shorebird populations.

Professor Mary Garson completed her PhD at the University of Cambridge, followed by research fellowships in Rome and in Cambridge and then briefly as an industrial medicinal chemist. She migrated to Australia in 1983 as a Queen Elizabeth II Research Fellow, and has been a Professor of Chemistry at UQ since 2006. Professor Garson has published widely on chemistry and chemical ecology of bioactive metabolites from marine sponges and mollusks. A second area of collaborative research explores the chemistry of south east Asian medicinal plants. Numerous invitations to present international conference lectures, together with >150 research publications and various editorial board memberships, attest to her senior status within the international natural products community.

Dr Grinham’s primary research interests are in monitoring and understanding biogeochemical processes within shallow water ecosystems. His formal training was in biochemistry and marine biology focusing on Southern Ocean food webs. Subsequently, he has focused on monitoring sediment loading and greenhouse gas emissions from sub-tropical coastal and freshwater systems.

Professor Hankamer is the founding director of the Solar Biofuels Consortium (2007) and Centre for Solar Biotechnology (2016) which is focused on developing next generation microalgae systems. These systems are designed to tap into the huge energy resource of the sun (>2300x global energy demand) and capture CO₂ to produce a wide range of products such as solar fuels (e.g. H₂ from water, oil, methane and ethanol), foods (e.g. health foods) and high value products (e.g. vaccines produced in algae). Microalgae systems also support important eco-services such as water purification and CO₂ sequestration.

Dr Daniel Harris is a coastal geomorphologist who focuses on the morphodynamics of coastal and coral reef systems, or more specifically, the nature of...
change in coastal geomorphology and the processes responsible for driving such change. This research is conducted on multiple temporal and spatial scales from short-term surf zone processes to the reconstruction of paleo sea levels and coral reef evolution. A major strength of his research is its multidisciplinary nature, encompassing elements of surf science, beach morphodynamics, spatial ecology, and marine geology in combination with effective and novel use of GIS analysis, hydrographic and topographic surveying, high-resolution surf zone measurement, and computer modelling of hydrodynamic processes and geomorphic change.

Damian Hine
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A/Professor Hine is the Acting Director of the Australian Institute for Business and Economics within UQ’s Faculty of Business, Economics and Law. Damian is an evolutionary economist, focused on change and innovation in enterprise. With Peter Mumby, Damian is a leader of the Capturing Coral Reef Ecosystem Services project funded by GEF and administered by the World Bank. Damian’s applied work employs enterprise led solutions to environmental problems. This includes the creation of innovative businesses, adoption of new business models and economic models, and repositioning local businesses in the value chain to increase viability by increasing the proportion of value captured by local businesses through innovation and diversification. Damian also works on business model innovation for community businesses to make them more attractive to impact investors. His research interests are built on the impact of innovation and innovations for businesses, communities and industries. He has worked with fisheries, the pearl industry, horticulture and tourism across the Asia-Pacific region.

Karlo Hock
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A Postdoctoral Research Fellow in the School of Biological Science, Dr Karlo Hock has published widely on coral reef resilience and ecosystem management.

Ove Hoegh-Guldberg
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Ove Hoegh-Guldberg is Professor of Marine Science and Director of the Global Change Institute (GCI) at the University of Queensland. His research group focuses coral reefs and ocean ecosystems, particularly regarding human driven global warming and ocean acidification. He is lead or co-author on 340 peer-reviewed publications and book chapters. Ove was also the coordinating lead author (CLA) for Chapter 30, (‘The Ocean’) for the fifth assessment report of the Intergovernmental Panel on Climate Change (IPCC, 2014) and more recently the Coordinating Lead Author for the Special IPCC Report on the implications of 1.5oC as a climate target (2018). He is member of the Australian Academy of Science, and received the Climate Change Prize from HSH Prince Albert II of Monaco in 2014 and the Banksia Foundational International Award in 2016.

Phil Hugenholtz
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From a PhD in 1994 at the University of Queensland, Professor Hugenholtz developed a career in microbiology and genomics in the USA and in Australia. Phil’s last position in the USA was as staff scientist (2004–2010) at the DOE Joint Genome Institute. In late 2010, Phil returned home to establish the Australian Centre for Ecogenomics. The centre was founded around him as Director, and ARC QEII Fellow and Deputy Director Dr Gene Tyson. Phil has published more than 100 papers in molecular microbial ecology, including several Science & Nature papers. Currently, Phil’s research interests include the microbial ecology and evolution of host-associated ecosystems such as the termite hindgut and human microbiome, and genomic mapping of the microbial tree of life. In 2006, Phil received the Young Investigators Award from the International Society of Microbial Ecology (ISME) and was elected in 2012 as a Fellow of the American Academy of Microbiology (AAM).

Karen Hussey
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Professor Hussey is Director of the Centre for Policy Futures located in the UQ Faculty of Humanities and Social Sciences. Trained as a political scientist and economist, Karen undertakes research in the field of public policy and governance, with a particular interest in public policy relating to sustainable development. Her recent research has focused on water and energy security, the role of the state in climate change mitigation and adaptation, the links between international trade and environmental regulation, and the peculiarities of public policy in federal and supranational systems. Prior to taking up her position at UQ, she was Associate Professor in the Fenner School of Environment and Society at the
ANU, where she now holds an Adjunct Professorship. From 2007–2010 Karen was based in Brussels as the ANU Vice Chancellor’s Representative in Europe, where she was responsible for developing the ANU’s research relationships and profile with European research teams and institutions.

Ron Johnstone
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Prior to his current position, Associate Professor Johnstone served as deputy director of the Centre for Marine Studies at the University of Queensland for five years, as well as the Assessment and Monitoring theme leader in the Coastal CRC, and as a member of the scientific advisory committee for CRC Reef. He has a long professional history in coastal nutrient and ecosystem function research, as well as in the communication of science to the community, government, and private sector bodies. In addition, Dr Johnstone has a long-standing international reputation in his field, having spent about 20 years undertaking CZM research and project management in more 13 countries on behalf of government and international donor agencies including IOC-UNESCO, Sida, and the World Bank. Within Australia, Dr Johnstone’s work is focussed on the understanding of benthic habitats, with an emphasis on nutrient processes and dynamics in coastal ecosystems. This includes aspects such as the influence of land-based inputs on coastal ecosystem function and its influence on specific outcomes such as toxic algal blooms.

Salit Kark
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Associate Professor Kark is an ecologist and conservation scientist, with interest and expertise in the processes (ecological, behavioural and evolutionary) shaping biodiversity and their implications for conservation, environmental decisions and management. She has worked across multiple spatial scales, from global to local (examining latitudinal and altitudinal gradients), and in both terrestrial (birds and mammals mostly) and marine ecosystems. She works in natural and human-dominated landsplaces, examining the generality of spatial patterns and processes. She is interested in integrating socio-economical and historical factors as well as biological and ecological drivers in disentangling the role of the multiple factors that shape biodiversity. In this framework, I aim to advance the links between science, practice and policy and in leading actions that allow us to improve science-based conservation.

She completed her PhD at The Hebrew University of Jerusalem (1999), and was a post-doctoral fellow at the Department of Biological Sciences, Stanford University (between 1999–2002) working with Prof. Harold Mooney and Prof. Paul Ehrlich at the Center for Conservation Biology at Stanford. Between 2002 and June 2013, she was a full-time research and teaching faculty member (Senior Lecturer) at The Hebrew University of Jerusalem where she established and was the Head of the Biodiversity Research Group.

Emma Kennedy
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Dr Kennedy is a postdoctoral research fellow at the UQ School of Earth and Environmental Sciences where she is currently working on the Allen Coral Atlas global coral reef mapping project. Her research interests include coral bleaching and mass bleaching events. After completing a PhD in Caribbean coral reef ecology at University of Exeter, she moved to Australia where she worked with the Great Barrier Reef Foundation to determine whether coralline algae can be used to track the impacts of climate change in the Great Barrier Reef.

Eva Kovacs
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Dr Kovacs is a postdoctoral research fellow at the UQ School of Earth and Environmental Sciences. After gaining a Bachelor of Science at James Cook University, Eva completed her Honours and PhD with UQ. She has published widely on seagrass and coral habitat mapping using remote sensing technologies, and currently works on the Great Barrier Reef and Allen Coral Atlas Global Coral reef mapping projects at UQ.
Janet Lanyon
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Dr Lanyon’s research interests include the conservation, biology and ecology of large marine vertebrates i.e. marine mammals, seagrass, turtles, plant-herbivore interactions — marine life, herbivore-plant interactions — marine life, marine mammal biology, marine studies, dolphins and whales.

Her current research interests:
- Population ecology of dugongs and coastal dolphins
- Population genetics of dugongs
- Physiology, functional morphology and ecology of dugongs
- Health assessment of inshore marine mammals, particularly dugongs.

Annie Lau
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Dr Lau joined UQ in 2016. Her primary research interest is in analysing past occurrences of coastal hazards, in particular extreme waves generated by storms and tsunamis, through sedimentary, geomorphological and historical records for assessing the future threat in coastal areas. In her recent project, Annie used the characteristics of large coastal boulders (e.g. size and distribution of rocks) to estimate the strength of extreme waves and to reconstruct the history of extreme events in the past millennia at a few tropical islands in the Asia-Pacific area. Coastal geomorphology and late Quaternary sea-level change were also examined at study sites, to investigate extreme-wave processes on different kinds of coastlines.

Richard Lewis
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Professor Lewis started working on toxins during his PhD studies at The University of Queensland, where he researched the nature and pharmacology of ciguatoxins responsible for ciguatera fish poisoning. After 10 years with the Queensland Department of Primary Industry following this line of research, he moved back to UQ to initiate research into the pharmacology of conotoxins, small venom peptides produced by carnivorous cone snails. This research led to the isolation and characterisation of several new classes of conotoxins, including two (w-CVID and Xen2174) that were developed clinically. His current research focusses on the discovery, evolution and structure-function of venom peptides, especially those with potential for the treatment of difficult to manage pain. Professor Lewis’s research on novel analgesics from Australian venomous animals has the potential to change the way severe pain is treated. His research on ciguatera has the potential to improve the management of this severe illness associated with the consumption of tropical reef fish that affects about 50,000 people a year.

Catherine Lovelock
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Professor Lovelock’s research focusses on the influence of environmental change, including climate change, on the ecology of coastal and marine plant communities and in providing knowledge to underpin conservation and restoration of these ecosystems now and in the future.

Mitchell Lyons
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A postdoc in the Remote Sensing Research Centre, Dr Lyons’s research is a mixture of ecology, geography and statistics. He finished his PhD at UQ, which focused on developing new remote sensing methods for long-term monitoring and change detection in terrestrial and marine ecosystems. He later focused on automated monitoring of seagrass environments using remote sensing and autonomous underwater vehicles (AUVs). At UNSW he worked on the application of modern statistical and modelling approaches for large-scale vegetation classification and mapping problems, with a side interest in drone-acquired image data. Dr Lyons is currently back at UQ, working on the Allen Coral Atlas global coral reef mapping project and Great Barrier Reef mapping project in the School of Earth and Environmental Sciences, where his primary activities include developing object-based (cloud-based, on the Google Earth Engine) classification and mapping algorithms and accuracy assessment.

Ian MacKenzie
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Dr MacKenzie is an environmental economist who can work on both theoretical and applied environmental projects. He specialises in environmental economics, environmental policy, and contest theory. In particular, he has published widely on the regulation of pollution markets and environmental auctions. His current focus is on designing mechanisms to cost effectively reduce pollution.
John Mangan
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John Mangan is a Professor of Economics within the UQ Business School at the University of Queensland and was the inaugural Director of the Australian Institute for Business and Economics (2014–15). With extensive academic, consultancy, editorial and ‘expert opinion’ experience, Professor Mangan is a skilled economic modeller, and a leading researcher in the areas of: labour and social economics, economic impact analysis, and applied micro-economics.

Karine Mardon
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Dr Mardon is the Facility Manager for the preclinical PET/CT for the Queensland Node of the National Imaging Facility (NIF) as part of the National Collaborative Research Infrastructure Scheme (NCRIS), based at the UQ Centre for Advanced Imaging.

Justin Marshall
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Professor Marshall’s principle aim is to understand how other animals perceive their environment. As arrogant humans we tend to assume we are the pinnacle of evolution, however, certainly in sensory terms this is far from true. By taking an approach to sensory systems which is based around ecology but also includes physiology, anatomy, behaviour and neural integration, Professor Marshall hopes to decode languages such as colour and polarisation. Much of his work focusses on the marine environment, in particular reef systems and the deep-sea.

Chris McGrath
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Dr Chris McGrath is a barrister in Queensland practising in environmental law and an Adjunct Associate Professor at UQ’s Global Change Institute. Dr McGrath has long advocated for environmental law reform and has worked to promote understanding of the way environmental law is applied in Australia.

Karen McNamara
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Dr McNamara is a senior lecturer in UQ’s School of Earth and Environmental Sciences. As a human geographer, Karen undertakes research into the impacts of, and responses to, environmental change on people’s livelihoods, particularly in the Pacific Islands region and parts of Asia. Karen has been undertaking research in this area for more than 15 years, partnering with numerous governments, and inter-governmental and non-governmental organisations throughout the Asia-Pacific region. She has published more than 60 academic papers and book chapters, and is currently lead Chief Investigator on the ARC Linkage project ‘Optimising community-based climate change adaptation in the Pacific Islands’, and Chief Investigator on National Geographic project ‘Navigating rising seas: a comparative study of relocation in Fiji, the Maldives and Tuvalu’. She has undertaken a number of research projects for the Australian Government, European Union, United Nations Development Programme, United Nations Educational, Scientific and Cultural Organization, and others.

Paul Mills
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Professor Mills’s research includes veterinary pharmacology and therapeutics, with special interest in transdermal drug delivery, pulmonary therapeutics and the control of inflammation. An additional interest includes wildlife ecology and therapeutics. Paul graduated from UQ School of Veterinary Science in 1987 and, after a period in clinical practice, completed a PhD investigating pharmacological control of inflammation in racing animals. He undertook a three-year postdoctoral position at The Animal Health Trust in the United Kingdom and established the Oxidative Stress research group. He was also the team veterinarian on a study of heat and humidity in horses towards the Atlanta Olympic Games. He returned to Australia and undertook positions as a NHMRC Senior Research Officer at the Princess Alexandra Hospital and as a Senior Government Veterinary Officer with Racing Queensland.

Jochen Mueller
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Professor Mueller’s research focusses on monitoring of trace organic pollutants, including pioneering work on sources, fate, monitoring techniques (including development of passive sampling techniques) and trends in human exposure to trace contaminants. More recently his group has been leading research in the field of wastewater epidemiology. Professor Mueller’s work on passive samplers, biochemical techniques for emerging chemicals and wastewater epidemiology has received support from ARC and numerous industry partners.
Peter Mumby
p.j.mumby@uq.edu.au

Professor Mumby’s research focuses on delivering science to improve the management of coral reefs. His group carry out empirical ecological studies at scales ranging from millimetres (algal patch dynamics) to thousands of kilometres (gene flow in Caribbean corals) to plug gaps in our understanding of reef processes. Empirical data are then used to develop ecosystem models from which they can investigate the effectiveness of conservation measures in mitigating disturbance on reefs including climate change. His research team combine ecological models with remotely sensed data to allow spatial conservation planning such as marine reserve design. They have worked around the world including locations in the Caribbean: Bahamas, Belize, Bonaire; Pacific: Palau, Great Barrier Reef, French Polynesia; Indian Ocean: Philippines, and Indonesia.

Peter Nielsen
p.nielsen@uq.edu.au

Professor Nielsen completed both his Master of Engineering and PhD at T.U. Denmark, before completing a Doctor of Engineering at UQ. His research interests include fluid mechanics broadly, water waves, coastal flooding, beach erosion and coastal groundwater issues.

Michael Noad
mnoad@uq.edu.au

Professor Noad’s research interests include the perception and use of sound by humpback whales (*Megaptera novaeangliae*). He is one of several PIs on a large international collaboration, the Humpback whale Acoustic Research Collaboration, or HARC, which is looking at this off the east coast of Australia. He’s also interested in other aspects of the ecology of the east Australian population of humpback whales, cultural evolution and transmission of song patterns within and among populations of humpback whales, the development of acoustic survey techniques for cetaceans, the potential pathological effects of underwater noise on marine mammals, acoustic communication and behaviour in other taxa, particularly birds, and in the ecology of the leopard shark (*Stegostoma fasciatum*).

Kate O’Brien
k.obrien@uq.edu.au

Associate Professor Kate O’Brien (BE Chemical Hons I, BSc, PhD) leads the chemical-environmental engineering program at The University of Queensland. She uses mathematical modelling and systems analysis to investigate how socio-ecological systems work, and how they can be managed more sustainably. Kate works in interdisciplinary teams, with collaborators from engineering, ecology, mathematics, business, social science and economics. She is particularly interested in how scientific knowledge can be synthesised and communicated to promote sustainability when dealing with complex systems and wicked problems. Kate teaches her students to think critically using an approach of Ruthless Compassion, and she is passionate about finding creative solutions to work-family conflict.

Peter O’Donoghue
p.odonoghue@uq.edu.au

Professor O’Donoghue’s area of specialisation is clinical protozoology and he practices essentially as a diagnostician; i.e. he detects and studies unicellular protozoan parasites infecting vertebrate hosts. He has long been fascinated by their extreme biodiversity as manifest by considerable variation in their structure, function and mode of existence. The prevailing theme of his research is to discover and describe protozoan species in Australian animals. His studies are deliberately parochial as our continent is simply the last great unexplored bastion for micro-fauna. Little is known about protozoa in the gut, blood and tissues of native mammals, birds, reptiles and fish. He seeks to define the morphology, biology, historical zoogeography and pathogenicity of endemic protozoan species. He wants to know their identity, origins and interactions with their hosts. Despite the diversity of hosts sampled, he confines his studies to four main protozoan assemblages: flagellates, amoebae, ciliates and sporozoans. He has detected a high degree of endemicity of these groups in Australian vertebrates suggesting their evolution in long isolation.
Jennifer Ovenden  
j.ovenden@uq.edu.au

Jennifer Ovenden is an Associate Professor at UQ and head of the Molecular Fisheries Laboratory. Her undergraduate honours degree was from the Australian National University in Canberra and PhD from the University of New South Wales in Sydney. Over more than 30 years, Jennifer has worked on the genetics of populations of wild animals. The majority of projects has focussed on species harvested (or impacted) by fisheries in Australia and other nations in the Southern Hemisphere. Species include molluscs, crustaceans, bony fish, sharks and rays. Jennifer has worked with allozyme loci, mitochondrial DNA, microsatellites and lately genomic data. Jennifer worked for the Queensland Government as a research scientist for many years, as well as at the University of Tasmania in Hobart.

John Pandolfi  
j.pandolfi@uq.edu.au

John Pandolfi is a Professor in Palaeoecology and Marine Studies at UQ. His research interests include the ecological dynamics of coral reef ecosystems over broad spatial and temporal scales, such as:

- Long-term ecology of coral reefs
- Using Historical Ecology to guide reef management actions
- The palaeoecological, evolutionary, and extinction dynamics of Indo-Pacific reef corals
- Hybridisation, extinction, and evolution in a Caribbean reef coral species complex.

Anna Phelan  
a.phelan@business.uq.edu.au

Dr Phelan is an ecological economist with twenty years professional and academic experience including collaborative interdisciplinary research, business development and technical consulting. Her current research themes lie at the interface between ecological and behavioural economics and encompass: sustainable livelihoods, ocean plastic pollution, sustainable tourism, and community-based enterprise development. Anna is the Director of the UQ Global Change Scholars Program, and is part of the business development team for the Capturing Coral Reef & Related Ecosystem Services (CCRES) Project, which is focused on alternative sustainable livelihoods that protect and enhance coastal ecosystem services. Anna has recently been awarded the GCI Flagship Project Grant — Small Island Initiative for a Plastic Free Ocean — a two-year research project focusing on reducing ocean plastic pollution in coastal communities in Indonesia.

Stuart Phinn  
s.phinn@uq.edu.au

Professor Stuart Phinn’s research interests are in measuring and monitoring environmental changes using earth observation data and publishing/sharing ecosystem data. Stuart is the Chair of the Committee that produced Australian Earth Observation Community Plan – 2026, he is also a professor of Geography at the University of Queensland where he teaches remote sensing and directs the Remote Sensing Research Centre, which includes programs to support government agencies across Australia( Joint Remote Sensing Research Program) and enabling coordination across all government, industry and research groups collecting and using EO data (Earth Observation Australia). The majority of his work uses images collected from satellite and aircraft, in combination with field measurements, to map and monitor the Earth’s environments and how they are changing over time. This work is done in collaboration with other environmental scientists, government environmental management agencies, NGO’s and private companies.

Hugh Possingham  
h.possingham@uq.edu.au

A Fellow of the Australian Academy of Science, Professor Hugh Possingham’s research interests are in conservation research, operations research and ecology. More specifically his lab works on problems to secure the world’s biological diversity: efficient nature reserve design, habitat reconstruction, monitoring, optimal management of populations for conservation, cost-effective conservation actions for threatened species, pest control and population harvesting, survey methods for detecting bird decline, bird conservation ecology, environmental accounting and metapopulation dynamics. Since 1 January 2014, Professor Possingham has been an Australian Research Council Laureate Fellow. He currently directs two national research centres, including an Australian Research Council Centre of Excellence for Environmental Decisions. He received his PhD from the University of Oxford in 1987. His research projects are in the field of decision theory in conservation biology:
UQ Marine Science Capability, Expertise and Experience

- Reserve design, biodiversity management and fire regime management
- Population viability analysis (PVA) — including the development of ALEX
- Pollination ecology
- Metapopulation dynamics
- Ecological economics
- Optimal monitoring and environmental accounts
- Stochastic modelling
- Biodiversity and climate change
- Population dynamics of marine organisms
- Marine reserve design
- Marine population dynamics
- Avian community ecology
- Edge effects and fragmentation
- Landscape ecology
- Behavioural and population ecology of parasitoids

**Mark Ragan**
m.ragan@imb.uq.edu.au

Mark Ragan is an Emeritus Professor at UQ's Institute for Molecular Bioscience. He was founding Head of IMB's former Division of Genomics & Computational Biology (2000–2014), founding Director of the Australian Research Council (ARC) Centre of Excellence in Bioinformatics (2003–2015), and co-founder of QFAB Bioinformatics. Mark is a graduate of the University of Chicago (Biochemistry) and Dalhousie University (Biology). His 200+ peer-reviewed research publications in biochemistry, molecular biology, evolutionary biology, genomics, algorithms, bioinformatics and computational biology have attracted more than 11300 citations. Core technologies in his research group (integration of large bioscience data, scalable algorithms on trees and networks, bioinformatic workflows, high-performance and data-centric computing) were applied to problems of genome sequencing and de novo assembly, comparative evolutionary genomics, and inference of biomolecular networks particularly in the coral reef symbiont Symbiodinium, and in targeting therapies against DNA damage repair networks in familial breast cancer. Mark was also involved in national and international infrastructure initiatives in genomics, computing, data and bioinformatics services.

**Anthony Richardson**
ajr@maths.uq.edu.au

Professor Richardson’s primary research interest is in understanding human impacts on marine systems and how we can improve their management and conservation. He uses statistical and mechanistic ecosystem models to understand marine systems currently, and then projects these models into the future under different climate change and fishing scenarios. He has made significant contributions to describing how marine species are responding to climate change and was the first to show changes in the timing of marine species. His current research focus is on how climate change could affect the movement of biodiversity and functioning of marine systems, and where we might best place protected areas, fish differently, or use other approaches to conserve ecosystems. Anthony is the author of 180 peer-reviewed papers and enjoys teaching mathematics and statistics to ecologists.

**Cynthia Riginos**
c.riginos@uq.edu.au

Associate Professor Riginos has research interests in molecular ecology and evolutionary genetics. Her research group studies dispersal, gene flow, and evolutionary adaptation in various marine species (corals and other invertebrates, fishes, and invasive mussels). This research program provides insights into fundamental evolutionary and ecological processes that are relevant for promoting marine ecosystem resilience and anticipating species’ responses to climate change (esp. range shifting and rapid evolutionary adaptation).

**Brent Ritchie**
b.ritchie@uq.edu.au

Professor Ritchie is Associate Dean (Research) in the Faculty of Business, Economics and Law. His research has focused on understanding risk from an individual and organisational perspective. He also explores the factors that influence risk perceptions. He is part of the social science team in the Reef Restoration and Adaptation Program (RRAP), exploring the Australian public perceptions of risk, attitudes and support for novel restoration interventions for the Great Barrier Reef.
Chris Roelfsema
c.roelfsema@uq.edu.au

Dr Roelfsema is a Senior Research Fellow (Coastal Marine) and co-director at the Remote Sensing Research Centre, UQ School of Earth and Environmental Sciences. His research interests include mapping, monitoring and modelling ecosystem health of coral reefs and seagrass habitats. The research on mapping approaches includes integrated: field, physical attributes and remote sensing image datasets, object-based analysis with eco-geomorphological knowledge. He has developed cost-effective mapping approaches and field data collection methods which have been adopted as standard practice in several resource management agencies and research institutes around the world. He leads the Great Barrier Reef Habitat Mapping for GBRMPA, and the habitat mapping component of the Allen Coral Atlas/Global Coral Reef Mapping in partnership with Vulcan Philanthropic, Planet Ltd, National Geographic and Arizona State University.

Helen Ross
helen.ross@uq.edu.au

Professor Helen Ross is an interdisciplinary social scientist (environmental psychologist and anthropologist) specialising in social aspects of sustainable development and environmental management. She manages social sciences at UQ’s School of Agriculture and Food Sciences and is responsible for agricultural extension and rural development. In her research she focuses particularly on people-environment relationships, sustainability and resilience, and collaboration processes for natural resource management. Much of her research is community-based, or fosters communication and collaboration between communities and governments. Helen is a Fellow of the Environment Institute of Australia and New Zealand, and a past winner of its national prize for contributions to environmental management. She chairs Healthy Waterways and Catchments Social Sciences Experts Panel, and is a member of the Australian Psychological Society’s Climate Change Experts Panel.

Peer Schenk
p.schenk@uq.edu.au

Professor Peer Schenk works to address food and energy security concerns facing today’s world using science and technology. Through his role at the UQ School of Agriculture and Food Sciences, Peer heads laboratories in both algae biotechnology and plant-microbe interactions. Peer is internationally recognised for his expertise in plant biotechnology, including the development of new disease-resistant plants and his extensive knowledge of algae cultivation and harvesting. Peer and his team recently opened the Algae Energy Farm at UQ’s Pinjarra Hills, a prototype demonstration farm that deploys new cost-saving technologies to produce food, feed, nutraceuticals or biodiesel from microalgae. The farm can also be used as a zero-input “power plant” with full resource recycling capability to produce fuel (biogas and biodiesel). Recognised for his R&D successes with industry, his research has led to two dynamic start-up companies: QPonics Pty Ltd (www.qponics.com) and Nexgen Plants Pty Ltd (www.nexgenplants.com) commercialised technology from six patents, and his published papers are cited by more than 1000 publications per year. He was Australia’s APEC representative for biorefinery concepts and produced several new crop varieties that are now commercially grown in three continents. Peer is currently overseeing the implementation of his low-cost algae cultivation technology.

Ethan Scott
ethan.scott@uq.edu.au

In Associate Professor Scott’s Lab, they’re interested in the workings of the brain at the level of cells and circuits. They aim to understand how sensory stimuli are perceived and processed in the brain, and how the brain then interprets these stimuli to produce adaptive behaviours. Because of the brain’s extraordinary complexity, these questions are difficult to address by looking at individual cells. The flow of information through the brain relies on the coordinated activity of thousands or millions of cells, and on ensembles of neurons that are active simultaneously. For this reason, their research involves imaging activity in thousands of cells, and seeking salient patterns of activity across these populations. In a range of projects, they characterise the neurons and circuits that respond to various visual, auditory, water flow, and vestibular stimuli; that play a role in the integration of information from these modalities; and that filter sensory information to produce behaviour.
Current projects

- Anatomical circuit mapping
- Sensory processing and integration
- Functional circuit mapping with optogenetics
- Zebrafish models of Autism Spectrum Disorder.

**Sabrina Streipert**  
s.streipert@uq.edu.au

Dr Streipert is an applied mathematician analysing the effects of different time scales on population dynamics and the spreading of diseases. After finishing her PhD in Applied Mathematics at the Missouri University of Science and Technology in US, she became a Research Associate at the University of Madison-Wisconsin in the Centre for Sleep and Consciousness, working on the mathematical theory of consciousness. In October 2017, she started as a Lecturer at the Centre for Applications in Natural Resource Mathematics in the UQ School of Mathematics and Physics, where she is currently involved in using her modelling skills to assess the Barramundi fish population.

**Christina Schroeder**  
c.schroeder@imb.uq.edu.au

Dr Schroeder received her MSc in Chemistry from University of Kalmar, Sweden in 1998. As part of her masters, she joined Prof. Richard Lewis for a six-month internship at the UQ Centre for Drug, Design and Development, working on conotoxins inhibiting calcium channels. After her masters, she worked as a research assistant at the Karolinska hospital and Stockholm University in Sweden until she returned to Australia in 1999 to conduct her PhD at UQ’s Institute for Molecular Bioscience under supervision of Professor Richard Lewis and Professor David Craik working on the development of an omega-conotoxin pharmacophore. After completing her PhD in 2003, she carried out a postdoc in Professor Lewis’ laboratory until 2006, when she joined Professor Philip Dawson’s laboratory at The Scripps Research Institute, La Jolla, USA to work on developing palmitoylated peptides as chaperones for infantile Batten disease. In 2007, she moved back to Australia, to join Professor Philip Hogg’s laboratory at the University of New South Wales in Sydney where she worked on the multimerisation of large proteins via disulfide bonds. In 2011 she was recruited back to IMB to join Professor David Craik’s group. Dr Schroeder’s research is focussed on using bioactive peptides in drug design and to understand the mode of action of toxins binding to sodium channels and their surrounding membranes with the ultimate goal to develop novel non-addictive pain therapeutics.

**Jennifer Seddon**  
j.seddon1@uq.edu.au

Professor Seddon is a veterinarian and a molecular geneticist. She has established an international reputation in using genetic tools to address ecological questions in support of the conservation of wildlife. She is also interested in disease ecology and using molecular tools to understand the spread of disease and vectors at the urban-rural interface. Jenny is passionate about quality student-centred veterinary education. She teaches genetics and genomics and has introduced innovative teaching activities and authentic assessment. Her research focuses on the application of genetics and genomics to ecological questions. This includes the distribution of genetic variation across landscapes, the impact of current and historical barriers to gene flow and estimating genetic relatedness and its impact on social systems. Research projects have been based mainly on mammals, including koalas, kangaroos, dugongs, dolphins, giraffe and mongooses, but also on other species, such as the cattle tick.

**Jamie Shulmeister**  
james.shulmeister@uq.edu.au

Professor Schulmeister’s interests lie in four related fields. In paleoclimatology, he focuses on the Southern Hemisphere westerlies and the Australian and Asian monsoons. In paleoecology he uses pollen, chironomids and other biological proxies to reconstruct environmental changes. His work is focussed mainly in Australia, New Zealand and China In glacial geology, he determines the nature and cause of glacial events from geochronology, geomorphology and sedimentology with projects in New Zealand, Tasmania and the Pacific NW of North America. He also has active projects on coastal evolution of high energy coasts and dunefields, with a current ARC Discovery grant on the Coooloola Sand Mass and Fraser Island in south-east Queensland, Australia. Jamie joined UQ in July 2009 from the University of Canterbury in New Zealand (on staff 2001–2009). He was previously at Victoria University of Wellington, New Zealand (1994-2001) and before that was a visiting professor at the University of Southern California (1993–1994) and a postdoc at the University of Canterbury in New Zealand (1991 – 1993). He was Head of School in Geography Planning and Environmental Management from July 2009 until December 2014.
Tracy Rout
t.rout2@uq.edu.au

Dr Rout is a Senior Research Fellow in the NESP Threatened Species Recovery Hub and an affiliate of the Centre for Biodiversity and Conservation Science. She applies methods from decision science to analyse and solve ecological management problems. Her areas of interest include: eradication of invasive species, adaptive management, as well as translocation and captive breeding. She is currently working on modelling the optimal timing of management relocations for species threatened by climate change, and developing decision tools for initiating captive breeding programs.

Peter Scarth
p.scarth@uq.edu.au

Dr Peter Scarth works with a cross-disciplinary team at the Joint Remote Sensing Research Centre (JRSRP) to develop data management systems and mathematical models that measure and map both major and more subtle changes in Australia’s vegetation using large earth observation data sets linked to vegetation field data systems. By building demonstrated value on our collective ecosystem data and engaging with stakeholders across academia, government and industry he aims to maintain and extend our data holdings and build “long science” to address wicked problems in the land management space.

Horst Joachim Schirra
h.schirra@uq.edu.au

Dr Schirra is Manager of the UQ Facility for NMR-based Metabolomics whose instrumentation and analytical capabilities are unparalleled in Australia. He is a specialist in Modern Metabolic Systems Biology and NMR spectroscopy with more than 20 years’ experience in the technique. The central focus of his research is the elucidation of metabolic regulation and the role it plays in fundamental biological processes as well as in health and disease. He uses NMR-based metabolomics to analyse the metabolic fingerprints of complex biological samples to characterise and understand the underlying physiological and biological/clinical processes. Samples range from biological fluids and tissue extracts to environmental, agricultural, and food samples.

Joe Shapter
j.shapter@uq.edu.au

Professor Shapter’s major interests are in the area of novel nanomaterial production, nanometer scale of these materials and their application. He explores ways to make novel nanomaterials and then apply them in areas such as photovoltaics, catalysts or sensors.

Timothy Stephens
timothy.stephens@imb.uq.edu.au

Our research focuses on the evolutionary genomics of coral symbionts (the dinoflagellate algae, Symbiodiniaceae) and how they adapt to environmental changes. Specifically, we are interested in the evolutionary transition of these algae from free-living to symbiotic lifestyle from the genomic perspective. We use cutting-edge genomic approaches to generate genome and (full-length) transcriptome data de novo.

Kevin Thomas
kevin.thomas@uq.edu.au

Professor Thomas is Director of the Queensland Alliance for Environmental Health Sciences (QAEHS). He is interested in the environmental occurrence, fate, effects and risks associated with contaminants of emerging concern (CECs) with the goal of protecting environmental and human health. Current research is focused on quantifying exposure to microplastics and associated additives, assessing community-wide health status through wastewater-based epidemiology, establishing alternative approaches to exposure monitoring, for example explanted silicone prostheses and wristbands, pollution and developing analytical methods for characterising and quantifying CECs.

Ian Tibbetts
i.tibbetts@uq.edu.au

Associate Professor Tibbetts grew up on the Devon coast hunting among the fucoids for crabs and shrimp. He undertook research while at school on the diet of blennies. At university in Swansea, south Wales, and as a marine Biology student he investigated informally the behaviour of intertidal pool dwelling organisms and more formally (Hons) the ecology of benthic invertebrates. His PhD at The University of Queensland delved into the ecology and evolution of halfbeaks.
Hemiramphidae). His research track-record since then reflects both his early interests and those developed subsequent to his PhD. He has published in diverse fields, reflecting his general curiosity about marine life, and in particular the dynamic between evolution and action addressing challenges to extant paradigms that his extensive time in the field have prompted.

**Gene Tyson**
g.tyson@uq.edu.au

Professor Tyson is a microbial ecologist whose research applies culture-independent molecular approaches to understand the structure and function of microbial communities in the environment. During his dissertation research (University of California, Berkeley) he was the lead author on one of the first studies to use metagenomics. In this work he investigated the metabolic potential and population diversity of microbial communities involved in acid mine drainage (AMD) generation, and demonstrated, for the first time, that metagenomic data could be used to reconstruct near-complete genomes directly from environmental samples. Using the metagenomic and metatranscriptomic approaches he helped to pioneer, his research group at The University of Queensland is investigating microbial communities in a wide range of different communities in both engineered systems and natural environments. The Tyson group is continuing to develop new ways to analyse genomic data by leading efforts in error correction for high-throughput sequencing platforms, single-cell sequencing and deep spatiotemporal metagenomics.

**Research focus and collaborations:**
- Molecular microbial ecology
- Microbial diversity
- Microbial evolution
- The role of microorganisms in the biogeochemical cycles that underpin life on Earth
- Phage — host interactions and co-evolution.

**Irina Vetter**
i.vetter@imb.uq.edu.au

Associate Professor Vetter is an NHMRC R.D. Wright Career Development Fellow and Deputy Director of the recently established Centre for Pain Research at UQ’s Institute for Molecular Bioscience. Her research interests lie in the fields of peripheral pain mechanisms, target identification and analgesic drug discovery. She investigates the contribution of ion channels to sensory neuronal physiology using highly subtype-selective toxins isolated from venomous animals with the aim to develop novel analgesics with improved efficacy and tolerability.
Zhang at the Hong Kong University of Science and Technology (2009–2011) and A/Professor Andreas Hofmann at Griffith University’s Eskitis Institute, Brisbane, Australia (2011–2012). I returned to the University of Queensland in 2012 to join an industry partnership funded by an ARC linkage grant. I am currently a Senior Research Officer and responsible for a team of research officers, assistants and postgraduate students. At UQ, my research involves interdisciplinary methods for design and engineering of peptides. I am interested in developing new tools that enable peptides to be translated into next generation biotechnological agents that have real impact.

Selina Ward
selinaward@uq.edu.au


Gregory Webb
g.webb@uq.edu.au

Professor Webb is a palaeontologist and carbonate sedimentologist. His research interests are clustered within the fields of carbonate petrology, reef palaeobiology, geomicrobiology, carbonate geochemistry and carbonate stratigraphy. These fields have major implications for understanding Earth history, palaeoclimatology, and mineral and energy exploration. In general, Professor Webb’s research focuses on understanding how organisms make rocks — how the biosphere interacts with the lithosphere through time — and how those rocks are preserved and how they record evidence of past environmental conditions in their geochemistry.

Yongping Wei
yongping.wei@uq.edu.au

Dr Yongping Wei is Associate Professor and ARC Future Fellow at the UQ School of Earth and Environmental Science. Before joining UQ in 2016, she was research fellow, senior research fellow and principal research fellow at the Department of Infrastructure Engineering, University of Melbourne (2008–2015). In her early career, Dr Wei had 11 years’ experience as an irrigation engineer then water manager in China. She was awarded her PhD in Natural Resources Management at the University of Melbourne (2007), and she also obtained Bachelor of Engineering and Master of Natural Resources Economics.

Marshall Weisler
m.weisler@uq.edu.au

Professor Marshall Weisler was awarded his Doctor of Philosophy (Anthropology) from UC Berkeley. A Fellow of the Australian Academy of the Humanities, his research interests include archaeology and prehistory of the Pacific Islands, prehistoric trade and exchange, and the geochemical analysis of stone tools. Other interests include marine resource exploitation, archaeological sites — fish and shellfish, and research collaboration with Indigenous people.

Mark Western
m.western@uq.edu.au

Professor Western is Director of the Institute for Social Science Research and a Fellow of the Academy of Social Sciences in Australia. He is interested in how to improve quantitative methods such as social surveys and statistical analyses to generate more valid and reliable conclusions from these kinds of data. Professor Western is also interested in how to use new computational methods such as machine learning on very large social science datasets, to identify patterns, classify observations, and make better predictions.

Kevin Welsh
k.welsh1@uq.edu.au

Dr Kevin Welsh is a lecturer in Sedimentology & Palaeoc at the UQ School of Earth and Environmental Sciences. With a PhD from the University of Edinburgh and BA Science from the University of London, Kevin pursues several specialised research interests, namely:

- El Nino-Southern Oscillation — late Pleistocene and Holocene reconstruction of ENSO using marine invertebrates and terrestrial sediments.
- Holocene sea level histories from the Great Barrier Reef — using corals and microatolls to reconstruct sea level variation through the Holocene along the Queensland coast.
- Environmental history of coastal dunefields — using OSL dating, sedimentological and pedogenesis of large coastal dune fields in Queensland to track past environmental histories.
- Evolution of the east Antarctic ice sheet — reconstruction of late Pleistocene dynamics of the EAIS during warm events.
Robbie Wilson
r.wilson@uq.edu.au

Professor Wilson’s research group studies animal performance in the laboratory and in the field. They focus on discovering the underlying mechanistic basis of physical performance and its implications for an individual’s survival and reproductive success. They’re particularly interested in how organisms respond to environmental variation, such as seasonal or long-term temperature change, and the costs of these responses to other traits. They examine interactions between behavioural, physiological and morphological traits to better understand how animal performance is optimised. Furthermore, the group wants to understand how an organism’s performance relates to population-level processes, enabling better conservation practices in urban and wild habitats. Their research is question-driven, and they use a variety of model systems in our studies, including freshwater fish, crayfish, reptiles, marsupials, and humans.

Cheong Xin Chan
c.chan@imb.uq.edu.au

Dr Chan has a PhD in genomics and computational biology from UQ. Upon graduation, he underwent postdoctoral training with Professor Debashish Bhattacharya at Rutgers University (New Brunswick, New Jersey), focusing on algal genomics and evolution (phylogenomics), and the origin of plastids. His research routinely involves de novo assembly and analysis of high-throughput sequencing data. Since his return to UQ in November 2011, Chan has been using advanced computational and database approaches to explore and develop highly scalable phylogenomic approaches, and to study genome evolution of microbes, including bacteria, algae and protists. Chan is also an Affiliate Lecturer at UQ’s School of Chemistry and Molecular Biosciences.

Professor Jian Zhao
j.zhao@uq.edu.au

Professor Zhao was awarded his PhD at the Australian National University. Before achieving his doctorate, he completed a Master of Science at the University of Adelaide and BA Science at Nanjing University of Chemical Technology. His research interests include archaeology, palaeoecology, and the palaeoenvironment. Jian has published widely in his fields and supervised or co-supervised more than 20 PhD candidatures.
<table>
<thead>
<tr>
<th>Project Title</th>
<th>Date Range</th>
<th>Granting Scheme</th>
<th>Investigator</th>
<th>Funding</th>
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<tr>
<td>Desktop analyses to inform the design for marine physico-chemical monitoring within the Reef Integrated Monitoring and Reporting Program (RIMReP)</td>
<td>30 Jan 2018 — 30 June 2018</td>
<td>Australian Institute of Marine Science</td>
<td>Mueller, J</td>
<td>$7,150</td>
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<td>Reef Restoration and Adaptation Program Design Phase (Commonwealth Department of Innovation, Industry and Science grant administered by Australian Institute of Marine Science)</td>
<td>1 Dec 2017 — 30 June 2019</td>
<td>Australian Institute of Marine Science</td>
<td>Mumby PJ &amp; Hussey K</td>
<td>$428,450</td>
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<tr>
<td>Sequencing, assembly and annotation of the crown-of-thorns starfish genome</td>
<td>2 April 2014 — 31 Dec 2015</td>
<td>Australian Institute of Marine Science</td>
<td>Degnan BM.</td>
<td>$52,800</td>
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<td><strong>Total AIMS-UQ Projects 2012–2019</strong></td>
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<td>$6,844,145</td>
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<tr>
<td>Hughes, Terry P.; Kerry, James T.; Alvarez-Noriega, Mariana; Alvarez-Romero, Jorge G.; Anderson, Kristen D.</td>
<td>2017</td>
<td>Global warming and recurrent mass bleaching of corals</td>
<td>Nature</td>
<td></td>
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<tr>
<td>Do, C.; Waples, R. S.; Peel, D.; Macbeth, G. M.; Tillett, B. J.</td>
<td>2014</td>
<td>NEESTIMATOR v2: re-implementation of software for the estimation of contemporary effective population size (N-e) from genetic data</td>
<td>Molecular Ecology Resources</td>
<td></td>
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<tr>
<td>Hughes, Terry P.; Anderson, Kristen D.; Connolly, Sean R.; Heron, Scott F.; Kerry, James T.</td>
<td>2018</td>
<td>Spatial and temporal patterns of mass bleaching of corals in the Anthropocene</td>
<td>Science</td>
<td></td>
</tr>
<tr>
<td>Cinner, Joshua E.; Huchery, Cindy; MacNeil, M. Aaron; Graham, Nicholas A. J.; McClanahan, Tim R.</td>
<td>2016</td>
<td>Bright spots among the world’s coral reefs</td>
<td>Nature</td>
<td></td>
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<tr>
<td>Ainsworth, Tracy D.; Krause, Lutz; Bridge, Thomas; Torda, Gergely; Raina, Jean-Baptise</td>
<td>2015</td>
<td>The coral core microbiome identifies rare bacterial taxa as ubiquitous endosymbionts</td>
<td>Isme Journal</td>
<td></td>
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<tr>
<td>MacNeil, M. Aaron; Graham, Nicholas A. J.; Cinner, Joshua E.; Wilson, Shaun K.; Williams, Ivor D.</td>
<td>2015</td>
<td>Recovery potential of the world’s coral reef fishes</td>
<td>Nature</td>
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*PHOTO: Trevally school en-mass near Lady Elliot Island. Photo: Underwater Earth*